

A photograph of a Purdue University campus scene, featuring trees, a building, and a stone structure in the foreground. The image is overlaid with a yellow tint.

2019 PURDUE UNDERGRADUATE RESEARCH CONFERENCE

APRIL 4 & 9, 2019

West Lafayette, Indiana

PURDUE UNDERGRADUATE RESEARCH CONFERENCE

SCHEDULE OF EVENTS

APRIL 4, 2019 :: STEW 214

1:00 — 2:00 PM	Oral Presentations I, STEW 214
2:30 — 3:00 PM	Oral Presentations II, STEW 214
3:00 — 4:00 PM	Oral Presentations III, STEW 214

APRIL 9, 2019 :: PMU BALLROOMS

8:00 — 9:00 AM	Morning Poster Session Set-Up
9:00 — 11:30 AM	Morning Poster Symposium
12:00 — 1:00 PM	Afternoon Poster Session Set-Up
1:00 — 3:30 PM	Afternoon Poster Symposium

Oral presentation session schedule and the poster symposium layout are found later in this program.

Refreshments are available during all sessions.

There will not be an awards ceremony this year.

Purdue Undergraduate Research Conference Oral Presentation Schedule

	PRESENTATION START TIME	STEW 214-A	STEW 214-B	STEW 214-C	STEW 214-D
SESSION 1 (1 to 2pm)	1:00	<i>The Jamesian Child</i> Hang Ma College of Liberal Arts	<i>Data Use and Privacy in the Public Sector</i> Sarah Rodenbeck College of Science Honors College	<i>Fatigue in Collegiate Aviation</i> Erik Levin Polytechnic Institute	<i>The Near Tragedy of Gemini 8: How Neil Armstrong's First Space Mission was almost his Last</i> Sam Conkle College of Engineering Apollo in the Archives
	1:20	<i>The Magic of Waiting: the Art of Queuing in Walt Disney World</i> Amanda Evans College of Liberal Arts	<i>Perceptions of Ally Confrontations</i> Celine Jusuf College of Health & Human Sciences	<i>A Comparison of Bioavailability between Two Different-Sized Magnesium Supplements</i> Jiada Zhan College of Health & Human Sciences	<i>Steering Saturn: It Took More Than a Calculator to get Armstrong on the Moon</i> Alex Crick College of Science Apollo in the Archives
	1:40	<i>Amelia Earhart: Feminist or Not?</i> Rachel Small College of Liberal Arts Archival Research Selection	<i>Optimize the Detection of N-Terminally Methylated Protein Substrates in Cell Lysates</i> Daniel Adeniji College of Pharmacy	<i>A Pilot Study of the Communication Barriers of Mandarin-Speaking International Students in American Colleges</i> Yuqing Wu Polytechnic Institute	<i>Female Strength in Tolkien's The Lord of the Rings</i> Zoe Franznick College of Liberal Arts
SESSION 2 (2 to 3pm)	2:00	<i>Effect of Hypoxia on Breast Cancer Cells</i> Hyesoo Chae College of Pharmacy Honors College	<i>Developing a Cell-Free System for Assessing On/Off-Target Activities of Argonate-Based Gene-Editing Tools</i> Zach Hartley College of Agriculture	<i>Whole-Brain Approaches for Investigating Iron Accumulation by R2* show no Excess from Occupational Exposure to Welding Fumes</i> Jennifer Davis College of Health & Human Sciences Interdisciplinary Research Selection	<i>Space Food between the Moon and Mars: Contributions from Purdue University</i> Celine Chang College of Engineering Apollo in the Archives
	2:20	<i>Discovering the Effects of Study Abroad within Participants' Lives</i> Laura Duke College of Education		<i>A Thrombin-Activated PAR-1 Pathway Drives Pancreatic Ductal Adenocarcinoma (PDAC) Growth and Metastasis</i> Emily White College of Science Honors College	<i>Neil Armstrong by the Numbers: Tracing the Small Steps to the Moon</i> Jaehyeok Kim College of Engineering Apollo in the Archives
	2:40	<i>Politics on the Periphery: Oscar Ewing and a Special Relationship with Israel</i> Sarah Weaver College of Education Archival Research Selection	<i>Food Safety Knowledge and Perception of Young Adults with Shared-Use Kitchens</i> Emily Chuang College of Agriculture	<i>Drying LAMP Reagents for Increased Portability and Usability of Point-of-Care Diagnostics</i> Lauren Jankowski College of Engineering Honors College	<i>Remembering Apollo: Criticism & Celebration</i> Tyler Mahlmann College of Engineering Apollo in the Archives
SESSION 3 (3 to 4pm)	3:00	<i>Perceptions of Campus Social Climate Among Racial and Ethnic Minority Students in Different Political Areas: A Multi-Institutional Analysis</i> Maya Black College of Science Honors College	<i>Size Distribution of Nicotine Aerosol Particles Produced Using a Vibrating Mesh Nebulizer</i> Alec Graff College of Health & Human Sciences Interdisciplinary Research Selection	<i>Employment Law: Antidiscrimination and Privacy Regulations Related to Genetic Information</i> Ethan Hicks Krannert School of Management Honors College	<i>Relation of Demographic and Socioeconomic Factors to Superfund Site Location in Indiana</i> Hannah Gallion College of Health & Human Sciences
	3:20	<i>Puzzle Theory: The Successful Puzzle Narrative in Detective Fiction & Gaming</i> Zoe Franznick College of Liberal Arts	<i>Catalyzing Change in the Energy Field</i> Ethan Edwards College of Engineering Honors College	<i>Employment Law: The Cost of Economic Gain</i> Samantha Kannmacher Polytechnic Institute	<i>"Experience is the Teacher of All Things": Examining the Connection between University Experiences and an Educator's First Year in the Classroom</i> Madeline Rhea College of Education
	3:40	<i>The Dehumanization of Immigrants and Refugees: A Comparison of Dehumanizing Rhetoric by All Candidates in Three U.S. Presidential Elections</i> Amanda Warnock College of Liberal Arts College of Health & Human Sciences Honors College Archival Research Selection	<i>Repurposing Acetazolamide as an Inhibitor of Vancomycin-Resistant Enterococcus</i> Amanda Graboski College of Pharmacy Interdisciplinary Research Selection	<i>Food Safety Education Among Health Professionals in China and Peru</i> Han Chen College of Agriculture	<i>Effect of Biomass Ashes on the Heat Resistance of Mortars in Function of Curing Temperature</i> Alice Ikuru College of Engineering

Archival research and "Apollo in the Archives" selections determined by the Purdue Archives & Special Collections.
Interdisciplinary research selections determined by Purdue University Libraries & School of Information Studies.

Start Time: 1:00pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Liberal Arts

The Jamesian Child

Author:

Hang Z. Ma

Abstract:

Beginning, notably, with Jean-Jacques Rousseau's "Emile," that the child could exercise reason and autonomy developed in the late-eighteenth century. In the literature of the nineteenth, we see authors experiment such an idea. As a realist concerned with the limitations of language and subjectivity, Henry James used children to expose the society in which they lived. By placing them at the heart of his plots, the writer exploited the linguistic gap and the inherent inaccessibility between children and adults. Studying the children in Henry James' novels provides a critical analysis into their rôle as the moral center of it all. Looking at "The Portrait of a Lady," "What Maisie Knew," and "The Pupil," I will argue that children are far from passive plot devices; that they define, through their interactions with the world around them, in fact the novel's standards for moral behavior. In doing so, this paper seeks not only to explore the historical representation of childhood, but also present the basis for our thinking today.

Research Mentor: Derek Pacheco, English, Liberal Arts;

Start Time: 1:00pm :: **Room:** Stewart 214-B :: Social Sciences/Humanities

College of Science; Honors College

Data Use and Privacy in the Public Sector

Author:

Sarah Rodenbeck

Abstract:

While having access to many of the same technological capabilities as the private sector, the public and nonprofit sectors raise very different questions in terms of data use practices and privacy. The goal of the public and nonprofit sectors are to provide benefits to society at a larger level, not to make a profit. Such services have the potential to save lives, for example by using cell phone location data to find survivors after a disaster. However, this data is often comprised of highly personal and identifiable information, which if revealed could be used to a person's detriment. Many of the current regulations concerning the use of data by federal agencies such as FEMA were created almost forty years ago, have many loopholes, or are not transparent. Technology and the field of data have fundamentally changed, and current regulations may fail to allow for the positive potential of emerging technologies to benefit individuals. However, they also are not equipped to handle some of the emerging privacy concerns, especially as they relate to historically underserved populations. Current regulations must be re-evaluated to allow for greater data collection and use, but with an increased focus on data access protocols and transparency to prevent data from being used against people. Additionally, checks and balances must be put into place recognizing the potential for biased data and algorithmic discrimination.

Research Mentor: Dr. Lindsay Weinberg, Honors College;

Start Time: 1:00pm :: **Room:** Stewart 214-C :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Fatigue in Collegiate Aviation

Author:

Erik Levin

Abstract:

The threat of fatigue to aviation safety is not fully understood. Contrary to mechanical defects, evidence for pilot fatigue is difficult to identify. Therefore, fatigue is rarely considered as a contributing factor in accidents or incidents. Although approximately seven percent of aircraft accidents have been associated with fatigue, this number is likely underestimated. According to the National Transportation Safety Board (NTSB), from January 2000 through December 2018, a total of eighty-five general aviation (GA) aircraft accidents in which fatigue was cited as a causal factor occurred in the United States. Of those accidents, eighty-two resulted in fatalities and twenty-six in destroyed aircraft. Participants were recruited from a Midwestern university's accredited Part 141 flight school and a partner fixed base operator (FBO). The researcher of this study used a survey questionnaire to gather quantitative and qualitative responses. Many respondents reported fatigued stemming from sleep quantity or quality deficits. The primary contributing factors included an insufficient resting time and an inadequate work-free time balance. Daily free time activities conducive to healthy sleep patterns were frequently neglected. Furthermore, several other factors that affected participants' lifestyles resulted from demands imposed by the college environment. Findings from this study can assist the GA community in gaining a greater understanding of how collegiate aviation students perceive, process, and manage the risk of fatigue in aviation.

Research Mentor: Dr. Flavio A.C. Mendonca; Dr. Julius Keller

Start Time: 1:00pm :: **Room:** Stewart 214-D :: Social Sciences/Humanities

College of Engineering

The Near Tragedy of Gemini 8: How Neil Armstrong's First Space Mission was almost his Last

Author:

Sam Conkle

Abstract:

As the space race heated up in the sixties, NASA was scrambling to get ready to put a man on the moon. Though the Apollo program is the one that landed the U.S. on the moon, the Gemini program ensured we had the necessary training and technology to make it to the moon and back. The Gemini 8 mission represented many firsts in NASA's long journey to the moon. It was the first attempt at docking, an essential and technologically challenging step that is often overlooked in the grand scale of the moon landing.

It was also Neil Armstrong's first mission in space and in the command pilot seat of a spacecraft, marking the beginning of his path to become the first person on the moon. However, the mission also could have led to a lot of lasts, for both NASA and Armstrong.

Once docked with the Agena, Armstrong and Scott found themselves in the first critical-in-space emergency in NASA history, as the craft began to spin out of control. If it wasn't for Armstrong's quick actions and level-headed thinking, both him and David Scott would have perished, most likely taking NASA and the Apollo missions with them. In the aftermath of the near disaster, NASA was quick to understate the severity of the failure, but the months leading up to the launch were marred with engineering mistakes and administration oversight. By looking through archival sources from Armstrong himself, it's shockingly clear to see how close NASA's race to the moon almost took two astronauts to the grave.

Research Mentor: Dr. Michael Smith, Department of History, College of Liberal Arts;

Start Time: 1:20pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Liberal Arts

The Magic of Waiting: The Art of Queuing in Walt Disney World

Author:

Amanda Evans

Abstract:

This paper highlights some key research done on Experience Architecture and intentional design in Walt Disney World. The research was conducted primarily online and resulted in a larger understanding of the way that the physical design of Walt Disney World affects its guests. The paper starts with an introduction to the design principles studied the shaped the foundation of the conclusions, then explores examples from areas of Magic Kingdom, like Main Street U.S.A. and Liberty Square. Then, a closer look at a ride queue that is extensively themed to manipulate guest experience.

Research Mentor: Dr. Michael Salvo, Professional Writing, College of Liberal Arts;

Start Time: 1:20pm :: **Room:** Stewart 214-B :: Social Sciences/Humanities

College of Health and Human Sciences

Perceptions of Ally Confrontations

Author:

Celine Jusuf

Abstract:

Research related to interpersonal confrontations, where one person points out a way in which another person had engaged in stereotypical or prejudicial bias, has provided a wealth of knowledge about factors that influence the extent to which confrontations reduce bias (e.g., Czopp, Monteith, & Mark, 2006; Chaney & Sanchez, 2017; Mallet & Wagner, 2011; Parker, Monteith, Moss-Racusin, & Van Camp, 2018). However, how do minority-group members perceive confrontations on behalf of their social/ethnic group, and does group membership of the confronter matter? The present experiment investigates how Asian women perceive confrontations of prejudice against their group when performed by an Asian woman, White woman, or Black woman. We are especially interested in testing whether confrontations provide contextual cues to safety (Wout, Murphy, & Sabrica, 2014) signaling that Asian women are valued and belong in a given setting. We examine whether the greater the amount of social identity overlap between the Asian women participants and the confronter, the greater safety and belonging participants will feel in the setting in which the confrontation took place. Results indicate that biased remarks without confrontation significantly lower participants' sense of belonging within a group along with other dependent variables compared to a condition in which no biased remark is made. Confrontations do not significantly heighten these results and serve as a safety cue, but White confronters show a tendency to be marginally effective at increasing these dependent variables.

Research Mentor: Dr. Margo Monteith, Psychological Sciences, Health and Human Sciences;

Start Time: 1:20pm :: **Room:** Stewart 214-C :: Life Sciences

College of Health and Human Sciences

A Comparison of Bioavailability between Two Different-Sized Magnesium Supplements

Author:

Jiada Zhan

Abstract:

Magnesium is an essential nutrient for the human body. However, half of the United States (US) population fails to consume an adequate amount of magnesium from foods. Current magnesium supplements can increase the magnesium intake, but they may cause side effects like diarrhea if given in a high dose. There is no known study in humans that compares the bioavailability of two different-sized magnesium salts. Also, few studies assessed the blood concentration of ionized magnesium (iMg), but iMg was thought to be the active form of magnesium. Our hypothesis is that decreasing the particle size of magnesium supplement may increase the bioavailability and reduce the side effect. The objectives of this study was to address the gap in the literature by comparing the magnesium bioavailability between two different-sized magnesium supplements: ReMag (picometer-sized magnesium chloride) and Natural Vitality Calm (normal-sized magnesium citrate) using the blood iMg. We conducted a preliminary analysis of 9 participants by performing 3 Matched pairs t-tests. The results showed that over 24 hours following administration of supplements, no significant differences of bioavailability were found between ReMag and Natural Vitality Calm. Also, blood iMg seems to be a more reliable indicator of magnesium status compared to serum Mg concentration and urine total Mg. Our findings did not support our hypothesis that ReMag would be more bioavailable because of the smaller particle size.

Research Mentor: Nana Gletsu Miller, PhD, Department of Nutrition Science, College of Health and Human Sciences;

Start Time: 1:20pm :: **Room:** Stewart 214-D :: Mathematical/Computational Sciences

College of Science

Steering Saturn: It Took More Than a Calculator to get Armstrong on the Moon

Author:

Alex Crick

Abstract:

The task of sending astronauts to the moon was not an easy one. Hundreds of companies along with hundreds of thousands of people worked tirelessly towards one goal: the Moon, by way of the Saturn V rocket. The team of software engineers at the Massachusetts Institute of Technology (MIT) wrote thousands of lines of code that guided the Command and Service Module (CSM) and Lunar Expeditionary Module (LEM), propelling their cargo through open space towards the Moon in order to orbit and land, and then safely return to Earth. The code gave life to the crucial functions of the Apollo Guidance Computer (AGC) that steered Saturn's upper stages to the moon. We tend to diminish its historical role given its rather weak calculating power, at least relative to contemporary computing. Yet the code and AGC were, for their day, cutting edge. The challenge of the astronauts was to learn about the fledgling field of computer science in order to understand this code and the basics of the AGC. This was especially true for Neil Armstrong, who both depended on its automatic guidance and control, and was forced to override the very system that was guiding him to the moon. The advancements made by the AGC also created the practical means of augmenting human performance and, thanks to its size, power, and ease of use, create new possibilities like fly-by-wire technology and the personal computer.

Research Mentor: Michael G. Smith, History, College of Liberal Arts;

Start Time: 1:40pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Liberal Arts

Amelia Earhart: Feminist or Not?

Author:

Rachel Small

Abstract:

Amelia Earhart is presently acknowledged for her work as an activist towards women's rights within the aviation industry and is regarded highly by feminists abroad as a role model for girls and women alike. The first purpose of this research was to analyze primary sources within the George Palmer Putnam Collection of Amelia Earhart papers at Purdue University's Archives and Special Collections as support towards A.E.'s feminist activism. The second purpose of this research was to highlight the implications modern ideas have on our understanding of the past. Both purposes required using the critical archival approach, which establishes the archive as a place of power and bias. This resulted in asking questions like, "Was Amelia Earhart a feminist during her lifetime?" and "What did the term 'feminist' mean in the 1930s?" This study acknowledged the archive's primary sources as fractional and adopted secondary sources as alternate perspectives for a more holistic analysis. A major finding of this study was that one primary source contradicted the modern perception of Amelia Earhart as a feminist activist. It was concluded that due to the nature of an archive, there will always be a bias in deciding if Amelia Earhart was a feminist or not.

Research Mentor: Sammie Morris, Purdue Libraries, Head Archivist; Kendall Roark, Anthropology, Liberal Arts

Start Time: 1:40pm :: **Room:** Stewart 214-B :: Life Sciences

College of Pharmacy

Optimize the Detection of N-Terminally Methylated Protein Substrates in Cell Lysates

Author:

Daniel Adeniji

Abstract:

N-terminal methylation is a form of post-translational modification done on proteins specifically by N-terminal methyltransferase (NRMT1/2). Mutations in these enzymes are linked to the causes of cancer; whereby, they hinder the DNA repair mechanism. To further understand N-terminal methylation on protein substrate, this research focuses on identifying the presence of N-terminal methylation on a wild type protein substrate (WT), and the absence of N-terminal methylation on a Tae-1 deleted protein substrate (Tae Δ 1). Both protein substrates are extracted from a yeast cell. Protein Substrate extracted from yeast cells were suited for this experiment due to yeast cells eukaryotic similarities with human, and they divide a lot faster. To observe these genotypic changes, optimizing our western blotting technique was very essential for an accurate result. Thus, this research utilized different blocking agents and conditions to observe the genotypic change. Optimizing the western blotting procedure with the use of centrifugated 5% milk, DNase, prolong experimental duration, varied amount of PBST, and varied dilution folds of the antibody and antibody with the blocking agents enabled us to obtain a clearer result that allowed us to distinguish between methylation presence or absence in the targeted yeast strains. Interestingly, we observed an extra MW bound on the WT strain lane; this is a clear indication of the methylation activity present in this strain – the status of this extra is a potential focus for our future experiment.

Research Mentor: Dr. Tony Hazbun, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy; Panyue Chen, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy

Start Time: 1:40pm :: **Room:** Stewart 214-C :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

A Pilot Study of the Communication Barriers of Mandarin-Speaking International Students in American Colleges

Author:

Yuqing Wu

Abstract:

The goal of this study is to mitigate the communication barriers caused by English for Mandarin-speaking international students in American colleges by providing information on accessible resources with a digital solution. This study utilized the user experience design approaches, including semi-structured interviews, workshop, and prototyping, to understand the roots of the problem and to propose a potential solution. It is suggested that communication barriers are only applicable to students who have specific communication needs. Long-term interests, altruism, and empowerment play huge roles in aiding international students to alleviate their communication barriers. In this paper, we brought insights from the primary research to effective action, proposing a mobile App design that introduces local resources to international students. Educators might consider paying extra attention to the communication problems Mandarin-speaking students currently face and employing technical interventions to allay the communication barriers.

Research Mentor: Austin L Toombs, Department of Computer Graphics Technology, Polytechnic Institute;

Start Time: 1:40pm :: **Room:** Stewart 214-D :: Social Sciences/Humanities

College of Liberal Arts

Female Strength in Tolkien's The Lord of the Rings

Author:

Zoe Franznick

Abstract:

Despite its continued popularity in fantasy fiction, many have condemned Tolkien's *The Lord of the Rings* (LOTR) as a misogynist work due to both the prevalence of male characters and the apparent misrepresentation of the few women who are in the novel as passive, citing the shield-maiden Eowyn as the exception which proves the rule. This paper asserts that this view is a misinterpretation of Tolkien's work, arguing that not only is it a reading which fails to accurately understand the main female characters' motivations and roles, it also implies that Tolkien's female characters must act out a singular representation of what a "strong female character" must be— a shield-maiden in battle. Rather, this paper demonstrates that each of the female characters in LOTR portrays a different representation of an empowered, strong woman in Middle-earth; in fact, Eowyn must face her own personal struggle as one of the least empowered female characters in Tolkien's novel before she finds her internal strength alongside the other women in Middle-earth. This paper illustrates that Tolkien argues that women need not only wield swords or play a dramatic role in a narrative, as Eowyn does, in order to be well-represented female characters, but may also hold empowered roles as counselor, exemplified by Arwen and Galadriel. Each of these women is depicted in a positive and even regal light, illustrating Tolkien's favorable representation of women in *The Lord of the Rings*.

Research Mentor: Shaun Hughes, Department of English Language and Linguistics, College of Liberal Arts;

Start Time: 2:00pm :: **Room:** Stewart 214-A :: Life Sciences

College of Pharmacy; Honors College
Effect of Hypoxia on Breast Cancer Cells

Author:

Hyesoo Chae

Abstract:

Breast cancer is the second most commonly diagnosed cancer among women in the United States. Although survival rate of breast cancer patients is high when the cancer is localized, survival rate is drastically decreased when cancer cells escape the local environment of the breast and invade distant secondary organs, a process known as metastasis.

Evidence shows that presence of hypoxia, or low oxygen tension, is positively associated with metastasis in cancer patients. Hypoxia is capable of drastically altering gene expression, including genes that regulate cell metabolism. However, the extent to which hypoxia differentially modifies gene and protein expression in non-metastatic compared to metastatic breast cancer cells is still not fully understood. My research in particular focuses on determining the effects of hypoxia on survival and migration in non-metastatic compared to metastatic breast cancer cells. MTT and wound healing assays were used to study these processes in breast cancer cells in either environmental (~20%) or hypoxic (1% oxygen) conditions. Our results show that hypoxia significantly increases viability of non-metastatic breast cancer cells, but not metastatic breast cancer cells. When determining the effects of hypoxia on cell migration, no significant differences were found in migration rates in non-metastatic or metastatic cells after 20 h in hypoxia. Our future work will determine whether altering the time that cells are exposed to hypoxia can significantly change migration rates. The overarching goal of my research is to determine the metabolic effects of hypoxia in metastatic and non-metastatic breast cancer cells.

Research Mentor: Dorothy Teegarden, Nutrition Science, Health and Human Sciences;

Start Time: 2:00pm :: **Room:** Stewart 214-B :: Life Sciences

College of Agriculture

Developing a cell-free system for assessing on/off-target activities of Argonaute-based gene-editing tools

Author:

Zachary Hartley

Abstract:

Prokaryotic Argonautes (pAgos) have recently been shown as programmable DNA endonucleases, rivaling the widely used gene-editing tool--CRISPR/Cas system, as pAgos do not require a specific DNA sequence to cut. In spite of attractive characteristic, there is no a simple, rapid, and straightforward method to quantify the on- and off-target activities of pAgos. Here, we developed a cell-free system with fluorescent outputs to quantify on/off-target activity within 24 hours. Unlike in vivo methods, the cell-free system allows a quantitative way to measure without worrying about transcription/translation variance in a living system. Our system is designed to use four plasmids harboring a T7 RNA polymerase (T7RNAP), a pAgo driven by a T7 promoter, Red Fluorescent Protein (RFP), and Green Fluorescent Protein (GFP), individually. T7RNAP is expressed first to induce pAgo expression. With programmable guides, pAgo can target either RFP or GFP, resulting in lower output. By measuring the outputs of RFP and GFP, we can assess the on-target and off-target activity of pAgo. We have already engineered both fluorescent proteins to have the same backbone so they will be expressed equally. Collectively, we developed an easy, fast, and straightforward system to assess on-target and off-target activity of candidate pAgo, facilitating the development of the next-generation gene-editing tool.

Research Mentor: Dr. Kevin Solomon, Biological Engineering, College of Agriculture; Kok Zhi Lee, Biological Engineering, College of Agriculture

Start Time: 2:00pm :: **Room:** Stewart 214-C :: Life Sciences

College of Health and Human Sciences

Whole-Brain Approaches for Investigating Iron Accumulation by R2* show no Excess from Occupational Exposure to Welding Fumes

Author:

Jennifer Davis

Abstract:

Iron (Fe) is commonly found in elevated quantities in the human brain afflicted by neurodegenerative diseases. While it is unknown how Fe plays in the etiologies of these diseases, welders inhale large quantities of metal particulates in welding fume, including iron (Fe) and manganese (Mn). Mn is a neurotoxin that has been shown to accumulate in the brains of welding fume exposed workers by increasing the magnetic resonance imaging (MRI) R1 contrast. R1 and R2* are MRI parameters that are proportionate to Mn and Fe accumulation, respectively. Measurements of Mn in the brain could be confounded by accumulated Fe, mostly altering R2* contrast, but also R1 contrast to some degree. Therefore, monitoring the amount of Fe accumulating in welders is of consequential interest. While some groups, including our own, have reported increased R2* levels in region-of-interest (ROI) based analyses, such findings were inconsistent and targeted few brain regions. To enable an unbiased whole-brain analysis of Fe accumulation in the brain using MRI, 47 welders and 38 controls were recruited from a local manufacturer. Whole-brain R2* maps were co-registered with T1-weighted structural images using SPM12 and then segmented into 192 different brain regions using Freesurfer. R2* in these segmented ROIs within the brain (e.g. white matter tracts and basal ganglia nuclei) were separately averaged and compared between welders and controls. Student's t-tests showed no statistically significant differences between controls and welders. Therefore, a more comprehensive analysis using machine learning was used to determine if any patterns using all 192 regions could discriminate between controls and welders. Principle component analysis (PCA) was performed on five different statistics of R2* distributions in

each ROI: mean, median, skew, 90thpercentile, and maximum value. For example, PCA performed on R2* mean showed that only 32 principle components (PCs) were required to explain 90% of all variation in mean between all 192 ROIs. A support vector machine (SVM) with a linear kernel was employed using these 32 PCs but could not distinguish between welders or controls better than chance. Similar results were found for the other four statistics. These null results suggest that R2*, and thus brain Fe accumulation, cannot distinguish welders from controls. This provides some evidence that measures of Mn accumulation shown in previous work in the same cohort is only caused by elevated Mn brain

levels and not confounded by elevated iron levels.

Research Mentor: Dr. Ulrike Dydak - Health Sciences (HHS); David Edmondson, PhD candidate - Health Sciences (HHS)

Start Time: 2:00pm :: **Room:** Stewart 214-D :: Social Sciences/Humanities

College of Engineering

Space Food between the Moon and Mars: Contributions from Purdue University

Author:

Celine Chang

Abstract:

Space food may not be the star of space travel, but the public has always been intrigued by its essential, if somewhat unglamorous, role. History records that Yuri Gagarin consumed the first food in space on April 12, 1961, squeezing beef and liver paste from metal tubes, followed by liquefied chocolate for dessert. More recently, space food received its two seconds of fame in the movie, *First Man* (2018), when Neil Armstrong opened a package of an unknown mush during his Gemini 8 mission. None of this sounds very appetizing. Yet these were beginnings.

Today, astronauts aboard the International Space Station (ISS) have better and more choices for space food, with over 250 different meal options, all prepared in a kitchen at the National Aeronautics and Space Administration (NASA). Some sixty years after Gagarin, the single most challenging obstacle remains weight. It costs around \$10,000 for each pound of space food. This problem is mostly solved by freeze drying, a process which removes 97% of the water. Yet as the time humans spend in space increases, food will become more important to long-term space travel, as for example when we will need a whole new way of growing our own food in a colony on Mars. This article explores the unique contributions to the development of space food by the students, professors, and alumni of Purdue University through the lens of its archives and interviews. They are continually trying to make food better to ensure that the astronauts have a link to their home culture and tastes, as they explore longer and farther away from earth.

Research Mentor: Michael G. Smith, Department of History, College of Liberal Arts; Tracy B Grimm, Associate Head of Archives and Special Collections and Barron Hilton Archivist for Flight and Space Exploration, Purdue Libraries

Start Time: 2:20pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Education

Discovering the Effects of Study Abroad within Participant's Lives

Author:

Laura Duke

Abstract:

Study Abroad at Purdue University has grown immensely in the past five years. As more students are taking advantage of this opportunity, it begs the question of how these programs affect participants' personal and professional lives. For ten years, the College of Education has sponsored a Maymester program that allows students to spend 4 weeks in Tanzania. This program has been popular among students ever since its first year, and to date over 150 students have participated. The research question we seek to answer in this study is how/in what ways has this study abroad program fit into your life journey? There are 4 subset questions to fully answer that question; (1) What experiences led you to participate in this study? (2) In what ways was the program influenced by your participation? (3) In what ways did the program impact your subsequent experiences? and (4) How did your experience impact others? Narrative inquiry is increasingly used in educational studies because this notion of studying human experiences translates into the view that education is the construction and reconstruction of personal and social stories; teachers and learners are storytellers and characters in their own and other's stories (Connelly and Clandinin, 1990, p. 2). Through the use of a survey, data collection is currently being analyzed through narrative inquiry before moving onto more in-depth accounts from participants. The survey was sent to a sample of 136 participants who participated in this program to understand what experiences each student brought into the program, how they affected the program, and how the program has impacted their lives since their participation.

Research Mentor: Jill Newton, Curriculum & Instruction, College of Education;

Start Time: 2:20pm :: **Room:** Stewart 214-C :: Life Sciences

College of Science; Honors College

A thrombin-activated PAR-1 pathway drives pancreatic ductal adenocarcinoma (PDAC) growth and metastasis

Author:

Emily White

Abstract:

Pancreatic ductal adenocarcinoma (PDAC) is a lethal cancer characterized by a wide range of mutations and a dense stromal environment that makes the disease resistant to chemotherapy. This chemoresistance, coupled with late stage diagnoses, often leads to fatal prognoses for patients diagnosed with PDAC. The purpose of this study is to define the role of a key G-protein coupled receptor, PAR-1, in PDAC malignancy, with the overall goal to identify potential targets for therapeutic intervention. Previous studies have shown that the PAR-1 pathway is thrombin-activated which provides a mechanism of experimental control over its activation. In vitro transwell migration and adhesion assays were used to measure metastatic abilities of a representative PDAC cell line, KPC2, in the presence or absence of thrombin. Additionally, tail vein injection assays were utilized to measure the in vivo metastatic ability of the KPC2 cell line. Initial results have provided evidence that the PAR-1 pathway is critical for pancreatic tumor development and metastasis. As this research project progresses, further work will be done to characterize specific downstream factors under the control of PAR-1, which will contribute to the understanding of how this pathway is inducing tumor progression.

Research Mentor: Dr. Stephen Konieczny, Biological Sciences, College of Science;

Start Time: 2:20pm :: **Room:** Stewart 214-D :: Social Sciences/Humanities

College of Engineering

Neil Armstrong by the Numbers: Tracing the Small Steps to the Moon

Author:

Jaehyeok Kim

Abstract:

On July 20, 1969, three valiant men from the Earth visited our closest planetary neighbor and set a foot on the Moon. As Neil Armstrong had it in his famous first words on the surface, "That's one small step for a man, one giant leap for mankind." The media celebrated Neil Armstrong and his crew members as conquerors. They praised Armstrong, the captain of the mission, as the ultimate hero, a symbol of mankind's glory in the "giant leap." Yet we also ought to remember Armstrong's many "small steps" that prepared him to explore space, to pilot a spacecraft, and to fulfill a mission. The two primary instruments of the entire Apollo 11 mission, Armstrong as astronaut and the Lunar Expeditionary Module (LEM) he piloted, formed a strong human-machine complex and interacted with each other through their journey. Armstrong represented the ultimate human element of the Apollo project, the aspect we all try to acknowledge yet still somehow diminish. He was at the pinnacle of Apollo's hierarchies of numbers and functions, stages and modules. By the measure of his own heartbeat, he helped achieve the Apollo 11 mission's success.

Research Mentor: Michael G. Smith, Department of History, College of Liberal Arts;

Start Time: 2:40pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Education

Politics on the Periphery: Oscar Ewing and a Special Relationship with Israel

Author:

Sarah Weaver

Abstract:

This paper will show that Oscar Ewing strategically utilized his political influence and role as US Federal Security Administrator—not diplomat or member of the State Department—to impact US policy toward Israel. Ewing contributed to the early development of the well-known “Special Relationship” between the United States and Israel. Ewing is a relatively unknown name in the history of the Truman administration and Israel, but his influence is significant. In this abridged version of the larger paper, I explain the process by which Oscar Ewing gains close proximity to President Harry S. Truman and utilizes his social welfare position to impact his larger goals for US foreign policy. Informed by archival material from several national libraries, this paper provides deeper understanding of the key actors involved in building the unique relationship with Israel that the United States maintains to this day.

Research Mentor: Dr. Stacy Holden, Department of History, College of Liberal Arts;

Start Time: 2:40pm :: **Room:** Stewart 214-B :: Social Sciences/Humanities

College of Agriculture

Food Safety Knowledge and Perception of Young Adults with Shared-Use Kitchens

Author:

Emily Chuang

Abstract:

Introduction: A recent national survey reported that nearly one third of the U.S. adults live in a shared household. The impact of shared-use residential kitchens on food safety has not been adequately explored. This study uses a young adult population to pilot study.

Purpose: To examine the effect of living with or without roommates on their perception of kitchen cleanliness, food safety knowledge and practice.

Methods: An online survey (Qualtrics, Provo, UT) was developed containing questions on demographic, perception of kitchen cleanliness, food safety knowledge and practice. Upon approval of Purdue University IRB, the survey link was sent to a listserv of all registered Undergraduate and Graduate students at Purdue University, West Lafayette.

Results: A total of 2214 students (60% reported to be female, 79% between 18 to 24 years of age) completed the survey. 66% of respondents confidently answered that they keep the kitchen clean. 25% of respondents believed that their roommates did not keep the kitchen clean. 53% of students that live alone report that they believe that their kitchen would be the same if they lived with a roommate and 35% believe that it would be worse. Over half (56%) of those with roommates believed that the state of the kitchen would be better if they did not have roommates compared to the condition. From this, it is determined that students themselves believe that they keep the kitchen more clean than their roommates and that most students believe that living with roommates will mean that the kitchen will likely be less clean. Over 90% students responded that they are willing to improve their safe food handling practices if materials were available. Young adults seem to be more willing to change their habits so a part II will be administered to see if given reading or video educational material on food safety and roommate communication skills will improve the condition of the kitchen as well as the relationship of those who share the kitchen.

Significance: Risks of foodborne illnesses in young adults can be reduced with proper food safety educational interventions and peer communication strategies. This study can also aid in other shared-use kitchen situations such as public or subsidized housing, and commercial shared-use kitchens.

Research Mentor: Dr. Betty Feng, Food Science, College of Agriculture;

Start Time: 2:40pm :: **Room:** Stewart 214-C :: Life Sciences

College of Engineering; Honors College

Printing and Drying of RT-LAMP Reagents for Increased Portability and Usability at the Point of Care

Author:

Lauren Jankowski

Abstract:

The field of molecular diagnostics has advanced rapidly in the past decade; however, the widespread use of molecular diagnostic devices is extremely limited by the equipment and conditions required for use. Further, complicated steps often require the user to have had scientific training. Creating a novel methodology for the storage of loop-mediated isothermal amplification (LAMP) reagents would allow for increased portability and usability for any pathogen-detecting point-of-care device that utilizes LAMP. A method was designed to deposit, dry, and store LAMP reagents at room temperature, eliminating the need for cold-chain storage. Reagents are separated into primer and enzyme groups to prevent premature amplification. A layered design is used to minimize the time taken for reagents to diffuse and mix upon rehydration. The primer layer is deposited on polyethylene terephthalate film and allowed to dry completely before the enzyme layer is deposited directly on top of the primer. Upon usage, the reagents are rehydrated with buffer and pathogen sample and heated at 65 C. Heating time depends on the specific pathogen being tested. Dried reagents can be rehydrated and successfully amplify sample after three weeks of storage. The method presented has been shown to be viable for the amplification of both bacterial and viral pathogens.

Research Mentor: Dr. Jacqueline Linnes, Weldon School of Biomedical Engineering; Taylor Moehling, PhD Candidate, Weldon School of Biomedical Engineering

Start Time: 2:40pm :: **Room:** Stewart 214-D :: Social Sciences/Humanities

College of Engineering

Remembering Apollo- Criticism & Celebration

Author:

Tyler Mahlmann

Abstract:

Many of those who were alive in the 1960s remember the Apollo 11 mission as a scientific and cultural phenomenon, perhaps the most ambitious endeavor mankind has ever undertaken and accomplished. Yet with every great project comes great cost, and recently several works have come out delineating the massive drawbacks of the Apollo program. These works, building off the criticisms made in the 1960s with the hindsight of today, have declared the Apollo missions as political folly. Analyzing the wide variety of primary sources left from this era reveals that, regardless of the possible validity of the criticisms, they have been outshone by the many admirations at the time and since.

This paper delves into select archival sources to sample the American public's reaction to the Apollo program during its missions. After the true goal of the program had been realized in the summer of 1969, many commentators were left with a deep but vague wonder. What was the meaning of these landings—what was their purpose, and how would they influence the future? The reactions were polarized. While the criticisms of Apollo revolve around the inordinate amount of time, money, and effort required to bring a man to the moon and back, this is also the precise reason for celebrating the project. Apollo 11 represented a demonstration of American and human capability—a capstone project in which its greatest boon was simply its accomplishment. The romanticism of such a unilateral, historical, and seemingly impossible goal as landing on the moon sparked the imagination of millions and continues to even today.

Research Mentor: Professor Michael G. Smith , History, Humanities/Soc. Sci.; Archivist Tracy Grimm , Purdue University Libraries-ASC

Start Time: 3:00pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Science; Honors College

Perceptions of Campus Social Climate Among Racial and Ethnic Minority Students in Different Political Areas: A Multi-Institutional Analysis

Author:

Maya Black

Abstract:

Campus social climate is an often forgotten, but highly impactful variable to the minority student experience at universities, particularly at Predominantly White Institutions (PWIs). Unfortunately, it is not thoroughly studied. As such, we have attempted to further understand how campus social climate can potentially impact minority students. Through this project, we have worked to see if there are disparities in perception of campus social climate correlated to race. More specifically, we have sought to discover correlations between more socially conservative or liberal campus social climates, defined by previous voting patterns of the state and student reported political affiliations on the SERU, and minority student experiences and disparity in perceptions of campus social climate and social belonging. Using statistical methods such as T-tests and data from the Student Experience at a Research University (SERU), we aim to see if perceptions of campus social climate and social belonging change based on different geopolitical areas across different institutions. We have established there are statistically significant differing perceptions of campus social climate and campus social belonging correlated to different racial groups across political areas.

Research Mentor: Dr. Jason Ware, Honors College;

Start Time: 3:00pm :: **Room:** Stewart 214-B :: Life Sciences

College of Health and Human Sciences

Size Distribution of Nicotine Aerosol Particles Produced Using a Vibrating Mesh Nebulizer

Author:

Alec Graff

Abstract:

With the rising popularity of electronic nicotine delivery systems (ENDS) such as electronic (e-) cigarettes with young people, continued research needs to be conducted with health effects and alternatives in mind. Even though E-cigarettes are known to be safer than traditional cigarettes, toxic metal contents generated or leached from the metallic heating coil have been found in e-cigarette fumes. One possible alternative to conventional ENDS could be a vibrating mesh nebulizer (VMN), which would eliminate contaminants given off by these metallic coils. The VMN containing 5% and 10% nicotine solutions was tested to generate the nicotine aerosols. The size distributions of produced nicotine aerosols were measured by a NanoScan scanning mobility particle sizer (SMPS) for nano-sized particles and an optical particle sizer (OPS) for micro-sized particles. Each measurement was conducted for 90 minutes. Modes were found for the NanoScan SMPS and OPS at 81.6 nm and 1337.0 nm, respectively. Total number concentrations from the NanoScan SMPS and the OPS were 9.7×10^4 particles/cm³ and 1.2×10^3 particles/cm³, respectively. From these results, it was determined that the vibrating mesh nebulizer could be a suitable ENDS alternative on this basis. Further work needs to be done with various operational conditions.

Research Mentor: Dr. Jae Hong Park, Occupational and Environmental Health, School of Health Sciences;

Start Time: 3:00pm :: **Room:** Stewart 214-C :: Social Sciences/Humanities

Krannert School of Management; Honors College

Employment Law: Antidiscrimination and Privacy Regulations Related to Genetic Information

Author:

Ethan Hicks

Abstract:

The advent of human genomics and its rapid growth over the last decade have created valuable tools, but also novel forms of discrimination and privacy invasion, many of which are related to employment. The U.S. government has enacted legal safeguards against such encroachments, the primary legislation of which is Title II of the Genetic Information Nondiscrimination Act of 2008 (GINA). The extensive and complex policies—comprised of GINA Title II, related statutes, bureaucratic regulations, and judicial opinions—impose significant liability exposure on businesses that employ 15 or more employees. For such a firm, an incomplete or inaccurate understanding of the law threatens to cause severe losses, related either to excessively cautious practices that hinder productivity or to noncompliant practices for which the government inflicts punishment. Conversely, for individuals, ignorance threatens to render the protections impotent by generating obstacles to rightful attainment of relief. These may include an inability to identify a violation, unawareness of the available means of seeking legal remedy, or filing of a technically flawed complaint. With the objective of informing firms and individuals of the law, so that the law may better concurrently protect individuals and avoid unnecessary damage to businesses, this examination first lays a sound foundation of legal analysis. It then separately addresses firms and individuals, outlining in plain language the details crucial to a company's implementation of minimally restrictive compliant policies, as well as those vital to the preservation of one's rights.

Research Mentor: Clifford Fisher, Business Law, Krannert School of Management;

Start Time: 3:00pm :: **Room:** Stewart 214-D :: Life Sciences

College of Health and Human Sciences

Relation of Demographic and Socioeconomic Factors to Superfund Site Location in Indiana

Author:

Hannah Gallion

Abstract:

EPA's superfund sites contain environmental contaminants which have the potential to cause adverse health effects on communities living near or in the area. However, there is relatively little research on the factors that may contribute to the presence of superfund sites. Therefore, the goal of this project is to determine whether county-level demographics can predict the occurrence of superfund sites in a county. The 92 counties within Indiana were included in the analysis. Data on the superfund sites was obtained from the United States Environmental Protection Agency's (EPA) National Priority List (NPL) website and demographic data was obtained from the United States Census. Multivariable linear regression models were created to identify which characteristics were associated with the number of superfund sites in a county. Models covariates included county-level data for household income, age, race, sex, obesity, and smoking. The results show that there is a significant negative correlation between the percent non-Hispanic whites living in the county and the number of superfund sites in the county. The Beta coefficient was -0.833 ($p < 0.001$) with a 95% confidence interval ($-1.043, -0.723$). The analysis shows that higher proportion of minorities is independently associated with a higher number of superfund sites per county within Indiana, whereas there was not a significant association of income, age, sex, obesity, or smoking with the number of superfund sites. Future work will evaluate relationships of superfund site location with county-level health outcomes.

Research Mentor: Dr. Ellen Wells, Health Sciences, College of Health and Human Sciences;

Start Time: 3:20pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Liberal Arts

Puzzle Theory: The Successful Puzzle Narrative in Detective Fiction & Gaming

Author:

Zoe Franznick

Abstract:

This paper examines the development of the “puzzle narrative” and its necessary elements within three mediums: detective fiction, adventure video games, and table-top role-playing games (RPGs). While many genres of novels and games include puzzles, only a few include puzzles as a form of the narrative genre itself. This distinction demonstrates that the use of the puzzle narrative creates more immersive, interesting and engaging works in any medium, namely because the puzzle narrative ensures that the intrigue of the story and the puzzle are inseparable.

The paper argues that unlike a typical puzzle, a puzzle narrative creates a deeper interaction between creator and player through three elements: a proper amount of interaction at an appropriate level for the medium, rules of fair play for creator and player, and finally, an inseparability between the puzzle and story itself. The paper further examines how the constraints of each medium—novels, video games, and RPGs respectively— vary the level of interaction the content creator has with the audience, and how that affects the puzzle narrative’s presentation within its other constraints. This paper concludes that the adventure of the mystery is found not only in solving the puzzle, but in the cohesiveness of finding the solution by players interacting with the story as a whole; a successful puzzle narrative demands interaction from the reader, establishes rules of fair play, and ensures that the puzzle is ultimately inseparable from the tale itself— its solution brings the story to its natural and satisfying end.

Research Mentor: Shaun Hughes, Department of English Language and Linguistics, College of Liberal Arts;

Start Time: 3:20pm :: **Room:** Stewart 214-B :: Innovative Technology/Entrepreneurship/Design

College of Engineering; Honors College

Catalyzing Change in the Energy Field

Author:

Ethan Edwards

Abstract:

Global demand for energy is continually increasing and it is vital that researchers discover more efficient and sustainable methods for utilizing scarce resources. Shale gas is a form of natural gas that is trapped within shale formations and has become an increasingly vital source of natural gas for the United States through the development of the hydraulic fracturing extraction process. Heterogeneous, non-acidic catalysts can be used to convert the light alkanes in shale gas to more usable and transportable products. Catalytic shale gas conversion is a two-step process that includes the dehydrogenation of light alkanes to olefins and then the oligomerization of olefins to longer chain products. These two processes are traditionally performed under different reaction temperatures and pressures. However, the two reactions are proposed to be related due to common metal-hydride and metal-alkyl intermediates. Single-site cobalt catalysts ($\text{Co}^{2+}/\text{SiO}_2$) are active in propane dehydrogenation, where the olefin selectivity was >95% at 6% conversion. This suggests that Co^{2+} forms the necessary reaction intermediates for oligomerization. This project demonstrates that Co^{2+} can also catalyze olefin oligomerization at high temperatures through dimerization tests. Dimerization tests of pure ethylene resulted in low conversions (~3%) to C4 products, along with the presence of other higher molecular weight hydrocarbons. Tests at higher pressures are expected to form liquid fuel products. This transformation to liquid fuel products will allow shale gas to be compatible with the current United States transportation infrastructure, further making it a viable alternative fuel.

Research Mentor: Dr. Jeff Miller, Davidson School of Chemical Engineering, College of Engineering; Nicole LiBretto, Davidson School of Chemical Engineering, College of Engineering

Start Time: 3:20pm :: **Room:** Stewart 214-C :: Life Sciences

Polytechnic Institute

Employment Law: The Cost of Economic Gain

Author:

Samantha Kannmacher

Abstract:

Employment Law

Some of the happiest moments of a person's life is spent with their children and family. Parents watching their children grow up is one of life's greatest adventures and treasures. What if the government said that after your child was born, you don't get paid leave from work? How would you react to that situation? The United States declared that mothers don't get paid leave after the birth of a child or an adoption. Mothers need time after child birth to recuperate and gain energy back. The stress of worrying about their job is not something that parents need after the birth of a newborn. One of the biggest issues that employers face in employment law is parental leave for their employees. If you compare the United States to countries in the European Union such as France, Ireland, and Germany, their regulations are more favorable towards paternal leave and pay. Why the difference between these European Union countries and the United States? This paper is going to explore the governmental legal regulations to determine why these countries, United States, France, Ireland, and Germany, all differ so drastically and make recommendations regarding the best form of governmental regulations for parental leave.

The United States government has a conservative stance when it comes to parental leave. This gives companies the opportunity to set their own parental leave standards as they see fit. A lot of issues stem from mothers not being treated equally because they are pregnant, and that they may not have their job when they come back after their pregnancy. The United States passed the Family Medical Leave Act (FMLA) that stated companies must give maternity leave up to at least twelve weeks for the mother of a newborn or an adopted child, and their job must be kept or be given a similar job at that level. This eliminates some stress for new parents about their employment, but all companies differ in the amount of leave time they allow. Some companies give paid maternity leave and some don't, it all depends on the company and their policies. The United States has very different policies than that of the European Union.

The three European Union countries this paper will explore are Germany, Ireland, and France. The governmental regulations vary among these three countries, but they emphasize the importance of the work/life balance and family life. The governments have different laws that emphasize different aspects of parenthood such as breastfeeding, up to a year of paid leave, and opportunities for fathers to take paid leave as well. For example, Germany offers up to three years of paid maternity leave until the child reaches the age of eight. France offers allowances for new families to support them financially throughout the first year of being parents. These countries vary in their style of liberal parental leave regulations, but have the same goal of promoting family life. Companies can offer additional benefits beyond what the government has requires, and most do. Their employment retention rates are much higher than in the United States. This paper attempts to compare these three European Nations and show the positives and negatives associated with each countries policies.

The differences between the conservative and liberal governmental stances between these four nations show how parental leave is still in the early stages of expansion around the world. Parental leave is an aspect of employment law that is expanding globally and could hurt employees and companies in the long run. This

paper will try to determine which legal aspects are best for the company, parent, and government. The legal aspects of these countries have changed drastically over time and will continue to change as people demand more. Companies need to think about long-term gains of employee satisfaction and retention rates when they create their personal parental leave policies, and governments should consider the economic demands of their country. Is there a balance of what the parents, companies, and governments want? Should governments offer more paid leave times for new parents? This paper will attempt to answer these questions by exploring governmental regulations and the government's stance from these four different countries.

Research Mentor: Cara Putman, Management, Krannert;

Start Time: 3:20pm :: **Room:** Stewart 214-D :: Social Sciences/Humanities

College of Education; Honors College

“Experience is the Teacher of All Things”: Examining the Connection between University Experiences and an Educator’s First Year in the Classroom

Author:

Madeline Rhea

Abstract:

This research adds to the existing literature related to novice teachers’ experiences and preparation, specifically regarding the first year as a teacher in a public school classroom. The topic of this research addresses which facet(s) of the university experience are the most effective in preparing a preservice teacher for the first year in the classroom: academic coursework, extracurricular activities, or related work experience. In this research, I collected personal narratives associated with a novice teacher’s first year to reveal key themes linked to their college/university experience in the form of a case study. The interview was based on questions related to the perceived value of various facets of this educator’s college/university preparation and experiences and how they helped prepare the educator for the first year of teaching. Data analysis for this study indicated that key themes were 1) the effectivity of coursework relative to boosting content area knowledge and confidence, 2) extracurricular experiences built essential “people skills” that transferred in daily interactions with students, and 3) related work experiences give valuable, specific hands-on experience that cannot be simulated in the absence of actually physically working with students. This study is necessary to understand what experiences provide the skills and knowledge that most effectively prepare educators for their first year in the classroom. This research helps inform the areas upon which emphasis is placed in university teacher preparation programs while providing an avenue for practicing first-year educators’ voices to come into the realm of research on this issue.

Research Mentor: Christy Wessel-Powell, Curriculum & Instruction Department, College of Education;

Start Time: 3:40pm :: **Room:** Stewart 214-A :: Social Sciences/Humanities

College of Liberal Arts; College of Health and Human Sciences; Honors College

The Dehumanization of Immigrants and Refugees: A Comparison of Dehumanizing Rhetoric by All Candidates in Three U.S. Presidential Elections

Author:

Amanda Warnock

Abstract:

This study contributes to contemporary dehumanization theory by tracking and comparing dehumanizing rhetoric used by all presidential candidates during the 2008, 2012, and 2016 elections. Using data hand-collected from all presidential speeches conducted during these periods, including accounting for adlibbing by Donald Trump, I argue that Trump was distinctive in his dehumanization of immigrants and refugees, far surpassing all other candidates. His language surrounding these groups focused heavily on 1) using non-human language to describe their actions and migrations; 2) assigning criminality and viciousness to immigrants; 3) repeating stories of the deaths of American citizens by immigrants; 4) saying that immigrants and refugees have values incongruent with Americans; and 5) emphasizing the idea that immigrants and refugees are a threat to the American way of life. Dehumanization is often used as justification for aggressive policies and behaviors, which has been demonstrated through the Trump administration's family separation policies. This paper adds to the conversation about dehumanization by providing evidence that Trump presents a major increase in dehumanizing rhetoric compared to previous candidates, which is important to note as new policies unfold. Additionally, it provides a foundation of collected data for future studies.

Research Mentor: Dr. James McCann, Political Science, College of Liberal Arts;

Start Time: 3:40pm :: **Room:** Stewart 214-B :: Life Sciences

College of Pharmacy

Repurposing Acetazolamide as an Inhibitor of Vancomycin-Resistant Enterococcus

Author:

Amanda Graboski

Abstract:

Enterococcus is a gram-positive bacterial species classified as an ESKAPE pathogen, which is a short list of multidrug resistant microbes that are a serious global health risk. Enterococcal infections have been on the rise since the early 2000's and are the second most common hospital-acquired infection in the United States. Two strains: *E. faecium* and *E. faecalis* are found naturally with low virulence in mammalian gastrointestinal tracts and human female genitalia. Upon long term exposure to antibiotics that disrupts the normal gut microbiota, enterococcal species begin to thrive unchecked. These strains, *E. faecium* in particular, are adept at acquiring resistance to common antibiotics. When resistance is acquired to the last line of defense, these strains become even more problematic. The current standard of treatment is antimicrobial agents such as linezolid or a combination of quinuprisin/dalfopristin. However, resistance against them has been documented in the clinic and these antibiotics kill off essential microflora that are necessary for proper immune and digestive function. With this knowledge, it is imperative that a new treatment option is developed to cure these vancomycin-resistant enterococcus (VRE) infections. A fast and reliable method of generating new therapeutics is by repurposing FDA approved drugs. A high-throughput screen was run against a chemical library of FDA approved drugs to find hits that inhibit the growth of VRE and vancomycin sensitive enterococcus (VSE). A carbonic anhydrase inhibitor known as acetazolamide was selective in targeting VRE and exhibited no toxicity against normal gut microbiota. The World Health Organization (WHO) regards acetazolamide as a safe and effective drug as it is used in long-term treatments for glaucoma world-wide with limited toxicity in high doses. A structure activity relationship (SAR) study of acetazolamide derivatives was explored. Approximately 30 novel analogs were synthesized, with improved minimum inhibitory concentrations (MIC) of 0.06-1 ug/mL, compared to acetazolamide which yielded values of 2-64 ug/mL. Our most potent analogs have been brought forward into mouse gut decolonization models where they displayed selectivity for VRE and have shown to be nontoxic in high doses. Resistant mutants of VRE against acetazolamide have been isolated in culture and the data suggests a drug target that has previously never been characterized and is unique to enterococcal strains. Validating the binding of our analogs to this unique target both in vitro and in vivo is currently in progress.

Research Mentor: Daniel P. Flaherty, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy;

Start Time: 3:40pm :: **Room:** Stewart 214-C :: Social Sciences/Humanities

College of Agriculture

Food Safety Education among Health Professionals in China and Peru

Author:

Han Chen

Abstract:

Introduction

Foodborne illness is a major public health concern globally. WHO estimates that over 600 million people worldwide infected annually. However, not all health professionals are aware of patients' vulnerability to foodborne illness. Previously, we identified barriers to food safety education among health professionals in the US. In this study, we went further to examine the global perspective of this issue. The objective is to evaluate health professionals' practice and attitudes toward food safety education in China and Peru.

Method

A face-to-face semi-structured interview was conducted to collect data among health professionals in China and Peru, using local languages (Chinese, Spanish). In China, participants were recruited from local hospitals in Guangzhou, the capital city of Guangdong province. In Peru, participants were recruited from local hospitals in Lima, the capital city of Peru.

Results

42 health professionals participated in this interview (China, n=30; Peru, n=12). The biggest food safety concern mentioned in China is food adulteration while in Peru is the use of contaminated water. All of the health professionals saw the necessity to deliver food safety education, but few of them actually delivered. The majority of health professionals in China and Peru felt confident about microbial food safety knowledge. However, only 8 participants had food safety training before. Lack of materials has been ranked as one top barrier in both countries.

Significance

The findings provided evidence to guide the decision making of government, educators and health professionals, supporting the development of next-generation food safety education strategies for the public.

Research Mentor: Yaohua Feng, Department of Food Science, College of Agriculture;

Start Time: 3:40pm :: **Room:** Stewart 214-D :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Effect of biomass ashes on the heat resistance of mortars in function of curing temperature

Author:

Alice Ikuru

Abstract:

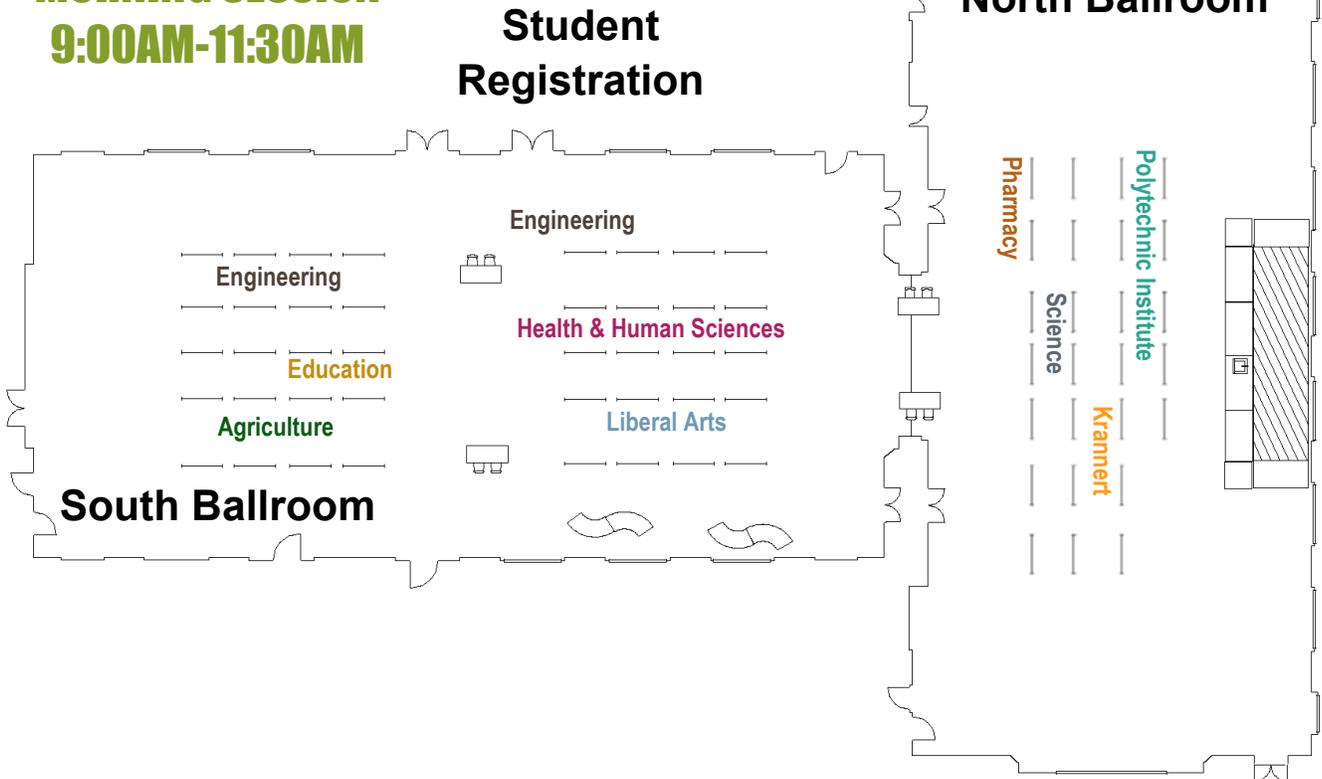
Concrete is the most widely used construction material in the world. Its main components are: cement, water, and aggregates. Use of concrete has grown exponentially over the last decades. Production of cement has a huge negative impact on the environment. Biomass ash, a waste from the paper industry, could be used as a partial replacement of cement due to its composition. However, due to the lack of studies about its effects, its use is not allowed. Knowing its positive and negative effects will contribute towards more sustainable regulations and to avoid potential problems. There are no studies about how biomass ashes affect the performance of concrete under extreme conditions. This research studies the effect of partial replacement of cement by biomass ashes on heat resistance of cement paste, in function of curing temperature. Cement paste with 0%, 10%, 20% and 40% of replacement of cement by biomass ash were studied. Curing temperatures were 10 °C, 20 °C and 40 °C. Tests will be performed before and after exposure to high temperatures (100 °C and 500 °C), including: compressive strength test, and tests to quantify hydration products (Differential Scanning Calorimetry and Thermogravimetric analysis). It is an ongoing investigation, test and analysis of the data are not completed yet. Preliminary results focused on the effect of 10% of biomass ashes on heat resistance, by comparing 7-day compressive strength before and after exposure at 500 °C for 2 hours, were completed. Results suggest that the biomass ash has a negative effect on heat resistance at 7 days. However, since biomass ash slows the hydration rate, it is possible that this negative effect will change if the exposure occurs at the long term. Test at 28 and 90 days will be performed. The ongoing tests will help us to have better understanding of mechanisms that drive this effect, to mitigate it or to avoid it.

Research Mentor: Mirian Velay-Lizancos, Civil Engineering, College of Engineering; Vito Francioso, Civil Engineering, College of Engineering; Carlos Moro, Civil Engineering, College of Engineering

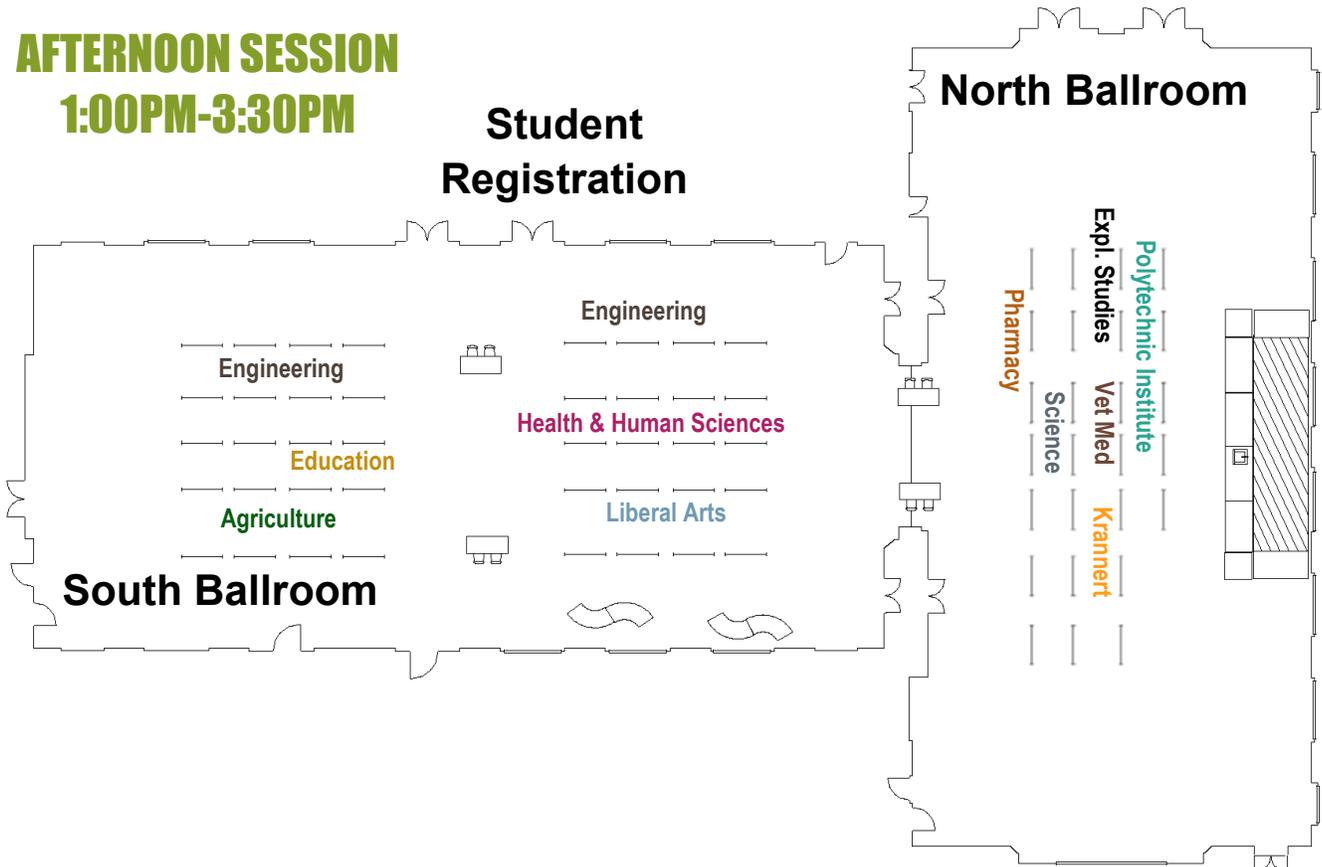
Undergraduate Research Conference

Poster Symposium :: April 9, 2019

MORNING SESSION
9:00AM-11:30AM



AFTERNOON SESSION
1:00PM-3:30PM



Purdue Undergraduate Research Conference

Poster Symposium :: April 9, 2019

MORNING SESSION POSTER ABSTRACTS

9:00am-11:30am

College of Agriculture			
		18a	<i>Emily Musenbrock</i> Mentors: Laura Bowley, John Dunning
1a	‡ <i>Andrew Ahlersmeyer</i> Mentors: Timothy Baker, Bruce Erickson	19a	<i>Christina Mussmann</i> Mentor: Lisa Mauer
2a	<i>Juan Archila</i> Mentors: Yaohua Feng, Tressie E Barret	20a	<i>Stephanie Orr</i> Mentor: Aaron Thompson
3a	‡ <i>Nicole Brockway</i> Mentors: Megan R. LaFollette, Brianna N. Gaskill	21a	■ <i>Ana Pascual-Garrigos</i> Mentors: Trevor Boram, Jeremy Lohman
4a	<i>Megan Brown</i> Mentor: Theresa Casey	22a	<i>Megan Riley</i> Mentors: Megan LaFollette, Brianna Gaskill
5a	<i>Juliana Brustolin</i> Mentor: Krishna Nemali	23a	<i>Morgan Ritzi</i> Mentor: Gordon McNickle
6a	■ <i>Gabrielle Buck</i> Mentors: Joseph Lynch, Natalia Dudareva	24a	<i>Tucker Rose</i> Mentor: Aaron Thompson
7a	<i>MaryClaire Chamberlain</i> Mentor: Lisa Mauer	25a	<i>Beenah Shokouhzadeh</i> Mentors: Megan LaFollette, Brianna Gaskill
9a	■ <i>Joanna Claudy</i> Mentor: Allan Schinckel	26a	■ <i>Samantha Smock</i> Mentors: Patrick Zollner, Alexander Cohen
10a	<i>Justin Couetil</i> Mentor: Michael R. Ladisch	27a	<i>Baishuai Sun</i> Mentors: Aswathy Chandran, Chris Rochet
11a	<i>Nathania Dianda</i> Mentors: Tahrira Binte Rouf, Jozef Kokini	28a	<i>Yoong Sin Tong</i> Mentor: Aaron Thompson
12a	<i>Kate Eastman</i> Mentor: Brian Dilkes	29a	<i>Jose Isaac Vargas</i> Mentor: Timothy Johnson
13a	<i>Ayla Grilly</i> Mentor: Emily Usher	30a	<i>Jose Enrique Velasco Ortiz</i> Mentor: Ariana Torres
14a	<i>Brianna Lammers</i> Mentor: B. Allen Talbert	31a	<i>Emma Wade</i> Mentor: Emily Usher
15a	<i>Megan Li</i> Mentor: Junyu Lu	32a	<i>Nathan Watervoort</i> Mentor: Jody Banks
16a	<i>Michelle Lockhart</i> Mentor: Aaron Thompson	33a	<i>Grace Wernert</i> Mentors: Theresa Casey, Aridany Suarez-Trujillo
17a	<i>Jackson McGee</i> Mentor: Aaron Thompson		

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College of Education

- 34a *Maya Cameron, Costa James, Laura Duke*
Mentor: P. Youli Mantzicopoulos-James
- 35a *Daniel Krause*
Mentor: Manushag Powell
- 36a *Jason Maynard*
Mentor: Elizabeth Hoffman
- 37a *Cayla Yannuzzi, Kailey Cerefin*
Mentor: Mandy Rispoli

College of Engineering

- 38a *Abhimanyu Agarwal, McKenzie Elliot, Ayyub Jose, Vishal Meyyappan*
Mentor: Barrett Robinson
- 39a *Lucas Allegrette*
Mentor: Thomas Siegmund
- 40a *Zachary Beyer*
Mentors: Jennifer DeBoer, Claudio Freitas
- 41a ■ *Allison Biddinger*
Mentor: Linda Haynes
- 42a *Romita Biswas, Cassidy Friedrich, Yug Rao, Aditya Chakraborty*
Mentors: Rih-Teng Wu, Mohammad Reza Jahansha
- 44a *Gowd Chagi, Xi Wu*
Mentors: Baekdu Choi, Jan Allebach
- 45a *Rohit Chatterjee*
Mentors: Kevin Solomon, Mrugesh Parasa
- 46a *Hao Chen, Yining Huang*
Mentors: David Ebert, Morteza Karimzadeh, Jieqiong Zhao
- 47a *Shivam Duhan, Chengming Zhang, Wenyu Jing, Mingqi Li*
Mentor: Guang Lin
- 48a *Kaylee Ecker, Albert Derek Lee*
Mentor: Jackie S. Cha
- 49a *Elliot Edmunds, Mithuna Thottethodi*
Mentor: Mithuna Thottethodi
- 50a *Nick Eliopoulos*
Mentors: Yung-Hsiang Lu, Kevin Woeste

- 51a *Marco Antonio Garcia, Luke Kok, Luis Materon Botelho, Xianmeng Zhang, Ruth Zhong*
Mentors: Mark Johnson, Matthew Swabey
- 52a *Lakshya Goyal, Roopasree Naidu, Youngsik Yoon*
Mentors: Yung-Hsiang Lu, Shuo-Han Chen
- 53a ‡ *Emily Haluschak*
Mentors: Tamara J. Moore, Kristina Tank
- 54a *Jacob Harmon, Li Yon Tan, Jack Hyslop, Isha Ghodgaonkar*
Mentors: Ryan Dailey, Yung-Hsiang Lu
- 55a *Yuta Hoashi*
Mentors: Byung-Cheol Min, Wonse Jo
- 56a *Andrew Jaseckas, Hussni Mohd Zakir, Jeemin Kim, Mimansa Verma, Nan Jia, Dotun Akinnola, Kubilay Sahin*
Mentors: Carla Zoltowski, Edward Delp
- 57a ‡ *Sanna Kapoor, Joshua Oderkirk, Matthew Olinde, Adithya Sundaram*
Mentors: Jeffery Gray
- 58a ■ *Mari Leland, Molly Carroll*
Mentors: Gabriel Vargas
- 59a *Raymond Li, Jun Min Ahn, Zachary Esteron, Qiyin Hong*
Mentors: Guang Lin
- 60a *Christina Lo, David Chen*
Mentor: Jared Covert
- 61a *Jessica Ma, Aditi Acharya*
Mentors: Craig Goergen, Hamna Qureshi, Brett Bosinski, George Wodicka, David Reuter
- 62a *Ashley Maddock, Sean Hwang, Pratik Bansal, Dharan Ramdoss, Somesh Dube*
Mentor: Samuel Midkiff
- 63a *Vadim Nikiforov, Chan Weng Yan*
Mentors: Mark Johnson, Timothy Rogers
- 64a *Neal Ottinger*
Mentor: John Byrnes
- 65a *Tikhon Pachin, Chris Jones, Meenakshi Pavithran, Meron Midksa*
Mentor: Robin Barrett
- 66a *Ethan Pappas*
Mentor: Elsje Pienaar
- 67a ‡ *Akshay Rao*
Mentors: David Warsinger, Abhimanyu Das

- 68a *Lanqing Zhao, Chieh-En Li*
Mentors: Jan Allebach, Shaoyuan Xu
- 69a *Benjamin Rentz*
Mentor: G.V. Reklaitis
- 70a *Joseph Sawyer*
Mentor: Thomas Siegmund
- 71a ‡ *Stephanie Schiavo, Samantha Dykhuis, Avalin Senefeld*
Mentors: Brandon Boor, Danielle Wagner
- 72a *Corren Scott*
Mentors: Yu-Hsuan Lee, Michael Harris
- 73a *Andrew Shen, Yoon Kim, Yi Xie, Nick Ellas, Josh Chang, Zijun Lin*
Mentors: Yung Hsiang Lu, Guofan Shao
- 74a *Arvind Sundaram*
Mentors: Ahmed Hassanein, Jitendra Tripathi
- 75a ‡ *Rachel Susler*
Mentors: Michael Harris, Sue Loesch-Fries
- 76a ‡ *Dwi Sutandar*
Mentors: Rakesh Agrawal, Swapnil Deshkmukh; Ryan Ellis
- 78a *Andrew Ulmer, Zohar Kapach, Daniel Merrick, Karthik Maiya, Abhay Sasidharan, Arshad Alikhan, David Dang*
Mentor: Yung-Hsiang Lu
- 79a *Anirudh Vegesana, Kaiwen Yu*
Mentor: Yung-Hsiang Lu
- 80a *Catherine Weaver*
Mentor: Neera Jain
- 81a *Jiaxing Yang, Yi-shan Lin, David Ebert*
Mentor: Lin Yi-Shan
- 82a *Douglas Yu; Devansh Rathi*
Mentors: Zhi Li, Jan Allebach
- 83a *Ximeng Zhang, QianLi Ma*
Mentor: Mithuna S Thottethodi
- 84a ‡ *Guoyang Zhou, Hamed Asadi, Denny Yu*
Mentors: Denny Yu, Hamed Asadi

College of Health & Human Sciences

- 85a ■ *Emily Adaniya*
Mentors: Wayne W. Campbell, Joshua L. Hudson
- 86a *Dina Al Ghabra, Alexis Morell, Tessa Garwood, Ellie Bonanno*
Mentors: Bridgette Tonnsen, Wei Siong Neo
- 87a *Seema Al-Hiraki*
Mentors: Philip S. Low, Stewart Low
- 88a *Maha Ali, Ben Watson*
Mentors: Seema Mattoo, Erica Zbornik
- 89a *Hannah Baker, Meghan Mitoraj*
Mentor: Elliot Friedman
- 90a ‡ *Kelsie Basile, Adria Diaconu, Camille Goodwyn, Sarah Kincade, Kaylee McCracken*
Mentors: Andrea DeMaria, Jaziel Ramos-Ortiz
- 91a *Timothy Becker*
Mentor: Shirley Reitdyk
- 92a *Margaret Becker*
Mentors: David Purpura, Ellen Litkowski
- 93a *Nudar Bhuiya*
Mentors: Jennifer Freeman, Jonathan Shannahan
- 94a *Morgan Braden*
Mentor: Heather Leidy
- 95a *Lauren Brulinski*
Mentor: Jennifer L. Freeman
- 96a *Cidney Colby*
Mentors: Laura Reese, Lauren Murfree
- 97a *Myia Dorsey, Rebecca Coan*
Mentor: Susan Swithers
- 98a *Sai Dwibhashyam*
Mentors: Wei Zheng, Luqing Liu
- 99a ‡ *Chandler Dykstra*
Mentor: Andrea DeMaria
- 100a *Lexi Ferngren*
Mentor: Jonathan Shannahan
- 101a ‡ *Victoria Glass, Alexa Rozycki*
Mentors: Ronnie Wilbur, Margaret Crabtree

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102a *Alexa Gordon, Alyssa Prohofsky*
Mentors: Amanda Arnold, Laura Claxton

103a *Heather Heyrman, Lois Carpenter, Madelyn Cruse, Megha Reddy*
Mentors: Jaziel Ramos-Ortiz, Andrea DeMaria

104a *Claire Hornsby*
Mentor: Azza Ahmed

105a ◊ *Claire Jackson*
Mentors: Ellen Wells, Christelene Horton

106a *Nicolette Kittrell*
Mentors: Zoe Taylor, Nayantara Nair

107a ‡ *Kaylee Mason, Alyson D'Eramo, Lesley Flores, Savannah Hottle*
Mentors: Andrea DeMaria, Stephanie Meier

108a *Katie Mason*
Mentor: Erin Hennes

109a *Riley McGuire, Cleveland Shields*
Mentor: Cleveland Shields

110a *Jade Meekin, Kennedy Skipper*
Mentor: Libby Chernouski

111a ‡ *Houston Meminger, Jadebrielle Bennesh*
Mentors: Susan Sangha, Amy L. Brewster

112a *Samantha Mitchell*
Mentor: Georgia Malandraki

113a *Ryan O'Connell*
Mentors: Ellen Wells, Jennifer Freeman

114a *Isabelle Olejniczak*
Mentor: Uzay Emir

115a *Kaushal Prasad, Alec Graff*
Mentor: Jae Hong Park

116a *Charles Price*
Mentor: Jason Cannon

117a *Meredith Robbins*
Mentor: Ellen M. Wells

118a *Alyssa Rosenorn, Kate Schrader*
Mentor: Bridgette Tonnsen

119a *Nathan Schaeper*
Mentor: Nana Gletsu-Miller

120a *David Schena, Michelle Coverdale, James Nairne*
Mentor: James Nairne

121a *Courtney Sheffield*
Mentor: Jason Harris

122a *Beatrice Smith*
Mentor: Alejandra Ortega

123a *Faith Stirm*
Mentor: Keith Stantz

124a *Arlyne Vargas, Emily Reyes, Maesyn Poidomani*
Mentor: Bridgette Tonnsen

125a *Madison Wierenga*
Mentor: Cordelia Running

126a *Rachel Yuska*
Mentor: Carlos Perez-Torres

College of Liberal Arts

127a ■ *Warisha Aslam*
Mentor: Maren Linett

128a *Nicole Blackburn*
Mentors: Brian Kelly, Christie Sennott

130a *Desiree Clark*
Mentor: Elizabeth Mercier

131a *Aiden Colburn*
Mentor: Nadia Brown

132a *Sarah Coon*
Mentor: Erik Otarola-Castillo

133a *Hollis Druhet, Vitasta Singh, Grace Morris*
Mentor: Derek Pacheco

134a *Georgia Green*
Mentor: Elizabeth Mercier

135a *Sophia Holt-Wilson*
Mentor: Erin Moodie

136a *Xuan Hu*
Mentor: Elena E Benedicto

137a *Yihan Jia*
Mentor: Ian Lindsay

138a ■ *Emily Jones*
Mentor: Megha Anwer

139a ‡ *Kaleigh Karageorge; Bailey Smith-Helman*
Mentors: Laura Zanotti, Kim Suiseeya

140a *Rachel King*
Mentors: Sherylyn Briller, Elizabeth Briody

141a ‡ *Jane Koch, Christopher Centrella*
Mentors: Tatjana Williams, Aletha Stahl

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- 142a *Nicole Koob*
Mentor: David McElhattan
- 143a *Emily Mast*
Mentor: Allegra Smith
- 144a ‡ ■ *Alejandra May*
Mentor: Erik Otarolla-Castillo
- 145a ‡ *Grace Morris*
Mentor: Renee Murray
- 146a ‡ *Alexander Mullenix*
Mentor: Chris Yeomans
- 147a *Antonia Neckopulos*
Mentor: Shaun Hughes
- 148a *Megan Pentecost*
Mentors: Ronnie Wilbur, Margaret Crabtree
- 149a *Jessica Perkins*
Mentors: Sammie Morris, Kendall Roark
- 150a *Lauren Robbers*
Mentors: Laura Zanotti, Kimberly Suiseeya
- 151a *Ian Smith*
Mentor: Alon Kantor
- 152a ■ *Evalyn Stow*
Mentor: Erik Otárola-Castillo
- 153a ◇ ‡ *Frankie Tao, Bri Meyer*
Mentor: Kathleen Hickey
- 154a *Tatum Theaman, Christina Strodel*
Mentor: Silvia Mitchell
- 155a *Courtney Thomas*
Mentor: Amanda Veile
- 156a *Isabelle Townsend*
Mentor: Silvia Mitchell

College of Pharmacy

- 157a *Abdulganiyu Gborigi*
Mentor: Ann Kirchmaier
- 158a *Erica Situ*
Mentor: Joanna Kalina Hodges
- 159a *Olivia Walker*
Mentor: Stephen Byrn

College of Science

- 160a *Isabel Adarve*
Mentors: Spencer Siddons, Catherine Searle
- 161a *Zaid Al Haddadin*
Mentors: Peristera Paschou, Apostolia Topaloudi
- 162a *Kevin Altman*
Mentors: Lynne Taylor, Dana Moseson
- 163a *Nishit Banka*
Mentor: Christopher Uyeda
- 164a ‡ *Swaraj Bhaduri; Binoy Shah*
Mentor: Dan Ferguson
- 165a *Riley Borgard*
Mentor: Tatsunari Watanabe
- 166a *Jillian Bouck*
Mentors: Birgit Cabot, Ryan Cabot
- 167a *Marin Bray*
Mentors: Spencer Siddons, Catherine Searle
- 168a *Natalie Brejcha*
Mentor: Jody Banks
- 169a *Ian Bretz*
Mentors: Jonathan Wilker
- 170a *Sophia Brown*
Mentors: Jason Hoverman, Wesley Flynn
- 171a *Mariah Burgmeier, Spencer Siddons, Catherine Searle*
Mentors: Spencer Siddons, Catherine Searle
- 172a *Thomas Chen*
Mentor: Nicolo Michelusi
- 173a ■ *Jairus Chittenden*
Mentor: Stephen Russell
- 174a *Maia Clare*
Mentor: Matthew R. Olson
- 175a *Rachel Collicott*
Mentor: Emily Dykhuizen
- 176a ■ *Cyan Cosby, Shirisha Chittiboyina, Sophie Lelièvre*
Mentors: Sophie Lelievre, Shirisha Chittiboyina
- 177a ‡ *Patricia Covington*
Mentor: Sharra Vostral

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178a	<i>Davide Delisi</i> Mentor: Shirisha Chittiboyina	196a	<i>Saron Manikam Bhoopathy</i> Mentors: Daniel M. Suter, Aslihan Terzi
179a	<i>Brittany Farmer</i> Mentors: Catherine Searle, Kacie Jonasen	197a	<i>Zachary McGuire</i> Mentor: Mohit Verma
180a ■	<i>Chrishan Fernando, Youssef Hegazy, Sara Cloutier, Elizabeth Tran</i> Mentor: Elizabeth Tran	198a	<i>Abigail Mesfin, Andrea Kasinski</i> Mentor: Chennan Li
181a	<i>Rodrigo Ferreira</i> Mentors: Ignacio Camarillo, Vishak Raman	199a	<i>Ayana Morris</i> Mentors: Nana Gletsu-Miiler, Sarah Butts
182a	<i>Alyssa Flint</i> Mentors: Peristera Paschou, Apostolia Topaloudi	199.5a	<i>Syed Mudabbir</i> Mentor: Euiwon Bae
183a	<i>Neta Friedberg</i> Mentor: Stanton B. Gelvin	200a ‡	<i>Alexis Musleh, Ignacio Camarillo, Rajeswari Sundararajan</i> Mentor: Lakshya Mittal
184a	<i>Mars Gao</i> Mentor: He Wang	201a	<i>Erin Paul</i> Mentors: Stephen Konieczny, Yi Yang
185a	<i>Abigael Gichaba</i> Mentors: Nicholas Noinaj, Robert Stephenson	202a	<i>David Prather</i> Mentors: Catherine Searle, Kacie Jonasen
186a ‡	<i>Adam Guerin</i> Mentor: Srividya Iyer-Biswas	203a	<i>Vandana Reddy, Alexandra Stiffler</i> Mentor: Seema Mattoo
186.5a	<i>Ashlyn Heniff</i> Mentor: Samarth Mathur	204a	<i>Logan Kulinski, Chaolun Shao, Anthony Niemiec, Amol Jha</i> Mentor: Gustavo Rodriguez-Rivera
187a ■	<i>Lucy Hilarides, Kasha Halbleib, Samuel Wernert</i> Mentor: Jason Ware	205a	<i>Caleigh Roleck</i> Mentors: Stanton Gelvin, Rachelle Lapham
188a	<i>Kiara Hughes</i> Mentor: Cleveland Shields	206a	<i>Nur Adilah Rosli</i> Mentors: Jon Rienstra-Kiracofe, Gudrun Schmidt
189a	<i>Nisreen Islaih</i> Mentor: Christine Hrycyna	207a	<i>Andrew Rothwell</i> Mentor: John Sundquist
190a	<i>Hannah Jones</i> Mentors: Stephen Elliott; Kevin O'Connor	208a	<i>Eryn Sale</i> Mentor: William Cramer
191a	<i>Gwenyth Joseph, Korie McCrea, Emily Sanders, Melanie Martinez</i> Mentor: Kari Clase	209a	<i>Mollie Shinkle</i> Mentor: David Thompson
192a	<i>Sarah Komanapalli</i> Mentor: Catherine Hill	210a ■	<i>Jessica Stone</i> Mentors: Daniel Suter, Kristi McElmury
193a	<i>Matthew Konkoly</i> Mentor: Sorin Adam Matei	211a	<i>Kayla Stradford</i> Mentors: Kristine Marceau, Emily Roland
194a	<i>Zhengming Li</i> Mentor: Sharra L Vostral	212a	<i>Rachel Stucky</i> Mentor: Sophie Lelièvre
195a ‡	<i>Ashlyn Lythgoe</i> Mentors: Michelle Hemler, Linda Prokopy	213a	<i>Halie Szilagyi</i> Mentor: Daniel Suter
		214a ‡	<i>Dawn Tilley</i> Mentors: Gaurav Chopra, Priya Prakash

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215a *Ena Tully*
Mentor: Richard J. Kuhn

216a ■ *Silvana Villela*
Mentors: Greg Michalski, Elizabeth Olson

217a *Brianna Westerberg*
Mentor: Greg Michalski

Krannert School of Management

218a *Schuyler Frashier*
Mentor: Cara Putman

219a ■ *Kristen Frohning*
Mentor: Cara Putman

220a ‡ *JJ Jeongjin Park*
Mentor: Lisa Bosman

221a *Aaron Rush*
Mentors: Matthew Lanham, Andy Alexander

Purdue Polytechnic Institute

222a ‡ *Sakhi Aggrawal*
Mentors: Alejandra J. Magana, Ying Ying Seah

223a ‡ ■ *Keita Arakawa*
Mentor: Lisa Bosman

224a *Benjamin Carpenter, Kalika Lacy*
Mentor: Vetricia L. Byrd

225a *Hayley Farmer*
Mentor: Colin Gray

226a *Aaron Manio, William Longworth, Taylow Sorrell*
Mentors: William Hutzell, Daniel Alloca

227a *Lucca McKay*
Mentor: Colin Gray

228a *Kayla Rux*
Mentors: Kathryn Seigfried-Spellar, Siddharth Chowdhury

229a *Andres Santiago*
Mentor: Mesut Akdere

230a ‡ *Elijah St Angelo*
Mentor: Lisa Bosman

231a *Isaiah Thomas*
Mentor: Mesut Akdere

232a *Vincent Tyson*
Mentor: John Piller

233a *Yuanxun Wang*
Mentors: Julia Rayz, Vitaliy Rayz

234a *Shuning Yin*
Mentor: Lisa Bosman

Poster Number: 1a :: Life Sciences

College of Agriculture

Examining the Economic Viability of Continuous Corn Cropping Systems in the United States Corn Belt

Author:

Andrew Ahlersmeyer

Abstract:

Corn cropping systems in the United States have generally involved rotations with soybeans. However, there have been times historically and in recent years that farmers have switched to a continuous corn system. Although rotational corn dominates the Eastern Corn Belt, there is a significant number of farmers throughout the Midwest that find continuous corn to be more profitable. There are many variables that affect the decision to execute a continuous corn system, including corn-soybean yield ratios, corn-soybean price ratios, geographic location, soil fertility, tillage practices, pest pressure, and fertilizer requirements. The objective of this research project is to examine how these variables impact the point where continuous corn becomes more profitable than a corn-soybean rotation. When all else is held constant, each variable can be analyzed individually to see how impactful it is to the overall profitability of the system. This is conducted through a Microsoft Excel spreadsheet that itemizes the revenue and expenses for both corn and soybeans, and then solving for net income under each crop budget. This takes into account not only the profit from growing continuous corn, but also the opportunity cost of growing corn instead of soybeans. Once the difference is calculated, the sign of the number will indicate the economic viability, and the size of the number will indicate the strength of certainty for the economic viability. By entering in customized values into the spreadsheet, a farmer can view the different scenarios for growing continuous corn, which will assist them in making economically sound decisions on their farm in terms of choosing their cropping system.

Research Mentor: Timothy Baker, Agricultural Economics, College of Agriculture; Bruce Erickson, Agronomy, College of Agriculture

Poster Number: 2a :: Life Sciences

College of Agriculture

Evaluation of Flour Handling Knowledge and Practices among Consumers and Popular Recipes

Author:

Juan Archila

Abstract:

Introduction: Approximately 48 million people get sick from a foodborne illness in the U.S. Many people are unaware of the food safety risk of low moisture foods, like flour and quick bread mix.

Objective: Assess food safety knowledge and behavior of flour handling among consumers and evaluate food safety implications from popular recipe sources.

Methods:

Phase I: An online survey (Qualtrics) was developed for data collection, consisting of three topics: source of recipe and food safety information, knowledge and practice of flour storage and handling, knowledge and practice of flour recalls. The participant selection criteria included (1) handling flour at least twice a year and (2) primary grocery shopper and food preparer in the household.

Phase II: Recipe from traditional source (cookbooks) and online source (blogs and YouTube videos) were selected and coded to assess the food safety implications according to FDA's flour handling recommendations.

Results:

Phase I: The online survey was distributed to one thousand consumers. Most of the participants showed lack of knowledge and practice of flour recalls.

Phase II: Qualitative and quantitative information was taken from videos, blogs, and cookbooks. The traditional source and the online sources presented flour handling errors and lacked precaution information addressing the food safety risk of flour handling.

Significance: Findings provide insights on elevated foodborne illness risk among consumers from poor flour handling and limited food safety knowledge. Strategies of enhancing safe flour handling in popular recipes should be developed by a consolidation of health educators, researchers, and policymakers.

Research Mentor: Yaohua Feng, Food Science, Agriculture; Tressie E Barret

Poster Number: 3a :: Life Sciences

College of Agriculture
Laboratory Personnel Beliefs about Rat Tickling

Author:

Nicole Brockway

Abstract:

Heterospecific play, or “rat tickling,” is a human-animal interaction that mimics rat rough-and-tumble play. This enrichment technique improves rat welfare by decreasing handling stress and increasing positive emotions. Despite these known benefits, its current application and barriers to application are unknown. This study’s purpose was to characterize the current use of and beliefs about rat tickling in the status quo. This study recruited laboratory personnel (N=611) from the United States and Canada who completed a brief 20-minute online survey. The survey consisted of sections that assessed attitudes toward, frequencies of, and familiarity with rat tickling. Additionally, it asked qualitative open-ended response questions pertaining to the possible barriers, advantages, and improvements to rat tickling application. We used the Theory of Planned Behavior and thematic analysis to determine barriers, advantages, and improvements to rat tickling. We found that rat tickling was implemented infrequently and often incorrectly. Personnel reported that Handling (61% of participants) and Rat Welfare (55%) were two key advantages to rat tickling. Personnel also reported that Time (59%), Personnel (22%), and Research (22%) were three key barriers to rat tickling. Current implementation of rat tickling is low and often incorrectly implemented. Targeting specific rat tickling barriers of time, personnel, and research has the potential to increase rat tickling implementation across laboratories.

Research Mentor: Megan R. LaFollette, Animal Sciences, College of Agriculture; Brianna N. Gaskill, Animal Sciences, College of Agriculture

Poster Number: 4a :: Life Sciences

College of Agriculture

Effect of BMAL1 Knockout on Mammary Cell Proliferation and Activity

Author:

Megan Brown

Abstract:

Milk production in dairy cattle is determined by mammary cell proliferation and metabolic activity. Circadian clocks generate key biological rhythms, including the timing of cell proliferation and activity. We hypothesize that circadian clocks in mammary glands regulate cell proliferation. The objective of our experiments was to determine how disruption of the mammary clock, through knockout of BMAL1 core clock gene, would affect cell growth and metabolism. Western blot analysis was used to confirm CRISPR-CAS9 knockout of BMAL1 (BMAL KO) gene in mammary epithelial cell line HC11. To determine the effect of BMAL1 knockout on cell proliferation, number of cells over an eight-day growth period and percent of cycling cells were compared between BMAL KO and wild-type HC11 (HC11) cell lines. MTT assay was used to measure NADH levels as an indicator of cellular activity. General liner analysis in SPSS found that day and line had a significant effect on cell growth. Doubling time between days two and four was not different between HC11 (21.9 ± 3.8 hours) and BMAL KO (26.9 ± 3.8 hours); however, BMAL KO cells reached stationary phase at a significantly lower density than HC11 cells. Cell cycle analysis did not yield any significant differences between average percent of proliferative cells between the two lines on any day. MTT results showed BMAL having lower absorbance values, indicating lower metabolic activity, on days two and four compared to HC11. Overall, significant differences between BMAL KO and HC11 cells indicate that knockout of the BMAL1 clock gene and disruption of the circadian clock in mammary epithelial cells have a negative impact on cell growth and metabolic activity.

Research Mentor: Dr. Theresa Casey, Animla Sciences, College of Agriculture;

Poster Number: 5a :: Life Sciences

College of Agriculture
Fighting Food Insecurity With Experimental Learning

Author:

Juliana Brustolin

Abstract:

Obesity in children is a major health problem in Indiana and the US. This is mainly due to poor food choices that lead to excess energy intake. Despite positive energy balance, these diets may actually be deficient in selected essential nutrients; many of which could be corrected by increased vegetable intake. Interventions at a young age that increase knowledge of and appreciation for healthy foods through experiential learning can aid in addressing the obesity problems in children. Exposing children to other food options, teaching them about vegetables and getting them excited about eating healthy might be one way to influence their food choices and possibly change the habits of the families and the whole community. The Centers for Disease Control and Prevention notes that Leafy greens are vegetables that have low energy density but are rich in 17 nutrients of public health importance. The proposed project uses an indoor leafy green production system (ILGPS) setup at two research sites, Franciscan Health, Lafayette, IN and Tri-County Intermediate School, Wolcott; IN. Franciscan Health donates food to children living in food insecure areas while Tri-County Intermediate is one of the 60 schools with a certified STEM program. Young children at these two facilities will regularly visit and work with plants in the ILGPS. In addition, we plan to provide educational programs that will increase knowledge about growing leafy greens and the nutritive value and health benefits of eating such plants. We expect that this will shift their preferences from more unfavorable to more favorable views of leafy greens and establish a greater appreciation for healthy food generally. Another expected outcome is that children get interested in learning more about not only Biology and Agriculture, but Science in general. To measure the impact, we will evaluate whether there is a change in knowledge level, preferences and behavior related to healthy eating among children participating in the project. We plan also on maintaining contact with the school and possibly expanding the project in case the results show positive impact in the community.

Research Mentor: Dr. Krishna Nemali; Department of Horticulture and Landscape Architecture

Poster Number: 6a :: Life Sciences

College of Agriculture

Reverse Genetic Probing for a Functional Cytosolic Shikimate Pathway in Plants

Author:

Gabrielle Buck

Abstract:

The shikimate pathway produces the aromatic amino acids—phenylalanine, tyrosine, and tryptophan—essential to human diets and involved in many plant, fungi, and microbe specialized functions. Therefore, it is commonly targeted for antibiotics and herbicide strategies, and genetic engineering. It is known to be localized in plastids (such as chloroplasts), but there is biochemical evidence of a cytosolic shikimate pathway. This experiment's goals are two-fold: 1) determine the presence of a cytosolic shikimate pathway and 2) characterize the genes encoding the pathway's enzymes. First, we aim to test for a cytosolic shikimate pathway by overexpressing a mutated, exclusively cytosolic 3-deoxy-D-arabino-heptulosonate-7-phosphate (DAHP) synthase—the first shikimate pathway enzyme—in petunias. If a complete cytosolic shikimate pathway exists, we expect overexpression of this DAHP synthase to increase the production rate of volatile organic compounds (VOCs), derived from phenylalanine. To date, we have grown 21 transgenic petunias, selecting using antibiotic resistance. We will soon verify overexpression of the feedback-insensitive, cytosolic DAHP synthase using Western Blot. Secondly, two putative cytosolic shikimate pathway enzymes have been identified: 3-dehydroquinate synthase (DHQS) and 2-dehydroquinate dehydratase/shikimate dehydrogenase (DHD-SHD). Suppression of these demonstrated that DHQS plays a role in VOC production, consistent with a role in the shikimate pathway. By visualizing fluorescently-tagged variants, we determined DHD-SHD is localized in the cytosol, as expected; however, DHQS is localized in plastids and is therefore unlikely to directly contribute to cytosolic shikimate pathway flux. Further analysis is required to determine these enzymes' precise roles with respect to the putative cytosolic shikimate pathway.

Research Mentors: Joseph Lynch, Department of Biochemistry, College of Agriculture; Natalia Dudareva, Department of Biochemistry and Department of Horticulture and Landscape Architecture, College of Agriculture

Poster Number: 7a :: Life Sciences

College of Agriculture

The Effects of Sugars and Sugar Alcohols on the Gelatinization Temperature Of Various Starches

Author:

MaryClaire Chamberlain

Abstract:

The purpose of this study was to determine the effects of sweetener type and concentration on the gelatinization temperature (T_{gel}) of various types of starches. The study consisted of making sweetener solutions (glucose, fructose, sorbitol, mannose, galactose, sucrose, maltose, trehalose, maltitol, isomalt, and isomaltulose) and combining each of them 1:1 w/w with starch (potato starch, dent corn, waxy corn, 70% high amylose corn starch, and 55% high amylose corn starch). The sweetener concentrations ranged from 1-4M for monosaccharides and 0.5-2M for disaccharides. The sweetener-starch slurries were held for 24 hours and then measured using differential scanning calorimetry (DSC). The DSC protocol increased the temperature from 30°C-130°C at 10°C/min. The resulting thermograms were used to identify the onset and peak gelatinization temperatures (T_{gel}) and the enthalpy of gelatinization. Both sweetener type and concentration had significant effects on starch gelatinization, and different types of starch gelatinized at different temperatures. All starch T_{gels} increased with increasing sweetener concentrations. The largest changes in T_{gel} were found in the presence of high concentrations of sorbitol, likely because sorbitol is a sugar alcohol with an open ring structure and has an extra hydroxyl group that can help stabilize the amorphous region of the starch. In reformulation strategies intended to reduce sucrose in foods, it is ideal to match the effects of sucrose on starch thermal properties. The data set generated provides a quantitative comparison of the effects of different sweeteners on starch gelatinization which could be beneficial for product reformulation and development.

Research Mentor: Dr. Lisa Mauer, Department of Food Science, College of Agriculture;

Poster Number: NO 8a ::

Author:

Abstract:

Research Mentor: ;

Poster Number: 9a :: Life Sciences

College of Agriculture
Evaluation of Sorting Accuracy for Market Pigs

Author:

Joanna Claudy

Abstract:

The objective was to estimate the impact that the accuracy in which pigs are sorted for marketing has on the optimal market carcass weight (CW) and economic returns. Four levels of body weight estimation error (BWEE) with SD's of 0, 4, and 8% of BW were simulated. Initially, pigs were marketed in 3 marketing cuts (MCUT), 25% at 169, 25% at 179 and remaining 50% at 193 d of age. The timing of marketing was shifted in 7 d intervals with mean marketing ages of 155.5 to 211.5 d with mean CW's of 75.7 to 108.7 kg. Sort loss was calculated using a market system for a U.S. pork processor (Tyson Foods). Sort loss (\$/pig) values were fitted to a polynomial function of mean CW for each combination of BWEE and PNVE. The increase in mean sort loss for each unit increase in CW above 93 kg increased as BWEE and PNVE increased. Pork production costs were estimated using an industry spreadsheet. A base price of \$1.433/kg of CW was used to produce a small profit per pig. Market prices of \$1.653 and \$1.322/KG CW were used to reflect times of large profit or losses per pig. Lean premium (LPREM, \$/100 kg CW) for gilts was estimated as: $LPREM = 0.4665 - 0.00198CW, \text{ kg}$ ($R^2 = 0.99$) and for barrows was: $LPREM = 0.4176 - 0.00216CW, \text{ kg}$ ($R^2 = 0.99$). The optimal CW's to maximize profit/pig and daily returns above daily costs were estimated for each combination of BWEE and market price. For a single mean pig and base price, the optimal CW for profit/hd and profit/hd/d were the day before sort loss discount was to occur (Age = 188, CW = 98.8, profit/hd/d = \$4.67, profit/hd/d = (\$0.028/d). With accurate sorting, (BWEE = 0) the optimal mean age for the 3 MCUT strategy was 183.5 d (169, 179 and 193 d MCUTs) at a mean CW of 96.4 kg and profit of \$3.49/pig. With less accurate sorting (BWEE = 8%), the optimal mean age decreased to 181.5 d with mean CW of 95.2 kg, and profit of \$2.89/pig. With this marketing system, the optimal market ages decreased only 1 to 2 d and CW's decreased 0.6 to 1.3 kg

decreased as the accuracy of sorting pigs decreased. The lower market price reduced the optimal CW by 1.2 kg (2d) and increase 2.4 kg (4d) with the higher market price. The Tyson Foods marketing system is less sensitive to the accuracy of sorting than other systems.

Research Mentor: Allan Schinckel

Animal Sciences

College of Agriculture;

Poster Number: 10a :: Life Sciences

College of Agriculture

Liquid-Gated Hollow Fiber Membrane Filtration for Rapid Pathogen Detection

Author:

Justin Couetil

Abstract:

The logistics of modern agriculture and nutrition incentivize quick distribution. In the time that traditional methods can detect pathogenic contamination, supermarkets are stocked, restaurants have served meals, and tainted food has been consumed. Prompt pathogen detection is a major obstacle for the world food industry. On average, 56% of foodborne outbreak deaths are multi-state incidences (CDC, 2015). This highlights the duty of food producers and distributors to embrace new detection technologies, detailed record keeping, and to promote a culture of safety. The main issue in pathogen detection in food systems is being able to detect the extremely low concentrations of bacteria that are sufficient to cause disease. To be able to reach detection thresholds, traditional culture methods require lengthy enrichment, *E. coli* being 24±2 hours (Thermo Scientific, ISO 16654:2001, ISO 7251:2005).

The Laboratory of Renewable Resources Engineering (LORRE) at Purdue University has developed the Continuous Cell Concentration Device (C3D), which employs hollow-fiber microfiltration to concentrate pathogens from liquid food samples, facilitating detection within a single working day (under 8 hours). Processing nutritionally complex food can incur costs in enzyme loading and filter membrane wear. Liquid-Gated Membranes (LGMs) may present a means to reduce membrane fouling, without detrimental effects to the proven and effective pathogen-concentrating procedures established by LORRE. LGMs have been characterized as non-toxic, self-cleaning, omniphobic, resistant to strong chemical treatment, while maintaining lower critical pressures and high flux rates during liquid filtrations. Their novel application in hollow-fiber microfiltration may be a conduit to reduce sample processing costs and broadened food type processing.

Research Mentor: Dr. Michael R. Ladisch. Distinguished Professor of Agricultural and Biological Engineering. Director of Laboratory of Renewable Resources Engineering.;

Poster Number: 11a :: Life Sciences

College of Agriculture

Effect of Solvent Polarity on the Secondary Structure, Surface Properties, and Tensile Properties of Novel Biodegradable Kafirin Films

Author:

Nathania Dianda

Abstract:

Kafirin, the prolamin from sorghum, has great potential for application in biodegradable food packaging materials, nanoparticulation and functional film research. However, the secondary structure and surface properties of kafirin are not yet fully understood. To understand the effect of solvent polarity on the physico-chemical properties, kafirin was extracted from sorghum flour and dissolved in 70%, 80%, 85%, and 90% ethanol, as well as in 50%, 60%, 70% and 80% tert-butanol, which was later plasticized and cast into films. The extracted kafirin powder, kafirin dissolved in the two different solvents, the unplasticized and plasticized kafirin films were characterized using FTIR. The secondary structure analysis of the pristine kafirin powder contained ~40% α -helices, and kafirin dissolved in 80% ethanol contained ~47% α -helices, whereas plasticized kafirin-80% ethanol films contained ~40% α -helices. Similar results were obtained for kafirin dissolved in tert-butanol solutions and kafirin-tert-butanol films. This suggests that there were solvent-induced transformation in the α -helical structure of kafirin when dissolved in different concentrations of ethanol and tert-butanol solutions. The addition of plasticizers and the drying of films may have also affected the α -helical structure due to solvent evaporation and kafirin-plasticizer interactions. Based on the results, 80% ethanol consistently yields the highest % α -helix. Circular Dichroism (CD) results for kafirin dissolved in ethanol and tert-butanol solutions showed trends similar to FTIR. With decreasing solvent polarity, the water contact angle increased, with the highest contact angle of 56° obtained for plasticized kafirin-70% tert-butanol films, and 53° for plasticized kafirin-90% ethanol films. The highest Young's Modulus obtained was 3.56 GPa from plasticized kafirin-85% ethanol films, which also has the highest tensile strength, but the lowest % elongation at break compared to other kafirin-ethanol films. For kafirin-tert-butanol films, highest Young's Modulus obtained was 1.91 GPa for plasticized kafirin-70% tert-butanol films, which also has the highest tensile strength 1.6 MPa and highest % elongation at break. Our findings suggest that both solvent polarity and plasticizer can effectively regulate kafirin assemblies and improve the surface hydrophobicity and mechanical properties of kafirin films for application in biodegradable food packaging materials.

Research Mentor: Tahrima Binte Rouf, Department of Agriculture, Food Science, Purdue University; Dr. Jozef Kokini, Department of Agriculture, Food Science, Purdue University

Poster Number: 12a :: Life Sciences

College of Agriculture

Discovery and Characterization of Mutants Defective in Gravitropic Growth of Shoots

Author:

Kate Eastman

Abstract:

Immediately following germination, plants reorient root and shoot growth response to gravity to effectively explore soil and obtain light, respectively. To better understand how this process is regulated we carried out a genetic screen to identify mutants that either failed to, or were slow to, reorient in response to a gravity vector in the dark. Using family-wise screening of Next-Generation EMS Mutagenized families, 30 mutants were identified that repeatedly exhibited slow shoot turnaround out of 800 tested families. Among these, 8 exhibited short thick shoots (sts) in the dark. Remarkably, these all display attributes consistent with in Brassinosteroid (BR) deficiency. Brassinosteroids are growth promoting phytohormones controlling cell elongation and multiple developmental processes. Similar to the known BR-deficient mutants (na1, na2, lil/brd1) these mutants exhibited persistence of pistils in the tassel florets (POPIT), upright leaves, and short stature similar to BR-deficient mutants. All 30 slow shoot turnaround families were grown to maturity and screened for architectural abnormalities with a focus on dwarfism and antigravitropism. No mutants with phenotypes similar to lazy plant1 were recovered in this screen. All known BR-deficient mutants of maize were germinated in the dark and tested for gravitropic growth. Although dwarfism was apparent in na1 and na2 lines, seedlings did not display the short thick shoots or slow shoot turnaround that characterized the sts mutants. Unlike these BR-deficient mutants, brd1 seedlings defective in BR-6-oxidase, did exhibit short, thick shoots and slow shoot turnaround when inverted in the dark. It is possible that the 8 sts mutants are new alleles of brd1 or are alleles in other steps of BR synthesis or signal transduction.

Research Mentor: Dr. Brian Dilkes, Biochemistry, College of Agriculture;

Poster Number: 13a :: Social Sciences/Humanities

College of Agriculture

Profiles of Nutrient Management Plan Adopters and Non Adopters in the St. Marys Watershed

Author:

Ayla Grilly

Abstract:

Ever since the 1960's, algal blooms in Lake Erie have caused environmental as well as human health impacts and have been largely attributed to agricultural nutrient runoff in the Western Lake Erie Basin. The St. Marys watershed drains into Western Lake Erie and has been identified as a contributor of nutrients, leading to toxic algal blooms. Nutrient management plans (NMPs) have been promoted to reduce nutrient runoff and nutrient loadings in the Western Lake Erie Basin. This report examines the profiles of farmers who have adopted NMPs and farmers who have not. The profiles were developed from surveys mailed to 986 farmers and landowners in the St. Marys watershed with questions pertaining to conservation practice adoption. The surveys response rate was 49.8% and the profile results include 143 valid responses. A total of 33 respondents reported adopting an NMP while 110 respondents reported they had not. Using descriptive statistics, this research describes the average NMP adopter in the St. Marys watershed and indicates that NMP adopters implement more conservation practices into their farming operation, including cover crops, gypsum application, conservation tillage, and conservation plans. This research helps us understand the demographics of non adopters and adopters and informs outreach and education in the St. Marys watershed.

Research Mentor: Emily Usher, Natural Resources and Social Science, and College of Agriculture;

Poster Number: 14a :: Social Sciences/Humanities

College of Agriculture

Beech Grove High School Urban Agriculture Program Effectiveness Study

Author:

Brianna Lammers

Abstract:

Urban agriculture is growing more popular every day. This includes agricultural production such as community gardens and backyard chicken coops, but it also includes agribusinesses and other related industries. This growth has spurred urban school systems to add Agricultural Education programs in high schools and middle schools. However, there is limited research on the impact of these programs and whether they foster student interest in agriculture. This study focuses on the relatively newly established urban agriculture program at Beech Grove High School in Beech Grove, Indiana. The program was established in 2012. The goal of this study was to see not only why students got involved in the program originally, but also why they stayed involved and how that could potentially relate to their future plans. All students enrolled in a high school agriculture class were given the opportunity to provide answers via a Qualtrics survey. The data were analyzed for trends that could be used to further the development of the Beech Grove agriculture program and the creation or boosting of other urban agriculture programs that have recently started or are thinking about starting. Participants provided responses in the areas of motivation to enroll in agriculture courses, motivation to become involved in the co-curricular student organization FFA, interest in the work-based component of the program, potential career plans, and feedback to improve the program.

Research Mentor: Dr. B. Allen Talbert, Agricultural Sciences Education and Communication, College of Agriculture;

Poster Number: 15a :: Social Sciences/Humanities

College of Agriculture

Comparing Farmers' Perceptions on Water Quality to Actual Water Quality Metrics in Three Watersheds

Author:

Megan Li

Abstract:

The prevalence of agricultural land use imparts specific water quality issues in watersheds across Indiana. These include nutrient runoff, erosion, and sediment, all of which can damage watersheds exposed to poor soil and land management. Awareness of these impairments can indicate the importance of water quality to farmers as well as influence the implementation of agricultural, conservation practices. Using survey data collected from producers and landowners in the St. Marys (n = 454), Big Pine Creek (n = 121), and Upper White (n = 361) watersheds, this research assesses farmers' perceptions on water quality in their respective watershed compared to the actual water quality metrics reported by the Environmental Protection Agency (EPA) in 2010. The water impairments addressed in the survey include sediment/silt, nitrate/nitrogen, phosphorus, bacteria in the water (such as *E. coli*) and pesticides. We used nonparametric statistics to compare farmers' perceptions on water pollutants across three watersheds and found that farmers generally perceived the problem of nutrient (nitrate/nitrogen & phosphorus) pollutants within their watershed correctly. However, farmers perceived the other pollutant problems differently to the EPA's reported impairments. Understanding how farmers perceive water quality issues within their watershed can prompt educators and outreach programs to increase awareness of the negative impacts of poor water quality. Recognizing the implications of agricultural land use on water quality is also an important step to implementing better management or conservation plans.

Research Mentor: Junyu Lu, Forestry and Natural Resources, College of Agriculture;

Poster Number: 16a :: Physical Sciences

College of Agriculture

Creek Corridor Plan: Reclaiming Wildlife Habitat and Recreational Opportunities along Little Cicero, Cicero, and Hinkle Creek

Author:

Michelle Lockhart

Abstract:

Corridor plans for Cicero, Little Cicero, and Hinkle Creek will outline areas for wetland restoration, tree canopy conservation and enhancement, and recreational trail development. Cicero, Little Cicero, and Hinkle Creek flow into the Morse Reservoir in northern Hamilton County, IN. The creeks are bordered by residential private property and farmland. Runoff from farmland and sediment erosion are the leading agents reducing water quality in Indiana. Conservation corridors along the creeks would provide wildlife connections to core forest habitat in southern Indiana as well as enhance recreational opportunities for nearby towns like Arcadia, Cicero, Atlanta, and Tipton. The creek corridors were analyzed to determine how planning for natural resource conservation could increase water quality, habitat viability, and local recreation. Current tree canopy and historic wetland areas were mapped to help identify areas for conservation and restoration along each creek. Geographic Information System Mapping Technology (GIS) was used to complete an overlay analysis of the natural resources for each creek. County land parcel layers identified current uses, residential and agricultural, along each creek and how these uses can evolve to enhance water quality, corridor habitat, and green recreation. The resulting creek corridor plan reveals that nearby towns will benefit economically and socially from the implementation of green trails promoting recreation and education around local natural resources. Increased water quality, habitat viability, flood and runoff mitigation will result from improved vegetative cover and wetland restoration along each of the three creeks.

Research Mentor: Professor Aaron Thompson

Horticulture and Landscape Architecture

College of Agriculture;

Poster Number: 17a :: Innovative Technology/Entrepreneurship/Design

College of Agriculture

Rethinking Suburbia: Applications of Autonomous Vehicle Design for Residential Neighborhoods

Author:

Jackson McGee

Abstract:

The implementation of an autonomous vehicle friendly built environment will enable designers to effect positive change in the development practices and community culture of suburban landscapes. St. John sits on the edge of an outwardly expanding urban sprawl band in Northwest Indiana. Tax benefits and proximity to Lake Michigan and Chicago, IL are pushing population centers South and East. Natural and agricultural environments are threatened by this urban sprawl. A need for well designed, intentional, landscape intervention is evident. Can a reduction of impervious surface and traditional vehicular traffic within a community be ecologically, culturally, and economically beneficial? And is there an opportunity to implement these practices in Northwest Indiana? By analyzing data on the current development trends, migration draws, and expected resident base we can assess the opportunity for landscape interventions in this area. Anticipated cost studies, comparing short and long term costs of traditional development vs that of proposed practice changes, will expose the financial feasibility of these landscape interventions. Based on data collected, the state of development and expected future resident base, St. John would benefit from implementation of the proposed landscape interventions. Through smart design decision making and improved practices the long term financial benefits of this type of development make it a financially feasible development option.

Research Mentor: Aaron Thompson, Horticulture Landscape Architecture, Agriculture;

Poster Number: 18a :: Life Sciences

College of Agriculture

Analyzing Excavations of Freshwater Mussels in the White River in Muncie, Indiana

Author:

Emily Musenbrock

Abstract:

Muncie Sanitary District's Bureau of Water Quality (BWQ) monitors the water quality of the West Fork of the White River. During quantitative mussel biomonitoring studies from 2011-2017, BWQ biologists sampled native Unionid mussels, recording whether mussels were found on the substrate surface or by excavation. With this data, we wished to determine whether mussel excavation was necessary to accurately represent the mussel populations. This would allow us to allocate sampling time to more accurately depict mussel density. Eight sites along the West Fork of the White River were sampled using Adaptive Cluster Sampling. This technique allowed biologists to record mussels on the substrate surface and through excavating up to 15 cm. Overall, 355 (36.3%) mussels were sampled on the substrate surface and 624 (63.7%) mussels were sampled through excavation. Of the 16 species found, the Giant Floater (*Pyganodon grandis*), Spike (*Eurynia dilatata*), Paper Pondshell (*Utterbackia imbecillis*), and Cylindrical Papershell (*Anodontoidea ferussacianus*) would be completely absent from mussel population analysis without excavation. Potential factors affecting vertical distribution at the time of sampling include: hydrological factors, weather, substrate, season, and glochidia release. Results indicated that species releasing glochidia during the study timeframe include the Plain Pocketbook (75% sampled at the surface) and the Threeridge (100% sampled at the surface). My analysis suggests that excavation is necessary to obtain an accurate representation of mussel densities, and that surface numbers may be affected by vertical movement due to periods of glochidia release. Suggestions for future studies include the effect of vertical distribution due to glochidia release on the occurrence of Unionid mussels on the substrate surface, and considerations for sampling timing based on these results.

Research Mentor: Laura Bowley, Muncie Sanitary District's Bureau of Water Quality; John Dunning, Forestry and Natural Resources, College of Agriculture

Poster Number: 19a :: Life Sciences

College of Agriculture

Fundamentals and Consequences of Water-Solid Interactions in Seasoning Ingredient Blends

Author:

Christina Mussmann

Abstract:

Ingredient blends containing both crystalline and amorphous ingredients are common in the food industry, including in seasoning blends. These blends may exhibit unwanted clumping or caking during storage due to the interactions between amorphous and crystalline ingredients and the environment, although little quantitative information is available regarding moisture content thresholds for caking or differences between different seasoning types. The purpose of this study was to characterize the moisture sorption and caking characteristics of individual seasonings and seasoning blends exposed to varying RH and temperature conditions. Twenty-six spice and herb powders and flakes, sodium chloride, sucrose, and maltodextrin were studied individually and in binary, tertiary, and quaternary blends. Moisture sorption profiles were generated by exposing the samples to increasing RHs (0-95%) using a moisture sorption instrument (SPS) and monitoring mass. A subset of samples was stored in controlled RH (44-75%RH) and temperature (20-50°C) desiccators and monitored over time for moisture sorption, appearance, and degree of caking. Due to the low deliquescence point of sodium chloride, blends containing sodium chloride were more sensitive to environmental RH conditions and sorbed the most water. As the blends containing sodium chloride became more complex, the deliquescence points were further lowered due to deliquescence lowering. The presence of maltodextrin caused a slow increase in weight gain before the deliquescence point, unlike the other mixture components, due to its amorphous nature. The herb flakes sorbed more moisture than the other spices and herbs studied, followed by garlic and onion powders. The moisture sorption behaviors of spice and herb blends dictated the caking and clumping tendencies of the blends. Understanding these behaviors will allow predictions of physical stability of many ingredient blends.

Research Mentor: Dr. Lisa Mauer, Food Science, College of Agriculture;

Poster Number: 20a :: Physical Sciences

College of Agriculture
Blue Corridor Plan near the Indiana Dunes

Author:

Stephanie Orr

Abstract:

The Blue Corridor Plan near the Indiana Dunes aims to assess water quality, while linking crucial habitat areas in and around the Indiana Dunes National Park. The Indiana Dunes is a sensitive area with great ecological diversity that deserves protecting. The specific study area is in-between Chesterton and Michigan City. The area is mainly agricultural land with forests, grasslands, and wetlands mixed in. This area is prime for future suburban development which is why an overall framework plan is crucial in order to identify critical natural areas for protection and land to acquire for overall connectivity which will allow for a healthy ecosystem to thrive when development does happen. The first step in this process is to determine which areas of land may be prime for protection. By looking at the layers containing forests, grasslands, streams, and wetlands it is possible to locate the key existing natural areas. Looking at a 200 meter buffer along the streams and waterways highlights the land use along the streams, while revealing which parcels may be prime for acquiring in order to link natural areas and/or for the health of the stream. From the results it is evident that there are important natural areas that need protection from development in order for the Indiana Dunes to continue to thrive and maintain a high level of water quality for the whole system.

Research Mentor: Dr. Aaron Thompson, Landscape Architecture, Agriculture;

Poster Number: 21a :: Life Sciences

College of Agriculture

Synthesis and Biological Activity of Non-decarboxylatable Malonyl-CoA Antimetabolites

Author:

Ana Pascual-Garrigos

Abstract:

Malonyl-CoA is a molecule involved in a variety of important reactions and it is biologically important as it is required for fatty acid synthesis. This compound is also highly reactive making it and the enzymes that use it difficult to study. As a result, in order to learn mechanistic information, more stable analogs of malonyl-CoA were made in order to mimic the size, shape and acidity of the thioester and carboxylate groups. Throughout the semester, some malonyl-CoA analogs were synthesized and bacterial inhibition growth assays were performed with *Escherichia Coli*, *Bacillus cereus*, and *Micrococcus luteus*. However, the inhibition predicted was not seen from any of the analogs previously synthesized. As a result, it was concluded that the information suggesting that the analogs did inhibit bacterial growth was not replicable and no minimal inhibition concentration against these microorganisms was able to be determined. To continue this research, more work will be done on synthesis of analogs that replace thioester sulfur with a carbon atom. Currently, we have synthesized several intermediate steps to completing analogs containing a ketone with different carboxylate bioisosteres. These analogs will be used to study different acyl-CoA utilizing enzymes by co-crystallizing the analogs with enzymes such as acetyl-CoA carboxylase (ACC). Finally, the K_d of the different analogs with ACC will be determined to observe how tightly they bind in the enzyme active site. We will measure this value using either isothermal titration calorimetry (ITC) or microscale thermophoresis (MST). This kinetic data in combination with the structural data gained through X-ray crystallography will allow us to determine catalytic details of different enzymes, such as ACC.

Research Mentor: Trevor Boram, Biochemistry, College of Agriculture; Jeremy Lohman, Biochemistry, College of Agriculture

Poster Number: 22a :: Life Sciences

College of Agriculture

Compassion Fatigue in Laboratory Animal Personnel: Do Euthanasia, Isolation, and Other Factors Impact Professional Quality of Life?

Author:

Megan Riley

Abstract:

Title: Compassion Fatigue in Laboratory Animal Personnel: Do Euthanasia, Isolation, and Other Factors Impact Professional Quality of Life?

Megan Riley

An important problem in the laboratory animal industry is that the constant building and breaking of the human-animal bond may lead to workplace stress. This may impact professional quality of life by increasing compassion fatigue (comprised of burnout and secondary traumatic stress). In this study, our objective was to explore associations between professional quality of life and potential risk or protective factors in laboratory animal personnel.

We surveyed 815 laboratory animal personnel currently working with laboratory animals in the United States or Canada. These personnel worked in a wide range of settings (e.g. industry, universities), research types (e.g. basic, applied), species (e.g. non-humans primates, mice), and roles (e.g. animal care technicians, veterinarians, laboratory managers). The survey consisted of a Professional Quality of Life questionnaire and questions about social support, euthanasia, enrichment provisions, and general behaviors towards laboratory animals.

Our results indicate that higher burnout and secondary traumatic stress were associated with lower levels of social support, enrichment provisions, and control over euthanasia (p 's<0.05). Conversely, lower compassion fatigue was associated with lower levels of stress or pain in animals being cared for, desire for greater enrichment, and general positive behaviors towards laboratory animals (p 's<0.05).

In conclusion, compassion fatigue is associated with various social and work related factors. This suggests that personnel could benefit from interventions that increase social support, control over euthanasia and enrichment. Future research could directly investigate these in an interventions trial to improve the professional quality of life of laboratory animal personnel.

Keywords: Professional Quality of Life; Compassion Fatigue; Burnout; Secondary Traumatic Stress; Human-Animal Bond; Laboratory Animals; Animal Welfare

Research Mentor: Megan LaFollette, Animal Sciences, College of Agriculture; Brianna Gaskill, Animal Sciences, College of Agriculture

Poster Number: 23a :: Life Sciences

College of Agriculture

Effects of Diversity and Density on Common and Endangered Hardwood Species.

Author:

Morgan Ritzi

Abstract:

The effects of diversity and density have been well described in regard to plant competition in small model species and crops. Unfortunately, this relationship has hardly been described in larger slow growing species like trees. These concepts are beneficial to understanding growth and spatial arrangement of species in regard to forest systems which has been poorly understood. This presentation expands these topics and highlights these responses in regard to the American chestnut tree, a highly threatened and historically important species that has been nearly eradicated due to an invasive pathogen, and the Northern red oak, a commonly found Northern hardwood and ornamental. Growth of tree species is compared to different densities and diversities of trees in plantation plots at the Martell forest near West Lafayette IN, which represent native species including the American chestnut. Growth is measured by extracting tree cores and using CooR Dendro software to average growth per year of tree rings. Mixed plots of diversity and density are compared, and the expected results show that density has more effects then diversity on growth. By better understanding the ecological principals of diversity and density, then restoration of the American chestnut can be aided, and ecologist will have a better understanding of basic ecological principles in regard to old standing growth plots.

Research Mentor: Gordon McNickle, Department of Botany and Plant Pathology;

Poster Number: 24a :: Physical Sciences

College of Agriculture

Wabash Nature & Education Center: Connecting West Lafayette to the Wabash River

Author:

Tucker Rose

Abstract:

The site will connect residents of West Lafayette to the Wabash River by responding to natural habitats and water systems in order to integrate recreational and educational experiences in a resilient, responsible, and rejuvenating manner. The Wabash River is situated along the bustling campus of Purdue University and the West Lafayette community, but residents are not able to properly acknowledge and engage with the river due to a lack of knowledge and infrastructure. The Wabash River is currently prone to flooding often and lacks diverse, vibrant wildlife habitat, yet it has great potential for conceptual and physical connections to the larger community. These connections could manifest through educational opportunities as well as bridging the gaps in existing trail and recreational infrastructure. The project addresses where connections to existing trail systems, parks, and streets could be implemented as well as procedures to address flooding and water quality concerns. Through assessing information found on site, ArcGIS data, and in Purdue University's Campus Master Plan (Giant Leaps), an overlay analysis was created to identify priority areas for each type of implemented change. The project also seeks to identify research and educational opportunities that would strengthen the overall character of the site and connection to educational institutions. These opportunities have been identified through analysis of current ongoing research that relates to the river habitats. The overlay analysis indicated that there are several access points that could connect to existing Wabash Heritage Trail, River Road, and Tapawingo Park infrastructure and programming through enhanced plant and land manipulation that mitigates flooding and promotes habitat. Educational opportunities are present with natural resources and wildlife research being conducted at Purdue University.

Research Mentor: Aaron Thompson, Horticulture and Landscape Architecture, College of Agriculture;

Poster Number: 25a :: Life Sciences

College of Agriculture

Tickling adult breeder rats: examining ultrasonic vocalization subtypes to determine emotional response

Author:

Beenah Shokouhzadeh

Abstract:

Laboratory rats may find initial human handling stressful. One enrichment technique that can help is rat tickling, which mimics aspects of rat rough-and-tumble play. In juvenile and singly housed adult rats, tickling has been shown to elicit 50-kHz ultrasonic vocalizations (USVs) – indicative of positive emotions – and increase approach behavior. However, it's unknown if adult breeder rats (who may play less) could also benefit from tickling. Therefore, our objective was to explore responses of adult breeder rats to tickling by analyzing USVs. Eight 8 week old Long Evans (LE) and CD breeder rat pair (N=16) were tickled for 7 non-consecutive weekdays and then at weekly cage changes. Tickling continued throughout breeding/gestation as pairs were separated and females had pups. USVs were recorded and coded into subcategories: 50-kHz (trills, flats, or other), 22-kHz (short or long), and lows. Long 22-kHz range are indicative of negative emotions. Preliminary results were analyzed with descriptive statistics (median; minimum-maximum). Although data analysis is still in progress, our initial analysis of 90 vocalization files show large individual differences in response to tickling. Positive 50-kHz other (69; 2-365) and trills (14.5; 0-173) were most common. Long 22-kHz USVs (0; 0-56) were less common, but occurred in high numbers in some sessions. In conclusion, it appears that breeder rats have large individual differences in response to tickling, with some animals showing very positive responses and others showing more negative responses. This suggests the importance of monitoring USVs when tickling breeding animals.

Research Mentor: Megan LaFollette, Department of Animal Sciences, College of Ag; Dr. Brianna Gaskill, Department of Animal Sciences, College of Ag

Poster Number: 26a :: Life Sciences

College of Agriculture

Modeling how Beach Characteristics, Predator's Response to Humans, and Bird's Tolerance of Humans Affect Piping Plovers (*Charadrius melodus*)

Author:

Samantha Smock

Abstract:

Piping plovers (*Charadrius melodus*) are federally threatened shorebirds whose nesting success is sensitive to disturbance by humans on beaches. Predation also impacts plover chick survival. Both plovers and their predators are influenced by human activity on beaches. However, the interaction between the direct influence of recreating humans upon plovers and the effects of these same humans upon the plovers predators are less clear. Humans might create a predator-free space for the plovers by driving predators out of areas where plovers are found. Alternatively, humans might attract more predators to areas where plovers nest increasing the risk of predation. Individual-Based modeling (IBM) can be an important tool for comparing scenarios such as the concurrent interactions of predators and prey to human disturbance. IBMs work by incorporating empirical data into virtual models that predict outcomes for different circumstances given a common set of assumptions. We used such an IBM to investigate the effects of human density, beach configuration, and two separate avian predators on important population rates such as chick survival, nest survival, chick weight, and average time spent flushing in response to disturbance. Using statistical models and effect sizes, we can relate our findings back to managers of plover habitat and advise them on which disturbances could be regulated to mitigate risk to plovers. Our findings will also inform and direct future research and investigation into the most harmful disturbance combinations. For example, predators that flee from humans at far distances may forage exclusively in the dunes areas where plovers forage. This could be especially detrimental on a beach with high human densities or narrow dunes.

Research Mentor: Patrick Zollner, Department of Forestry and Natural Resources, College of Agriculture; Alexander Cohen, Cardno

Poster Number: 27a :: Life Sciences

College of Agriculture

Neuroprotective Abilities of Overexpressing Nfe2L1 in Parkinson's Disease Model

Author:

Baishuai Sun

Abstract:

Parkinson's disease (PD) is a complex progressive neurodegenerative disorder that affects 6-7 million people. PD is characterized by a profound loss of dopaminergic neurons in the substantia nigra of the midbrain. One of the defining pathological events occurring in PD is the aggregation of aSyn which ultimately leads to formation of Lewy bodies and neurotoxicity. While abnormal protein accumulation is key, a combination of age induced oxidative damage, proteasome dysfunction, and environmental factors plays a significant role as well in the progression of pathology. Alpha-synuclein aggregation leads to oxidative and proteasomal stress, and the proteasomal stress results in inefficient protein clearance systems which in turn increases aggregation of alpha-synuclein. Such a vicious circle culminates in the loss of dopaminergic neurons. Thus, any therapeutic strategies to attenuate alpha-synuclein aggregation or increasing proteasomal and antioxidant activities would be beneficial. Nuclear factor erythroid-derived 2-related factor 1 (Nfe2L1) is an ER bound transcription factor which translocates to the nucleus then upregulates the expression of Antioxidant Response Elements (ARE)-regulated genes and proteasome assembly genes when proteasomal activities are inhibited. In recent research, it has been shown that Nfe2L1 is downregulated in PD patients' brains, and the lack of Nfe2L1 increases the sensitivity to oxidative and proteotoxic stress. These observations suggested the hypothesis that overexpressing Nfe2L1 would alleviate oxidative stress and proteasomal dysfunction to protect neurons against PD-related insults. Our data suggests that Nfe2L1 expression can decrease the MG132 induced proteasomal stress in rat primary cortical astrocytes and reduce oxidative stress induced by neurotoxin paraquat. Nfe2L1 overexpression also shows a trend towards protection against aSyn neurotoxicity. Currently we are working to test the neuroprotective effects of different variants of Nfe2L1 in order to find the most and transcriptionally active form.

Research Mentor: Aswathy Chandran, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy; Jean-Christophe Rochet, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy

Poster Number: 28a :: Social Sciences/Humanities

College of Agriculture
Greening Gary - A Vacant to Value Land Manual

Author:

Yoong Sin Tong

Abstract:

A proposal for addressing blight and vacant lands in the Central neighborhood of Gary, Indiana by transforming empty lands into informal parks and landscaped corridors, as well as setting aside selected sites for solar or wind power generation. The city of Gary, Indiana has suffered from decades of decline, being so intimately tied to the fortunes of the U.S. Steel industry. It has resulted in a dramatic depopulation of the city, resulting in much of Gary being overtaken by nature. We will be exploring and codifying steps taken by the Philadelphia Horticultural Society through their LandCare program to inform us on how we can better address blight issues in Gary, on a limited budget while maximizing the involvement of local stakeholders. Our proposal will additionally include plans to develop renewable energy on existing "brownfield" sites in Gary, on places already identified through the EPA's Re-Power program, as this will be an additional means of generating more taxable revenue, on a city notorious for having too much land for too little people. We will be using the neighborhood of Central in Gary, as our pilot neighborhood for our purposed interventions, with an eye for further expansion to other neighborhoods, in time. Using GIS for inventory purposes and layering layers of information over one another for analysis, we proposed ways to turn Gary around, by the way of many cost effective, small but socially conscious neighborhood projects.

Research Mentor: Dr Aaron Thompson;

Poster Number: 29a :: Life Sciences

College of Agriculture

Evaluation of a High Carotenoid Corn Diet as Modulator of the Chicken Gut Microbiome

Author:

Jose Isaac Vargas

Abstract:

Gut health has a crucial importance in poultry industry due to its implications in productivity, nutrition and susceptibility to diseases. Traditionally, the poultry industry has managed the gut microbiome composition and diversity with the use of antibiotic growth promoters (AGPs). Lately these products have shown ineffectiveness and have increased the concern about antibiotic resistant bacteria and transmission to humans, through the consumption of contaminated products. This project will determine the effects of feeding corn with different carotenoid (lutein and zeaxanthin) profiles on the composition and diversity of the gut microbiome of broilers and layers, across three animal trials with a total of 70 pens and 1620 animals. Additionally, the project will determine if the microbiome composition has correlation with animal production characteristics such as weight, color of muscles, eggs and susceptibility to diseases (coccidiosis and footpad dermatitis). To perform the study, the DNA of 198 cecal and 144 ileal samples of fully-grown chicken will be extracted, quantified and normalized. Then, amplicon libraries will be made by amplifying the 16s rRNA gene. Next, the resulting PCR products will be normalized and pooled in equal ratios. Finally, the amplicon library will be submitted for sequencing on an Illumina MiSeq sequencer. Overall, the project will compare differences between bacterial populations among the treatments, and determine correlations between gut microbiome, different corn diets and litter environment. The identification of dominant bacterial genus in each of the treatments will allow the establishment of a relationship between bacterial genus and productive variables.

Research Mentor: Dr. Timothy Johnson.

Assistant Professor of Animal Sciences.

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Poster Number: 30a :: Life Sciences

College of Agriculture
Economic Impact of PGRs in Landscape Maintenance

Author:

Jose Enrique Velasco Ortiz

Abstract:

The landscape maintenance industry generates important economic contributions in the United States; over 1 million jobs and \$54.7 billion in total sales in 2013 (Hodges et al., 2015). Labor is the single largest expense in agriculture, and the landscape maintenance industry is not an exception. Labor costs can represent between 30% to 55% of all costs for landscape business (IBIS World, 2018). Thus, labor savings is one of the most important tasks for managers in the landscape industry.

In looking for cost-effective ways to lower labor costs, landscape maintenance businesses have started using Plant Growth Regulators (PGRs), being paclobutrazol one of the most tested products. Our study investigates the economic impact of PGRs on the labor savings of landscape maintenance companies. Specifically, we investigate the labor savings (in dollars) determined by shortening pruning time and waste disposal reductions. We used a partial budget analysis to evaluate the financial effect of incremental changes in labor savings due to an adoption of PGRs for shrub maintenance.

Some results show that applying PGRs can, on average, reduce the number of prunes by 64.5% and the time of pruning by 56%. Together, these results show landscape maintenance businesses can reduce 443 hours of labor per year due to labor savings in pruning, depending on shrub specie. Considering a minimum wage of \$7.25/hour, this translates into expected savings of around \$3,217 per year. In addition to the data obtained from the study, our study will draw conclusions on improved occupational safety, labor reallocation savings, and labor productivity due to shorter maintenance time.

Research Mentor: Ariana Torres, Ph.D., Dept. Horticulture & Landscape Architecture, Dept. Agricultural Economics

Poster Number: 31a :: Social Sciences/Humanities

College of Agriculture

Likelihood of Soil Health Management Systems Users to Adopt Other Conservation Practices in the Big Pine Creek Watershed

Author:

Emma Wade

Abstract:

Since the 1970s the hypoxic zone in the Gulf of Mexico has been growing due to fertilizer runoff and soil degradation. The hypoxic zone impacts the productivity of aquatic ecosystems and threatens industries that rely on coastal areas. Soil Health Management Systems (SHMS) have been introduced to reduce nutrient runoff and downstream pollution. Farming practices impact downstream waterways so it is important to understand what influences the adoption of conservation practices such as SHMS. A survey was developed to collect producer and farmland owner demographic information and to determine whether they adopt conservation practices. Five conservation practices were evaluated: SHMS, nutrient management plans, conservation plans, conservation tillage, and cover crops. We sought to deduce if there were demographic differences between SHMS users and non-users and if SHMS users were more likely to adopt other conservation practices. Overall, the response rate was 36% and just over a quarter (26%; n=96) of respondents use SHMS. Both SHMS users and non-users tend to be male, approximately 60 years old, and have been farming for about 35 years. However, SHMS users have higher levels of education and tend to have smaller farm sizes. Additionally, SHMS users are more likely to implement the four other conservation practices. Low education and large farm size may be barriers to the adoption of conservation practices. To increase adoption, it may be effective to target farmers in those categories to create accessible conservation programs. Since SHMS use increases the adoption of other conservation practices, it may be useful to facilitate the implementation of SHMS to increase the adoption of other conservation practices.

Research Mentor: Emily Usher, Natural Resources Social Science, College of Agriculture;

Poster Number: 32a :: Life Sciences

College of Agriculture

Optimizing the Purification of a Sex-Determining Pheromone

Author:

Nathan Watervoort

Abstract:

Antheridiogens are a class of gibberellin-like pheromones that play an integral role in the life cycle of homosporous ferns. The presence of an antheridiogen causes a germinating spore, which would otherwise become a hermaphroditic or female gametophyte, to develop into a male gametophyte. Antheridiogens have been identified and characterized in other ferns but not in *Ceratopteris richardii*. The current steps to purify *C. richardii* antheridiogen (ACE) demonstrate that it is possible to purify ACE from crude *C. richardii* gametophyte growth medium using ethyl acetate extractions and column chromatography. Once enough material has been collected, these samples could then be used to generate structures from techniques such as crystalline sponge or LCMSMS.

Research Mentor: Jody Banks, Botany and Plant Pathology, Agriculture;

Poster Number: 33a :: Life Sciences

College of Agriculture

Disrupting circadian rhythms during the dry period decreases blood glucose but significantly increases milk production

Author:

Grace Wernert

Abstract:

The circadian timing system (CTS) functions to maintain homeostasis and we hypothesized that disrupting the CTS during the prepartum dry period would affect metabolic homeostasis and decrease milk yield in the subsequent lactation. Our objectives were to determine the effect of disrupting the CTS on: 1) Blood glucose, beta-hydroxy butyrate (BHBA) and non-esterified fatty acids (NEFA) in the pre and post-partum, and 2) milk production to 60 days in milk (DIM). Five weeks before expected calving (BEC) multiparous cows (n=32) were moved to a tie-stall barn and divided into two treatments: control (n=16; 16 h light: 8 h dark) or phase-shifted (PS, n=16), a chronic jet lag paradigm which shifted the light-dark phase 6 h every 3 days until parturition. All cows were exposed to control lighting after calving. Blood samples were taken at least bi-weekly at 0600 in the pre- and postpartum to measure glucose, BHBA and NEFA, and every 4 h over 48 h at three time points: 23 BEC, 9 BEC, and 5 days postpartum (PP). NEFA was measured using colorimetric assay; blood glucose and BHBA were measured with a Centrivet monitor. Core body temperature was recorded vaginally using ibutton data loggers at 23 BEC, 9 BEC, and 5 PP. PS significantly ($P<0.05$) shifted phase and attenuated circadian rhythms of core body temperature. Daily feed intake was not different between control (30.5 ± 0.6 kg) and PS (29.8 ± 0.6 kg) cows. Blood glucose was significantly ($P<0.05$) decreased in PS cows pre and postpartum, however there was no effect of treatment on BHBA or NEFA concentration. Cosine fit analysis found control cows exhibited circadian rhythms of plasma NEFA only at 5PP ($R^2=0.69$; $P=0.002$); whereas PS cows lacked circadian rhythms throughout study. Milk yield and fat corrected milk yield were significantly increased ($P<0.05$) through 60 DIM in PS (42 ± 0.92 and 43.5 ± 1.04 kg/d) versus control (39.3 ± 0.92 and 40.3 ± 1.04 kg/d) cows. Thus, lack of difference in BHBA, NEFA and feed intake along with decreased blood glucose, supports that disrupting circadian rhythms in late parturition increases milk production efficiency.

Research Mentor: Theresa Casey, Animal Sciences, College of Agriculture; Aridany Suarez-Trujillo

Poster Number: 34a :: Social Sciences/Humanities

College of Education

Elementary Teachers' Knowledge, Skills, and Confidence in Addressing Diversity across the Curriculum

Author:

Maya Cameron

Costa James

Laura Duke

Abstract:

Elementary Teachers' Knowledge, Skills, and Confidence in Addressing Diversity across the Curriculum

Teachers are responsible for preparing students to collaborate and work with others in an increasingly diverse environment. Two key aspects of diversity, important to consider in the classroom, are sex and race. To create a safe, inclusive classroom environment and provide students with appropriate instruction, teachers must have the knowledge, skills, and confidence to integrate issues of social justice. However, limited evidence exists in this area. Our proposed study employs survey methodology to meet this need. Using both open-and closed-ended items, we examine responses from a representative sample of Indiana elementary school teachers. Mixed-methods analyses will: (a) document teachers' knowledge and efficacy in diversity instruction; (b) address the extent to which teacher responses differ depending on sex, race, grade-level, content area, and school locale (urban vs rural), and (b) identify teachers' concerns and needs. Our findings will yield implications for practice as well as for research on this critical issue.

Research Mentor: P. Youli Mantzicopoulos-James

Educational Studies

College of Education;

Poster Number: 35a :: Social Sciences/Humanities

College of Education

Captivity Narratives and the Barbary Archive

Author:

Daniel Krause

Abstract:

Ahmed el Inglizi: The Forgotten Englishman

Abstract: Between the 16th and 19th centuries, European texts depict Muslim corsairs as brutal, chaotic, and immoral pirates who capture and torture their slaves, terrifying Europeans. However, we find that individual captives' stories complicate the picture, especially when European captives convert to Islam (called becoming Renegades), such as Ahmed el Inglizi, an Englishman, and French mathematician and architect Theodore Cornut. Captured Europeans often returned home to tell of mistreatment, but we often miss the story of the European that stayed in Muslim countries after being captured. We know who Theodore Cornut was before and after his time in countries not his own, but we know little of Ahmed el Inglizi, despite his being born a European. The two were in Morocco at approximately the same time and even worked on some of the same projects, but their stories could not be more archivally different. Reading the examples of Cornut and Inglizi together underscores the problems with answering questions about the latter: Who is Ahmed el Inglizi and why did his history disappear after he was no longer a "proper" European?

Research Mentor: Powell, Manushag - Associate Professor of English - ENGL / CLA -;

Poster Number: 36a :: Social Sciences/Humanities

College of Education

Pacifists During WWI

Author:

Jason Maynard

Abstract:

This research project analyzes news and media publications from the years 1917 to 1921 to gauge the attitude of the public and major media publishers towards pacifists, who in the majority were socialists, during the end of the World War I period. The project focuses on one individual, Victor L. Berger, from Milwaukee, WI. The goal is to investigate the actual attitudes of major media sources per the time period, not the assumed. The method that has been used for this investigation is article analysis and classification into one of three categories. After reading an article from a major media publisher, such as Current Events, the articles were categorized based on bias towards the subject, Victor L. Berger, and the citation was added in an electronic spreadsheet. This project has been a continuation over the course of multiple semesters in which over 340 articles have been compiled. It has been observed that the overwhelming majority of the articles that were sampled from the period held a neutral bias towards Victor L. Berger and socialists in general, which is not what is generally perceived by many individuals in our current time. The data compiled asserts the stance that many major media outlets in the period of 1917 to 1921 gave vastly neutral reports on events that were happening in Congress and major urban areas concerning national-scale socialists and pacifists. This research project is a portion of what will become a publication by Dr. Elizabeth Hoffman.

Research Mentor: Elizabeth Hoffman, Communication, College of Liberal Arts;

Poster Number: 37a :: Social Sciences/Humanities

College of Education

Teachers as Coaches for Paraprofessionals

Author:

Cayla Yannuzzi

Kailey Cerefin

Abstract:

Often young children with the most intensive behavioral needs are served by paraprofessionals, who are typically among the least trained and least supported staff in the school. While professional development opportunities are oftentimes limited for special education teachers, such professional growth opportunities are typically completely unavailable for paraprofessionals. The purpose of this study was to evaluate a program in which preschool special education teachers served as coaches for paraprofessionals. Using a single case research multiple baseline design across paraprofessionals and child dyads, we evaluated the effects of the teachers as coaches program on paraprofessional implementation fidelity of a behavior intervention and corresponding child engagement in challenging behavior and appropriate communication. Results showed that with teacher coaching, paraprofessionals increased their behavior intervention implementation fidelity to 100%. Results maintained 100% fidelity for two participants and were above baseline for one participant. Results also showed corresponding decreases in child challenging behavior and increases in appropriate communication. Implications for research and practice in supporting paraprofessionals are discussed.

Research Mentor: Mandy Rispoli

Special Education

Education;

Poster Number: 38a :: Physical Sciences

College of Engineering

ELECTROMAGNETIC COMPATIBILITY TEST ON A ROUTER

Author:

Abhimanyu Agarwal

McKenzie Elliot

Ayyub Jose

Vishal Meyyappan

Abstract:

ELECTROMAGNETIC COMPATIBILITY TEST ON A ROUTER

Abhimanyu Agarwal, Ayyub O. Jose, McKenzie Elliott, Vishal Meyyappan

The experiment's objective was to measure the amount of unintentional electromagnetic radiated and conducted emissions from a 2.5 GHz router to estimate compliance with Federal Communications Commission (FCC) regulations. Conducted emissions were tested using a line impedance network stabilizer (LISN) and radiated emissions were tested using an antenna and near field probes. Emissions were measured using an oscilloscope and a spectrum analyzer.

The emissions from the router to power line were certainly in the allowable emission range specified by FCC Electromagnetic Compliance limits. The in-band radiated emissions were in compliance. Some out-of-band emissions were noted outside the 2.5 GHz operating range of the router. Based on these observations, it was concluded that the product met the FCC compliance limits for in-band emissions. Further study of the exact FCC limits for the out-of-band emissions is needed.

Research Mentor: Barrett Robinson , Electrical and Computer Engineering , and College of Engineering;

Poster Number: 39a :: Physical Sciences

College of Engineering

Residual Stress and Chain Reactions in "Stick Bombs"

Author:

Lucas Allegrette

Abstract:

A stick bomb is a rigid structure made from popsicle sticks that is held together by stored energy. When one of the sticks is removed, the energy is released in the form of an "explosion". Stick bombs are a popular toy, but they also have properties that may be useful in engineering applications. Several models of different stick bomb configurations were created in Abaqus to observe the build-up and release of energy in each structure. Each model consisted of an assembly of multiple instances of a single part, which had the material properties of a popsicle stick. Boundary conditions and contact definitions were then added to the model to "assemble" the stick bomb. The constraints were removed, resulting in the formation of residual stress in a similar way to a real stick bomb. Finally, the end "trigger" stick was released to create the explosion. The models provide both a visual representation of the reaction and results about the residual stress and release of energy throughout the simulations.

Research Mentor: Thomas Siegmund, Mechanical Engineering;

Poster Number: 40a :: Social Sciences/Humanities

College of Engineering

Gaining Insights into the Perspective of Refugee Learners in an Introductory Engineering Course

Author:

Zachary Beyer

Abstract:

Gaining Insights into the Perspective of Refugee Learners in an Introductory Engineering Course

Zachary Beyer, Purdue University, West Lafayette

There has long been a lack of access of tertiary education for refugee learners, with currently only one percent of refugees having access to these educational opportunities [1]. In recent years, there have been initiatives to provide such opportunities to those living in the refugee context. This presentation describes a mixed-methods approach to investigate the student experience of refugee learners within an introductory engineering course for university level learners in the Azraq refugee camp in Jordan and the Kakuma refugee camp located in Kenya. Gaining insights into the perspectives of learners will allow us to begin to understand the complex experience of being enrolled in such a course. Previous work has explored the student experience of higher education within refugee camps, but focused on differing types of data [2]. Surveys provide a unique opportunity to look at trends over time using analysis of repeated measures, while also using the same subjects to analyze specific points in the course. Preliminary findings of these data published in prior work [3] examined the more surface level experience of students in the course. This research will build upon the original findings by analyzing the student experience in a more holistic view, by confirming initial findings and generating new results through more robust quantitative measures. Qualitative analysis will also be a component, using interviews from previous courses, as well as incorporating preliminary findings from open-ended responses from students enrolled in the current course, with which thematic analysis will be utilized to confirm and expand upon the quantitative findings.

[1] United Nations. "Online Study Scheme Gives Refugee Students a Degree of Hope." UNHCR, 26 Sept. 2017, www.unhcr.org/en-us/news/stories/2017/9/59c391214.html.

[2] Crea, Thomas M. "Refugee Higher Education: Contextual Challenges and Implications for Program Design, Delivery, and Accompaniment." *International Journal of Educational Development*, vol. 46, 19 Dec. 2014, pp. 12–22., doi:10.1016/j.ijedudev.2015.11.005.

[3] Beyer, Z., Freitas, C. C. S., DeBoer, J. (2018). Cultivating Engineering Thinking through an Innovative Educational Approach to Address Relevant Community Problems in the Azraq Refugee Camp. (Poster Presentation) 2018 Purdue Fall Undergraduate Research Expo, West Lafayette, IN.

Research Mentor: Jennifer DeBoer, Engineering Education, College of Engineering; Claudio Freitas, Engineering Education, College of Engineering

Poster Number: 41a :: Social Sciences/Humanities

College of Engineering

3D-Printing in Medicine: An Ethical Challenge

Author:

Allison Biddinger

Abstract:

As the human organ shortage becomes increasingly prevalent on a global scale, a solution must be found in order to decrease the number of transplant-related deaths in the future. Bioengineering, or the use of artificial tissue, organs, or organ components to replace damaged or absent parts of the body, has been impacting the field of medicine for generations because of its ability to replace an organ donor. Commonly known as regenerative medicine, this technique uses a biological scaffold, or a structure that has the capability to grow human tissue, to inject a human's stem cells into; thus, decreasing the risk of the patient rejecting the newly transplanted organ. As many researchers concluded, the biological scaffold approach is the most effective; however, there are certain ethical concerns related to 3D-printing biological tissue, especially when using the stem cells of various patients, or 3D-printing body parts for the use in teaching.

Research Mentor: Linda Haynes, Department of English, College of Liberal Arts;

Poster Number: 42a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Deep Reinforcement Learning for Autonomous Inspection System

Author:

Romita Biswas

Cassidy Friedrich

Yug Rao

Aditya Chakraborty

Abstract:

The objective of the group is to investigate the application of Reinforced Deep Learning to autonomously complete damage inspection on buildings after natural disasters. By using Reinforced Deep Learning with Convolutional Neural Networks performing image processing, the drone will be trained to navigate itself towards buildings and perform building inspection without scanning the whole structure. The algorithms for Reinforced Deep Learning can be used to drive drones autonomously and perform inspections currently done by humans. The stability of the structure of buildings are unknown when these inspections are performed. This application would greatly reduce the risk of individuals involved in inspecting the building structures and provide greater insight into the stability of these structures.

Research Mentor: Rih-Teng Wu, Civil Engineering; Mohammad Reza Jahansha, Civil Engineering

Poster Number: 44a :: Mathematical/Computational Sciences

College of Engineering

Color space YyCxCz to CMY Lab inverse table

Author:

Gowd Chagi

Xi Wu

Abstract:

The color space YyCxCz, which is known to be useful in gamut mapping for its perceptually uniform and linearized properties, is derived at Purdue University from the widely used CIE Lab color space. Because the color space CMY is used as the input for printing modules, converting color from YyCxCz to CMY plays a key role in getting the most vibrant colored results from printers. While the process is very likely nonlinear, the current approaches are mostly simple linear interpolation methods, which leaves an untapped potential to research new, unconventional ways of mapping the two color-spaces. In this project, we proposed to use machine learning for converting YyCxCz color spaces to CMY color spaces. This was done by gathering large amounts of YyCxCz-CMY combination data, and feeding that data into a neural network which uses regression to map the two spaces. In the end, the results from the neural net were tested for accuracy by comparing the results from using linear interpolation and seeing the actual color printed.

Research Mentor: Baekdu Choi, ECE, Purdue University

Jan Allebach, ECE, Purdue University;

Poster Number: 45a :: Life Sciences

College of Engineering

Improved Biofuel Production with Tunable Transcriptional Regulation via Elastin-like Polypeptides

Author:

Rohit Chatterjee

Abstract:

The metabolism of *E. coli* and other microbes can be engineered to create valuable chemicals such as biofuels, and medicines. However, process efficiency is limited by the toxicity of intermediates in the production pathway, which induces cellular stress and kills production in cells. By fusing elastin-like polypeptides (ELPs) with sigma factors (SF), we propose a stress feedback system can be created to recognize cues of cellular health and autoregulate expression of bioproduction pathways for improved health and production. ELPs undergo a sharp, reversible, phase transition causing an aggregation above a certain temperature (T_t) based on conditions that align with intracellular health such as intracellular pH. This behavior, along with the ability to control T_t through sequence alterations, makes ELPs ideal sensors for controlling gene expression. Fused SF, which activated gene expression, are sequestered in ELP-SF aggregates above the transition temperature, reducing their free concentration. To evaluate the potential of ELP-SF to control gene expression, we expressed green fluorescent protein (GFP) from a promoter driven by the fused SF. In vivo, this system activated the expression of GFP at levels comparable to a SF control. However, at elevated temperatures, the system reduces gene expression by 20% relative to the control demonstrating the ability of the construct to control gene expression. The dynamic performance of the system was also modeled in MATLAB to reveal key parameters that affect system behavior. Parameter values were determined experimentally, and a range of temperatures were used to further evaluate the system. These results validate our main hypothesis and suggest a new strategy to optimize the sustainable production of valuable chemicals from microbes.

Research Mentor: Kevin Solomon, ABE, engineering; Mrugesh Parasa, ABE, engineering

Poster Number: 46a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Poster Presentation

Author:

Hao Chen

Yining Huang

Abstract:

The milestone management project aims to provide a solution to better manage the more than 20 simultaneous, interdependent research projects within the Arequipa Nexus Institute for Sustainable Food, Energy, Water, and the Environment to allow stronger collaboration and resource management. To achieve this, we have created a web-based visual analytics dashboard that ingests project progress data from different research teams, and presents the combined knowledge on a progress timeline, the dependency between different collaborating parts, and the geospatial locations of the research, allowing more effective knowledge transfer and project management. We update our design iteratively based on the feedback we receive from the collaborators to address the following challenges:

First, we aim to improve the usability of the map view, which displays the location of projects. We have updated the project selection process from hover to mouse click and provided an intuitive way to return to displaying the overview. We are also collecting spatial data from different collaborators, and the data received might be in different formats. Thereby another task is to feed the data given onto the map with data cleaning from different types of data to a uniform format.

Second, we updated the visual analytics in the system to help users understand the connections and dependencies between the different collaborators and projects better. As part of future research, we plan on designing a new visual representation for project dependencies. The goal is to help users better understand the different perspectives of the project more efficiently.

Research Mentor: Dr. David Ebert, ECE

Morteza Karimzadeh, ECE

Calvin Yau, ECE

Jieqiong Zhao, ECE;

Poster Number: 47a :: Mathematical/Computational Sciences

College of Engineering

Factory Optimization using Deep Reinforcement Learning

Author:

Shivam Duhan

Chengming Zhang

Wenyu Jing

Mingqi Li

Abstract:

The long-standing goal of factory optimization is to find optimal machine and conveyor belt placement to maximize the efficiency of the assembly line. We are developing a reinforcement learning agent to play Factorio, a game where you build and maintain factories, without prior domain knowledge. Factorio is the perfect environment for deep reinforcement learning as it supports extensive modification using an in-game debugging mode which allows our agent to interface with the game effortlessly. The reinforcement learning agent implements a policy of actions based on the reward function, continuously optimizing towards incremental goals specified by the user. The ultimate goal of our agent is to learn how to automate production, find creative solutions to maximize production efficiency in the game, and then transfer this learning to the design and management of real-world factories.

Research Mentor: Guang Lin, Mathematics, College of Science;

Poster Number: 48a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Recliner for Your Arms: Towards Exoskeletons in Surgery

Author:

Kaylee Ecker

Albert Derek Lee

Abstract:

Background: Musculoskeletal (MS) symptoms, fatigue, and injuries negatively affect worker health and performance in surgical environments. There have been little interventions or assessments of intervention benefits in operating room (OR) environments. Passive upper-body exoskeletons may decrease upper-body biomechanical loads by supporting workers' arms, shoulders, and/or back, decreasing risk for MS symptoms. However, feasibility of exoskeletons for sterile OR environments and complex surgical work requires investigation.

Purpose: Determine the facilitators and barriers to adopting passive exoskeletons in the OR.

Methods: Seven surgical residents, four surgical technicians, and one attending surgeon participated in focus groups answering questions regarding technology adoption, supporting worker tasks, safety, and health. Responses were recorded, and transcribed. Then content analysis was performed by three raters using NVivo to identify themes regarding exoskeleton implementation in the OR.

Results: Four main themes emerged: 1) characteristics of individuals, 2) benefits, 3) barriers, and 4) intervention characteristics. Barriers included maintaining sterilization, lack of familiarity, and inability to immediately observe the exoskeletons' benefits. Benefits identified were long-term reduction of MS symptoms and development of ergonomics training. Exoskeleton intervention characteristics such as usability in the OR, and characteristics of individuals were perceived to impact adoption. Themes identified can be used to support future work facilitating adopting exoskeletons for surgical teams.

Conclusions: The potential of exoskeletons to improve workforce retention, decrease MS symptoms, and prompt development of ergonomics training was recognized. Results suggest that adopting exoskeletons can be advantageous in the OR. However, barriers such as cost, maintenance, and team member buy-in of exoskeleton adoption need to be addressed.

Research Mentor: Jackie S. Cha

School of Industrial Engineering

College of Engineering;

Poster Number: 49a :: Innovative Technology/Entrepreneurship/Design

College of Engineering
Virtual Teaching Assistant

Author:

Elliot Edmunds

Mithuna Thottethodi

Abstract:

With a growing size of classes in universities and the increasing demand for online courses, professors and teaching assistants are noticing an increasing burden on communication with students, such as email, discussion board, Piazza etc. Additionally, it is usually found that similar questions are asked and answered repeatedly. Therefore, there is a need to filter the frequently asked questions out and leave teaching staff to more intellectually demanding issues. In addition, instant responses to students are also conducive to improving their learning experience. This project is aimed to provide a chatbot to fulfill all the needs stated above. It is expected to read users' questions and give a corresponding response.

In order to accomplish this objective, an open-source NLP software "ChatScript" is used as the backbone of our application. The chatbot will be able to identify students' needs and provide a proper response based on a knowledge base the admin created. The usual responses could be the answers from the knowledge base, forwarding questions to teaching staff, scheduled appointments etc. For the convenience of admins, the knowledge base should be the only place to keep all the answers to the questions the chatbot is designed to answer. Additionally, it should be readable and comprehensible for a layman of ChatScript language. The expectation is that one can learn to create a knowledge base within 5 minutes.

The main tasks are the following:

Building a simple bot that can answer basic questions about the ECE 477 course:

Parse information from the website. E.g. The due dates of homework assignments, important event dates, course policies, etc.

Using python to transform human-readable data into ChatScript knowledge base.

Writing the ChatScript rules to provide a response to incoming sentences and query the knowledgebase.

Develop the connection between a database intelligible to normal people and the knowledge base of the ChatScript engine. The database must be designed as it can be built easily by people with no understanding of ChatScript language, so that teaching staff is willing to use the product.

Set up the web server and frontend design for teachers and students. Teachers will be able to easily input information into the database, and track student's questions from their log. Students will be able to talk to the chatbot easily.

The preliminary product will be tested on previous data of interactions between students and teaching staff. The testing will be considered as a pass if the chatbot successfully provides correct answers to corresponding questions and forwards to teaching staff the questions without a corresponding answer in the knowledge base.

The plan for next semester is to expand the chatbot so that it can answer more questions, and provide more functions that are needed by users. In addition, we hope to connect our chatbot to the popular chatting apps such as Messenger and WhatsApp so that students can get easy access.

Research Mentor: Mithuna Thottethodi

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Poster Number: 50a :: Mathematical/Computational Sciences

College of Engineering

Automated Inventory Analysis of Forests

Author:

Nick Eliopoulos

Abstract:

The vitality of a forest is tied to the health of its encompassed ecosystem – foresters are interested in taking an inventory of various characteristics of the huge swaths of land occupied by these trees. This analysis is done by hand, and can be laborious and exhaustive work – classifying the species, measuring the diameter of the trunk at breast height, and so on. Our team seeks to automate this process by employing an array of cameras mounted on a backpack, which is operated by a single person traversing the forest while the cameras record footage. This video footage is then interpreted off-site autonomously. Our team has adopted specialized cameras that return both color and depth information. The color information is exceedingly useful in classifying the species and visually derivable characteristics of a tree, while the depth information is used to compute physical dimensions and properties of each tree. The FIA team is invested in developing a machine-learning solution that is able to classify each tree's species, as well as algorithmically detect the trunk diameters of each tree from only the recorded video. The success of our solution here could be adapted to analyze more than just trees, but entire ecosystems and environments. The information that we are able to gather can be cross-referenced and layered with other geographical information to give a clear picture on the state of a forest, but also the environment itself.

Research Mentor: Yung-Hsiang Lu, ECE, College of Engineering

Kevin Woeste, Forestry & Natural Resources

Guofan Shao, Forestry & Natural Resources;

Poster Number: 51a :: Mathematical/Computational Sciences

College of Engineering
System on Chip Design and Verification

Author:

Marco Antonio Garcia

Luke Kok

Luis Materon Botelho

Xianmeng Zhang

Ruth Zhong

Abstract:

The System on Chip Extension Technologies (SoCET) team is aimed at implementing a Reduced Instruction Set Computer RISC-V open-source processor on an SoC (system-on-a-chip). The motivation behind the SoC design is to create a core based on a free and open-source instruction set architecture for a wide range of hardware design users, including students and researchers. Applications of this design include, but are not limited to, resources for microcontroller-based projects for ECE 36200 (Microprocessor Systems and Interfacing) and ECE 47700 (Digital Systems Senior Design). Multiple sub-teams are working to build and test the different parts of the SoC. The core sub-team is responsible for designing, implementing and integrating the digital logic that goes into the chip. They are also updating the core to the most recent version of the RISC-V instruction set architecture (ISA). It will then integrate a floating-point unit (FPU) to allow the chip to perform operations on non-integer values, which is essential in scientific workloads. The analog sub-team is responsible for the transistor level design of the chip to allow the chip to process analog signals. While basic tests will be conducted to improve the overall performance after the design is finished, more rigorous testing will be performed by the verification sub-team. This sub-team's mission is to validate and confirm the peripherals on the chip are working as expected. To accomplish this, Universal Verification Methodology (UVM) was employed to structure the tests. This project allows students to have hands-on experience with the full integrated circuit design flow, from specification and implementation to verification and fabrication.

Research Mentor: Dr. Mark Johnson, Electrical and Computer Engineering, College of Engineering; Dr. Matthew Swabey, Electrical and Computer Engineering, College of Engineering

Jacob Stevens, Electrical and Computer Engineering, College of Engineering

Jacob Covey, Electrical and Computer Engineering, College of Engineering

Manik Singhal, Electrica

Poster Number: 52a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Image & Video Indexing Storage System

Author:

Lakshya Goyal

Roopasree Naidu

Youngsik Yoon

Abstract:

The goal of the project is to build a storage system for real-time indexing of incoming surveillance streams and make it searchable. We want to design, implement and evaluate a database that can retrieve image or video data, build index by object detection and store the respective data and index in an easy to access manner. Due to lack of image feature information, indexing and accessing data is cumbersome. However with the image database, students and researchers can further their work by having access to specialized datasets. We are using a scalable object storing service, Minio, to store images that are retrieved from cameras. Features extracted from these images will be stored as indexes in Vitess, our MySQL database system and data can be queried by users through our command line interface.

Research Mentor: Dr. Yung-Hsiang Lu, Electrical & Computer Engineering, College of Engineering; Dr. Shuo-Han Chen, Computer Science

Poster Number: 53a :: Social Sciences/Humanities

College of Engineering

Comparison of Teachers Communicating Engineering Design and Computational Thinking to First Grade Students

Author:

Emily Haluschak

Abstract:

As STEM and computational thinking(CT) concepts are included in standards, veteran teachers have to develop new pedagogical content knowledge for these unfamiliar topics. In order to support teachers, we need to develop a better understanding of the actions of experienced teachers who are successfully engaging their students in these new topics. To do this, we qualitatively analyzed the actions of experienced teachers to address the following research question: How do first grade teachers' classroom actions change as they gain experience teaching engineering and CT? Three first grade teachers from the same school who had implemented the same integrated STEM and CT curriculum and followed the curriculum closely for at least two years in a row were the focus of this study. Researchers analyzed video and interview data with the help of a veteran teacher to identify teacher and student actions and talk across the curriculum. Interviews with each teacher following completion of the unit were also used to assess experience with CT and engineering design. Results from the video analysis show that many teacher actions change from year one to year two. One interesting difference that was seen from year one to year two was the extent to which the teachers let students ramble until they come up with relevant ideas versus when the teachers' decided to intervene or redirect conversation to keep the lesson moving. Analysis of the interview data revealed that teachers felt more comfortable and even willing to make small modifications to the curriculum and their teaching in the second year. Developing a better understanding of how veteran teachers engage their students with computational thinking and EDP lessons can provide insight for professional development and for supporting early elementary teachers when implementing STEM and CT curricula.

Research Mentor: Dr. Tamara J. Moore, Engineering Education, College of Engineering, Purdue University; Dr. Kristina M. Tank, Education, College of Human Sciences, Iowa State University

Poster Number: 54a :: Mathematical/Computational Sciences

College of Engineering

Cost-Effective Active Transfer Learning

Authors:

Jacob Harmon

Li Yon Tan

Jack Hyslop

Isha Ghodgaonkar

Abstract:

Training a neural network often requires large datasets that may contain redundant data. An instance of data is redundant if it contains features from a previously learned domain or features repeated within the current target domain. For supervised learning, redundant data increases the cost of labeling. Active learning methods strive to filter for the most informative instances. Transfer learning is used to boost model accuracy while exploiting the overlap between the source domain of the pre-trained model and the target domain. Previous active learning methods incorporate some form of outlier detection. However, these methods rely on clustering and reduced dimensional graphs that result in information loss. We propose a solution that entails curating a smaller subset of the larger dataset that is representative and informative. Our approach is a three-step process. The first step pools data using an open set classifier that distinguishes between seen and unseen classes. The second step sorts instances from highest entropy to lowest entropy. Finally, a novel batch sampling step uses the Kullback-Leibler divergence to identify diverse data between instances from the sorted set. Our approach outperforms active learning methods when compared and evaluated by the change in training accuracy for each additional label queried.

Research Mentors: Ryan Merrill Dailey, Electrical and Computer Engineering, College of Engineering; Yung-Hsiang Lu, Electrical and Computer Engineering, College of Engineering

Poster Number: 55a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Development of Pond Cleaning Unmanned Surface Vehicle (USV)

Author:

Yuta Hoashi

Abstract:

Harmful algal blooms in ponds and lakes produce toxic effects on people and the environment. They can degrade water quality, severely impacting the economies of fisheries, tourism industries, and residential properties. We present an autonomous multi-robot system for algae removal in various environments using mechanical measures, which seemed to be the most environmental-friendly and immediate method of control for the algae bloom. The proposed system is based on a multi-robot system composed of a heterogeneous team of Unmanned Aerial Vehicle (UAV) and Unmanned Surface Vehicles (USVs). The main task of the UAV is to provide a global view of the environment to identify algae patches. We developed a machine learning-based computer vision system to detect algae in various environments and conduct a path planning for the USVs, which are allocated near algae patches and remove the algae. We aimed for the small size and the low cost of the USV by assembling most of the components from PVC pipes. After extensive simulations on the model regarding the structural safety and the water/air flow, the USV was assembled and tested in indoor water, where we had success in its floatation, the algae suction, and the device control. As for the future work, the filtering system will be designed in order to separate algae from water efficiently and perform its task in outdoor water resources, such as lakes and ponds. The problem tended to occur due to the algae attachment to the device in the unexpected areas, so the algae separation will be very significant in the future work.

Research Mentor: Byung-Cheol Min, Department of Computer and Information Technology, Polytechnic Institute; Wonse Jo, Department of Computer and Information Technology, Polytechnic Institute

Poster Number: 56a :: Mathematical/Computational Sciences

College of Engineering
Emotion Recognition

Author:

Andrew Jaseckas

Hussni Mohd Zakir

Jeemin Kim

Mimansa Verma

Nan Jia

Dotun Akinola

Kubilay Sahin

Abstract:

The purpose of this project is to reliably detect and classify emotions portrayed in facial expressions. Facial expressions are often classified using appearance-based features or geometric-based features from the faces. We will be using a two-branched network that will utilize both appearance-based features and geometric-based features during its classification decision. We will utilize a Convolutional Neural Network (CNN) to learn appearance-based features from each emotion. We will train the CNN model using an image dataset of 305GB containing 750,000 images that are labeled with the emotions each picture is expressing. As for the geometric-based features, we plan on training a Neural Network with features from facial landmarks of faces expressing each emotion. The Neural Network will serve as the second branch of the classification method. Both branches will then be joined at the end and make the final decision of what emotion the face is expressing. One of our applications would be using this emotion detection model to detect undesired emotions to help manage large audiences/excessive images, giving feedback to the user. We have done much research on Image Processing and plan on doing extensive research on the topics of Machine Learning and facial recognition to design the project. We also have an immense dataset that should allow us to train our CNN very well, leading to very accurate results. After two semesters of work, we are hoping for around 80-85% accuracy on emotion detection- a number decided on by the group since we have very powerful dataset that should be enough for a very high accuracy percent. We do not plan on building a flawless CNN though, which would lower the effectiveness of our dataset. We plan on measuring our results primarily on the satisfaction of the user since our emotion detection can be used in many ways, but we will also consider the increase in productivity/production the user has gained from our product. Detecting emotions from images and videos has many implementations for everyday tasks, so creating such a project will have many benefits for all people.

Research Mentor: Carla Zoltowski, ECE

Edward Delp, BME & ECE;

Poster Number: 57a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Creating MATLAB Based Graphical User Interface for ADEPT-m

Author:

Sanna Kapoor

Joshua Oderkirk

Matthew Olinde

Adithya Sundaram

Abstract:

With growing concern wavering around the issue of sustainable energy, A Device Emulation Program and Toolbox (ADEPT-m) focuses on improving the way research is conducted on photovoltaic cells. ADEPT-m is user-based MATLAB toolbox that has the visualization and data manipulation capabilities focused on simulating and modeling photovoltaic cells. The matter in concern regarding ADEPT-m is that it a tedious job to set each of the 128 variables and learn the appropriate commands. An extensive knowledge of programming in MATLAB is required to simulate a proper photovoltaic device. Therefore, our goal is to design a Graphical User Interface (GUI) that is simple yet intuitive enough so that it can benefit a multitude of users. Previously, the ADEPT-m team created a main page which directs the user to each of the three prominent function menus; Build, Test and Examine. The basic functionality requirements of Test and Examine menus have been met. In order to complete the GUI, the focus will be the Build menu so that it will make constructing the desired device to model more effective for research purposes. Currently, the focus is on creating pre-determined classes that store default values for common device materials such as Silicon, without having manually look up parameters to set up their desired device. This feature will also be able to reduce user-based error in order to construct an accurate device. Ultimately, the GUI aims to ease the simulation process, allowing users with less knowledge of MATLAB programming to utilize this research tool.

Research Mentor: JEFFERY L GRAY

Electrical and Computer Engineering; None

Poster Number: 58a :: Life Sciences

College of Engineering

The Study of Common Foodborne Pathogens and Functions that Influence Biofilm Formation

Author:

Mari Leland

Molly Carroll

Abstract:

The food pathogens *Salmonella*, *Listeria*, and *Escherichia coli*, present a growing problem for society because of their ability to form and maintain biofilms. The current focus of food safety is preventing bacterial contamination, however, if these methods fail to prevent biofilm formation and attachment, there are few to no effective procedures preventing contamination outbreaks.

Through bioinformatics research surrounding biofilm triggers and pathogenicity functions, possible methods to destroy and prevent biofilms can be found. Specifically, investigating the evolutionary relationships of these species, the various causes of biofilm formation, the functions of antibiotic resistance, and the proteins that can break down biofilms all help form a deeper understanding of the issue and how to solve it.

This study found that many environmental factors cause *Salmonella* and *E. Coli* to form biofilms. All three species rely on the Lux S gene involved in quorum sensing to begin biofilm creation. The protein families of penicillin binding proteins and beta-lactamase have a strong presence in the genomes of all three species, while *Listeria* is the only species with the VEG gene and significantly higher amounts of metallo-beta-lactamase. Lastly, the glycosyl hydrolase protein families found in the bacteria have a potential to break down their own biofilms, eliminating the need for antibiotics and harsh chemicals. The results presented in this study form a critical foundation calling for further lab research.

Research Mentor: Gabriel Vargas, University of Chicago

Poster Number: 59a :: Mathematical/Computational Sciences

College of Engineering

Playing Touhou with Deep Reinforcement Learning

Author:

Raymond Li

Jun Min Ahn

Zachary Esteron

Qiyin Hong

Abstract:

In the past decade, learning algorithms developed to play video games better than humans have become more common. Google's DeepMind Technologies developed learning algorithms that could play Atari video games and also demonstrated their famous AlphaGo algorithm which outperformed professional Go players. However, little research has been done on learning algorithms developed to complete the particularly difficult single-player games. In particular, much further research could be done on developing learning algorithms for mechanically challenging games such as "bullet hell" games. We believe that agents could learn to efficiently evade obstacles utilizing deep reinforcement learning. The purpose of this study is to understand how to create such an efficient evasion algorithm. The deep learning model utilized is a convolutional neural network trained with a variant of the Q-learning algorithm. The model is given positional coordinate data and bullet location data as its input and outputs a value function to determine the best following action. The agent controls the directional inputs of the game's user avatar and its inputs, or actions, are modeled as a two-dimensional Markov decision process. The agent uses the game's internal score and the amount of time its user avatar avoids being hit by obstacles as its target and experiments with its inputs each episode to increase the maximum reward. Each training episode is reset when the user avatar is hit by the bullets.

Research Mentor: Guang Lin; Math, Mechanical Engineering; Purdue University;

Poster Number: 60a :: Mathematical/Computational Sciences

College of Engineering
Earth Remote Sensing Opportunity

Author:

Christina Lo

David Chen

Abstract:

Autonomous Capturing of ORBCOMM Satellite Transmissions for Earth Remote Sensing

Team: Earth Remote Sensing with Signals of Opportunity

Purdue University: School of Electrical and Computer Engineering

Advisor : James L. Garrison - jgarriso@purdue.edu

Authors : Eric Smith, Nick Demsher, Andrew Nguyen, Christina Lo, David Chen, Jonathon Warnick, Leo Li

Academic Standing : Senior, Junior, and Sophomore

Total number of semesters on research : 1

Type of Submission: Poster

The agricultural industry is constantly looking for novel methods of optimizing output. Our team is tasked with utilizing Signals of Opportunity to determine changes in the coefficient of reflection of the surface of the earth. This data can then be used to determine soil moisture content several meters below the surface, in the root-zone of the farmland we are surveying. Previous attempts have been made in the EHF band, but these signals only penetrate a few centimeters into the ground. By receiving signals in the VHF band, we are able to calculate soil moisture content several times further beneath the surface, leading to more long-term measurements of soil moisture.

Previously, performing remote sensing with Signals of Opportunity was limited to stationary towers or manned flights. Stationary towers have limited range, and manned flights are expensive. By utilizing a Software Defined Radio and a commercial UAV, remote sensing using these signals can be done autonomously.

A USRP E310 Software Defined Radio has been configured to collect VHF signals from ORBCOMM communication satellites. The radio and RX antennas are attached to a DJI Matrice 600 Pro UAV such that the receiver can collect data from different locations autonomously.

Our team expects to measure various coefficients of reflection dependent upon the moisture content of the medium that the signal reflects off of. In the case of more torrid soil conditions, we would expect a low relative coefficient, properly irrigated soil would have a coefficient between 0.6-0.9, and a body of water would produce a coefficient and a body of water would produce a coefficient ~ 1.0 .

Keywords: SDR (Software-Defined Radio), ORBCOMM, Earth Remote Sensing, Root-zone Soil Moisture, MatLab, Signals of Opportunity, Signal Processing, QPSK, Loop Antenna.

Research Mentor: Jared / College of Engineering;

Poster Number: 61a :: Life Sciences

College of Engineering

An Automated Supine Pressor Test: Implications for the Diagnosis of Preeclampsia

Author:

Jessica Ma

Aditi Acharya

Abstract:

Preeclampsia, which involves excess protein in the urine as well as hypertension in pregnancy, affects up to 5-8% of pregnancies and 50-75,000 women die from preeclampsia-related complications every year [1]. This is a dangerous obstacle that can affect both the mother and fetus, often leading to premature birth. For those in low-resource settings, more than 250,000 neonatal preterm births are a result of preeclampsia because these mothers lack the necessary access to healthcare and the opportunity to seek out medical expertise. In this study, we are automating a detection tool for preeclampsia, referred to as the supine pressor test (SPT), to allow clinicians and expecting mothers to track the risk for preeclampsia longitudinally throughout pregnancy.

Research Mentors: Craig Goergen, Biomedical Engineering, College of Engineering; Hamna Qureshi, Biomedical Engineering, College of Engineering; Brett Bosinski, Biomedical Engineering, College of Engineering; George Wodicka, Biomedical Engineering, College of Engineering; David Reuter, Seattle Children's Hospital

Poster Number: 62a :: Innovative Technology/Entrepreneurship/Design

College of Engineering
Autonomous Land Vehicle

Author:

Ashley Maddock

Sean Hwang

Pratik Bansal

Dharan Ramdoss

Somesh Dube

Abstract:

The demand for the autonomous land vehicle industry has been increasing tremendously, and continues to grow; nearly 30 million autonomous vehicles are expected to be sold by 2040.¹ Through the Autonomous Lands Vehicle (ALV) VIP team, students develop both the hardware and software to help enhance knowledge and gain experience in vehicle autonomy. An automatic pilot has been built that can drive the vehicle in real time. The purpose of this pilot is to generate vehicle control commands that will direct the vehicle from the starting point to the finishing point, without hitting unforeseen obstacles. A remote controlled vehicle has been transformed into an autonomous vehicle by implementing appropriate steering logic based on incoming data from ultrasonic distance sensors. The Team has strategized that the use of the Raspberry Pi single board computer would be the best candidate to function as the brain of the project due to open source software and familiarity of use. The current steering logic has been refined through an obstacle course based testing in scenarios with low gradient surfaces. For future iterations of this project, implementation of object recognition via a Pi CAM can relay what the ALV is seeing and with the introduction of a GPS module the user can actively monitor the coordinates of the vehicle. In addition to this, the project could be improved with a wider variation of testing in less controlled environments.

Reference: <https://news.ihsmarket.com/press-release/automotive/autonomous-vehicle-sales-surpass-33-million-annually-2040-enabling-new-auto>

Research Mentor: Dr. Samuel Midkiff, Electrical and Computer Engineering, Purdue University;

Poster Number: 63a :: Mathematical/Computational Sciences

College of Engineering

Machine Learning Edge Node Processor for Remote Sensing Applications

Author:

Vadim Nikiforov

Chan Weng Yan

Abstract:

Lightweight microcontrollers typically don't have the computational power required for performing machine learning algorithms locally. This restricts their options to either transmitting significant amounts of raw data over a network where inferencing is performed remotely or limiting the amount of data it can process. If a microcontroller can perform inference locally and thus "sense-and-act", it can have significant time and energy savings compared to a microcontroller implementing a "sense-and-send" model. Additionally, a microcontroller that is less reliant on a network will have a smaller attack surface, thus improving its security as well. However, most hardware accelerators for machine learning come with significant area and energy costs, which make them unsuitable for highly low-power and cost-effective systems. We plan to implement an ISA extension for our RISC-V core that will dynamically identify zero-value registers and skip future instructions that depend on them. This technique exploits a common attribute of Deep Neural Networks known as sparsity. This method has been proven in simulation to significantly reduce computation time and energy consumption, while requiring minimal architectural changes [Sanchari Sen et. al., IEEE Transactions on Computers, 2018]. We plan to implement this by adding hardware tables to the core that track registers that contain zero values as well as skippable instructions. Given that our current RISC-V implementation uses a minimal instruction set, we expect to see greater performance and energy savings by implementing this optimization compared to prior simulations. The goal of our project is to design, synthesize, and fabricate a general purpose processor with these improvements. The proposed optimizations could allow proven machine learning software techniques to be implemented on embedded devices with minimal algorithmic changes.

Research Mentor: Dr. Mark C Johnson, School of Electrical and Computer Engineering, College of Engineering; Dr. Timothy Rogers, School of Electrical and Computer Engineering, College of Engineering, Dr. Matthew Swabey, School of Electrical and Computer Engineering, College of Engineering, Dr. Peter Bermel, School of Electrical and Computer Engineering, Colleg

Poster Number: 64a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Aircraft Concept Design for a Survivable Autonomous Tanker

Author:

Neal Ottinger

Abstract:

The purpose of this concept design is to assess the performance of a survivable and autonomous tanker aircraft that would augment the current U.S. Air Force tanker fleet as a low-cost solution for delivering fuel to fighter aircraft in high-risk combat environments. The design process started with research of the performance parameters and mission profiles of current tanker and fighter aircraft, which was leveraged to create a mission profile and a set of specifications for the conceptual design. The tanker aircraft was required to have a flight range of 3,000 miles, cruise at 35,000 feet at Mach 0.85, and offload 36,000 pounds of fuel amongst two fighter aircraft. The next step was to iterate through aircraft weight and engine performance estimates until the calculated performance values met a basic set of mission specifications. Once the basic parameters for the aircraft were decided, various software tools, such as Open Vehicle Sketch Pad, were used to refine the shape, aerodynamics, and stability of the aircraft to fulfill the remaining mission requirements. Weighing just over 100,000 pounds at takeoff, the autonomous tanker aircraft carries about 66,000 pounds of fuel, has a range of 3,500 miles, and cruises at 35,000 feet at Mach 0.85. Novel features were incorporated into the design such as a flying wing body, engines embedded within the body, and a retractable refueling boom to increase survivability. Military researchers might consider developing low-cost, expendable, unmanned aircraft that augment the capabilities of existing military aircraft while taking risk away from pilots.

Research Mentor: John Byrnes

Air Force Research Laboratory

Aerospace Vehicles Division

Aerodynamic Configuration Branch;

Poster Number: 65a :: Mathematical/Computational Sciences

College of Engineering
EMC Compliance of a laptop

Author:

Tikhon Pachin

Chris Jones

Meenakshi Pavithran

Meron Midksa

Abstract:

The purpose of the project was to test the radiated and conducted emissions of a laptop operating in its regular mode and to investigate its compliance with FCC and European regulations. With the laptop running several high performance programs, the laptop was tested for radiated and conducted emissions. All of the ports of a laptop were analyzed with a spectrum analyzer fitted with a specialized antenna to test for the radiation testings and a calibrated loop for the magnetic induction testing. The laptop, with peripheral cables, was also tested for the conducted emissions of the power adapter using a Line Impedance Stabilization Network. Emissions were measured using a spectrum analyzer in the frequency domain and an oscilloscope in the time domain. The results of the tests indicated that it met the pertinent regulations for compliance with FCC and European EMC standards. While the measurements met the requirements, the laptop did emit other radiations. All the emissions were within the appropriate standards.

Research Mentor: Robin Barrett, ECE;

Poster Number: 66a :: Mathematical/Computational Sciences

College of Engineering

Computational Model of Ebolavirus Matrix Assembly: Phospholipid Influence on Production of Viral Particles

Author:

Ethan Pappas

Abstract:

VP40 is a vital matrix protein to the Ebolavirus (EBOV). During viral budding, VP40 progressively oligomerizes at the host cell surface to form the mature EBOV matrix. VP40 association to the inner leaflet of the host cell membrane is essential in this assembly process [1]. Recent experimental studies indicate that inhibition of host cell membrane-associated phosphatidylserine (PS) significantly lowers VP40 membrane-binding affinity, thereby inhibiting assembly of mature virus-like particles (VLPs) [2],[3]. This indicates that host cell membrane PS content could present a viable drug target in treating Ebola virus disease. However, quantitative dynamic effects of PS inhibition on VP40 oligomerization are largely uncharacterized. Therefore, the potential of PS as a drug target is challenging to evaluate. We describe an ordinary differential equation-based computational model to evaluate PS influence on VP40 oligomerization at various membrane PS concentrations. This model presents a valuable tool in evaluating potential treatment options. The model considers VP40 production, PS regulation, VP40 membrane-association affinities as a function of PS, VP40 oligomerization, VLP formation and budding. The model is calibrated to an experimentally calculated ratio of VP40 oligomers of size hexamer and higher relative to VP40 monomers and dimers. This mathematical model provides insights into production dynamics of developing and mature viral particles, how PS concentration affects these dynamics, and an estimation of VP40 oligomerization rate constants. The model is now poised to consider additional viral proteins, dose-response predictions for drugs that affect membrane PS concentration, and mechanism identification for drug discovery in parallel with experimental studies.

Research Mentor: Dr. Elsje Pienaar, Department of Engineering, Weldon School of Biomedical Engineering;

Poster Number: 67a :: Physical Sciences

College of Engineering
Water in Extraterrestrial Systems

Author:

Akshay Rao

Abstract:

A new wave of space exploration is pushing the bounds of feasibility in terms of interplanetary travel and habitability and the availability of water is a primary metric for the habitability of an extraterrestrial system. On Earth, desalination systems are often characterized by their thermodynamic energy requirement. There is limited development regarding the thermodynamic energy requirements of obtaining fresh water in systems where there is some form of water present. In our solar system, trace amounts of water have been found to exist in the form of ice caps, salty bodies of liquid water, and atmospheric vapor. In this work, we investigate the minimum energy associated with obtaining pure water from its available states, on Enceladus, Europa, Ganymede, Jupiter, Mars, and Venus. A comprehensive breakdown of the least work associated with obtaining pure water at consumable conditions (1 bar and 300K) is presented. Results show that desalination is by far the method with the least energy cost. For systems where liquid water is not available, melting ice is generally more efficient than atmospheric vapor condensation. Overall, as the change in temperature and pressure required to bring the ambient water to the desired state increases, the energy requirement increases. By modeling the energy cost associated with each method of obtaining water, as a function of each system's atmospheric conditions, it is possible to begin to understand design parameters of real water systems in these harsh environments.

Research Mentor: David Warsinger, Heat and Mass Transfer, Mechanical Engineering; Abhimanyu Das, Thermodynamics, Mechanical Engineering

Poster Number: 68a :: Mathematical/Computational Sciences

College of Engineering

Emotion Recognition Using Convolutional Neural Networks

Author:

Lanqing Zhao

Chieh-En Li

Abstract:

Emotion recognition recently becomes a popular topic of machine learning and computer vision and generates a wide range of applications in other academic fields as well as in our everyday life. The primary idea is to process the input of a human facial expression frame and output a result that classifies such expression into some designated emotions such as basic seven emotions or other compound emotions. The existing conventional method requires a handcrafted feature extractor of facial Action Units(AUs) to extract feature from designated Facial Landmark regions, and these extracted AUs codes are processed through traditional machine learning algorithm such as Nearest Neighbors and SVM, which is a typical type of linear classifier. The problem with conventional method is that the lighting variations and different position of object may corrupt the feature vector so that the accuracy is greatly reduced. In this project, we approach the problem by applying Convolutional Neural Networks(CNNs), which does not require the step of handcrafted feature extraction in some fixed designated facial landmark region but produces an system that automatically extracts feature segments and completes classification process by feedforward calculations. This system achieves the relatively most optimal solution through the process of backpropagation in which the algorithm learns the weights through stochastic gradient descent that can find the directions that best minimize the loss from the ground truth. The numerical result of the algorithm will show a probabilistic result of each labeled class. Furthermore, such method best resolves the issues of lighting variations and different orientation of object in the image and thus achieves a higher accuracy.

Research Mentor: Jan Allebach

Electrical and Computer Engineering

College of Engineering; Shaoyuan Xu

Electrical and Computer Engineering

College of Engineering

Poster Number: 69a :: Mathematical/Computational Sciences

College of Engineering

Data Acquisition, Manipulation, and Visualization for a Continuous Pharmaceutical Process

Author:

Benjamin Rentz

Abstract:

In the pharmaceutical industry, tablets are traditionally produced using batch processes. An alternate approach, continuous pharmaceutical manufacturing, offers many advantages over batch manufacturing and may be a new direction for many pharmaceutical manufacturers seeking a higher quality product for a lower manufacturing cost. Some advantages of continuous pharmaceutical manufacturing include simplified process scale-up, shorter supply chains, and ideally, a more consistent product. The inherent disadvantage of continuous pharmaceutical processing is the complex sensing and control schemes required. As process monitoring and control technology rapidly improves, it has now becoming possible to reliably operate a continuous pharmaceutical process. Ongoing research at Purdue University is focused on not only the tools used to monitor these processes, but the data infrastructure associated with these measurements. These tools, known as process analytical technology (PAT), are used to monitor critical quality attributes (CQA's) and to verify that the pharmaceutical product meets all quality specifications. The measurement of one particular CQA, the particle size distribution, has been an area of focus over the past year. A visual imaging sensor, the Innopharma Eyecon has been used to estimate the particle size distribution of a flowing particle stream in real-time. The Eyecon, other PAT tools, and process equipment generate vast streams of valuable data when operated continuously. However, this data is useless unless it is properly collected, analyzed, and visualized. The data associated with the operation of continuous pharmaceutical processes has been the subject of significant research. Enterprise-level data management systems including OSI-PI, have been implemented at Purdue's continuous pharmaceutical manufacturing line and are currently being studied. With adequate data acquisition, manipulation, and visualization, continuous pharmaceutical manufacturing will allow for the production of low-cost, quality pharmaceutical products.

Research Mentor: G.V. Reklaitis, CHE, Engineering;

Poster Number: 70a :: Life Sciences

College of Engineering

Augmented reality, 3D printing, and finite element simulation for communicating bone microcracking

Author:

Joseph Sawyer

Abstract:

Osteoporosis is a common condition in older populations and current graphics fail to accurately portray the microcracking in the bones of osteoporosis patients. Methods were developed to communicate the effect of microcracks numerically, as well as visually through computer and physical modeling. Trabecular bone samples were stained with BaSO₄ scanned using micro CT. The resultant volumetric scan data was processed to create a finite element model and a stereolithographic reconstruction. The finite element model was used to quantify up to a 3.5% reduction in elastic modulus of the bone sample due to the microdamage at a level of 2.5% damage volume fraction. This reduction in stiffness was analyzed at the local trabecular level by comparing high stress/strain regions to the areas with microdamage. Results showed that high stress and strain regions both correlate to the localization of microcracks. Additionally, microcracks were shown to alter overall stress and strain distributions in predictable ways. The stereolithographic reconstruction was used to create an augmented reality visualization as well as for 3D printing physical models. These three kinds of modeling techniques allow microcracking in osteoporosis to be visualized in novel ways, which may provide ease of understanding to patients in the future.

Research Mentor: Professor Thomas Siegmund, Mechanical Engineering;

Poster Number: 71a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Global Air Quality Trekkers: Clean Kitchen Study

Author:

Stephanie Schiavo

Samantha Dykhuis

Avalin Senefeld

Abstract:

Indoor air pollution is a widespread problem in Africa and is the leading cause of premature death in many African countries. This pollution is primarily caused by the burning of biomass fuels inside an enclosed kitchen in order to provide heat for cooking. Global Air Quality Trekkers is an undergraduate engineering team within the EPICS department at Purdue, and our goal is to create a kitchen design that utilizes natural ventilation to mitigate the amount of air pollutants present in these kitchens, specifically in Nandi, Kenya. This year, our goal is to analyze the ability of 9 different kitchen designs to reduce the amount of air pollution present. After this semester, the team will be traveling to Nandi, a community that has already begun to use these modified kitchens. After conducting research this semester on our West Lafayette test kitchen, we will be able to determine the most effective kitchen designs and share this with our project partners in Nandi. Additionally, we will be analyzing the effectiveness of different types of kitchens in Nandi, conducting surveys within the community regarding the new kitchen designs, and teaching an engineering module at the Tumaini school in Nairobi, Kenya. Overall, our hope is that these new kitchen designs will be adopted by more members of the community. These designs have the potential to save the lives of women and children, who become victim to diseases such as COPD and pneumonia after many years of smoke inhalation. Ultimately, our goal is for these designs to spread to all areas of Kenya and Africa, and improve the health of the people who live there.

Research Mentor: Dr. Brandon Boor, Civil Engineering/Environmental and Ecological Engineering, College of Engineering; Danielle Wagner, Environmental and Ecological Engineering, College of Engineering

Poster Number: 72a :: Life Sciences

College of Engineering

Developing a Novel Biotemplate with High Stability for Nanoparticles synthesis

Author:

Corren Scott

Abstract:

Biological templates are attractive tools for the synthesis of nanoparticles due to their uniform dimension and architecture. While the Tobacco Mosaic Virus (TMV) is a commonly used biotemplate, its ability to be coated with metals is limited relative to Barley Stripe Mosaic virus (BSMV). In spite of this attractive characteristic, BSMV can only be coated with specific metals due to its sensitivity to the extreme pHs and calcium concentrations required for metal deposition. Here, we present our efforts to engineer BSMV to enhance its stability and increase possible processing conditions for metal deposition. By comparing the structure of BSMV to that of TMV, we identified several candidate amino acid residues within a predicted carboxylate center, which govern the self-assembly and stability of BSMV coat proteins. We then neutralized the negative charge of the carboxylate center by genetic modification and tested whether the changes allow for the assembly of more stable BSMV biotemplate. Expression of native BSMV coat proteins in a bacterial system does not form a viable BSMV biotemplate. However, our engineered modifications of the coat protein within the predicted carboxylate center increased stability, forming BSMV bio templates (BSMV-VLPs) for the first time without the help of RNA. We are currently evaluating whether other modifications form BSMV-VLPs without RNA. Together, we demonstrate BSMV-VLPs production without RNA in a bacterial system for the first time and develop more stable biotemplate for nanoparticles synthesis.

Research Mentor: Yu-Hsuan Lee, Engineering, Chemical Engineering; Michael Harris, Engineering, Chemical Engineering

Poster Number: 73a :: Life Sciences

College of Engineering
Automated Forest Inventory Analysis

Author:

Andrew Shen

Yoon Kim

Yi Xie

Nick Ellas

Josh Chang

Zijun Lin

Abstract:

There are developing technologies and expanding usage of objects identification used in auto-driving car, facial recognition. However, the traditional method to do the forest survey, measuring tree diameters and heights, is low-efficient and manpower-consuming. The improved measurement would use photogrammetry and video recording as data collection, then machine learning would be used to calculate the parameters of a tree based on the data collection. We are using multiple cameras to gather all the video data including distance, size, circumference, etc. Tensorflow or other AI network will be integrated to our backpack to identify the target tree in the photo and select effective data points on the edge of the tree stem. The expected result would be that the error of tree diameter measurement should be within one centimeter.

Research Mentor: Yung Hsiang Lu, ECE, engineering; Guofan Shao, Forestry, Agriculture

Keith, Woeste, Forestry, Agriculture

Poster Number: 74a :: Physical Sciences

College of Engineering

Investigating Tungsten and Tantalum as Plasma Facing Materials in Nuclear Fusion Reactors

Author:

Arvind Sundaram

Abstract:

Nuclear fusion is a potential source for producing unlimited environment-friendly energy. However, fusion reactors need to be made of a material that shows strong resistance to the plasma and does not absorb fuel. Tungsten (W) is the primary candidate material for plasma facing components in nuclear fusion reactors due to its high melting temperature (3695 K), low sputtering yield and strong mechanical properties. Although these properties are desirable, multiple studies have confirmed severe surface morphology on W when exposed to the plasma. Additionally, our previous studies indicate that tantalum (Ta) may show better resistance to the harsh radiation environment and there is a dearth of literature on Ta. Therefore, the scope of this paper is to analyze the fuel retention in these materials at fusion-like conditions using thermal desorption spectroscopy (TDS). Preliminary results indicate that Ta has inferior fuel retention properties but due to the high temperatures involved, all the trapped fuel may escape, thus negating the effect.

Research Mentor: Dr. Ahmed Hassanein, School of Nuclear Engineering, Purdue University; Dr. Jitendra Tripathi, School of Nuclear Engineering, Purdue University

Poster Number: 75a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Production of Barley Stripe Mosaic Virus Biotemplates with Customizable Lengths for Nanowire Synthesis

Author:

Rachel Susler

Abstract:

Biotemplating is an attractive means for the synthesis of nanomaterials because it allows for directed synthesis and dimensional control while simultaneously offering a relatively simple and economically feasible method for mass-production. Although Tobacco Mosaic Virus (TMV) is currently the most popular biotemplate, our laboratory has shown that Barley Stripe Mosaic Virus (BSMV) is a potentially better alternative as it can bind more than twice the amount of metal. Despite attractive characteristics, the engineering of BSMV is limited by its requirement of a plant cell production platform which is associated with the virus' replication and recombination processes. In our research, we have developed a BSMV biotemplate production platform in the *Escherichia coli* bacterial system. To synthesize BSMV biotemplates in this bacterial system, we have expressed the coat protein of BSMV and verified the formation of the biotemplate through transmission electron microscopy. As initial efforts to express BSMV coat proteins in *E. coli* failed to form biotemplates, the research team decided to fuse a linker and a genetic sequence that initiates self-assembly to our BSMV constructs. As a result, we are able to report the first successful production of BSMV biotemplates in a bacterial system. Current work is focused on controlling the dimensions of our produced BSMV biotemplates. By selecting the length of the linker sequence, we believe that we can customize the length of the expressed BSMV biotemplate. More specifically, we are investigating the effect of varying the length of the linker sequence. Collectively, we have developed a bacterial system for BSMV biotemplate production with potentially customizable lengths, expanding the nanomaterials synthesis toolkit.

Research Mentor: Dr. Michael Harris, Chemical Engineering, College of Engineering; Dr. Sue Loesch-Fries, Botany and Plant Pathology, College of Agriculture

Yu-Hsuan Lee, Chemical Engineering, College of Engineering

Kok Zhi Lee, Agricultural & Biological Engineering, College of Engineering

Poster Number: 76a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Impurity-Free Synthesis of Photoabsorber Nanoparticles for High-Efficiency, Solution-Processed, Thin-Film Photovoltaic Cells

Author:

Dwi Sutandar

Abstract:

Thin-film photovoltaic cells have sparked excitement among photovoltaic enthusiasts and scholar communities for their potentials and advantages in comparison to their counterpart, silicon-wafer solar cells. As an advantage, it allows for cheaper manufacturing cost per watt produced, the potential to achieve higher efficiency (the current world record is at 22.9% for copper indium gallium diselenide (CIGS) cells), and the requirement of remarkably thin film making it compatible to be implemented on a wider-spectrum of surfaces including flexible surfaces and more resilient compared to the silicon-wafer cells. However, the current manufacturing method requires the use of vacuum and other extreme conditions to get high-performing thin-film cells. The current more scalable method of solution process uses metal salts and long-chain oleylamine ligands which resulted in ionic impurities and carbon impurities, respectively. Our research group came up with a novel method to synthesize nanoparticle inks using pure metal precursor solutions to reduce the impurities of the absorber layer of the thin-film cells. To avoid the impurities from the salts, our team used amine-thiol solution to dissolve the pure metals under an inert condition at 45°C, a relatively easy-to-achieve condition. To avoid the carbon impurities, our team came up with a strategy to use volatile ligands such as dodecylamine and the decomposition product of thioacetamide in the form of hydrogen sulfide as the ligand. Our ultimate target is to achieve high-performance, industrially-scalable thin film cells technology by reducing impurities and controlling particle size by time and ligand variations.

Research Mentors: Dr. Rakesh Agrawal, Chemical Engineering, College of Engineering; Dr. Swapnil Deshkmukh, Chemical Engineering, College of Engineering; Dr. Ryan Ellis, Chemical Engineering, College of Engineering

Poster Number: 78a :: Mathematical/Computational Sciences

College of Engineering

Actively Preventing Negative Transfer

Author:

Andrew Ulmer

Zohar Kapach

Daniel Merrick

Karthik Maiya

Abhay Sasidharan

Arshad Alikhan

David Dang

Abstract:

Transfer learning is a common technique used in a wide variety of deep learning applications. Transfer learning methods are typically used to make use of a source domain, where there is an abundance of labeled data, to make inferences in a target domain, where labeled data is scarce. In the digital age, improving a model's ability to generalize knowledge gained from the massive amount of data available online to new contexts is crucial. Most new contexts of interest, like radiological scans, have very few labels, an obstacle that can be overcome with improved transfer learning methods. A basic transfer learning technique involves resetting the weights and biases associated with the last few layers of a deep learning model that has been trained on the source domain, and then re-training the model on the target domain. This is a very widely used technique, but can often times result in a phenomenon known as negative transfer. Negative transfer occurs when the knowledge gained in the source domain proves to be harmful when transferring to the target domain. In order to prevent this phenomenon, our team is focusing on making a systematic method for determining which weights and biases should be reset when transferring knowledge. The basic idea is that if the source and target domains are similar, then most of the model's knowledge gained in the source domain will be transferred to the target domain. However, if the source and target domains are different, the model will forget that knowledge which would be harmful in its learning the target domain.

Research Mentor: Yung-Hsiang Lu, School of Electrical and Computer Engineering, Purdue University;

Poster Number: 79a :: Mathematical/Computational Sciences

College of Engineering

Camera Database Health Checking and Visualization

Author:

Anirudh Vegesana

Kaiwen Yu

Abstract:

Camera database health is a significant factor for enabling further research in image recognition, making it a main focus for the CAM2 Camera Database and Web UI. We also seek to present webcam metadata to potential clients by displaying the streams of the active cameras in a map on the web site, so ordinary people can learn about the scope and purpose of CAM2.

The health checker had problems detecting the activeness of a camera that are in the dark as well as with location checking of new cameras added to the database. A problem with the camera page was that Google Fusion tables was being deprecated and we needed to devise a new data visualization method.

The camera health checker took snapshots from the cameras in the database and saw if there is a difference in the two images. If so, the camera is marked as active. The health checker function has been reconstructed to avoid redundant code. The CAM2ImageArchiver module was imported to parse the images from all types of cameras to include streaming cameras. We implemented a script that ensures the latitude/longitude values match the location of the camera.

For the camera page, we changed it so it no longer needs Google Fusion Tables or the old CAM2 REST API. It will now use Google Sheets, Google Charts, and the CAM2 API Python client to display the map and uses marker clustering to increase performance for the user.

A clean camera database provides a large training set which supports CAM2's future research in computer vision technology.

Research Mentor: Yung-Hsiang Lu, Department of Electrical and Computer Engineering, College of Engineering;

Poster Number: 80a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Economic Rule-based Control of Micro-Combined Heat and Power Systems

Author:

Catherine Weaver

Abstract:

Micro-combined heat and power (micro-CHP) systems have the potential to be a sustainable residential source of heat and electricity. Micro-CHPs, composed of a prime mover with integrated waste heat recovery, are typically installed with heat-led or electricity-led control algorithms, which follow the thermal or electric load of the household, respectively. In this work we propose a novel rule-based control algorithm that determines the least-cost operation of the micro-CHP to meet the highly-variable domestic hot water and electricity demands of a single household. We consider three modes of operation of the micro-CHP system, namely, when the system is off, when the the system is generating power equal to the electric demand of the household, and when the system is generating maximum power. The algorithm determines the least-cost mode of operation, and we propose logic for auxiliary support components to ensure household hot water and electricity demands are met. A 24-hour simulation is performed on the controller and micro-CHP system for a variable time of use electricity price and hot water and electricity demand recorded at 1 minute intervals from a real household. Simulation results are used to demonstrate improved performance of the proposed algorithm over conventional heat-led and electricity-led algorithms.

Research Mentor: Neera Jain, Mechanical Engineering, College of Engineering;

Poster Number: 81a :: Mathematical/Computational Sciences

College of Engineering

“Visualizing Influential Social Media Posts”

Author:

JIAXING YANG

Yi-shan Lin

David Ebert

Abstract:

“Visualizing Influential Social Media Posts”

Jiaying Yang, Yi-Shan Lin (Mentor), Dr. David Ebert,

Social media is increasingly used for situational awareness during crisis times. However, the amount of irrelevant posts (noise) makes the identification of influential tweets difficult. To solve this problem, we use graduated point symbols (resembling proportional bubbles on a map) to visualize the popularity and importance of a tweet in an integrated visual analytics environment. The size of the symbol is determined by analyzing the popularity based on the number of re-tweets and likes. In future research, we will represent relationship between the important tweets (like or re-tweet relationship) in that region by showing links between one tweet to another. This implementation will better visualize the important content on social media as assessed by other social media users who like or retweet certain posts.

Research Mentor: Yi-Shan, Lin. Computer Science.;

Poster Number: 82a :: Mathematical/Computational Sciences

College of Engineering

Understanding Fashion Aesthetics With Deep Learning

Author:

Douglas Yu

Devansh Rathi

Abstract:

As the online commercial retail industry continues to see unprecedented growth and popular magazine companies transition to producing online material, retail websites and other vendors find it increasingly more important to organize and optimize images to increase sales and provide more quality content. Photographs taken in a less than ideal setting often have low aesthetic quality, making it necessary for companies to manually remove or edit images that may not fit what the company wants. By developing a model that can judge image aesthetic quality, it is possible to create a system that can promptly predict the aesthetics of an image and allow the company to decide whether to filter it out, keep it, or change it. Through a large-scale database used for Aesthetic Visual Analysis known as AVA, we can train a predictor model that can learn photography styles that correlate to higher aesthetic quality and appeal. With the information provided from this predictor model, image features marked as aesthetically pleasing can be used to further improve the company's future methods and practices. This will ultimately improve the aesthetic value of the company and their products.

Research Mentor: Zhi Li, School Of Electrical and Computer Engineering, College of Engineering; Jan Allebach, School Of Electrical and Computer Engineering, College of Engineering

Poster Number: 83a :: Innovative Technology/Entrepreneurship/Design

College of Engineering
Indoor Positioning System

Author:

Ximeng Zhang

QianLi Ma

Abstract:

The purpose of our project is to develop a complementary system to the current GPS with a focus on indoor localization and navigation. The current need for localization extends beyond what GPS can provide in today's state of technology. Radio signals used in the global system are vast but weak, unable to penetrate obstacles and buildings in high density, populous areas of the world. Our system is designed to solve this problem by implementing an Indoor Localization System using a stronger ultra-wideband signal in the frequency spectrum. At a high level, the system is modeled after the architecture of the global positioning system by utilizing anchors as the satellites and tags as the receivers. With the use of up to date cloud technology, an end-to-end system is created through the Internet of Things with the inclusion of information security and a fully developed front-end user interface. The packaging is encapsulated within a miniature PCB design at a low cost, aimed as a plug-and-play integration within other systems in need of indoor detection. Applications of our IPS design include domains such as navigation (room-to-room assistance in a building), national defense (search and rescue operations, underground tracking, surveillance), commercialized zones (indicators for specific products on shelf, asset tracking in warehouses), and robotics (autonomous vehicles, drone detection). We demonstrate that all the components mentioned are essential to effectively carry out successful indoor localization with a focus on user flexibility and efficiency in response. We are able to use the system to enable an indoor drone show.

Research Mentor: Mithuna S Thottethodi

Associate Professor of Electrical and Computer Engineering;

Poster Number: 84a :: Innovative Technology/Entrepreneurship/Design

College of Engineering

A Computer Vision Approach For Estimating Force Exertion

Author:

Guoyang Zhou

Hamed Asadi

Denny Yu

Abstract:

Musculoskeletal injuries, which can be caused by continually involving in repetitive and forceful activities, will potentially harm workers in multiply ways, such as decreasing production capacity and life's quality. In order to reduce the possibility of getting musculoskeletal injuries, an easily attainable and highly reliable technique of detecting unsafe muscle force exertion levels for human activities is needed. However, measurement of force exertion levels of human being is challenging, and existing techniques are either subjective in nature, affected by the machine interface in unwanted ways, or highly intrusive, thus cannot be commonly applied to workers. In our studies, we used computer vision and machine learning techniques to classify the muscle force exertion levels (0% = rest level, 50% = moderate effort level and 100% = high effort level). Subjects' face videos and PPG(Photoplethysmography) signals were recorded while they were holding a grip dynamometer with different force levels. Through some video process techniques, we put 128 landmarks on each subject's face and took the average movement of each landmark as one of the features for our neural network model. Distances between peaks and troughs in the PPG signals were extracted as the other feature of our model. Even with only 15 subjects collected, processed, trained and tested, the neural network model provided a 73% accuracy in classifying or predicting muscle force exertion levels. For future works, we plan to collect more subjects and explore different features to increase the performance of our model and thus the reliability of our approaches.

Research Mentor: Denny Yu, Industry Engineering, College of Engineering; Hamed Asadi, Industry Engineering, College of Engineering

Poster Number: 85a :: Life Sciences

College of Health and Human Sciences

The Influence of Within Day Protein Distribution on Weight Loss and Resistance Training Induced Changes on Glucose Control

Author:

Emily Adaniya

Abstract:

Evenly redistributing protein intake throughout the day, from our typically skewed distribution, decreases the carbohydrate to protein ratios at breakfast and lunch. Lower carbohydrate to protein ratios may improve daily and meal-specific glucose control. Our aim was to quantify the effect of within-day dietary protein distribution on changes in interstitial glucose concentrations before and after 16wk of dietary energy restriction and resistance training. Using a randomized, parallel-design, 41 adults (male=15; female=26) (age: 35 ± 2 y; BMI: 31.5 ± 0.5 kg/m²; mean \pm SEM) performed resistance-exercise training 3d/wk and consumed a controlled diet containing 750 kcal less than their estimated energy requirement for 16wk. Participants consumed 90 g protein/d (~ 1.1 g/kg/d) in either a skewed (10 g breakfast, 20 g lunch, 60 g dinner; n=20) or even (30 g breakfast, lunch, and dinner; n=21) distribution pattern. Twenty-four hour interstitial glucose concentrations were measured pre- and post-intervention. Following the intervention, body mass decreased by $8\pm 0.6\%$ (LSmean \pm SE). From 0200-0500 interstitial glucose concentration average (-6.4 ± 3 mg/dL), variability (-1.7 ± 1), peak (-9.2 ± 4), fluctuation (-5.2 ± 2), and time spent above 100 mg/dL (-29.7 ± 15). From 0500-1100 the interstitial glucose concentration average (-5.5 ± 2 mg/dL), variability (-1.4 ± 1), peak (-8.4 ± 3), fluctuation (-5.6 ± 3), and time spent above 100 mg/dL (-58.0 ± 21). From 1100-1600 the interstitial glucose concentration average (-7.2 ± 3 mg/dL), variability (-2.6 ± 1), peak (-11.0 ± 3), fluctuation (-8.6 ± 2), and time spent above 100 mg/dL (-52.4 ± 20). From 1600-0200 the interstitial glucose concentration average (-9.2 ± 3 mg/dL), variability (-2.6 ± 1), peak (-14.1 ± 4), fluctuation (-10.9 ± 3), and time spent above 100 mg/dL (-109.9 ± 45). There was no effect of protein distribution on continuous interstitial glucose levels.

Research Mentor: Dr. Wayne W. Campbell, Nutrition Science, Health and Human Sciences; Dr. Joshua L. Hudson, Nutrition Science, Health and Human Sciences

Poster Number: 86a :: Social Sciences/Humanities

College of Health and Human Sciences

Infant Temperament as an Indicator of Patterns in Heart Activity During Arm Restraint

Author:

Dina Al Ghabra

Alexis Morell

Tessa Garwood

Ellie Bonanno

Abstract:

Previous investigations have produced mixed results regarding the relationship between infant temperament and autonomic physiology. The present study assessed whether temperament, as measured by Negative Affect (NA) scores on the Infant Behavior Questionnaire (IBQ-R), was predictive of changes in heart rate throughout an arm restraint task in typically-developing infants ($n=24$; 10-13 months). Maternal responses to the IBQ-R were collected prior to a developmental assessment ($NA=3.47+0.9$; $M+SD$). Infants wore EKG monitors throughout the assessment. We hypothesized that (1) higher NA scores would be associated with a steeper rise in heart rate at the onset of arm restraint and (2) higher NA scores would be associated with a more gradual decline in heart rate during recovery. At this point, heart rate data processing is still ongoing. Analysis of isolated segments of heart rate data will permit us to clarify the relationship between temperament and autonomic physiology in typically-developing infants. This will allow for stronger cross-syndromic comparisons in other areas of developmental research and inform the development of more individualized interventions and treatments.

Research Mentor: Dr. Bridgette Tonnsen, Department of Psychological Sciences, College of Health and Human Sciences; Wei Siong Neo, M.A., Department of Psychological Sciences, College of Health and Human Sciences

Poster Number: 87a :: Life Sciences

College of Health and Human Sciences

Pharmaceutical Application of Fracture Targeted Parathyroid Hormone Agonist for Bone Repair

Author:

Seema Al-Hiraki

Abstract:

The estimated expenses due to hip fractures in the elderly are \$20 billion/year in the U.S. alone due to the conventional treatments followed and the subsequent loss in productivity. The purpose of this project is a laboratory to clinical transformation of a bone anabolic agent, which when injected systematically would selectively accumulate on fracture surfaces, promoting quick healing. This anabolic agent was obtained by synthesizing abaloparatide with a spacer and binding acid, oligopeptide. While it demonstrated similar effects as Forteo used in clinical trials of osteoporosis, it works in a paracrine manner whilst given subcutaneously. It is also observed that the inherent free GSK3B inhibitor is excreted, showing no affinity towards the fractured bone. The targeted abaloparatide surpasses the performance of the saline control, and the free-form abaloparatide showing better mechanical analysis, bone density and curative results in the subcutaneous as well as the in-vivo experiments. Blood chemistry results show no change (even with high dosage) and the heart rates and weights of the control and test animals are not different from each other, indicating safety of the targeted drug. This therapy will prove to be particularly applicable for osteoporotic hip fractures and will help avoid invasive surgery. Dangers of ectopic bone growth is eliminated, and the rate and quality of fracture repair is improved. Loss of mobility and fatality due to invasive-surgery associated complications, suffered by the aging population of US, undergoing treatment for frequency of hip fractures will also be reduced thus resulting in a promising effective treatment.

Research Mentor: Dr. Philip S. Low

Department of Chemistry

College of Science

Institute for Drug Discovery; Stewart Low

Institute for Drug Discovery

Poster Number: 88a :: Life Sciences

College of Health and Human Sciences

Development of Gateway clones for testing the *Bordetella bronchiseptica* Fic protein, BbFic, in bacterial, yeast, and mammalian systems

Author:

Maha Ali

Ben Watson

Fic (filamentation induced by cAMP) proteins constitute a newly discovered enzyme family that plays critical roles in prokaryotic and eukaryotic signal transduction pathways. These proteins act predominantly as adenylyltransferases and are defined by a core HxFx(D/E)(G/A)N(G/K)RxxR motif, where the invariant His is required for activity. By catalyzing an adenylylation or AMPylation reaction, Fic proteins are able to hydrolyze ATP (adenosine triphosphate) to covalently add an AMP (adenosine monophosphate) to their target proteins. Fic proteins were originally identified as bacterial toxins that translocate into mammalian host cells, where they induce cytotoxicity by AMPylating and inactivating Rho GTPases, as a mechanism of evading the host immune response (Mattoo et. al, 2011). The respiratory pathogen, *Bordetella bronchiseptica*, encodes a single Fic protein (called BbFic) of unknown function. Our preliminary characterization of BbFic led us to hypothesize that it could be important for pathogenesis. We, therefore, opted to analyze BbFic biochemically, by expressing and purifying it from a bacterial protein expression system, and by using mammalian and yeast models to assess morphological phenotypes. BbFic clones for bacterial, yeast, and mammalian expression were generated using the Gateway Cloning Technology. Gateway Cloning Technology is a novel molecular biology technique that bypasses tedious DNA cutting and ligating methods that are traditionally used in cloning procedures. Instead, Gateway cloning relies on the use of a donor plasmid to transfer the same DNA insert into several vector backbones as a single event. With this technology, the wildtype BbFic gene was inserted into a bacterial expression vector containing an N-terminal His6 tag for protein purification by affinity chromatography. Additionally, mammalian and yeast expression constructs with GFP and V5 tags were also generated. Using site directed mutagenesis, I also created the constitutively active BbFic-E62G mutant and its catalytically inactive BbFic-E62G/H196A mutant. The creation of these clones and establishing the Gateway Cloning protocol in the lab has greatly facilitated not just further analysis of BbFic activity in various model systems, but has also allowed us to expand this technology to other Fic proteins being studied in the lab - in particular, Fic proteins from the genetically intractable gastric pathogen, *Helicobacter pylori*.

Research Mentor: Dr. Seema Mattoo, Department of Biology, College of Science; Erica Zbornik, Department of Biology, College of Science

Poster Number: 89a :: Social Sciences/Humanities

College of Health and Human Sciences

Positive Relationships as a Protective Factor for Disability in a National Sample of Aging Adults

Author:

Hannah Baker

Meghan Mitoraj

Abstract:

Social relationships, determined by structural (e.g., social integration), functional (e.g., social support), and qualitative (e.g., relationship satisfaction) elements, are robust predictors of better health and greater longevity in aging adults. The current study examined a relatively understudied aspect of relationship quality - the eudaimonic well-being domain of positive relations with others - and its independent associations with change in and incidence of mobility limitations in a sample of mid-life and older adults from the Midlife in the United States (MIDUS) study. Using data from all 3 waves of MIDUS, we examined the extent to which positive relations with others predicted smaller increases in limitations and reduced risk of onset of new limitations over a 18-20 follow-up period. Linear and logistic regression models, adjusted for demographic and health confounds, showed that higher positive relations scores predicted slower increase in limitations over time ($p=.003$) and reduced risk of incidence of new limitations ($p=.01$). These effects were also observed over and above the associations with more traditional structural and functional measures of social relationships, neither of which was significantly linked to changes in functional abilities. These results suggest that positive relations with others may act as a unique protective factor for functional decline in individuals with no initial functional limitations as well as in individuals with at least one initial functional limitation. They also extend prior research on the potential health benefits of social relationships to include a social dimension of eudaimonic well-being. Finally, they suggest that vulnerability to functional limitations and the potential benefits of social connectedness extend to mid-life as well as older adults.

Research Mentor: Elliot Friedman, HDFS in Health and Human Sciences;

Poster Number: 90a :: Social Sciences/Humanities

College of Health and Human Sciences

“Going somewhere makes sense, but somehow it seems more shameful:” Italian women’s attitudes and perceptions of reproductive tourism

Author:

Kelsie Basile

Adria Diaconu

Camille Goodwyn

Sarah Kincade

Kaylee McCracken

Abstract:

Background: Law 40/2004 transformed Italy from a place with a largely unregulated commercial medically assisted reproduction (MAR) market to a country with the most conservative approach to MAR. As a result, the number of Italians seeking MAR outside of Italy skyrocketed, doubling in one year as citizens sought to escape the strict legislation. Even though restrictions were lifted on procedures like gamete donation, surrogacy is still banned, and single women and homosexual couples still cannot access MAR in Italy.

Objective: The purpose of this study is to understand Italian women’s perceptions of, and experiences with, reproductive tourism, including benefits and barriers, and emotional, mental and physical costs.

Methods: Using qualitative methodology techniques, in-depth interviews with 30 (May-June 2018) women aged 18-50 living in or around Florence, Italy and using the Italian healthcare system. Interviews were audio recorded and transcribed verbatim. HyperRESEARCH data assisted in data management, and open and axial coding were conducted to break down data using a grounded theory approach.

Results: Limitations in Italian reproductive care are a result of restrictive legislature and religious presence, causing Italians to travel abroad for treatments. The current perceptions and attitudes Italian women have towards reproductive tourism show that women do not commonly discuss this among others and are not completely knowledgeable of the circumstances. The financial cost of traveling for reproductive care complicates women’s access, and traveling abroad for such care can increase the emotional impact of being infertile.

Conclusions: Reproductive tourism in Italy is misunderstood and difficult for Italians to pursue. Policy change is necessary to further adapt laws and provide options for individuals, especially same-sex couples and single women, seeking reproductive treatments. Italian women often experience emotional and financial burdens when experiencing infertility and while reproductive tourism is not a perfect solution, it is sometimes the only

option. Thus, ways to facilitate access (i.e., referrals, financial assistance, etc.) to MAR could mitigate the effects of the strict legislation.

Research Mentor: Dr. Andrea DeMaria, Consumer Science and Public Health Graduate Program, College of Health and Human Sciences; Jaziel Ramos-Ortiz, Consumer Science, College of Health and Human Sciences

Stephanie Meier, Consumer Science, College of Health and Human Sciences

Poster Number: 91a :: Physical Sciences

College of Health and Human Sciences

Smartphone System for Gait-Based Fall Risk Prediction in Older Adults

Author:

Timothy Becker

Abstract:

Abstract

Background: Falls and fall-related injuries account for 28,000 annual deaths among older Americans. Interventions to prevent falls are effective, but resources are limited. Currently, there is no practical solution to assess those at risk of falling to prioritize intervention resources. Due to these limitations, we are evaluating a monthly assessment approach using a smartphone-based system as a biometric measure of gait changes and fall risk in older adults.

Methods: The gait monitoring approach was evaluated by tracking the gait characteristics of 43 older adults, over a period ranging from 1-11 months (mean of 5 months). In addition to gait measurements, participants recorded any incidences of falling. Using this data, a logistic regression model was created to identify the occurrence of a fall within one month preceding a gait recording session. A non-fall-month indicated that no fall was reported in the month following the gait assessment (214 assessments), and a fall-month indicated that a fall occurred within one month following the gait assessment (11 assessments).

Results: Sensitivity results showed that 72.7% of falls were predicted in the specific month the fall occurred. In addition, the system correctly predicted months without falls with 74.2% specificity. This performance is comparable to that of other established fall risk assessment tools features the added benefits of objectivity and ease of use.

Conclusion: The system warrants continued evaluation and future consideration for health care industry adoption.

Keywords: falls, gait, speed, older adults, biometric

Research Mentor: Shirley Reitdyk, Kinesiology, HHS;

Poster Number: 92a :: Life Sciences

College of Health and Human Sciences

Parent Math Anxiety and Mathematical Performance of Pre-Kindergarten Children

Author:

Margaret Becker

Abstract:

Prior work demonstrates that an individual's math anxiety may be negatively related to his or her mathematical achievement (Ashcraft & Moore, 2009; Vukovic, Kieffer, Bailey, & Harari, 2013). However, little research has investigated whether this relation between math anxiety and math performance is present prior to the elementary school years (Ganley & McGraw, 2016; Vukovic et. al., 2013), or whether the math anxiety of children's primary caregivers (e.g., parents, teachers) is associated with children's early math performance. The purpose of the current study was to investigate the relation between parent math anxiety and child mathematical performance during the pre-kindergarten year. The participants included 310 preschool-age children (155 female) and a parent of each child. Structural equation modeling (SEM) results demonstrated that a latent factor representing parents' math anxiety was significantly negatively related to children's performance on the Preschool Early Numeracy Skills Screener (PENS) in the spring of their pre-kindergarten year. Multi-group path analyses were used to further probe the effect of child gender on this relation and revealed that the association between parents' math anxiety and children's math outcomes did not differ for male versus female children.

*Research Mentor: Dr. David Purpura, Human Development & Family Sciences, Health and Human Sciences;
Dr. Ellen Litkowski, Human Development & Family Sciences, Health and Human Sciences*

Poster Number: 93a :: Life Sciences

College of Health and Human Sciences

Binding Interactions between Graphene Nanoplatelets and the Herbicides Atrazine and Glyphosate

Author:

Nudar Bhuiya

Abstract:

Atrazine and glyphosate are the two most common agricultural herbicides used in the U.S. Scientific studies support atrazine as an endocrine disrupting chemical, while there are conflicting reports on the carcinogenicity of glyphosate. Both herbicides can move in the environment, which results in contamination of drinking water sources increasing the risk of human exposure. Graphene nanoplatelets (GNPs) are an emerging nanoparticle with potential uses for the remediation of environmental contamination. This study's main aim was to determine whether GNPs can be used as a tool for environmental remediation of atrazine and glyphosate contamination. Mixtures involving nonfunctionalized GNPs (at 1 mg/ml) and the herbicides atrazine (at 3 ppb) and glyphosate (at 700 ppb) at their current US maximum contaminant level (MCL) in drinking water were created to mimic environmental conditions. The mixtures were incubated for 24 hours on a rotating apparatus. Following incubation samples were centrifuged and the supernatant was collected. The supernatant was used to quantify the concentration of atrazine and glyphosate using Abraxis ELISA assays. The assays detected the unbound atrazine and glyphosate. Data was analyzed in order to determine the binding interactions, if any, among the nonfunctionalized GNPs, atrazine, and glyphosate. The data from this study demonstrated that nonfunctionalized GNPs bind to atrazine, and binding does not occur between glyphosate and nonfunctionalized GNPs. In addition, glyphosate did not interfere with the binding between atrazine and nonfunctionalized GNPs (ANOVA with a Dunnett's Multiple Comparison Test, $p < 0.05$, $n = 4$).

Research Mentor: Dr. Jennifer Freeman

Health Sciences

College of Health and Human Sciences; Dr. Jonathan Shannahan

Health Sciences

College of Health and Human Sciences

Poster Number: 94a :: Life Sciences

College of Health and Human Sciences

The Effects of a Novel, School-Based High Protein Breakfast Intervention on Physical Activity and Mood in Young Adolescents

Author:

Morgan Braden

Abstract:

Objective: To examine the effects of higher-protein (HP) vs. normal-protein (NP) school breakfasts on daily physical activity and perceived energy in middle-school-age adolescents. **Methods:** Four-hundred eighteen, 6-8th-grade students (Age: 12 ± 1 y; BMI weight for age: $75.6\pm 1.8\%$) participated in the following 16-wk crossover study. During the first 8-weeks, the students were provided with NP school breakfasts (420kcal; 83g CHO/11g PRO/5g FAT) to consume every day prior to the start of school through the 'Breakfast in the Classroom' program. During the second 8-weeks, the students were provided with isocaloric HP school breakfasts (48g CHO/24g PRO/15g FAT) using similar procedures. At the end of each 8-week period, the participants completed a modified Physical Activity Questionnaire for Older Children (PAQ-C) to assess daily physical activity over the past 7-days. In addition, pre-breakfast, post-breakfast, and pre-lunch 100 mm visual analog scale questionnaires were completed to assess perceived energy. Per protocol analyses were performed on the participants who participated in the school breakfast programs at least 50% of the time. **Results:** The participants displayed an overall average physical activity score of 2.5, indicating low physical activity levels. No difference in physical activity was observed following the HP vs. NP breakfast programs ($P=0.59$). Regarding perceived energy, the HP breakfast consumption led to greater increases in postprandial energy ($+12.8\pm 3.4$ mm) vs. the NP breakfast consumption ($+2.6\pm 2.7$ mm, $P<0.03$). Pre-lunch energy was not different following the breakfast programs ($P=0.27$). **Conclusion:** Regardless of breakfast quality, the daily consumption of breakfast did not influence physical activity. However, the consumption of the higher-protein school breakfast elicited greater postprandial increases in perceived energy compared to consuming the normal-protein school breakfast in middle-school students.

Research Mentor: Dr. Heather Leidy, Nutrition Science, College of Health and Human Science;

Poster Number: 95a :: Life Sciences

College of Health and Human Sciences

Toxicity Interaction of the Two Most Common Agricultural Herbicides in the United States: Glyphosate and Atrazine

Author:

Lauren Brulinski

Abstract:

Glyphosate and atrazine are the two most common agricultural herbicides in the United States. These herbicides are sprayed on crops to reduce weed populations, but move into drinking water sources following rain events. They are both controversial because of suspected hazardous health effects. The US EPA established the maximum contaminant level (MCL) of glyphosate in drinking water at 700 ppb ($\mu\text{g/L}$), and the IARC designated glyphosate as “probably carcinogenic to humans.” Atrazine is also suspected of being a carcinogen but, it’s main concern is endocrine disruption. Atrazine’s MCL is set at 3 ppb. Though there are countless studies concerning the individual toxicity of these herbicides, there is limited research on the potential toxic interaction making this a substantial gap in our knowledge. This study aims to test the hypothesis that a toxicity interaction occurs between atrazine and glyphosate at treatment concentrations below those observed for the single chemical exposure. In order to observe toxicity interactions, zebrafish were employed as a model organism. They were bred and their embryos immediately collected and exposed to one of four treatments (0 ppb, 3 ppb atrazine (ATZ), 700 ppb glyphosate (GLY), or 3 ppb ATZ and 700 ppb GLY mixture). Currently, at 120 hours post fertilization the behavior results showed that all treatment groups were significantly different from the control ($p < 0.05$; $n = 4$ with 32 subsamples/biological replicate). The morphological data including total larval length, head length, head width, and brain length were not significantly different in the mixture exposure ($p > 0.05$; $n = 7$ with 11-12 subsamples/biological replicate).

Research Mentor: Jennifer L. Freeman PhD., Toxicology, Health and Human Sciences;

Poster Number: 96a :: Life Sciences

College of Health and Human Sciences

Mother, Father, Victim or Suspect: Variations in Labeling of Female versus Male Perpetrators of Homicide-filicide in NVDRS Narratives.

Author:

Cidney Colby

Abstract:

My research focuses on the gendered aspects of reporting within the National Violent Death Reporting System (NVDRS). The NVDRS database compiles information from 42 U.S states, including law enforcement and medical examiner reports. I specifically looked at whether narratives written by NVDRS abstractors take a softer tone with females perpetrators compared to male perpetrators, such as providing multi-layered reasoning for why females commit filicide (e.g., ongoing mental health issues, experiencing bad breakups, etc.) while male perpetrators actions are due to lack of control in the moment or aggression towards others. Female perpetrators are more likely to be referred in reference to their relationship to the victim, while male perpetrators are more likely to be described as suspect/victim (i.e., S/V or B) and by the victim's relationship to the perpetrator. My paper narrows in on these differences to help facilitate conversations on both how gender norms emerge in abstractors descriptions and the stressors mentioned for male and female perpetrators.

Research Mentor: Laura Schwab Reese, College of Health and Human Sciences, Department of Health and Kinesiology; Lauren Murfree, College of Health and Human Sciences, Department of Health and Kinesiology

Poster Number: 97a :: Life Sciences

College of Health and Human Sciences

Effects of consuming a ketogenic diet with caloric or non-nutritive sweeteners on body weight gain, energy intake and glucose tolerance in female rats.

Author:

Myia Dorsey

Rebecca Coan

Abstract:

Ketogenic diets (KD), which are high in fat and low in carbohydrates, are designed to shift energy utilization from glucose as a primary fuel source to ketone bodies such as beta-hydroxybutyrate (b-HB). The popularity of ketogenic diets has increased as they are purported to aid in weight loss and ameliorate metabolic diseases such as type-2 diabetes. Non-nutritive sweeteners (NNS), such as sucralose (the sweetener in Splenda) have been promoted for use in conjunction with a KD because they allow the consumer to stay in ketosis, and while avoiding sugars typically included in sweet tasting foods. However, it is not clear that weight loss observed with KD is an effect of achieving ketosis while on the KD, or secondary due to decreases in caloric intake that occur as a result of restriction of foods that are consumed. In addition, evidence has suggested that consuming NNS may actually promote weight gain by interfering with metabolic responses to sugars consumed along with NNS. The goal of the present experiment was to , examine the effects of consuming the NNS sucralose or the nutritive sweetener sucrose in conjunction with a KD. Female Sprague-Dawley rats, were assigned to a control (standard chow) diet or a KD ad lib. Animals consuming the KD also received a fixed quantity of Crisco® daily. For one group, the Crisco mixed with sucralose (0.15 mg/g); for the second group, no sweetener was added (plain). These groups were expected to enter a state of ketosis. The third KD group received Crisco mixed 1:1 with sucrose; this group was expected to have lower levels of ketones due to consumption of the carbohydrate. Rats received the diets for 12 weeks and body weight, food intake, b-HB levels, blood glucose, and body composition were measured. After 12 weeks, animals were given an oral glucose tolerance test . The results showed that weight gain and percent body fat were similar in control and KD+sucrose fed animals, while KD+sucralose and KD+plain animals gained significantly more weight and fat compared to control animals. B-HB levels were similar in chow and KD+sucrose animals, but were significantly higher in KD+plain and KD+sucralose animals . All animals on the KD showed impaired glucoregulation during the OGTT compared to control animals. These results suggest that KD do not prevent excess weight gain, and the addition of a NNS to a KD diet was less successful than the addition of sucrose at preventing weight gain.

Research Mentor: Susan Swithers, Psychological Science, Health and Human Science;

Poster Number: 98a :: Life Sciences

College of Health and Human Sciences
Arf1 Expression in the Blood Brain Barrier

Author:

Sai Dwibhashyam

Abstract:

ADP-ribosylation factor 1 (Arf1) is a GTP binding protein that functions as a secondary messenger in cell signaling. Without Arf1, the function of the Golgi apparatus is severely compromised. Recent data suggest that Arf1 is involved in copper intracellular trafficking. Regulation of cellular copper (Cu) homeostasis involves Cu-transporting ATPases (Cu-ATPases), i.e., ATP7A and ATP7B. This lab has shown that the presence of excess Cu or Mn in the choroid plexus cells led to ATP7A relocating toward the apical microvilli facing the CSF, but ATP7B toward the basolateral membrane facing blood. Collectively, these data suggest that Cu is transported by the blood brain barrier (BBB) from the blood to brain, which is mediated by ATP7A in brain capillary. By diffusion, Cu ions move from the interstitial fluid into the CSF, where they are taken up by the BCB. However, the role of Arf1 in this translocation is unknown. Less is known the presence of Arf1 in brain barrier systems, i.e., BBB. This study was designed to test the hypothesis: "Arf1 is present in the BBB. We used Z310, RBE4, and N27 cells to test this hypothesis. By using qPCR, the expression of Arf1 was detected. The abundance, however, is unknown. The function of Arf1 under toxic metal exposures is currently in progress in this lab. Within the choroidal epithelial cells, Cu ions are transported by ATP7B back to the blood. This research is interested in understanding the expression of Arf1 in the choroid plexus cells, dopaminergic neurons, and kidney cells.

Research Mentor: Dr. Wei Zheng, Toxicology, College of Health and Human Sciences; Luqing Liu, Health Sciences, College of Health and Human Sciences

Poster Number: 99a :: Social Sciences/Humanities

College of Health and Human Sciences

Contextualizing Challenges of Reproduction and Motherhood in Florence, Italy: A Qualitative Study

Author:

Chandler Dykstra

Abstract:

Background: Italy finds itself at a crossroads after years of economic distress and birth rate decline. Fertility rates have fallen considerably since 1995, with an especially steep drop in the last decade; 91,000 fewer live births in 2015 than in 2008. Women living in Italy face a unique reproductive health culture, molded by social pressures (i.e., pro-reproduction health campaigns, motherhood expectations) and health challenges (i.e., increasing maternal age). This study sought to understand attitudes, behaviors, and expectations surrounding reproductive planning, infertility, and motherhood among women living in Italy.

Methods: Researchers conducted 55 in-depth interviews from February to August 2017. Participants included 46 reproductive-aged women (M=32.16.3 years) located in Florence, Italy, currently utilizing the Italian healthcare system, and 9 Italian healthcare professionals. Researchers used an expanded grounded theory approach to understand women's reproduction experiences with the social ecological model serving as a conceptual lens for data analysis. HyperRESEARCH, a data management system, assisted with open and axial coding and theme development.

Results: Fertility care inadequacy and financial instability impacted participants' attitudes toward reproduction. Women's shifting roles and reduced marital salience prompted decisions to delay or forego childbearing. For reproducing women, perceived postpartum challenges included employment discrimination, childrearing costs, and variable paternal support. Some participants discussed increased parental responsibility sharing, but many noted lingering expectations that women prioritize motherhood above other pursuits. Competing maternal role expectations – sexual/romantic partner, friend, employee – created stress, but also presented opportunities for satisfaction through balanced, social living.

Conclusion: Findings provide insight into Italian women's reproduction attitudes and behaviors in the current economic and social environment. Results suggest practical recommendations for policy and sociocultural interventions to address reproductive barriers, such as affordable childcare, improved fertility care, and better maternal employment protection and acceptance. Rather than using fear messaging to boost birth rates, campaigns should focus on creating a supportive and empowering environment for women choosing motherhood informed by Italian cultural values.

Research Mentor: Dr. Andrea DeMaria, Public Health Graduate Program, Department of Consumer Science, College of Health and Human Sciences;

Poster Number: 100a :: Life Sciences

College of Health and Human Sciences

Disease-Induced Variations in the Biomedical Application of Engineered Nanomaterials

Author:

Lexi Ferngren

Abstract:

Nanotechnology is a rapidly expanding field, with applications in many different areas. One specific area nanoparticles are being studied and utilized is in biomedical applications. Several different nanoparticles such as iron oxide, gold and silver are all being researched due to their unique properties. Silver nanoparticles (AgNPs) have large surface areas, and antibacterial properties. Because of these properties, they are often used in coating medical devices/ IV bags as well as personal health care products. Recently in the United States, prevalence of chronic diseases such as obesity and high cholesterol have been becoming increasingly more common, with over 95 million adults being affected for each disease. Because these diseases are so prevalent, it is important to identify how the compromised body will impact uptake and/or distribution of the silver nanoparticles. In order to test this, mice (C57BL/6) were given a high fat diet (60% calories) to induce obesity (50g) or a low-fat diet (10% calories) to maintain a healthy weight (30g). Silver nanoparticles (20 nm) were then characterized by size, charge, particle counts and imaging. After being characterized, AgNPs were utilized in a pilot study where they were injected through the tail vein at doses of 1, 2, or 4 mg/kg in both healthy and obese mice. After 24 hours, tissues were necropsied and used for sampling to identify biodistribution (CT scanning, Atomic Absorption Spectroscopy(AAS)) and evaluate toxicity levels (Inflammation, Oxidative stress). Our AAS results determined that the most AgNP uptake (ug/g of tissue) occurred in the liver and spleen. However, our CT scans were inconclusive in visibly identifying silver in the tissues at the concentrations utilized. Our future studies will aim to evaluate potential differences in silver nanoparticle deposition due to obesity.

Research Mentor: Jonathan Shannahan, Nano-toxicology, College of Health and Human Sciences;

Poster Number: 101a :: Social Sciences/Humanities

College of Health and Human Sciences

Longitudinal Analysis of Eyebrow Position in American Sign Language

Author:

Victoria Glass

Alexa Rozycki

Abstract:

College of Liberal Arts

Longitudinal Analysis of Eyebrow Position in American Sign Language

Authors:

Victoria Glass

Alexa Rozycki

In American Sign Language (ASL) linguistics, use of eyebrow position is not fully understood. The eyebrows may serve grammatical functions such as denoting “yes/no” and “wh” questions (Lentz, Mikos, & Smith, 2008). However, brows are raised/lowered in other situations. To better understand brow use, we need to find consistency over time. Here we looked at eyebrow position in a single signer three years apart. Using video software we are annotating brow positions, comparing them in each response to the same English sentences, and analyzing consistency. The pair in (1) each have one instance of lowering (bl) and one of raising (br), but they cover different signs. The pair in (2) differ even more: (2a) has one brow-raise, whereas (2b) has two.

(1) ‘As a general rule, firefighters are intelligent’ -- expect ‘br’ on ‘firefighters’

2015: (a) GENERAL [FIREFIGHTER]br THEY [TYPICAL SMART]bl

2018: (1b) [GENERAL]br [FIREFIGHTER THEY SMART]bl

(2) ‘A lion has a bushy tail’ -- expect ‘br’ on ‘lion’ and ‘tail’

2015: (2a) [IT LION IT TAIL]br BUSHY IT HAVE IT

2018: (2b) [YOU KNOW LION]br TYPICAL [TAIL]br BUSHY

With the exception of 'firefighters' in (1b), 'br' appears where predicted. The variation may be related to signing speed, or other factors that require exploration. This study opens opportunities to determine optionality of non-manual markers and alternate phrasing for the same information, thus contributing to understanding of their stylistic use in addition to grammatical function, which will allow individuals who learn and teach ASL to express themselves in more nuanced and sophisticated ways.

Works Cited

Lentz, E. M., Mikos, K., & Smith, C. (2008). Signing naturally: Student workbook units 1-6.

Research Mentor: Dr. Ronnie Wilbur

Speech Language and Hearing Sciences/ Linguistics

Health and Human Sciences/School of Interdisciplinary Studies; Margaret Ruth Crabtree, Linguistics, School

Poster Number: 102a :: Social Sciences/Humanities

College of Health and Human Sciences

Does walking with a toy at 13-months predict productive vocabulary abilities at 24-months?

Author:

Alexa Gordon

Alyssa Prohofsky

Abstract:

The onset of independent walking in infants is associated with increases in language ability, but the mechanisms underlying this relationship are unknown. One explanation could be object carriage. Carrying objects while walking leads to increased stability in newly walking infants and this increase in stability could enhance language learning opportunities. Infants who spend more time walking while carrying a toy have a higher receptive but not productive vocabulary at 13-months; however, productive vocabulary lags receptive vocabulary and therefore, the toy walking-productive vocabulary relationship may develop later. We examined whether the amount of time walking while carrying a toy at 13-months predicts productive vocabulary abilities at 24-months. Eleven children participated in the longitudinal portion of a larger project. At 13-months, infants engaged in a video recorded 20-minute free-play session during which they played with a variety of toys. From the videos, trained coders identified toy walking bouts (walking bouts of four or more continuous steps where the infant was carrying a toy). At 24-months, parents completed a productive vocabulary ability assessment (MacArthur-Bates Communicative Development Inventory). There was no relationship between toy walking bouts at 13-months and productive vocabulary abilities at 24-months ($r=0.17$, $p=0.62$), suggesting the toy walking-productive vocabulary relationship may not exist, or the relationship may develop after 13-months of age but be washed out by other experiences by 24-months of age. Therefore, carrying a toy while walking may not have long term benefits for productive vocabulary. However, given the small sample size, more data needs to be collected before these results are conclusive.

Research Mentor: Amanda J. Arnold & Laura J. Claxton; Department of Health and Kinesiology in the College of Health and Human Sciences

Poster Number: 103a :: Social Sciences/Humanities

College of Health and Human Sciences

La Bella Figura: The role of a cultural philosophy on Italian consumerism

Author:

Heather Heyrman

Lois Carpenter

Madelyn Cruse

Megha Reddy

Abstract:

The La Bella Figura concept extends to many Italian cultural dimensions including physical appearance, perception of self, and behaviors. La Bella Figura plays an essential role in shaping Italian consumer behavior and consumerism. The current study sought to understand how women living in Italy conceptualize La Bella Figura and how it affects their day-to-day lives, attitudes, and consumption behaviors. This research extracted concepts from Consumer Culture Theory to construct a qualitative codebook and structure thematic data analyses. Semi-structured interviews were conducted with 30 women aged 18-50 years living in Florence, Italy. Participants were recruited through study flyers, social media, and snowball sampling. Open and axial coding were facilitated by HyperRESEARCH 4.0.1 software to generate key themes. Data were collected and analyzed by trained researchers living in Florence, Italy, who utilized grounded theory techniques to identify emergent themes. Results indicated various components of La Bella Figura contributed to consumer behavior, namely its influence on identity (i.e., appearance, confidence), lifestyle goals (i.e., health, consumerism), and social norms (i.e., perceptions of others, media). Findings offer practical recommendations for marketers and retailers to appeal to the Italian market through effective and informed mediums.

Research Mentor: Jaziel Ramos-Ortiz, MS; Consumer Science; HHS; Andrea L DeMaria, Phd, MS; Public Health/Consumer Science; HHS

Poster Number: 104a :: Life Sciences

College of Health and Human Sciences

Social Factors Associated with Obstacles to Human Milk Donation

Author:

Claire Hornsby

Abstract:

Background: Human breast milk has been shown to improve the health outcomes of infants. When an infant's mother's milk is not available donated breast milk is an option; however, donated human breast milk has a limited supply and is very costly. To increase the supply and availability of donated breast milk we must first understand the population of breast milk donors and the obstacles they experience throughout the donation process.

Purpose: To determine the significance of human milk donor demographic and obstacles encountered during the donation process.

Methods: A cross-sectional online survey with a convenience sample of 227 women who previously donated breastmilk from various regions of the United States collected information on their demographics and whether they encountered an obstacle during the donation process, such as having difficulty transporting milk to bank, finding time to pump, etc. Descriptive statistics and logistic regressions were conducted using SPSS software.

Results: Out of the sample of 227 women, the average woman was white, 33 years old, employed, holding a graduate or professional degree, and living in an owned home in a suburban community with a household earnings of \$50,000 or more annually. At a significance level of 0.1, there was no evidence that race, employment, education, type of residence, community, or household income was associated with a higher rate of obstacles to donate breastmilk encountered.

Conclusions: Demographics could influence a mother's chances of experiencing obstacles during the process of donating breast milk. Response bias and lurking variables may exist. Further studies with more diverse populations are needed.

Research Mentor: Azza Ahmed, Health and Human Sciences, School of Nursing;

Poster Number: 105a :: Life Sciences

College of Health and Human Sciences

Geographical Analysis of Early-Life Exposure to Lead and Alzheimer's Disease Mortality

Author:

Claire Jackson

Abstract:

The goal of this project was to examine the possible link between early-life exposure to lead and subsequent Alzheimer's disease (AD) mortality in Illinois and Kentucky. Lead was extensively used in the mid-20th century, especially in mining and metal industries. It has been shown that workers can bring home lead to their families as dust on their clothes. For this reason, 1930s census data on occupational activity was used to estimate early-life lead exposure. A Historical Exposure Index (HEI) was created for each major city, which estimates lead exposure for the population in that city based on how many people were in each occupation and how likely it was that the occupation involved lead exposure. AD mortality data from the Center for Disease Control was obtained; this data is measured in percent of total deaths. The HEIs for each city and Alzheimer's disease mortality in each county were mapped using ArcGIS software. Descriptive statistical analyses of the HEIs and AD mortality were performed and maps were compared qualitatively. The average HEI was found to be higher (126.388) in Illinois than in Kentucky (114.104), and the average percent of total deaths caused by AD was also found to be higher in Illinois (0.75%) than in Kentucky (0.50%). Overall, though, it was found that there was no clear correlation between areas that had high lead exposure and areas that had high Alzheimer's disease mortality. However, it was found that in both states, the areas with the densest populations had the highest per capita rates of Alzheimer's disease mortality. Further statistical analysis needs to be done to confirm or deny any correlation.

Research Mentor: Dr. Ellen Wells

School of Health Sciences

College of Health and Human Sciences; Dr. Christelene Horton

postdoctoral student

Poster Number: 106a :: Life Sciences

College of Health and Human Sciences

Developmental Antecedents to Adolescent Optimism: A Study of Rural Latino Youth in Central Indiana

Author:

Nicolette Kittrell

Abstract:

Optimism is an individual characteristic that reflects the extent to which people hold generalized favorable expectancies for their future. Optimism is linked to psychological and physical health, as well as important constructs such as motivation, hope, self-efficacy, and positive attribution style. Optimism is a particularly important adolescent cognitive factor for moderating the effects of stressors. However, researchers have less often assessed optimism in Latino youth, despite their higher risk for health disparities and higher levels of stressors. Furthermore, researchers have rarely assessed antecedents to optimism, so it is unclear how optimism can be fostered in Latino youth.

In the present study, participants included 119 Latino youth in the 5th or 6th grade and their mothers. We examined whether salient developmental tasks (ethnic pride, school attachment, and resilience) positively affected optimism cross-sectionally (Time 1) and one year later (Time 2), controlling for depression. In our cross-sectional model, resilience and school attachment were positively associated with T1 optimism. Longitudinal models found resilience and school attachment at T1 were marginally associated with T2 optimism (controlling for T1 optimism); however, unexpectedly, resilience was negatively associated with T2 optimism. T1 depression was marginally negatively associated with T2 optimism when controlled for prior levels. Contrary to prior literature, we found no visible association between optimism and ethnic pride at either T1 or T2. By noting the association between salient developmental tasks and optimism, many avenues for intervention can be provided for Latino youth and families to help foster optimism, which could improve health and well-being.

Research Mentor: Dr. Zoe Taylor, Department of Human Development and Family Studies, College of Health and Human Sciences; Nayantara Nair M.A., Department of Human Development and Family Studies, College of Health and Human Sciences

Carly Evick, M.S., Department of Human Development and Family Studies, College of Health and Human Sciences

Poster Number: 107a :: Social Sciences/Humanities

College of Health and Human Sciences

“I think you might feel isolated:” Infertility knowledge, attitudes, and behaviors among Italian women

Author:

Kaylee Mason

Alyson D'Eramo

Lesley Flores

Savannah Hottle

Abstract:

Background: Italian women live in a complex reproductive society, which is currently facing several obstacles: the fertility rate is the lowest in Europe and in Italian history. Due to recent legislation, this infertility crisis is far from being settled. Women who experience infertility face adverse physical and psychological outcomes.

Objective: The purpose of this study is to investigate Italian women’s infertility perspectives and experiences, and how cultural constructs (e.g., recent legislation, social stigma, and religion) intersect with the issue. Inclusion criteria included women (ages 18 – 50 years) who lived in Florence and were utilizing the Italian healthcare system at the time of study enrollment.

Methods: Researchers conducted 30 in-depth, one hour interviews during May and June 2018. The explored women’s experiences with infertility and the treatment options that women seek within the healthcare system. All interviews were transcribed verbatim along with observer comments in order to identify emerging themes and patterns, using HyperRESEARCH as a data management program. A constant comparative and grounded theory approach was completed to analyze all data and build conceptual categories and themes.

Results: Several participants expressed a lack of knowledge on infertility treatments and options. Those that were informed suggested a desire for reform of the Italian healthcare system in regards to infertility, as participants perceived it as unsupportive of women’s and families’ goals. Findings suggest that psychological distress may be present in infertile couples. Italian culture and religion may play an influential part in legislation and family planning. Findings also explore the different resources women use for infertility information.

Conclusions: Findings from the research assist in understanding the women’s healthcare system in Italy and how it affects women experiencing infertility. Results also identify the dynamic of social rejection among women that are experiencing difficulties, often resulting from cultural and social norms. Further, findings underscore the impact of religion on infertility experience, including within the healthcare system and in the social environment.

Research Mentor: Andrea L DeMaria, PhD, MS; Consumer Science; Health and Human Sciences; Stephanie Meier, MA; Consumer Science; Health and Human Sciences

Poster Number: 108a :: Social Sciences/Humanities

College of Health and Human Sciences

Increasing the perceived malleability of gender bias using a modified video intervention for diversity in STEM (VIDS)

Author:

Katie Mason

Abstract:

Scholars are increasingly responding to calls for interventions to address persistent gender disparities in the sciences. Yet, interventions that emphasize the pervasiveness of bias may inadvertently damage efficacy to confront sexism by creating the perception that bias is immutable. We examined this possibility in the context of a successful bias literacy program, Video Interventions for Diversity in STEM (VIDS). In two studies with working adults from the general public (N = 343) and science faculty (N = 149), we modified VIDS by developing an additional module (UNITE) that offers tools for addressing bias and promotes the mindset that bias is malleable. VIDS alone was sufficient to increase awareness of bias, reduce sexism, and improve bias identification. However, UNITE buffered against perceptions that bias is immutable and restored self-efficacy to address bias. We conclude that interventions must aim not only to increase bias literacy but also offer concrete tools and avoid implying that these problems are insurmountable.

Research Mentor: Dr. Erin Hennes, Psychological Sciences, Health and Human Sciences;

Poster Number: 109a :: Life Sciences

College of Health and Human Sciences

Analyzing Shared Decision Making (SDM) for Cancer Pain Management

Author:

Riley McGuire

Cleveland Shields

Abstract:

The goal of SDM is to develop a shared understanding of patients' conditions and to come to a mutual agreement in management or improvement of illness. When patients make well-informed decisions and play an active role in decision-making, patients are more likely to adhere to their medication, to manage their long-term conditions, and to make cost-effective decision-making. For SDM to function given the time restraints, there must be a give-and-take in conversation between patient and physician unless the patient asks for additional information to enhance their medical understanding. We conducted a study to understand how SDM is executed for decision-making in cancer pain management.

Research Mentor: Cleveland Shields, PhD: Human Development and Family Studies, College of Health and Human Studies;

Poster Number: 110a :: Social Sciences/Humanities

College of Health and Human Sciences

Doctor Interaction: Is there discriminatory treatment at play?

Author:

Jade Meekin

Kennedy Skipper

Abstract:

While research on healthcare disparities exist, specifically about racial disparities and pain, no studies have explored how these implicit biases impact young adults and their social interactions with their doctors. This study explored how race, age, and gender impacts the way that their medical professionals interact with their patients. A survey was sent out to many students of Purdue University where they answered various questions regarding their doctor visits. African American participants reported feeling as though their medical doctors were unwilling to pursue more extensive or serious treatment when compared to the responses of Caucasians, Asians, and other ethnicities. A larger percentage of African Americans, when compared to other races, also felt as though their symptoms were ignored by their medical doctors.

Research Mentor: Libby Chernouski in the Department of English language in the college of liberal arts.;

Poster Number: 111a :: Life Sciences

College of Health and Human Sciences

Changes in microglial morphology following an acute stressor in male and female rats

Author:

Houston Meminger

Jadebrielle Bennesh

Abstract:

Changes in microglial morphology following an acute stressor in male and female rats

Houston Meminger^{1*}, Jadebrielle Bennesh^{1*}, Mikayla Voglewede

¹Department of Psychological Sciences, Purdue University

*Contributed equally

Post-traumatic stress disorder (PTSD) is characterized by generalized fear responses to previously non-aversive stimuli following exposure to a traumatic event. Despite incidence rates for traumatic events being nearly equal between the sexes, women are twice as likely to develop PTSD. To explore these sex differences, we are examining how microglia in the prefrontal cortex respond to stress in both male and female Long Evans rats. Specifically, male and female rats were exposed to 15 1.0 mA unsignaled footshocks over the course of 90 min—control animals were exposed to the context without any shock delivery. 9 or 15 days after this acute stressor, rats were euthanized, and their brains were removed and sectioned for immunohistochemical staining with IBA1 antibodies and DAB. Preliminary data demonstrate differences in microglial morphology between 9 and 15 days after exposure to an acute stressor in male rats, and current analyses are evaluating whether these differences are also occurring in females. These morphological analyses will determine if microglia are operating differently between males and females in response to stress, which may serve as a stepping stone for future research investigating sex differences in developing PTSD.

Research Mentor: Susan Sangha, Department of Psychological Sciences, Health and Human Sciences; Amy L. Brewster, Department of Psychological Sciences, Health and Human Sciences

Poster Number: 112a :: Life Sciences

College of Health and Human Sciences

Investigating swallowing and communication efficiency in children with unilateral cerebral palsy and typically developing children

Author:

Samantha Mitchell

Abstract:

Speech and swallowing are two essential everyday functions that use several shared structural and neural substrates. Despite this, empirical evidence of the relationship between these two functions in child development is sparse. To start addressing this gap, this study investigated the relationship between eating and speech efficiency in a group of typically developing children (TDC) and a group of children with unilateral CP (UCP). Fifteen TDC and 13 children with UCP (age range: 7-12 years of age) participated. Average mealtime duration was used as a measure of swallowing/eating efficiency, and speech rate was used as a measure of communication efficiency. Average bite/sip duration was calculated by measuring total snack consumption duration and dividing it by total number of bites/sips. Communication efficiency was assessed through a standard protocol for assessing speech rate using a delayed speech imitation paradigm. Results showed that TDC have significantly shorter average mealtime duration (mean=10.38 seconds/bite-sip; SD=1.87) than children with UCP (mean=13.85 seconds/bite-sip; SD=5.535) ($p<0.015$). TDC also have significantly faster speech rate (mean=221.55 syllables/minute; SD=22.97), than the UCP children (mean=179.37; SD=35.78) ($p<0.0004$). Although in the TDC group the two measures are not correlated, for the UCP group, a moderate negative correlation ($r=-0.51$) is seen, indicating that children with UCP with longer average mealtime duration have a faster speech rate. Further analysis of our data taking into account the prevalence of dysarthria and dysphagia in our UCP group will elucidate the reasons behind this finding.

Research Mentor: Dr. Georgia Malandraki

College of Health and Human Sciences

Speech, Language, and Hearing Sciences Department;

Poster Number: 113a :: Life Sciences

College of Health and Human Sciences

An Investigation of Environmental Health Risks in the Cusco Region of Peru

Author:

Ryan O'Connell

Abstract:

Chemicals and other environmental agents are known to have deleterious effects on human and environmental health. For any region, it is important to understand the breadth and severity of potential environmental health threats because this knowledge helps organizations implement solutions in a more comprehensive, effective manner. Therefore, the purpose of this study is to gauge environmental health risks in the Cusco region of Peru. This project is intended to serve as preliminary data to inform development of future studies. Using government-funded studies and mapping data from Peru, key environmental health issues have been identified. Additionally, data were obtained from the USDA website on agricultural and pharmaceutical exports into the US from Peru. During the research process, key search terms included "mining and environmental health Cusco", "Peru contaminated exports", and "environmental impacts Peru". The three largest issues were based on prevalence in news articles and research reports. These issues include yearly increases in illegal mining operations, deforestation around rivers, and agricultural expansion. These issues were shown to be interconnected. Mining operations are generally located near rivers or tributaries and increase the amounts of heavy metal contamination in the waterways and soil. Agricultural expansion increases the likelihood of harmful chemicals such as pesticides to enter the soil system. Deforestation makes it easier for contaminants to leach through the soil into waterways and occurs to create more room for mining operations and agriculture. This study provides insight about the areas of most concern in Peru's environmental health. Future studies can use this information as a baseline to further identify, analyze, and solve these prevalent issues in the Cusco region.

Research Mentors: Dr. Ellen Wells, Environmental and Occupational Health Sciences, College of Health and Human Science; Dr. Jennifer Freeman, Toxicology, College of Health and Human Science

Poster Number: 114a :: Life Sciences

College of Health and Human Sciences

Correlation of Pain Perception with GABA and Glutamate Levels in the Insula of the Brain

Author:

Isabelle Olejniczak

Abstract:

Neuroimaging studies of patients with chronic pain have shown that neurotransmitter abnormalities, including increases in glutamate and decreases in GABA, could be responsible for the cortical imbalance in excitatory and inhibitory activities observed in some pain conditions. The goal of this study was to map GABA and Glutamate (Glu) levels using MRS imaging (MRSI) in the insula of the brain and determine whether their levels correlated with pain perception. To achieve this, two-dimensional (2D) MRSI acquisition techniques with asymmetric narrow-transition-band adiabatic inversion pulses was used for the detection of the metabolites using double spin-echo localization pulse sequence at 3T. The greatest alteration of the neurotransmitter, Glutamate, was observed for anterior to posterior in the insula. This study demonstrates the ability to obtain neurotransmitter signals from the entire insula with a resolution of 2 mL. The resultant data provides a reference for subsequent utilization for studies of pain perception.

Research Mentor: Dr. Uzay Emir, PhD, School of Health Sciences, College of Health and Human Sciences;

Poster Number: 115a :: Life Sciences

College of Health and Human Sciences

Characteristics of Nanoparticles Emitted from Kanthal and Nichrome Heaters Used in Electronic Cigarettes.

Author:

Kaushal Prasad

Alec Graff

Abstract:

Electronic (e-) cigarettes consist of a heater to vaporize nicotine solution, a reservoir containing nicotine solution, and a wick to deliver nicotine solution to the heater. The Kanthal (iron+aluminum+chromium alloy) and Nichrome (iron+nickel+chromium alloy) coils are most commonly used for e-cigarette heaters. When the heater is operating, metal vapor can be produced from the heater surface, cooled by air, and then proceed to form nanoparticles (<100 nm) through condensation, nucleation and coagulation. In this study, metallic nanoparticles produced from the heaters were characterized. The Kanthal or Nichrome heater was installed in a lab-made e-cigarette system without the wick and the nicotine solution. The e-cigarette system was operated under various conditions (coil resistance of 0.1-1.0 Ω and applied power of 10-70 W). The size distribution of airborne particles emitted from each test heater was measured using a scanning mobility particle sizer for 30 minutes. When the coil resistance increased from 0.1 to 1.0 Ω , the initial number median diameter (NMD) of airborne particles was maintained between 40-52 nm for both Kanthal and Nichrome heaters. Under the normal testing conditions of 0.5 Ω at 10W, the initial total number concentration (TNC) of particles from Kanthal heater was 1.1×10^6 particles/cm³ and decreased to 2.4×10^5 particles/cm³ after 30 minutes. Similarly, the TNC from Nichrome heater was decreased from 1.9×10^6 particles/cm³ to 2.5×10^5 particles/cm³ after 30 minutes. The heater resistance was proportional to the initial TNC. When the applied power increased from 10 to 70 W, both NMD and TNC were increased. In all cases, the particle number concentrations decreased over time because surface oxidation (aluminum oxides layer on coil surface) prevented further nanoparticle formation. As a result, a used coil may reduce the risk of the metal exposure from e-cigarettes.

Research Mentor: Dr. Jae Hong Park

School of Health Sciences

College of Health and Human Sciences;

Poster Number: 116a :: Life Sciences

College of Health and Human Sciences

Nigral Oxidative Stress Is Associated with Optineurin Expression in Genetically Modified Mice

Author:

Charles Price

Abstract:

Nigral Oxidative Stress Is Associated with Optineurin Expression in Genetically Modified Mice

Charles G. Price, John P. Wise, Jr., Rachel Foguth, Jason R. Cannon

Abstract

Parkinson's Disease (PD) is a neurodegenerative disorder that targets the brain's nigrostriatal dopamine system. Although it affects more than ten million people around the world, its pathogenesis remains largely unknown. Furthermore, early detection and curative therapies are lacking. It is known that dysfunction in mitochondrial autophagy (mitophagy) is critical in early stage PD. Mitophagy dysfunction and the formation of aggregated protein inclusions in the brain's nigrostriatal region likely induce oxidative stress, thus impairing the dopaminergic neurons. Optineurin, a protein involved in the signaling pathway for mitophagy, has been linked to other neurodegenerative diseases such as ALS and glaucoma. The current purpose of this study is to determine if optineurin expression has an important role in modulating neuronal oxidative stress levels in the substantia nigra, the brain region most affected in PD. Brains from transgenic mice expressing wild-type optineurin, optineurin knock-out, or an E50K mutation linked to glaucoma were analyzed.

Immunocytochemistry followed by confocal imaging analysis was performed on nigral brain sections. Tissues were stained for optineurin, nitrotyrosine (a marker for oxidative stress), and alpha synuclein (a main component of protein aggregates common in PD). Ongoing analyses are determining the role of optineurin in PD-relevant neuropathology. This serves as a pilot study to open the doors for future, more extensive investigations into the role of optineurin in PD pathogenesis, ultimately leading to early detection and/or prevention techniques.

Research Mentor: Jason Cannon, Purdue College of Health and Human Sciences, Health Sciences;

Poster Number: 117a :: Life Sciences

College of Health and Human Sciences

Biomarker Comparisons of Heavy Metals in a Welder Population

Author:

Meredith Robbins

Abstract:

Biomarker Comparisons of Heavy Metals in a Welder Population,

Meredith Robbins, Dr. Ellen M. Wells, and Dr. Ulrike Dydak

Heavy metal exposure is a serious occupational health hazard for many industrial workers. Exposures can cause behavioral changes, nausea, anemia, and damage to the nervous system. Biomarkers for short term exposures of heavy metals have been shown to be inconclusive in which is more accurate in showing acute concentrations. The goal for this project is to describe and compare air, blood, and toenail measurements of manganese, zinc, and copper in a cross-sectional study of semi-trailer factory workers. Thirty-nine subjects (welders and non-welders) were sampled from a semi-trailer welding factory. Biomarker samples were taken from each of the subjects and concentrations of the metals were determined using ICP-MS. Population demographics were collected by questionnaire and include age, race, BMI, smoking use, and alcohol use. Mean and standard deviation values were found for each biomarker and metal, stratified by welding status. Pearson correlation values comparing the different biomarkers for each metal were determined. Overall, concentrations of manganese and zinc were higher for welders versus non-welders, while the copper serum value was higher for non-welders than welders. The correlation of air copper with serum copper (Pearson's $\rho=0.53$, $p=0.0087$) was higher than comparisons of either air or serum with toenail copper ($\rho=0.12$, $p=0.6720$ and $\rho=0.11$, $p=0.6628$, respectively). For zinc, serum and toenails had the highest correlation ($\rho=0.31$, $p=0.2234$) while toenail and air had the lowest ($\rho=0.20$, $p=0.4450$). For, manganese air and toenail concentrations had the highest correlation ($\rho=0.58$, $p=0.0024$) while the toenail and blood sample had the lowest ($\rho=0.21$, $p=0.3940$). Correlation values could be influenced by sampling methods and homeostatic control of the metals within blood tissue. Future work includes analyzing other concentration samples that were found within this sample set as well as explore the correlation values when non-welder data is taken out of the initial analysis.

Research Mentor: Dr. Ellen M. Wells, Assistant Professor of Environmental and Occupational health, College of Health and Human Sciences, College of Health Science;

Poster Number: 118a :: Life Sciences

College of Health and Human Sciences
Intervention Services in Neurogenetic Syndromes

Author:

Alyssa Rosenorn

Kate Schrader

Abstract:

Introduction: Angelman (AS), Prader-Willi (PWS), and Williams syndrome (WS) are known to be associated with a range of developmental challenges. Early intervention services (occupation therapy (OT), physical therapy (PT), and speech language therapy (SLT)) are often administered to children with these rare neurogenetic syndromes. Little information is available on the prevalence of therapy services in these groups.

Methods: The present study is an ongoing collection of data on the development of children with neurogenetic syndromes. Parents completed an online questionnaire about their child's development. Participants include 90 children (AS=30, PWS=28, WS=32) with reported intervention service use.

Hypothesis: (1) Across disorders, children with AS will show the highest percent of service utilization. (2) Within AS, percent of children using therapy will be similar across interventions. (3) Within PWS and WS, OT and PT will be most common. (4) Across disorders, children with AS will show the highest rates of hours/week across all therapy types. (5) Families with lower income will have the fewest hours/week of services.

Analyses: Statistical analyses include descriptive statistics, Fisher's exact test, Kruskal-Wallis one-way analysis of variance, and Spearman's rank correlation coefficient. AS does not significantly show highest percent of service utilization ($p=0.825$; $p=0.738$; $p=.658$). Within all syndromes, analyses suggest percent of children using therapy do not differ (p 's $>.368$). Groups differ in hours of service utilization for OT ($p=0.012$) and PT ($p=0.001$). Analyses indicate that income does not differ by hours/week of intervention ($p=0.94$).

Impact: The data analyzed can assist future studies in determining satisfaction and effectiveness of intervention services in neurogenetic syndromes.

*Research Mentor: Dr. Bridgette Tonnsen, Psychological Sciences, College of Health and Human Sciences;
Lisa Hamrick, College of Health and Human Sciences*

Poster Number: 119a :: Life Sciences

College of Health and Human Sciences

Effect of Health Coaching Targeting Physical Activity on Glucose Tolerance in Adolescents Who Are Obese; A Pilot Study

Author:

Nathan Schaeper

Abstract:

Background: Over the last twenty years there has been a dramatic increase in type two diabetes (T2D) in adolescents. Concurrent increases in sedentary behavior may put adolescents at a greater risk for T2D. Objective: Using baseline data from an ongoing clinical trial called Dietary Interventions for Glucose Tolerance in Teens (DIG IT), we determined relationships among physical activity, sedentary behavior, and measures of glycemia. Methods: Adolescents, who were overweight or obese wore an activPAL accelerometer (PAL Technologies, Glasgow, United Kingdom) for seven days to assess physical activity and sedentary behavior. Glycemia, during oral glucose tolerance testing (OGTT), was measured using point-of-care instrumentation. We analyzed 34 participants (64.7% girls) age 13 ± 2 years, who were obese (BMI z-score, 2.12 ± 0.48). Daily activity averages for the total sample were: sedentary time, 618 ± 87 min; total steps, 7073 ± 2406 ; stepping time, 92 ± 30 min; and moderate and vigorous physical activity (MVPA) time, 44 ± 62 min (which is below the MVPA recommendations of 60 minutes per day). Average glycemia measures for the total sample were: HbA1c, $5.4 \pm 0.3\%$; FPG, 94 ± 5 mg/dL; 2-hr OGTT, 121 ± 26 mg/dL. Spearman rank order correlations did not find significant correlations between the measures of glycemia and any measures of activity/sedentary behavior; however, there were trends (HbA1c concentrations and MVPA time, $r=-0.26$, $p = 0.15$). Conclusions: Glycemia may not be associated with activity levels in boys and girls who are obese; however, a larger sample size may be more conclusive.

Research Mentor: Dr. Nana Gletsu-Miller, Department of Nutrition Science, College of Health and Human Sciences;

Poster Number: 120a :: Social Sciences/Humanities

College of Health and Human Sciences

Investigating the Minimal Counterintuitiveness Effect

Author:

David Schena

Michelle Coverdale

James Nairne

Abstract:

Scholars believe that minimally counterintuitive concepts are more memorable than intuitive ones (Barrett, 2008; Upal 2011). If an item has an unusual or counterintuitive property, such as a ball that rises rather than falls when dropped, the unusual property makes the item more memorable. However, experiments investigating this effect tend to have experimental confounds that make interpretation difficult. Our experiment aimed to solve these problems by using counterbalanced lists of nonwords, using the nonwords to control for prior associations and experiences.

Participants viewed a series of nonwords along with a noun-adjective pair (e.g. Frav – a roaring tiger) and were told that each nonword represented a name. Some nonwords were the names of an intuitive item (e.g. a roaring tiger) whereas others were counterintuitive (e.g. a writing tiger). Participants rated the likelihood that the described nonword was from Earth or from a parallel universe where things were different. Everyone was told to remember the nonwords and noun-adjective pairs for a later test. To improve overall recall, each item was presented and rated twice. After a distractor, participants were asked to recall as many of the nonwords as possible.

The results revealed that counterintuitive items were not better-recalled than intuitive items. In fact, in most tests, intuitive items were recalled significantly more often than intuitive items. Our results do not support the Minimal Counterintuitiveness Effect and suggest that when to-be-remembered words and their accompanying nouns are matched across conditions (counterintuitive and intuitive), that intuitive information is more memorable than counterintuitive information.

Research Mentor: Dr. James Nairne

Purdue Department of Psychology

College of Health and Human Sciences;

Poster Number: 121a :: Life Sciences

College of Health and Human Sciences

Development of a Qualitative Model for Assessing Radiological Risk at Medical Facility

Author:

Courtney Sheffield

Abstract:

The use of radiation and radioactive materials for beneficial purposes continues to grow, especially for medical imaging and therapy. Staff employed by medical facilities receive training about the safety risks due to radiation exposure and take proper precautions to protect themselves. However, personnel receive very little information about the potential security risks of radioactive material that may result due to malicious acts, such as theft or sabotage. To increase awareness of the potential radiological security risk, a probability model and written survey were developed and conducted for a medical facility. The model considered threat frequency and vulnerability, which was further broken down into natural disasters, power outages, and crime. The specific radioactive material (asset) used in this study was Gamma Knife®, which is a Category-1 medical device as designated by the International Atomic Energy Agency (IAEA). Data regarding natural disasters such as tornados, extreme wind, or snow, was taken from the National Oceanic and Atmospheric Administration (NOAA) and narrowed down by state or county. County crime statistics were obtained from the Federal Bureau of Investigation (FBI) website. The written survey consisted of questions intended to reveal general nuclear security awareness and technical nuclear security awareness that included topics such as detection, response, transportation, training, accountability and physical security. The goal of this study was to give medical facilities an understanding of the security of radioactive materials as well as identify areas of improvement, such as additional training or better metrics for physical protection.

Research Mentor: Dr. Jason Harris, Radiological Health Sciences, College of Health and Human Sciences;

Poster Number: 122a :: Innovative Technology/Entrepreneurship/Design

College of Health and Human Sciences

Biometrics: A Key Security Solution

Author:

Beatrice Smith

Abstract:

Biometric technology has been on the rise for years. Biometrics are used across the world as a form of security and a mode of identification. This is especially prevalent in the United States, where there is a spike of interest in increased security measures since the 9/11 terrorist attacks. After these events, an ongoing rise of biometric technology, or identification technology, was initiated.

By analyzing different physical and behavioral factors about a person or tendencies that they possess, a biometric profile can be created. By using these profiles, biometrics can help to distinguish one individual from another. This can be applied to identifying criminals, personalizing of social services, or even tracking medical history. The goal of this essay will be to analyze the impact that these biometric security measures have on the population. I will achieve this by using a mixture of both scholarly and popular sources to evaluate the presence of biometric technologies in modern society.

I will analyze the presence of biometric technology in a nation where technology is constantly evolving. Specifically, I will ask: What are biometrics? How has the use of biometrics increased since the 9/11 terrorist attacks? What is the role of biometrics in the aspect of security in our present society? And finally, I will examine how the rise of biometric technologies correlate with the increase of societal control by specifically looking at the role of biometrics in the United States government.

Research Mentor: Alejandra Ortega

PhD student, Literary Studies

Modern Fiction Studies TA

Graduate Instructor, ENGL106

Purdue University, Department of English;

Poster Number: 123a :: Life Sciences

College of Health and Human Sciences

Determining the Relationship between Tumor Microenvironment and Delta-Like-Ligand 1 Expression

Author:

Faith Stirm

Abstract:

The tumor microenvironment (TME) within solid tumors play a critical role in the development and treatment of cancer. Recent studies have shown that these regions support the stem-like properties of cancer and provide ways of escaping the body's immune system. Delta-Like-Ligand 1 (DLL1), a Notch pathway ligand, plays an important role in T-cell lineage and cancer stem cell (CSC) maintenance, and thus may play a role in allowing CSC's to escape the body's immune system. The purpose of this experiment is to determine the relationship between DLL1 expression and TME through the usage of anti-angiogenic drugs. For this experiment, SUM149 TNB tumors from athymic mice were treated with either no, low, moderate, or high doses of DC101, a monoclonal antibody targeting VEGFR2. Pathological analysis of DLL1 was performed post-treatment. Total DLL1 expression significantly decreased for treated mice compared to controls, while increasing at high doses. These regions were then scored based on the percentage of cells showing nuclear staining and the percentage showing cytoplasmic staining, demonstrating drug activity at the mRNA level. In conclusion, low doses of DC101 can significantly downregulate DLL1 reducing CSC prevalence in breast tumors, while higher doses can be detrimental. Future work investigates the effects of TME on immune cells.

Research Mentor: Dr. Keith Stantz, Health Sciences;

Poster Number: 124a :: Social Sciences/Humanities

College of Health and Human Sciences

Associations between language environment and parenting stress in infants with and without Angelman Syndrome

Author:

Arlyne Vargas

Emily Reyes

Maesyn Poidomani

Abstract:

Angelman syndrome (AS) affects many domains of a child's language abilities, with the most profound delay in their expressive speech (Summers, Allison, Lynch, & Sandier, 1995). These delays can have significant impact on the family environment, with 58% of mothers reporting high parenting stress (Wulffaert, Schoelte, & Van-Berckelaer, 2010). Our research focuses on the relationship between a child's language abilities and parenting stress. Our study included 32 children (15 AS, 17 LRC), aged 6.44-46.85 months. Each child completed a day-long in-home recording using a LENA device. We examined a child's language ability using the Language Environment Analysis (LENA) system, a specialized audio recorder worn by the child that collects information about the child's language environment. The LENA produces a Vocal Productivity (VP) score, which measures the length of children's vocal output in well-formed consonant-vowel pairs. Parenting stress was examined using the Total Parenting Stress score from the Parenting Stress Index, Fourth Edition – Short Form, a 36-item self-report survey completed by the child's mother that incorporates three domains of stress: child characteristics, parent characteristics, and situational/demographic stress. We will examine differences in VP among children with AS compared to low-risk controls (LRCs) using a Wilcoxon-Rank Sum test, as well as the association of child VP score with parental stress using a Spearman's Correlation test. We hypothesize that the AS group will have significantly lower VP than the LRC group and that lower VP scores will be associated with higher levels of parental stress in both groups. Understanding the association between VP and parenting stress will be beneficial in creating an optimal language environment for children to ensure best possible outcome.

Research Mentor: Bridgette Tonnsen, Psychological Sciences, College of Health & Human Sciences;

Poster Number: 125a :: Life Sciences

College of Health and Human Sciences

Water should not feel like slime: Sensory acceptability of chemesthetic beverages for managing swallowing disorders

Author:

Madison Wierenga

Abstract:

Many older adults suffer from difficulty swallowing thin beverages like water, coffee, or juice. To improve swallowing safety, beverages are typically thickened, which creates a new problem: the thickened beverages are disgusting. New work suggests chemesthesis, particularly intense sourness, spiciness, or carbonation, could improve swallowing without the need for thickeners. Yet, work is needed to assess the palatability of chemesthetic beverages among older adults. Thus, we recruited participants to rate sweetness, sourness, fizziness, stinging, and overall liking of unsweetened carbonated waters (1 plain, 5 flavored), sour orange juice, spicy ginger beer, and colas (sugar or aspartame sweetened). Initial tests (N=30) indicated sour orange juice, spicy ginger beer, and two of the flavored waters were not well-liked, so the other beverages were selected for larger tests (N=64). All the flavored sparkling waters and colas were rated as sweeter than the carbonated water (all $p < 0.05$). Both colas were rated as sweeter than any of the flavored waters, but there was no significant difference in sweetness between colas ($p = 0.696$). All beverages had a mean liking rating above 2 (Dislike, all $p < 0.05$), and the sugar-sweetened cola had a mean liking rating above 3 (Neutral, $p < 0.05$). Participants liked the colas more than any of the flavored sparkling waters and carbonated water, and liked sugar-sweetened cola more than aspartame-sweetened cola. The stinging of plain carbonated water was marginally greater than diet cola ($p = 0.051$). Further work is ongoing to determine if any of these chemesthetic beverages will be effective in improving swallowing safety, as well as to determine if these beverages, despite having relatively low liking ratings in isolation, would be preferable to thickened beverages.

Research Mentor: Dr. Cordelia Running, Nutrition and Food Science, College of Health and Human Sciences;

Poster Number: 126a :: Life Sciences

College of Health and Human Sciences

Developing Drug Therapies for Cognitive Damage in Mice Following Brain Radiation

Author:

Rachel Yuska

Abstract:

Pediatric brain cancer patients are at a high risk for radiation induced cognitive impairment due to white matter changes in the brain. Half of six-month radiotherapy survivors develop significant changes in white matter. Previous research has shown that a mouse model can be used to show similar cognitive and behavioral deficits shown in human patients. The purpose of this work is to evaluate the effectiveness of two drug therapies, Donepezil and 3,3-Diindolylmethane, (DIM), that could be used to either protect the brain from radiation injury or cure the cognitive injury and behavioral deficits that result from whole-brain irradiation. This project consisted of two parts: administration of Donepezil post-radiation as a symptomatic cure and administration of DIM before radiation as a protectant. The mice received 30 gray whole brain radiation and their behavioral changes were measured at 4 and 8 weeks post-radiation. The behavioral changes were observed using two tests: Open Field Test and a Marble Burying test. The goal of using these tests was to see if the treated mice would have results closer to the baselines established in previous research. From our data, we observed Donepezil to be an ineffective form of therapy, as the deficits did not improve. However, DIM has shown to be a promising protectant drug therapy as the behavioral data is close to the results of a healthy control. This research validates the potential of DIM to be used as a radio protectant in preventing radiation injury from occurring and also preventing any cognitive deficits following.

Research Mentor: Dr. Carlos Perez-Torres, College of Health and Human Sciences, School of Health Sciences;

Poster Number: 127a :: Social Sciences/Humanities

College of Liberal Arts

Modernist Transhumanism and its Political/Bioethical Implications

Author:

Warisha Aslam

Abstract:

The research project revolves around modernist, or 20th-century transhumanism. Transhumanism is the idea that individuals are capable of transcending their mortal bodies through various means, including genetic engineering, extermination, spirituality as well as technological progression, which all point towards human enhancement. Thus, the purpose of this research is to comprehend the political and bioethical implications of transhumanism, especially its impact on disability. The purpose is achieved through close analysis of the 20th-century literature in reference to transhumanism, with the focus on science fiction.

This project encompasses a thorough investigation of articles, scholarly findings and works of nonfiction and fiction written in the early 20th century that are relevant to the study. Results of the investigation elaborate upon what the writers thought of transhumanism, the rationale behind their perspective, as well as the contemporary implications of the society's understanding of transhumanism. The contemporary connotations, which will be discussed through the results of the research study, include the influence that transhumanism, in reference to disability, has on public policy, literature and scientific enhancements.

Research Mentor: Maren Linett, English Department, College of Liberal Arts;

Poster Number: 128a :: Social Sciences/Humanities

College of Liberal Arts

Romantic Decision Making Among Young Women

Author:

Nicole Blackburn

Abstract:

The study of Romantic Decision making among Young Women seeks to analyze the micro-decisions which may or may not lead to romantic or sexual encounters in social events where alcohol is involved. We intended to contribute to the growing literature on 'hook-up' culture by understanding the often-overlooked decisions which lead up to these encounters. These micro-decisions include who the participant attends social events with, where they go, alcohol consumption, as well as interactions with potential partners. By using a methodology of asking participants to photographically record their night to use later in the interview to spark memories and gain a better understanding of the settings where these events and decisions take place. We found that participants were able to more clearly articulate their evening through using these photographs and often sparked discussions about the evening which may not have been uncovered without the photographs. The participants presented a mix of outcomes that allowed us to see how the decision to 'hook up' with someone can be influenced by a number of factors such as an obligation to stay with the original friend groups or a setting which does not encourage hooking up.

Research Mentor: Brian Kelly, Sociology, Liberal Arts; Christie Sennott, Sociology, Liberal Arts

Poster Number: 130a :: Social Sciences/Humanities

College of Liberal Arts

Rival 17th Century French Encyclopedias

Author:

Desiree Clark

Abstract:

The purpose of this research is to discover information about the production, provenance, contents and special features of the 1692 encyclopedia *Le Grand Dictionnaire Historique* by Dr. Louis Moréri and its follow-up critique *Dictionnaire Historique et Critique* by Pierre Bayle in 1720. The project is in the initial stages and will examine the unique nature of these early modern books and their printing history including printer's marks, embossing, watermarks, and dedications using original copies. This research will also explore the connection between two eminent authors who were rivals in different religious perspectives and created their books with opposing philosophies. Moréri, a French Catholic priest, first published his book in 1674 and it is unique for its strong focus on geographical and historical subjects for that time. As a result, it was translated into French, Spanish, German, and English, which marked an epoch for encyclopedias becoming available in Europe's vernaculars and having entries listed alphabetically. Additionally, the book inspired Pierre Bayle, an iconoclast French Huguenot, to create his version of the encyclopedia in 1697 whereby Bayle updated the content by correcting and adding entries and expanding footnotes. Bayle's aspersions denounced Moréri's work by elucidating and superseding the Catholic perspective contained in the entries with his own philosophy furthering the acrimonious divide between the Catholics and persecuted Huguenots of 17th century France.

Research Mentor: Professor Liz Mercier, School of Languages and Cultures, College of Liberal Arts;

Poster Number: 131a :: Social Sciences/Humanities

College of Liberal Arts

Black Women Politicians: How Appearances Affect Public Perception

Author:

Aiden Colburn

Abstract:

Female politicians face a disproportionate amount of scrutiny surrounding their appearances compared to their male counterparts. Black women politicians have a whole other layer added to this. Black women in general are often criticized for wearing natural hairstyles in professional settings. The critiques black women politicians face not only have sexist overtones but racist ones as well. This research sought to better understand the ways in which black women politicians are perceived by the public.

Research Mentor: Nadia Brown

Political Science/Women's Studies

College of Liberal Arts;

Poster Number: 132a :: Social Sciences/Humanities

College of Liberal Arts

3D Scanning of Human Hunting and Butchery Evidence

Author:

Sarah Coon

Abstract:

The purpose of the research is to study the morphology of bone surface marks in order to isolate the differences between types of marks and provide statistical support. For this research three different types of marks are being studied: trampling, butchery, and crocodile marks. These marks are experimentally made, then 3D scanned and edited. Editing of the scans is completed through the use of the computer program Meshlab and solely limited to the extraction of the marks of interest from the 3D scans. The scans must be edited in-order to remove unnecessary variables from them such as generic bone surface or other insignificant marks. The isolated marks are then further processed through the use of R-programming to create a generic shape for each individually extracted mark. These mark shapes are then further compared using statistical analysis in R-programming in order to observe general trends of difference in each of the types of marks. The data can eventually be used to be compared to unidentifiable mark types, allowing for statistical analysis of the probability an unknown mark is one of the types.

Research Mentor: Dr. Erik Otarola-Castillo

Anthropology

Liberal Arts;

Poster Number: 133a :: Social Sciences/Humanities

College of Liberal Arts

Beyond English

Author:

Hollis Druhet

Vitasta Singh

Grace Morris

Abstract:

Our research strives to situate and re-examine what benefits can be gained from reading and studying literature in the modern world. As less people today choose to read or pursue literary studies, we experience a loss of good reading practices in a fast-paced technology driven society. To engage these problems our research analyzes benefits of deep reading, how exposure to literature can affect the public good, and how literature courses can better prepare students with the skills to maneuver their future career paths. It is important to remember that reading is epigenetic, making the practice impossible to inherit. With a loss of deep-reading, we will be negatively influencing how the future generations adapt to this habit. Overall, we seek to understand the deep-reading processes and how the brain responds when presented with a text.

We also aim to understand how we can successfully transfer these deep reading skills in a digital-media setting, guiding the brain to adapt to digital media without losing the tools inherited by the consumption of print media. Our work examines how expanded digital media exposure can take away from the benefits of literacy and written communication. Additionally, our work examines the idea that the loss of critical analysis, reflection, and constantly evolving thought can severely harm the intellectual and emotional growth of a human being. We also explore how literary reading offers a place for individuals to escape, enabling them to discover the full human experience. Approaching these topics, we look to revitalize the importance of a literary education and how an engagement with literature engenders a more thoughtful and empathetic citizen for the global world.

Research Mentor: Derek Pacheco, English, Liberal Arts;

Poster Number: 134a :: Social Sciences/Humanities

College of Liberal Arts

The Rare Books Registry: Identifying the Use and Significance of Watermarking

Author:

Georgia Green

Abstract:

Georgia Green

Abstract

Wilke Undergraduate Research

The Rare Books Registry: Identifying the Use and Significance of Watermarking

The purpose of this project—looking through rare books to find their watermarks—is to use the differentiating markings to discern the early significance of copywriting and accreditation. Using the Dutch University Institute for Art History Florence’s database to identify watermarkings in selected rare books, the information gathered can be used to understand the significance of early crediting practices and how the practice has translated into modern print. The goal will be to study the creation, aesthetics, and history of watermarking so as to discover this aforementioned fascination with crediting creators and producers that occurs in past and modern writing and publications. Through this work, it can be determined the significance of ownership and why it is necessary in the creation, sharing, and distribution of works.

Research Mentor: Elizabeth Mercier, classics, College of Languages;

Poster Number: 135a :: Social Sciences/Humanities

College of Liberal Arts

Metatheater in Ancient and Modern Comedy

Author:

Sophia Holt-Wilson

Abstract:

My research with Dr. Erin Moodie for her book *Comic Subversion: Metatheater in Athens, Rome, and Beyond* explores metatheatrical language in ancient and modern comedy. In this research, metatheater and metatheatrical moments are defined in a number of different ways. This may include, but is not limited to: a character or characters speaking directly to the audience, characters alluding to the fact that they are in a play, or play-within-a-play moments. The texts explored are ancient Roman plays by Plautus and Terence, and Greek plays by Aristophanes and Menander. This research is ongoing, but modern comedy will also be analyzed in television shows such as “30 Rock” and “Community.” Throughout history, metatheater has served as an important component in challenging authority and social hierarchies, as metatheatrical language is often related to low-status characters.

Research Mentor: Erin Moodie, School of Language and Cultures, College of Liberal Arts;

Poster Number: 136a :: Social Sciences/Humanities

College of Liberal Arts

Mandarin Localizers, their Grammatical Category and Syntactic Distribution

Author:

Xuan Hu

Abstract:

The purpose of this research project is to explore how human beings encode locative phrases in our mind. To be more specific, we focus on Mandarin and investigate the underlying syntactic structure resulting in the ambiguous properties that Mandarin Localizers manifest, which further leads to controversial categorization.

Localizer phrases in Mandarin possess features of both XP locative phrase and nominal phrase. To address this conflicting behavior, we use Svenonius (2007), who postulates different projections for DP and AxParts. Our hypothesis is that the mixed behavior observed in Mandarin can be the result of the localizer occupying different syntactic positions within the constituent (either as a DP or as an AxPart). This research distinguishes monosyllabic and disyllabic localizers by identifying how nominal suffixes (i.e. “bian”, “mian” and “fang”) of the latter one serve as a functor which shift the vector spaces denoted by AxPart into a region within the projection of vector spaces. Based on this assumption, some controversial features of Mandarin localizers (i.e. the incompatibility of AxPart and degree modification marker such as “zui”, which fill in the position of Deg) can be explained.

By considering the underlying structure of the elements under question, we are able to provide an explanation for the apparent ambiguity of Mandarin localizers' distributional behavior in particular, and supplement the structure of human language to a more comprehensive and insightful degree.

Research Mentor: Dr. Elena E Benedicto, English Department, College of Liberal Arts;

Poster Number: 137a :: Social Sciences/Humanities

College of Liberal Arts

Down the Rabbit Hole: Tracking the Reach of ANTH Courses on Undergraduate Plans of Study

Author:

Yihan Jia

Abstract:

This project intends to match each undergraduate academic programs that use anthropology courses with their home college/school. According to the Purdue University Catalog, undergraduate courses offered by the Anthropology department appear on a total of 153 plans of study across different college/schools on campus, where 68 (~44%) of them are not from the College of Liberal Arts. Many courses end up appearing on unexpected majors like Game Design, Computer engineering, Aviation Technology, etc. This study uses anthropology courses as a case study to examine this issue so that the department can better track and promote their courses. The research process includes: a) run curriculog course impart reports, b) match programs with home colleges and advisors, c) process data with excel coding, d) analyze and visualize data and discover relative patterns. The ultimate goal of this project is to help the department to increase course enrollments through strategic course promotions using the outcomes of this project.

Research Mentor: Ian Lindsay, Department of Anthropology, College of Liberal Arts;

Poster Number: 138a :: Social Sciences/Humanities

College of Liberal Arts

Forgettable Infractions: Street Harassment in Victorian Literature

Author:

Emily Jones

Abstract:

There has been no shortage of research on gendered violence in Victorian London. With predators like Jack the Ripper, and the popularity of the hyperbolic crime plot in literature, the era is rife with instances of both real and fictional violence. However, the rich space of street harassment in Victorian London remains largely unexplored. As the 19th century urban space was being occupied and navigated by both genders, women became subject to a number of public “micro-aggressions.” This research investigates contemporary conceptions of women in urban spaces by analyzing Sensation novels. Character travels and micro-aggressions are tracked and digitally mapped to visualize trends of violence according to gender, class, and circumstance. We broadly define micro-aggressions to include leers, feelings of dread, hostile glances, stalking, and unwelcome flirtatious advances. Our findings show that, though the fictional urban woman traveled less often and for shorter distances than her male counterpart, she was far more likely to be subject to violence. Interestingly, the women’s aggressors were often known to them, whether as husbands, fathers, and acquaintances, with private disputes following female characters out of the home and into the streets. This indicates a need to broaden popular conceptions of harassment, which often assume that an aggressor is a stranger. Current issues surrounding gendered violence have roots in these early, urban interactions—both real and fictional. Taken in the historical context of increased literacy rates and urbanization, our research indicates that the prevalence of micro-aggressions in Sensation literature worked to normalize street harassment in a crucial point of urban development.

Research Mentor: Megha Anwer, Diversity and Global Awareness, Honors College;

Poster Number: 139a :: Social Sciences/Humanities

College of Liberal Arts

Gender and Global Environmental Governance: An Intersectionality Approach

Author:

Kaleigh Karageorge

Bailey Smith-Helman

Abstract:

This research engages with literature in international relations, political ecology, feminist political ecology, and Indigenous studies to explore how representations of gender at sites of global environmental governance frame Indigenous Peoples, traditional peoples, and local communities' roles in environmental governance. This work is part of the Presence to Influence project, which is a multi-sited, multi-year collaborative research project that seeks to understand how marginalized and underrepresented groups in global environmental governance access and influence these governance processes. Our sites currently include three main events, the 2015 Paris Climate Summit (COP21), the 2016 World Conservation Congress, and the 2018 International Society of Ethnobiology Meetings (Belém +30). Specifically, we engage with an intersectionality approach and decolonial work to determine: How is gender discussed and in what context? How do different actors define gender issues and solutions in global environmental governance? How does gender discourse frame environmental action and global environmental policy? This poster will highlight key findings from a narrative literature review and point to findings from grounded qualitative data analysis across our data sets from sites of global environmental governance. Our work addresses how engaging with an intersectionality approach can foster interdisciplinary-oriented theoretical synergies in analyzing the processual unfolding of representational politics at sites of global environmental governance, expand how and in what way scholars engage with questions of gender across polycentric scales, identify the power-laden contexts of constructions of bodies and identities, and draw sharp attention to hegemonic configurations of discourses that currently dominate at sites of global environmental governance.

Research Mentor: Laura Zanotti, Anthropology, College of Liberal Arts; Kim Marion Suiseeya, Political Science, Weinberg College of Arts and Sciences (Northwestern)

Poster Number: 140a :: Social Sciences/Humanities

College of Liberal Arts

A Space for Practice: International Learning Initiatives

Author:

Rachel King

Abstract:

The Space for Practice is a new Purdue applied anthropology lab. Its purpose is to facilitate applied anthropology pedagogy and to provide programming to foster student-practitioner interactions and networking. Numerous beneficial resources on international learning and study abroad were donated by a senior practitioner. This undergraduate-led research project will involve cataloging the collection of materials, literature review on best practices for exposing students to international learning opportunities, expert interviews, and other methods. The project will result in a report for the Space for Practice planning committee with recommendations about how we can foster international learning in this educational space.

Research Mentor: Sherylyn Briller, Anthropology, Liberal Arts; Elizabeth Briody, Anthropology Adjunct Faculty, Liberal Arts

Poster Number: 141a :: Social Sciences/Humanities

College of Liberal Arts

"LLC/ Interculturally-Driven: Developing Curiosity through Culture in the Italian Language Classroom"

Author:

Jane Koch

Christopher Centrella

Abstract:

Our project seeks to embed the explicit instruction of intercultural attitude of curiosity in teaching the Italian culture in the second-semester Italian language course (Italian 102). For that purpose, after researching relevant topics in the fields of intercultural theory and language instruction, we developed a pilot-instructional unit in the target language that integrates cultural content commonly taught in Italian 102 with a deliberate focus on developing the intercultural attitude of curiosity. The instructional unit, structured as a guided virtual scavenger hunt, taking place in Venice, Italy, follows the guidelines of ACTFL Intercultural Can-Do Statements. Rather than placing students in the role of recipients of cultural knowledge and facts that remain external to the learners, our instructional unit gives students the role of active intercultural investigators. This shift in perspective will enable students to develop intercultural attitude of curiosity, as well as other skills and behaviors in addition to knowledge, leading to a potential transformation of their existing cultural perspectives. The overarching goal of our project is to exemplify a methodology that would complement the redesign of the Italian curriculum currently underway at Purdue, which focuses on the implementation of intercultural perspective through discrete intercultural laboratories that target the skills of curiosity and openness (as defined by the AAC&U Rubric), and that are conducted mainly in English. We predict that the combination of the methodology exemplified by our pilot-unit with the approach currently applied in the Italian program will lead to an increase in student's intercultural curiosity, as well as in their motivation to continue studying the Italian language and culture.

Research Mentor: Tatjana Babić Williams, SLC, CLA; Aletha Stahl, CILMAR

Poster Number: 142a :: Social Sciences/Humanities

College of Liberal Arts
State Gun Policy & Violent Crime

Author:

Nicole Koob

Abstract:

In the current discourse around crime, gun control and violent crime rates are often topics of debate. The media highlights mass shootings, and often the question is posed 'are we doing enough to monitor the sale of firearms?' However, it's not often discussed how imposing strict regulations may or may not produce the desired effect of lowering violent crime due to easy access of weapons from low-regulated neighboring states. Current research on gun control policy shows contradicting evidence of its effect on violent crime. The project will examine how violent crime rates in states with strict gun regulations are affected by their proximity to states with weaker policies. As a participant in this work, my contribution will be mainly focused on literature reviews, building data sets, and conducting legislative history. By drafting memos on current research related to gun control, identifying various state policies and documenting changes over time, we can create a data set that we can compare to violent crime rates reported by the FBI. Our goal is that this will allow us to analyze the impact that gun control has on violent crime, and whether or not proximity to states with lighter control has an effect. The findings of this project could impact policy formation surrounding gun control on both a state and federal level.

Research Mentor: David McElhattan;

Poster Number: 143a :: Social Sciences/Humanities

College of Liberal Arts

Miss Universe Organization Communication Audit

Author:

Emily Mast

Abstract:

The research's purpose was to compare the communication strategies of the Miss Universe Organization (MUO) to their competing organizations: Miss International, Miss World, and Miss Earth. A comparative analysis examines the communication strategies of the four international pageant's websites and Instagram accounts. A SWOT Analysis was used to further evaluate MUO. The data reveals that MUO has an effective website design and social media presence due to the accessibility of the website and number of followers on Instagram. However, the use of advertisements on their website disrupts their ethos, as they are a non-profit organization. MUO has the opportunity to expand their reach to younger generations of women. The competing organizations pose large threats to MUO due to similar web designs and logos, and negative media portrayal of pageantry threatens success. Three suggestions for the Miss Universe Organization are: (1) In light of recent negative media coverage about pageantry, create a team of marketers to communicate the positive effects of pageantry before December 2019 to improve TV ratings of the competition, (2) Form a marketing team to target women who are younger than 18 within the next year, and (3) Considering the similarity of website designs between MUO and Miss World, collaborate with the current MUO website designer to differentiate the organization from Miss World within the next six months. In conclusion, the current communication strategies are efficient in reaching MUO's target audience, however the competing organizations pose a threat.

Research Mentor: Allegra Smith, English, Liberal Arts;

Poster Number: 144a :: Social Sciences/Humanities

College of Liberal Arts

The effect of climate change on the niche space of North American proboscideans.

Author:

Alejandra May

Abstract:

Most researchers agree that the extinction events of North American megafauna, including proboscideans, occurred approximately 13,000 years ago. The reason for the demise of these creatures, in particular proboscideans such as mammoth and mastodon, is a matter of debate. There are three accepted general hypotheses explaining the extinction of these North American megafauna: (1) human over-hunting (2) climate change leading to a reduced niche, or (3) a combination of climate change and human over-hunting. While two of the three hypotheses invoke climate and environmental change as a factor impacting proboscidean extinctions, how climate change might have affected the suitability of the proboscideans' environments remains unclear. Here, using archaeological and paleontological location data and paleoenvironmental reconstructions of key environmental variables, we reconstruct and examine the niche space occupied by North American proboscideans and investigate the effects of climate-variable changes on niche space fluctuations between 30,000 and 10,000 years ago. Studying the impact of climate change on the proboscidean niche should facilitate parsing the non-human effects on their disappearance, and increase focus on the effects that human hunting might have had on these mammal extinctions.

Research Mentor: Dr. Erik Otarolla-Castillo, Department of Anthropology, College of Liberal Arts;

Poster Number: 145a :: Social Sciences/Humanities

College of Liberal Arts

Communication in Dance and Interactive Technology

Author:

Grace Morris

Abstract:

The purpose of this research is to examine how communication occurs in a real-time performance setting through the interaction of dance movement and wearable technology. Our work involves discussions of the physical use of the interactive wearable technology which includes a flex sensor of the elbow and two flex sensors of the knees. Overall, these flex sensors manipulate theatre lights through a sensor network that can change the lights' intensity, the lights' colors, and the colors' saturation. Through this interaction of movement and the wearable technology, we can track whether communication occurs and determine how this affects the audience's understanding of the work in a performance setting.

Through our research, we found that it is easier to track communication occurring between the dancers and the lights in specific sections of the work that directly relate the two elements. Although communication occurs in other sections of the work as well, it can be difficult for the audience to recognize and track it. We seek to understand whether an easier process can occur to better equip the audience with the ability to recognize the lights and dancers' interactions. Additionally, we seek to determine the ways choreographed and improvisational movement influences how the dancers communicate in the space, which further influences their interaction with the theatre lights. Ultimately, in this process, communication does occur between the multiple entities in the space, and it enhances the work in a performance setting by making the dancers aware of theatre lights communicating with them.

Research Mentor: Renee Murray, Division of Dance, College of Liberal Arts;

Poster Number: 146a :: Social Sciences/Humanities

College of Liberal Arts

Post-Recession Capitalism: Economic Rights through the Lens of Political Philosophy

Author:

Alexander Mullenix

Abstract:

This project seeks to explore economic activities through the lens of political philosophy so as to further bridge the gap between the highly technical works in economics and sociology with the theoretical in philosophy. The context of the Great Recession provides a strong backdrop to discussions of what social actions exist in our modern economy and what rights might apply to those actions in a philosophical sense. This project is primarily rooted in literature reviews of works concerning economic pathologies, studies of workforce behavior, and other explorations of behavior and outcomes in the modern economy. These works provide significant context to what motivates individuals in the post-recession economy and how their behavior may effect the economy. This project also serves as a complimentary basis to an ongoing book project undertaken by the advisor for the project.

Research Mentor: Chris Yeomans, Philosophy, Liberal Arts;

Poster Number: 147a :: Social Sciences/Humanities

College of Liberal Arts

LLC/Parallels and Peculiarities between American Noir and Scandinavian Noir

Author:

Antonia Neckopulos

Abstract:

The purpose of this paper is to outline the historical socio-political events that took place in America and Scandinavia, respectively, and explore how they influenced key components of two detective fiction subgenres: American Noir and Scandinavian Noir. After a thorough analysis of the historical impact, the paper will then focus on direct comparisons between each genre's components. The research utilizes a variety of novels as well as academic writings to analyze the distinctiveness between aspects such as genre origin, features of main characters, narrative landscape, and sexually empowered women. Often, each genre's individualities are overlooked because both are subgenres of detective fiction; however, critical scrutiny of the social and historical events that took place around the genesis of both genres, as well as selected examples pulled directly from texts and scholarly articles, reveals that the components of each genre are far more different than they are similar. A thorough examination of each of the selected texts highlights the unique socio-political issues that occurred at the naissances of both American Noir and Scandinavian Noir and how these events acted as a framework that influenced the various qualities of both genres. An explication of the social unrest and political instability during both time periods illuminates the ties that each genre held to their respective cultures and highlights the powerful effects that civil unrest has on literature. This paper further develops the way American events between World War I and World War II and Scandinavian events in the twentieth and twenty-first centuries comparatively impact each detective fiction subgenre.

Research Mentor: Professor Shaun Hughes, Linguistics, Comparative Literature, Medieval Studies, English, College of Liberal Arts;

Poster Number: 148a :: Social Sciences/Humanities

College of Liberal Arts

The Grammar of Necessity in ASL: Epistemic vs. Deontic Modal Verbs

Author:

Megan Pentecost

Abstract:

American Sign Language (ASL) linguistics is an understudied field. Here, we investigate how ASL shows necessity in two types of modal verbs: deontic and epistemic. Deontic modal verbs indicate one's requirement or duty (e.g. "You must go to work") while an epistemic modal verb expresses one's evaluation of the obligation (e.g. "You must be hungry"). In English, the deontic and epistemic form do not have to be differentiated. We propose that in ASL, these forms differ in non-manual markers (NMMs) (grammatical facial expressions or body movements). Specifically, the signs MUST and REQUIRE convey a deontic commitment, whereas SHOULD, which shares 2 of 3 manual features with MUST, show the epistemic form. We identify the combination of "taut-mouth" (tm) and "head-back" (hb) as unique to deontic modal verbs. Additionally, we find that the epistemic forms occur with 'hb', "eye-squint" (es), and mouthing of the first phoneme of the English equivalent. These differences in NMMs are crucial in differentiating SHOULD and MUST. Our results are consistent with Bross & Hole (2017). This study proposed that the universal hierarchy of syntactic projections (Cinque, 2006) applies to sign languages in addition to spoken languages. They theorized that higher projections will translate to higher production locations on the body. In this hierarchy, the epistemic is placed higher than the deontic. This supports our findings of the epistemic 'es' occurring higher on the face than the deontic 'tm'. These results contribute to the limited understanding of NMMs in ASL and linguistics as a whole.

Research Mentor: Ronnie B. Wilbur, Linguistics, College of Liberal Arts; Speech, Language, and Hearing Sciences, College of Health and Human Sciences; Margaret R. Crabtree, Linguistics, College of Liberal Arts

Poster Number: 149a :: Social Sciences/Humanities

College of Liberal Arts

The Amelia Earhart Legacy at Purdue University

Author:

Jessica Perkins

Abstract:

My research began with the question of what Amelia Earhart's impact was on Purdue University. The focus of my research examined Earhart's time at Purdue where she worked in the Department of Aeronautics as well as a consultant in careers for women. Most of my research was done by examining primary source documents from the George Palmer Putnam Collection of Amelia Earhart Papers. In accordance with the archival material, I also used secondary sources to gain a greater perspective of the Purdue community's relationship with Earhart. My findings are that the impact of Amelia Earhart's presence at Purdue University extends beyond her lifetime in terms of legacy. While at Purdue, Earhart proposed new academic curriculums, created support systems for female students, and made technological advances in the field of aviation. My research also suggests that AE influenced the mindset of women at Purdue and her achievements were jointly celebrated by her and the university. The impact of Earhart exist in the realms of aviation and also more broad aspects of university life, spanning from her time employed up to present day.

Research Mentor: Sammie Morris, Libraries and School of Information Studies; Kendall Roark, WGSS, CLA

Poster Number: 150a :: Social Sciences/Humanities

College of Liberal Arts

Data Management of Collaborative Event Ethnography; Indigenous Environmental Governance

Author:

Lauren Robbers

Abstract:

Data Management of Collaborative Event Ethnography; Indigenous Environmental Governance

Presence 2 Influence (P2I) is an interdisciplinary project, led by Dr. Kimberly Marion Suiseeya and Dr. Laura Zanotti, composed of group of researchers working together to analyze sites of global environmental governance and examine the role of indigenous representation in shaping the policy outcomes. The goal of this team is to analyze the Paris Climate Summit (COP21), the World Conservation Congress (WCC), and the XVI Congress of the International Society of Ethnobiology (ISE) in order to determine the extent to which underrepresented groups influence environmental governance. Undergraduate and graduate students from both Purdue University and Northwestern University have attended these policy events and have been working together as a collaborative group to analyze their in-field collection of data. Types of data collected at COP2, WCC, and the ISE events include photos, audio and visual recordings of proceedings, blog posts, spatial sketch mapping, interviews, documents and materials, and field notes.

We use three innovative methodologies, collaborative event ethnography, visual ethnography, and digital ethnography, to examine how the practices and politics of global environmental governance shape the possibilities for influence. Data curation is a critical part of supporting collaborative qualitative work among ethnographic teams and producing transferable knowledge. My role in the P2I is to assist with data curation and management of multimodal data gathered from the collaborative event ethnography at ISE Belém +30. The goal is to replicate the data in a standardized format, make data useable in excel sheets, and gain familiarity with the qualitative data for common themes that have emerged within and across the teams. Using BOX.com, I use our qualitative data protocols to sort through the mass amounts of digital data collected from the researchers in order to compose a collaborative archiving system. I have practiced different forms of data literacy associated with taking inventory of each piece of data, and translating the inventory to make sense in shared group space. The importance of a critical approach to data management in a collaborative research group promotes interdisciplinary team building, allows for other scientific communities to make sense of the great amount of data collections within our project, and renders our data visible and useable for Indigenous Peoples.

Research Mentor: Laura Zanotti

Anthropology Department

College of Liberal Arts; Kimberly Marion Suiseeya

Department of Political Science

Northwestern University

Poster Number: 151a :: Social Sciences/Humanities

College of Liberal Arts

The Identity Crisis in Jewish Films

Author:

Ian Smith

Abstract:

The purpose of this study is to problematize the idea of a cohesive Jewish cinema. Then it seeks to critically analyze the thematic progression of Jewish films in an attempt to find common themes among them in an effort to answer the question: what is a Jewish film? It also seeks to make predictions as to what the future of Jewish films could look like. This study was done by watching, analyzing, and dissecting films that are typically deemed as Jewish while taking into account the historical conditions of the Jewish people during the films' respective eras. Films of different eras, countries of origin, and genres were surveyed for the study. Then, the films were critically compared to find commonalities between them. The research concluded that Jewish films fall very well into certain pre-existing categorical eras coinciding with the historical condition that the Jewish people were in at the time of the film. Also, the theme of identity struggle was present and foregrounded in every film surveyed. However, this theme manifested itself in different ways depending on the film; some dealt with national identity, some with religious identity, etc. Thus, it seems that the theme of identity struggle persists in Jewish films over the boundaries of language, time, and country of origin. Given that identity is such a pertinent theme throughout all of Jewish cinema, it is safe to predict that this theme will carry over into the future; albeit manifesting itself in whatever way the future historical condition of the Jewish people dictates.

Research Mentor: Alon Kantor, Department of Jewish Studies, School of Languages and Cultures, College of Liberal Arts;

Poster Number: 152a :: Social Sciences/Humanities

College of Liberal Arts

Quantitative Analysis of Bone Surface Modifications on the Bowser Road Mastodon and its Implications for Human Predation of North American Megafauna

Author:

Evalyn Stow

Abstract:

At the end of the Pleistocene, North America experienced a mass extinction of megafauna, such as mammoths and mastodons. The role of human predation in these extinctions is widely debated in the field of archaeology. Experts now question the validity of qualitatively assessed bone surface modification (BSM) which was once interpreted as evidence of butchery, thereby implicating humans as proboscidean predators. This study utilizes new statistical techniques using 3D-imaging data to determine the origin of BSM observed on the skeletal remains of the Bowser Road Mastodon, excavated from Middletown, N.Y. This technique has been shown to have high accuracy in identifying types of BSM. Through this analysis the origin of the marks will be determined – whether from human activities such as hunting and butchering, or from taphonomic processes such as plowing or trampling. This project will contribute to the dialogue surrounding the role of humans in the extinction of North American megafauna. More specifically, the project will test a new method in identifying bone surface modification on faunal remains with a higher accuracy than current methods.

Research Mentor: Erik Otárola-Castillo, Department of Anthropology, Purdue College of Liberal Arts;

Poster Number: 153a :: Social Sciences/Humanities

College of Liberal Arts

Translating the Phenomenon of Gender Politics in Social Media and Professional Environments through Choreography and Interactive Technology

Authors:

Frankie Tao

Bri Meyer

Abstract:

“Translating the Phenomenon of Gender Politics in Social Media and Professional Environments through Choreography and Interactive Technology,” is a continuous research project that focuses on the integration of dance and technology. From the beginning of the project, the researchers experiment with utilizing different choreographic elements and proximity sensors to convey different themes and meanings. For the past two semesters, the research has continued to refine the choreography and the functionality of the proximity sensors. The goal of the current research culminates into the effective translation of the phenomenon of gender politics in social media and professional environments through choreography and interactive technology. There are two sections of the research. The first section is the creation of the visual performance utilizing the interactive technology and the choreography. The lights changing in the piece are a result of the interaction between the performers’ proximities to each other, which is sensed through the proximity sensors (interactive technology). The choreography is designed to function in cooperation with the interactive technology to convey the power struggle and oppression that women face in professional settings. The second section of the research is done through literature review, in order to support the themes and motifs present in the meaning of the performance. Thorough research was conducted on the treatment of women in professional and academic settings, as well as treatment within the usage of social media. Research sourcing primary sources were also utilized in the performance in order to bolster the conveyance of the themes within the piece through spoken word. Both sections then amalgamate into the final performance, which combines choreographic movement, interactive technology, and spoken word in order to create an effective and impactful piece for the public.

Research Mentor: Kathleen Hickey, M.F.A., Visiting Instructor of Dance, Patti & Rusty Rueff School of Design, Art, and Performance

Poster Number: 154a :: Social Sciences/Humanities

College of Liberal Arts

A Palace of Her Own: Mariana of Austria and the Palace of Uceda

Author:

Tatum Theaman

Christina Strodel

Abstract:

“A Palace of Her Own: Mariana of Austria and the Palace of Uceda” is a project supervised by Dr. Silvia Mitchell. It explores Mariana of Austria’s activities while she was Queen Mother of Spain (1679-1696), using her private residence as a means to understand the political influence she wielded in the court of her son, King Carlos II of Spain (r. 1665-1700). The palace of Uceda served as a social and political hub for visiting dignitaries and guests who sought to gain favor with the Queen Mother in order to gain favor with the King. This project has looked specifically at the location of the palace relative to other government buildings in Madrid. We worked with an original seventeenth-century map of Madrid in order to identify the location of the Palace of Uceda.

We have dedicated part of our time during the WILKE internship to track down primary source documents on the diplomatic negotiations with France, the Holy Roman Empire, and other princes of Europe using the online catalogues of the Newberry Library in Chicago. We approached our research based on specific periods and topics, such as the Peace of Nijmegen (1679), the War of Reunions (1683-1684), intra-Hapsburg relations, the formation of the Grand Alliance against Louis XIV, the War of the Grand Alliance (1689-1697), and many others. These material are complemented by archival material Professor Mitchell found at the Spanish Archives.

Research Mentor: Silvia Mitchell, College of Liberal Arts, History Department;

Poster Number: 155a :: Social Sciences/Humanities

College of Liberal Arts
Bioanthropology of Maternal-Child Health

Author:

Courtney Thomas

Abstract:

The purpose of this study was to study the relationship between birth mode and obesity / overweight in Mayan children from the Yucatan. The height, weight, arm length, arm circumference, skin folds, and percent body fat were measured in children in order to analyze this relationship. All of these measurements were taken throughout several years from 2010 to 2018. The study measured children from ages 0 to 18. Children who were born vaginally were compared to children born via cesarean section in order to infer the relationship between birth mode and overweight in Mayan children. Tests have not been run yet, but we suspect that they will follow similar studies that have shown that children born via cesarean section in the Maya are subject to being overweight or obese as compared to other Mayan children that were born vaginally.

Research Mentor: Amanda Veile, Department of Anthropology, College of Liberal Arts;

Poster Number: 156a :: Social Sciences/Humanities

College of Liberal Arts

“Brides and Heiresses: Women's Inheritance Rights and the War of the Spanish Succession”

Author:

Isabelle Townsend

Abstract:

“Brides and Heiresses: Women's Inheritance Rights and the War of the Spanish Succession”

Royal women's inheritance rights in Early Modern Europe is an area of study that has been glossed over in the past, despite the importance of these rights. The Habsburg dynasty that ruled over the Habsburg lands, held the office of Holy Roman Emperor and ruled the Spanish monarchy in the Early Modern Period, very successfully executed marriage alliances that passed power, capital, and titles through the women. In this project we traced six women, starting with Maria of Austria (b. 1528) and ending with Maria Antonia of Austria (d. 1692). Through these women we studied the amount of money given to them at marriage, titles given to them through their marriage, and importantly what they were required to capitulate upon getting married. We studied them by looking at primary sources, including their marriage capitulations, as well as secondary sources. In this case, we have found that over the century and a half that these six women span, the amount given to them upon getting married increased, also women marrying into the French monarchy frequently gave up their inheritance rights to the Spanish throne. Most importantly, we found that the inheritance rights that passed through these women ultimately led to the War of the Spanish Succession, as there were many claimants to the throne through the Habsburg women they were related to. These Habsburg women were exceptionally wealthy and powerful, and they only gained more wealth and power after they married.

Research Mentor: Dr. Silvia Mitchell, Department of History, College of Liberal Arts;

Poster Number: 157a :: Life Sciences

College of Pharmacy

Effect of the metabolite fumarate in aiding DNA repair mechanism in double stranded breaks in DNA.

Author:

Abdulganiyu Gborigi

Abstract:

The TCA cycle enzyme fumarase is both found in the mitochondria as well as in the cytoplasm of eukaryotic organisms. Upon exposure to DNA damaging agents, expression of fumarase is induced and fumarase migrates to the nucleus. Double stranded DNA breaks can be repaired by two ways: non-homologous end joining, (NHEJ) and homologous recombination, (HR). HR requires homology of DNA in order to carry out its repair function while NHEJ repair DNA and doesn't require sequence homology, It joins two non-homologous ends together. In mammals, upon DNA damage, fumarase binds to H2A.Z, an ortholog of HTZ1p in yeast, and this interaction promotes the repair of damaged DNA. We hypothesize exogenous fumarate can bypass the interaction between fumarase and HTZ1 to promote DNA repair. To test this hypothesis, we are testing the efficiency of DNA repair in cells containing or lacking HTZ1 and also the presence and absence of the metabolite fumarate.

Fumarase produces a metabolite fumarate, which, in turn, inhibits alpha-ketoglutarate-dependent histone demethylases, thus promoting double stranded DNA break repair by NHEJ in mammals. We speculate that if fumarate is provided as a supplement, it can improve the efficiency of this type of DNA repair. A re-ligation assay is being used to measure the efficiency of NHEJ with or without exogenous fumarate, and a growth-based assay is being used to monitor HR.

Research Mentor: Ann, Kirchmaier, Department of Biochemistry, College of Agriculture;

Poster Number: 158a :: Life Sciences

College of Pharmacy

The Effects of Blueberries on Bone Resorption in Postmenopausal Women

Author:

Erica Situ

Abstract:

Background: Postmenopausal osteoporosis is the most common cause of bone loss and can substantially compromise the quality of life. Preliminary data from animal studies suggests that blueberries prevent bone loss due to their high polyphenolic content. This study quantified changes in urinary excretion of calcium radioisotope Ca-41 in postmenopausal women to assess the effects of the addition of blueberries to a regular diet on bone resorption. **Methods:** Freeze-dried blueberry powder was given to 14 healthy women who were at least 4 years past menopause. To determine the dose-response effect of blueberries on bone resorption, all participants were administered with Ca-41 and changes in urinary Ca-41/Ca were measured by Accelerator Mass Spectrometry. The study consisted of a 5-mo equilibration period for Ca-41 deposition in bone and a 6-wk baseline period, in which none of the participants were administered blueberries. This period was then followed by three alternating rounds of 6-wk intervention periods and 6-wk washout periods. Participants were given a randomly assigned sequence of low, medium, or high daily intake of freeze-dried blueberry powder during each intervention period. Twenty-four h urine was collected on a weekly basis during intervention and every 3 weeks during washout to compare the amount of Ca-41 lost from bone with and without the consumption of blueberries. **Results:** Eighteen healthy postmenopausal women (average BMI = 26.2 ± 3.9) were successfully recruited for this study and n = 14 successfully completed the entire study. Specimen analyses are in progress and their results will be presented at the Purdue Undergraduate Research Conference. **Conclusion:** Results from this study will help develop a better understanding of the effect of blueberries on bone health and determine whether some properties of berries have a therapeutic advantage in comparison to other current methods to treating bone loss.

Research Mentor: Joanna Kalina Hodges, Department of Nutritional Sciences, College of Health and Human Sciences;

Poster Number: 159a :: Life Sciences

College of Pharmacy

Using FDA Metrics to Create a Drug Quality Scorecard

Author:

Olivia Walker

Abstract:

A variety of FDA metrics (import refusals, recalls, site inspections, etc) are publicly available as quality metrics. The goal of my research is to compare medications across drug manufacturers by quantifying these metrics. My team and I compile this information from reliable resources, such as the FDA Enforcement Reports and the FDA Data Dashboard, and then compile this information into a scorecard. By using graphs and charts to visually display each metric, this format consolidates high-level quality information in a way that patients are able to easily understand.

As we continue, we hope to allow consumers to interact with the scorecard digitally by linking the overview of a metric to more detailed information. For example, we currently display a manufacturer's five most recent recalls within the Recall Section. Later versions of the scorecard will link this section to a more comprehensive listing of all the recalls a firm has experienced.

Having a way to quickly relate various drug manufacturers allows consumers to make more educated decisions regarding their medications. In an age of rising drug prices and competitive generic pharmaceutical market, it is imperative that patients are given every resource possible to be smart consumers. The Drug Manufacturer Quality Scorecard is an important step to providing patients with the tools that they need to hold pharmaceutical manufacturers accountable for their products.

Research Mentor: Dr. Stephen Byrn

Charles B. Jordan Professor of Medicinal Chemistry

Department of Industrial and Physical Pharmacy

College of Pharmacy;

Poster Number: 160a :: Life Sciences

College of Science

Examining the effects of leaf litter on growth of the amphibian fungal pathogen, *Batrachochytrium dendrobatidis*

Author:

Isabel Adarve

Abstract:

Leaf litter and the chemicals that leach from leaves in bodies of water (leachate), can influence organisms and species interactions within the environment. Organisms that may be affected by leachate include pathogens of aquatic organisms. The aquatic fungal pathogen *Batrachochytrium dendrobatidis* (Bd), is a primary cause of amphibian populations declines over recent decades in many parts of the world. However, it is unclear how leachate from different tree species impacts Bd growth. To explore this topic, we tested the hypothesis that the leachate of various tree species would influence Bd growth due to their chemical composition. We predicted that greater Bd growth would occur at lower concentrations of leachate across all species. We also predicted greater Bd growth in leachate from invasive species relative to non-invasive species. A single strain of Bd was exposed to solutions of leachate from soaked leaves of one of six species for 10 days. The number of zoospores and zoosporangia were then quantified via light microscopy. We will present results of zoospore and zoosporangia densities across tree species and concentrations of leachate. These results can be a step towards a solution that might help mitigate the impact of Bd on amphibians.

Research Mentor: Spencer Siddons: Biological Sciences, College of Science.; Dr. Catherine Searle (PI): Biological Sciences, College of Science.

Poster Number: 161a :: Life Sciences

College of Science

Discovering Genetic Risk Factors in Autoimmune Disorders: A Meta-analysis of Genome-wide Association Studies For Autoimmune Diseases in European Populations

Author:

Zaid Al Haddadin

Abstract:

The purpose of this study was to find the common genetic variants in single nucleotide polymorphisms (SNPs) contributing to the expression of different autoimmune diseases and disorders; patients suffering from one diagnosed autoimmune complication may be suffering from other underlying autoimmune complication(s). This study examined for common genetic risk factors in Myasthenia Gravis (MG), Systemic Lupus Erythematosus (SLE), Multiple Sclerosis (MS), Celiac Disease (CEL), and Narcolepsy (NAR) in European populations. Meta-analysis genome-wide association scans were performed with publicly available datasets for the autoimmune diseases and disorders. METAL software was used to filter out the heterogeneous SNPs among the datasets to determine the common SNPs shared throughout at least any three of the examined autoimmune complications. METACARPA software was then used to calculate the meta-analysis p-value by correcting for any sample overlaps between the datasets. Initial scans showed an overlap in the genetic variants with significant meta-analysis p-value scores, indicating that a number of autoimmune diseases and disorders share common genetic risk factors. The findings of common genetic risk factors can help in understanding the common genetic mechanisms and pathways that are shared among the studied autoimmune diseases and disorders.

Research Mentor: Peristera Paschou, Department of Biological Sciences, College of Science; Apostolia Topaloudi, Department of Biological Sciences, College of Science

Poster Number: 162a :: Physical Sciences

College of Science

The Effect of Drug Particle Size, Temperature, and Residence Time on Hot Melt Extrusion Processing of Amorphous Solid Dispersions

Author:

Kevin Altman

Abstract:

The dissolution of poorly soluble drug molecules into a polymer matrix is a popular oral drug delivery strategy known as amorphization. In this type of molecular dispersion, the amorphous form of the drug achieves a thermodynamic solubility advantage over the crystalline form, resulting in higher bioavailability. Hot melt extrusion (HME) is one of two major techniques used to manufacture these amorphous solid dispersions (ASDs). Material, equipment, and process design variables contribute to the product performance of the ASD, and the goal of this study is to evaluate the impact of drug particle size on ASD formation. Physical mixtures of bicalutamide and PVPVA were prepared and analyzed using differential scanning calorimetry, and the calorimetric data was used to construct a temperature-composition phase diagram. The acceptable processing design space for extrusion was derived from this phase diagram and guided the preparation of bicalutamide-PVPVA ASDs at various temperatures and residence times. The extent of residual crystallinity was determined by polarized light microscopy and powder X-ray diffraction. As expected, residual crystallinity decreases with increasing temperature and residence times across all particle sizes. ASDs prepared with larger starting particle sizes consistently possess more residual crystallinity than ASDs prepared with smaller starting particle sizes. The extent of crystallinity in extruded ASDs reflects the kinetic nature of crystal dissolution in a polymer melt. Additional work will include preparation of ASDs from an intermediate particle size, additional sample characterization, and comparison of results to existing dissolution models.

Research Mentors: Lynne S. Taylor, PhD., Department of Industrial and Physical Pharmacy, College of Pharmacy; Dana E. Moseson, Department of Industrial and Physical Pharmacy, College of Pharmacy

Poster Number: 163a :: Physical Sciences

College of Science

Two Component Fused Bi-cyclic ring formation via a formal [4+2+1] cycloaddition

Author:

Nishit Banka

Abstract:

Fused bicyclic structures are ubiquitous in organic synthesis, motivating a wealth of multi-component reactions targeting their assembly. Here, a two-component [4+2+1]-cycloaddition is demonstrated between a tethered ene-diene and a vinylidene ($R_2C=C:$), utilizing 1,1-dichloroalkenes as the vinylidene precursor. The reaction is promoted by a Ni(pyridine-diimine) catalyst and Zn as a terminal reductant.

Research Mentor: Christopher Uyeda, Chemistry, Science;

Poster Number: 164a :: Innovative Technology/Entrepreneurship/Design

College of Science

ABAKAS - Demographic Based Personality Evaluation

Author:

Swaraj Bhaduri

Binoy Shah

Abstract:

The purpose of ABAKAS is to promote a greater understanding of an individual's personality traits and characteristics with regard to a chosen demographic. For accomplishing this purpose, we created a private tool for professors and employers alike to provide surveys to their students/employees. The analysis of the data from these survey responses is done via scripts in R and the result from this consequent analysis is used to create personality characteristic based data visualizations with the aim of facilitating comparisons of an individual's characteristics with the broad characteristics of the demographic. The individual completing the survey receives this information via a report which they can download from the ABAKAS website. In the report the individual also receives suggestions to improve in the said characteristics. The eventual goal of ABAKAS is to reach a larger base of universities and businesses so as to promote a more self-aware and self-growth-based student body/workforce and enable individuals to seek out roles and tasks based on their evaluations either to reinforce existing strengths or strengthen weaker personality traits.

Research Mentor: Dr. Dan Ferguson, College of Engineering

Poster Number: 165a :: Mathematical/Computational Sciences

College of Science

Construction of σ^+ -Game Solutions on a Rectangular Grid

Author:

Riley Borgard

Abstract:

The σ^+ -game is played on a directed graph where the vertices (lights) are assigned a state of 0 (off) or 1 (on). The player can press any light, thereby toggling it along with its neighbors. The objective of the game is to turn all lights off given an initial configuration. Of particular interest in this paper are rectangular grid graphs with all lights initially on. In this paper, we explore different classes of grid sizes and dimensions with unique solutions, and we construct the solutions to grids of size $(2^{n-1}) \times (2^{n-1})$ with all lights initially on.

Research Mentor: Tatsunari Watanabe, Mathematics, Embry-Riddle Aeronautical University;

Poster Number: 166a :: Life Sciences

College of Science

Intracellular Localization Patterns of BRD7 Protein in Porcine Embryos

Author:

Jillian Bouck

Abstract:

Chromatin remodeling is a highly regulated process that plays a key role in proper embryo development. The SWI/SNF chromatin remodeling complexes are comprised of multiple protein subunits and are known to alter chromatin structure to regulate transcription. One complex group in the SWI/SNF family, PBAF, is comprised of several subunits, including BRD7, ARID2, and BAF180. In previous studies, conflicting information about intracellular localization of BRD7 in 4-cell stage embryos has been reported. Porcine preimplantation embryos are a good model for human embryos because of their similar size and development. Therefore, the objective of this study was to evaluate the localization patterns of BRD7 in 4-cell stage porcine embryos at various timepoints. We hypothesized that BRD7 would show a localization shift from the nucleus to the cytoplasm over the course of the 4-cell stage. To assess this, porcine oocytes were parthenogenetically activated, cultured, and fixed at discrete timepoints. The intracellular localization of BRD7 in the parthenogenetic embryos was determined using an immunocytochemical staining approach. We found that at 36 hours post-activation, only 13% of embryos showed a cytoplasmic enrichment of BRD7 (n=2/15), while the remaining embryos possessed ubiquitous staining (n=8/15) or weak nuclear localization (n=5/15). In contrast, at 52 hours post-activation, 30% of embryos showed a cytoplasmic enrichment of BRD7 (n=6/20), while the remaining embryos possessed ubiquitous staining (n=9/25) or weak nuclear localization (n=5/20). These results indicate that BRD7 may be required up to the 4-cell stage, at which point a shift to other SWI/SNF complexes might occur.

Research Mentor: Birgit Cabot - Department of Animal Science (College of Agriculture); Ryan Cabot - Department of Animal Science (College of Agriculture)

Poster Number: 167a :: Life Sciences

College of Science

Higher chytrid fungus (*Batrachochytrium dendrobatidis*) infection prevalence in human-made versus natural wetlands

Author:

Marin Bray

Abstract:

Wildlife disease dynamics are influenced by changes to the environment resulting from anthropogenic practices. For example, pollution and habitat modification are common risks in human-made habitats that can often have unknown effects on host-pathogen dynamics. Wetlands are a common human-made habitat that are becoming increasingly common across much of North America and have the potential to support native plant and wildlife communities. However, these wetlands are typically established for water retention, and therefore do not prioritize habitat quality and wildlife health. Accordingly, we aimed to compare differences in anuran community composition and infection levels of the pathogenic fungus *Batrachochytrium dendrobatidis* (Bd) between human-made and natural wetlands in central Indiana. We conducted visual encounter surveys of anurans communities and estimated Bd infection prevalence and infection load at 8 localities in Tippecanoe County (IN). Habitat characteristics, water parameters, and surrounding land-use practices were also compared across sites to examine their influence on anuran communities. We found significantly higher levels of infection prevalence at human-made sites than at natural sites. Several water parameters such as salinity and total dissolved solids were consistently higher at human-made sites than natural sites. These findings suggest human-made wetlands pose a greater risk to anurans in contracting Bd infections. Understanding how environmental conditions common in human-made sites can direct conservation efforts to slow Bd spread or prevent outbreaks.

Research Mentor: Spencer Siddons, Ecology Department, College of Science; Dr. Catherine Searle (PI), Ecology Department, College of Science

Poster Number: 168a :: Life Sciences

College of Science

Identification of a Strong Promoter in the Plant *Ceratopteris Richardii*

Author:

Natalie Brejcha

Abstract:

Promoters are an essential section of a DNA sequence that allow RNA polymerase to bind and produce mRNA. Studies have shown that the 35S promoter is often used in genetic research because it is a strong promoter in many plants. However, the 35S promoter in *Ceratopteris richardii* is relatively weak. Thus, the purpose of this project is to identify a strong promoter in *Ceratopteris richardii* that can be used for research regarding gene expression. To discover this promoter, we used RNA sequencing technology to identify genes that were expressed at high levels in all parts of the plant. We originally collected the sequences of two such candidate promoters and identified primers that could be used to amplify the suspected location of the promoter using PCR. These PCR products were run in an ethidium bromide gel to determine the size of the fragments, and the resulting size was then compared with the predicted size of the fragment. The PCRs using these two gene sequences were not successful, so four more genes were used with the same process. Amplification of a sequence in the cyclophilin-like peptidyl-prolyl cis-trans isomerase gene has shown multiple fragments, including a band similar in size as the expected fragment. As this project continues, we will be working to isolate and sequence this fragment using a nested PCR as well as use other genes to identify promoter sequences. Once a promoter region is determined, this promoter can be cloned into a vector to promote the expression of green fluorescent protein. The vector will then be used to transform *Ceratopteris richardii* to determine if the promoter is expressed in all parts of the plant.

Research Mentor: Jody Banks, Botany and Plant Pathology, and College of Agriculture;

Poster Number: 169a :: Physical Sciences

College of Science

Studying the Adhesive Capabilities of Climbing Plants

Author:

Ian Bretz

Abstract:

Several species of climbing plants and vines utilize the method of biochemical adhesion to aid their ascension from the soil. Though the precise mechanism of this specialized structure varies from species to species, adhesion is considered an incredibly effective approach to climbing in this manner. In this project focused on the Creeping Fig (*Ficus pumila*), a common ornamental vine, we study the development and behavior of the adhesive pads present in the mature plant, and report on the chemical mechanism of adhesion which is used. This biological tool which has arisen from evolutionary differentiation has tremendous potential in the field of strong synthetic adhesives, as it may be incorporated in glues with the unique property of being biodegradable. The demand for biodegradable adhesives is ever increasing, as in today's world virtually all manufacturing processes and components are being driven toward more "green" methods. Possible applications for such a glue span from the world of agriscience to biomedical use. Though literature exists on the given topic, and regarding this species specifically, we wish to provide a more in-depth and comprehensive study than exists at the present time. In this project, we aim to explore and analyze in detail the biochemical functionality of this organic adhesive in efforts to drive forward the development of synthetic mimics.

Research Mentor: Dr. Jonathan Wilker

Department of Chemistry

College of Science;

Poster Number: 170a :: Life Sciences

College of Science

Exploring the effects of poly/perfluoroalkyl substances on the susceptibility of tadpoles to trematode infection

Author:

Sophia Brown

Abstract:

Per/polyfluoroalkyl substances (PFAS) are globally spread contaminants of emerging concern. PFAS rapidly bioaccumulate in larval amphibians, and studies increasingly demonstrate detrimental effects on larval growth and development. Additionally, it has been hypothesized that PFAS could impair the immune function of amphibians. Given that disease is one of the major contributors to global amphibian declines, PFAS has the potential to significantly alter host-pathogen interactions in this system. However, the effects of PFAS in conjunction with other natural stressors are unknown. We examined the effects of PFAS exposure on the interaction between larval Northern leopard frogs (*Lithobates pipiens*) and trematodes (*Echinoparyphium* spp.). Our focal PFAS were perfluorooctane sulfonate (PFOS) and perfluorohexane sulfonate (PFHxS), which commonly occur at contaminated sites. Larvae were exposed to 10 ppb or 100 ppb concentrations of each PFAS for 10 days. Following the chemical exposure, the larvae were moved to fresh water and exposed individually to 50 trematodes to their ability to resist infections. We found that exposure to PFAS significantly influenced trematode loads in Northern Leopard larvae. However, the effects were dependent on the chemical and concentration. More specifically, larvae exposed to 10 ppb of PFHxS had 17.5% greater parasite loads relative to the control, while exposure to 100 ppb of PFHxS did not alter parasite load. We also found no effect of either concentration of PFOS on parasite loads in the larvae compared to the control. These findings suggest that PFHxS may have greater immunosuppressive effects on amphibian larvae than PFOS. Future work examining a broader range of concentrations and parasite exposure levels is warranted. Collectively, our study calls attention to the potential effects of PFAS exposure on disease risk in natural systems.

Research Mentor: Jason T. Hoverman, Forestry and Natural Resources, College of Agriculture; R. Wesley Flynn, Forestry and Natural Resources, College of Agriculture

Poster Number: 171a :: Life Sciences

College of Science

Effects of road salts on proliferation of a fungal pathogen

Author:

Mariah Burgmeier

Spencer Siddons

Catherine Searle

Abstract:

The amphibian chytrid fungus, *Batrachochytrium dendrobatidis* (Bd), infects the skin of amphibians and is a leading factor in recent global amphibian declines. Growth and motility of Bd can be inhibited by elevated salt concentrations (NaCl), which has been suggested to be a mitigation technique. However, salts often infiltrate wetlands after they are applied to roads in many parts of North America. There is little known about how various road salts impact Bd proliferation, and how they differ from common NaCl exposure. This study investigated how different road salts at various concentrations affect the growth and motility of Bd. We predicted that Bd growth would be lowest when exposed to road salts that contain more de-icing chemicals such as calcium chloride (CaCl₂) and that Bd growth would be the greatest in salts that contain fewer de-icing chemicals, such as Beet-infused road salt. Bd was cultured in NaCl, CaCl₂, and Beet salt at concentrations of 0.5, 1, 1.5 and 2 parts per thousand (ppt). We measured growth and viability via zoospore and zoosporangia identification and quantification. We found that mean number of zoospores was higher in no-salt controls than in Beet salt and NaCl treatments. Further, mean density of zoosporangia did not differ across salt treatments, but all salt-exposed treatments had lower zoosporangia densities than no-salt controls. Our findings suggest several types of roads salts may have negative effects on Bd growth that could translate to lower infections in amphibians. Mean zoospore and zoosporangia densities did not differ across salinity concentrations suggesting that Bd can equally tolerate concentrations of several salt types up to 2.0 ppt. Future studies should explore how road salts directly affect amphibians and how infection dynamics change when both host and pathogen are in the presence of these salts.

Research Mentor: Spencer Siddons

Department of Biological Sciences

College of Science; Catherine Searle

Department of Biological Sciences

College of Science

Poster Number: 172a :: Mathematical/Computational Sciences

College of Science

Genetic Generation of Network Topologies for Dynamic Network Optimization Testing

Author:

Thomas Chen

Abstract:

As the number of interconnected devices grow through the widespread adoption of cellular, IoT, and other cloud connected devices, the risk of consumption of network resources reaching critical saturation grows. Network populations have become increasingly heterogeneous with a large variety of devices such as smart phones, smart appliances, IoT sensors, and cloud connected vehicles operating at massive scales. As a result, new methods for generating, simulating, testing, and proving out network optimization techniques are essential to maintaining performant wireless communications. This project explores a novel application of genetic algorithms for generating network topologies which are leveraged to dynamically test protocol level network optimizations in an autonomous fashion. By approaching optimization testing in this manner, potential optimization approaches can be validated against a far greater number of potential network variations while also gradually isolating exactly which types of topologies a specific optimization technique is most vulnerable to. Certain optimization techniques which may at first seem robust, can be proven to have critical weaknesses through the application of this process. This end to end process has yielded non trivial benefits in rapidly classifying which avenues of optimization will potentially yield useful performance gains and which will not - ultimately providing an efficient approach to network optimization development.

Research Mentor: NICOLÒ MICHELUSI

Assistant Professor in the Department of Electrical and Computer Engineering

College of Engineering;

Poster Number: 173a :: Life Sciences

College of Science

Uncovering the True Diversity of Chanterelle Mushrooms in Indiana

Author:

Jairus Chittenden

Abstract:

Chanterelles are some of the most popular wild mushrooms in Indiana and throughout the Midwest. These attractive orange and yellow fungi are a natural delicacy, and the global trade in chanterelles exceeds \$1 billion per year. Like so many other clades of fungi, only a fraction of the chanterelles' true diversity in North America is known to science. Given their economic and ecological value, I believe that chanterelles deserve a phylogenetic analysis using the full capabilities of modern DNA sequencing technology. This project will determine how many species of chanterelles there are within Indiana and how they are related to each other and species across the world. DNA was extracted from over 100 chanterelle specimens collected during the recent Indiana Mycoflora Project, and the genes for transcription elongation factor 1 (TEF1) and the large ribosomal subunit (LSU) were used as barcode regions. Incorporating observations of each specimen's morphology, the sequence data were compared with previous database entries and published literature on Midwestern chanterelles. Evidence of chanterelle species never before recorded in the Midwest was found, and some specimens may represent species new to science. Further phylogenetic analysis will clarify chanterelle taxonomy, identifying synonymous and divergent species and establishing the evolutionary relationship between them. The project will contribute nearly 200 barcode sequences of Indiana chanterelles to public databases, and hopefully generate public interest in mycology from mushroom hunters throughout the state and beyond.

Research Mentor: Stephen Russell, Botany and Plant Pathology, College of Agriculture;

Poster Number: 174a :: Life Sciences

College of Science

Interleukin-1beta promotes differentiation of IL-9-secreting Th9 cells when IL-2 is limiting

Author:

Maia Clare

Abstract:

CD4+ T helper cells play an important role in adaptive immunity by stimulating or suppressing inflammation. IL-9 producing T helper cells (Th9) are mainly known for their role against parasitic infections and driving allergic and intestinal inflammation, though there is still much left not understood about their mechanisms of differentiation. The cytokine IL-2 has proven to be an important cytokine in Th9 differentiation in vitro but the environments where Th9 cells are typically found in vivo are largely depleted of IL-2. Previous experiments indicate that other signals could be present in vivo that substitute IL-2 signaling in Th9 differentiation. Our first experiments tested several cytokines/inflammatory mediators present in highly inflammatory and IL-2-depleted environments in vivo to identify if these signals could replace IL-2 signaling in the in vitro culture system. Both IL-1b and the TLR2 ligand, Pam3CSK4, were capable of rescuing IL-9 production when IL-2 signaling was blocked. Additional experiments showed that both IL-1b and Pam3CSK4 induced expression of the Th9-associated transcription factor BATF, suggesting this pathway may be involved. As both IL-1b and Pam3CSK4 signal through MyD88 and NFkB protein pathways, we can speculate that several cytokines that signal in this pathway may function to rescue IL-9 production in IL-2-depleted environments. These data overall give a clearer indication of the mechanism of Th9 differentiation in vivo and the relation between the MyD88 and NFkB pathways and IL-9 production.

Research Mentor: Matthew R. Olson, Biological Sciences, College of Science;

Poster Number: 175a :: Life Sciences

College of Science

Expression and Purification of a Putative Chromodomain from BAF155 – A Subunit of the SWI/SNF Complex

Author:

Rachel Collicott

Abstract:

Small cell carcinoma of the ovary, hypercalcemic type (SCCOHT), is a rare type of ovarian cancer. Although it is rare, it is extremely aggressive, primarily affects young women, with an average age of diagnosis of 23, and the majority of patients die within 2 years. By sequencing cohorts of tumors from SCCOHT patients, scientists recently discovered that these cancers are driven by an inactivating mutation of a single gene called SMARCA4, also known as BRG1. BRG1 is the ATPase of the SWI/SNF, also known as the BRG1 associating factors (BAF) complex. This complex is a chromatin remodeling complex, which creates regions of accessible DNA required for gene activation. BRG1 has a series of bromodomains that it uses to create these accessible regions of DNA through interactions with acetylated lysine residues on histone tails. The presence of BRG1 is essential for function of the BAF complex. The BAF complex is needed for gene expression and, without BRG1 to power the complex, the mechanism of gene expression in these cell lines is unknown. Determining the specific interactions between chromatin and BRG1's bromodomains is essential for understanding the mechanism of gene expression in SCCOHT cell lines. To accomplish this, BRG1 bromodomain mutant lines in SCCOHT cell lines COV 434 and TOV122D will be constructed. After confirmed mutant lines have been established, sequential salt extractions will be performed to determine how presence or absence of the various bromodomains effect the binding affinity of the BAF complex to chromatin. Over 20% of cancers have mutations in one or more subunits of this complex, making uncovering the mechanism by which the BAF complex suppresses cancer of utmost importance. Specifically, the mutation of another subunit, ARID1A, is present in the majority of ovarian clear cell carcinoma patients, making our work with the SWI/SNF complex in regard to SCCOHT relevant for many other ovarian cancers.

Research Mentor: Dr. Emily Dykhuizen, Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy;

Poster Number: 176a :: Life Sciences

College of Science

Role of microenvironmental stress in increased breast cancer risk

Author:

Cyan Cosby

Shirisha Chittiboyina

Sophie Lelièvre

Abstract:

The cell microenvironment is essential for tissue architecture that controls cell signaling, survival, and proliferation. Reactive oxygen species (ROS) in the microenvironment that may lead to oxidative stress (OS), interact with stromal components, change ECM stiffness, and may play a role in carcinogenesis. Interestingly, ROS has been reported to alter nuclear morphometry (shape and size) itself under the influence of mechanotransduction from the ECM that is known to control gene expression. Our central hypothesis is that the density of ECM, influenced by ROS, increases the risk of cancer via an altered nuclear morphology controlling gene expression. We have used a three-dimensional (3D) cell culture model that comprises non-neoplastic HMT 3522 breast epithelial S1 cells embedded in collagen 1 matrix with stiffness (800 Pa) similar to that of real tissue, and a higher stiffness of 1500 Pa which correlates with the density of tissues-at-risk for cancer. To induce acute OS, cells were exposed to 250 μM H₂O₂ for four hours on day 10 of culture. Using immunostaining for the distribution of ZO-1, a marker of apical polarity we have measured a significant loss of polarity in the cell population exposed to ROS compared to the control group. Moreover, cells cultured on a stiffer matrix, exhibited bigger and less circular nuclei compared to those cultured in the matrix of 800 Pa. These results confirm the role of microenvironment on influencing cell phenotype. Further we will study induced-changes in matrix stiffness under ROS by incorporating fibroblasts in the culture model.

Research Mentor: Dr. Sophie A. Lelievre, Basic Medical Sciences, College of Veterinary Sciences; Shirisha Chittiboyina, Basic Medical Sciences, College of Veterinary Sciences

Poster Number: 177a :: Life Sciences

College of Science

Increasing Chance of Survival: A Design for an Improved Snake Bite First Aid Kit

Author:

Patricia Covington

Abstract:

Poisonous snake bites are a huge medical issue in remote areas of the world. Although they are one of the leading causes of death in these areas there has been very little research done on them. Previous studies have shown that the current first aid treatment protocol is not effective. This project aims to design an improved snake bite kit to replace the traditional ace bandage developed in Australia and distributed by humanitarian organizations. Data from previous studies were analyzed to determine the most effective combination of snake bite treatments. Tourniquets, local herbal remedies, and incisions were found to have no increase in survival rates. The single variable most strongly linked to rates of survival was distance to a healthcare facility and ability to immobilize the limb. A tightly wrapped crepe bandage to limit flow of poison was found to have the highest improvement in survival rates out of any currently used treatment if applied correctly; however, further studies have shown that very few people including healthcare professionals and the layperson could effectively wrap the bandage after being instructed on how to do so. One experimental study has shown that a small high pressure rubber bandage on the location of the snake bite with immobilisation could have similar if not greater benefits than the crepe bandage. Current materials to allow easy immobilisation of a limb exist but have never been put together in an effective snake bite kit to be distributed to poisonous snake prone areas of the world. This kit would include a retractable splint to be used on either an arm or a leg and sling materials to allow for immobilisation of an arm. The proposed device to take the place of the crepe bandage is a localized pressure bandage similar to a blood pressure cuff. The bandage will allow for increase of pressure when an air pump is pushed and will have a small pressure gauge with markings to allow the layperson to see when they have increased the pressure enough. This device would also allow for slow reduction of pressure by a healthcare professional after antivenom has been administered to prevent sudden envenomation. This device would allow the average layperson to be able to administer the correct amount of pressure on the area of a snakebite until a healthcare facility could be reached.

Research Mentor: Dr. Sharra Vostral;

Poster Number: 178a :: Life Sciences

College of Science

Investigating the role of oxidative stress on microenvironment and risk for breast cancer

Author:

Davide Delisi

Abstract:

Investigating the role of oxidative stress on microenvironment and risk for breast cancer

Davide A. Delisi, Cyan Cosby, Shirisha Chittiboyina, Sophie A. Lelièvre

aDepartment of Basic Medical Sciences, , cBirck Nanotechnology Center, Discovery Park, , dDepartment of Biological Sciences, , e Center for Cancer Research, Purdue University, West Lafayette, IN 47906

ABSTRACT: Reactive oxygen species (ROS), a major feature of tissue microenvironment, lead to oxidative stress (OS) and influence gene expression, affect nuclear morphology, change mammographic density, another risk factor for breast cancer, by activating stromal fibroblasts in the microenvironment. Our preliminary studies revealed that under acute ROS exposure, the breast epithelium produced in 3D cell culture displayed loss of polarity, a barrier against cancer development. Our central hypothesis is that microenvironmental oxidative stress in synergy with altered matrix stiffness promotes breast cancer risk via activation of stromal cells. To test our hypothesis we are using 3D cell culture models that comprise human mammary fibroblasts HMS32-hTERT cells. Exposure to 250 μM H₂O₂ for four hours and 25 μM H₂O₂ for 10 days, induced acute and chronic OS respectively. To test the effect of matrix stiffness on stromal cells, fibroblasts were embedded in collagen I matrices of 770 Pa and 2000 Pa stiffness. Phenotypic changes were measured on a per cell basis using cell shape (phalloidin staining of the actin skeleton) and nuclear morphometry (DAPI staining of DNA). Fibroblasts displayed a higher percentage of activated phenotype under increased stiffness and chronic OS. In addition at higher stiffness (2000 Pa), HMS320-hTERT cells displayed bigger and less circular nuclei compared to those at 770 Pa. To better understand the effect of ROS activated fibroblasts on tissue stiffness and breast epithelium, we will coculture epithelial cells on fibroblasts embedded in collagen I matrix and expose them to a gradient of ROS using a microfluidics-based tissue-chip.

Research Mentor: Shirisha Chittiboyina, Department of Basic Medical Sciences, Birck Nanotechnology Center, Discovery Park;

Poster Number: 179a :: Life Sciences

College of Science

Effects of Salinity on Invasion in Freshwater Communities

Author:

Brittany Farmer

Abstract:

Salt runoff from roads affects our freshwater systems in many ways; both chloride and sodium, the major components of road de-icing salt, are toxic to aquatic life and high levels can impair the survival of aquatic wildlife and vegetation. Salt concentrations may also influence other aspects of the ecosystem, including the invasion of non-native species. In this experiment, two freshwater species were used to study the effects of salinity on invasion. A salt sensitive zooplankton native to North America (*Daphnia dentifera*) and a common zooplankton invader (*Daphnia lumholtzi*) were used to simulate an invasion scenario across three salt concentration treatments (0 g/L, 0.75 g/L, and 1.5g/L of NaCl). Because *D. dentifera* appear to be more sensitive to salt concentrations, it was predicted that *D. lumholtzi* would be more likely favored to invade the population of *D. dentifera* at higher salt concentrations. *D. lumholtzi* and *D. dentifera* were counted weekly to monitor population density over time. On the day of invasion, densities of *D. dentifera* were significantly lower in the 1.5 g/L salt concentration when compared to the 0.75 g/L and 0 g/L salt treatments. These differences in *D. dentifera* densities across salt concentrations diminished by the final sampling day. In addition, there were no significant differences in *D. lumholtzi* densities or total Daphnia densities between salt treatments by the last sampling day. It was expected that *D. lumholtzi* invasion would be facilitated by higher salt concentrations, however this experiment contradicted that prediction by ultimately showing no significant differences in *D. lumholtzi* population densities. Although *D. dentifera* populations appear relatively resilient to high salinity, the low overall numbers of *D. lumholtzi* could have limited our ability to observe any significant impacts their invasion had on the populations of *D. dentifera*. Ultimately, our data could suggest some mechanism of tolerance to high salinity in *D. dentifera*, perhaps through the uptake of salt or evolved tolerance and that the trajectory of *D. lumholtzi* populations in invaded communities may not be influenced by salinity.

Research Mentor: Catherine Searle, Department of Biological Sciences, College of Science; Kacie Jonassen

Poster Number: 180a :: Life Sciences

College of Science

Identifying factors that genetically interact with R-loops to suppress gene expression

Author:

Chrishan Fernando

Youssef Hegazy

Sara Cloutier

Elizabeth Tran

Abstract:

Long non-coding RNAs (lncRNAs) were once thought not to have useful functions in organisms but rather to be products of aberrant transcription. However, roles are being found for lncRNAs in beneficial processes such as controlling gene expression. In some of these cases, lncRNAs form R-loops in vivo. R-loops are nucleic acid structures consisting of hybridized strands of single-stranded DNA (ssDNA) and single-stranded RNA as well as a displaced strand of ssDNA. Formation of these R-loops is important for gene regulation by the lncRNAs. However, the mechanisms by which this form of regulation occurs is poorly understood. Thus, there is a need to identify factors that participate in R-loop mediated gene repression. To identify such factors, a genetic reporter strain has been constructed in *Saccharomyces cerevisiae* using the PHO84 gene. It is an appropriate gene for the reporter because expression of PHO84 is suppressed by the formation of R-loops containing an antisense lncRNA produced downstream of PHO84. The PHO84 reporter strain is being used to perform direct testing of factors that potentially interact with R-loops to suppress gene expression. A synthetic gene array screen will also be performed in *S. cerevisiae* to identify genes that promote R-loop formation genome-wide. The effects of these genes will be studied thoroughly to develop a mechanistic understanding of how they interact with R-loops and how they suppress gene expression.

Research Mentor: Elizabeth Tran, Department of Biochemistry, College of Agriculture;

Poster Number: 181a :: Life Sciences

College of Science

Lippia origanoides extract significantly decreases the viability of MDA-MB-231 triple negative breast cancer cells by inhibiting metabolic pathways

Author:

Rodrigo Ferreira

Abstract:

Breast cancer is the most common type of cancer worldwide in women, affecting about 1 in 8 females in the U.S. The most aggressive subtype of breast cancer, triple negative breast cancer (TNBC), is typically resistant to conventional therapies that target hormone receptors. Previous studies have shown that a natural extract from *Lippia origanoides* possesses significant anti-cancer properties. In this study we confirm the concentration-dependent decrease in viability of MDA-MB-231 cells treated with L42, as well as a significant increase in cleaved caspase 8 in MDA-MB-231 cells treated with L42, demonstrating the activation of the extrinsic pathway of apoptosis, and thereby explaining the decrease in cell viability. We also show that the main metabolic pathways were being targeted by the extract. In this study we provide evidences that L42 is a potential source of bioactive compounds that could be used for alternative treatment for TNBC.

Research Mentor: Ignacio Camarillo, Biology Department, College of Science; Vishak Raman, Biology Department, College of Science

Poster Number: 182a :: Life Sciences

College of Science

Functional annotation of Myasthenia Gravis genetic risk variants: results from a genome-wide study

Author:

Alyssa Flint

Abstract:

Myasthenia Gravis (MG) is an autoimmune disease of the neuromuscular junction. The purpose of this study was to analyze the biological pathways and key genetic contributors that lead to MG. In this study, we performed functional annotation of the significant variants from the results of an MG Genome-Wide Association (GWAS) study on a Southeastern European population. Furthermore, the three approaches used were positional mapping of the SNPs, pathway analysis, and eQTL mapping. The positional and eQTL mapping were performed through FUMA. We annotated the SNPs to genes based on their physical position, and for the eQTL we used data from public repositories to test whether the expression of the gene is associated with allelic variation at the SNP. For the pathway analysis we used MAGMA; first, gene-analysis was performed in order to determine the p-value per gene based on whether the SNPs included in a gene were significantly associated with MG. Thirty-five genes were detected by all three approaches using the early-onset MG cases; all of them are located in the Major Histocompatibility Complex (MHC) region, which is reported to be associated with MG in previous studies. Five genes in the dataset including both early and late onset cases were detected by all three approaches, one being THEMIS and the other four are located in the MHC region. Overall, our study supports the results of previous studies as well as identifying novel risk factors. Further studies into the functions and mechanisms of these novel genes may allow researchers to develop therapeutics and treatments which would delay the progression of the disease or lessen the symptoms.

Research Mentor: Peristera Paschou, Biology, College of Science; Apostolia Topaloudi, Biology, College of Science

Poster Number: 183a :: Life Sciences

College of Science

Using T-circles as a Surrogate to Investigate Agrobacterium T-DNA Integration Into the Plant Genome

Author:

Neta Friedberg

Abstract:

Agrobacterium tumefaciens is a Gram-negative plant pathogen that incites tumors known as crown gall disease. Virulent *Agrobacterium* strains contain a large tumor inducing (Ti) plasmid. A portion of the Ti plasmid, the transferred DNA (T-DNA) region, is mobilized into the plant and randomly integrates into the plant genome, creating genetically modified (GM) organisms. Researchers have used this system to make transgenic plants by placing genes of interest in the T-DNA. However, the exact mechanism of T-DNA integration is unknown. T-DNA most likely integrates into nicks or breaks in the plant genome using an unknown DNA repair pathway. T-DNA border sequences are located at the sites where the Ti-plasmid is nicked so that a single strand T-DNA molecule (the T-strand) can be peeled off and transferred to the plant; T-DNA borders thus define and delimit T-DNA. T-circles, which are circular, double-stranded, extrachromosomal T-DNA structures found in plants after *Agrobacterium*-mediated transformation, may serve as surrogates to study T-DNA integration in plants. Previous sequencing of T-circles showed that conjoined T-DNA border sequences mimic T-DNA/plant DNA junction sites in transgenic plants. T-circles and integrated T-DNA/plant DNA junction sites both show patterns such as small deletions or filler DNA insertions around the left and right T-DNA borders. I have constructed a plasmid that can be used more efficiently to isolate T-circles from *Agrobacterium*-infected plants. I plan to use this plasmid to isolate and characterize T-circles from wild-type *Arabidopsis thaliana* and several different DNA repair mutants. I shall determine if specific DNA repair pathways affect T-circle prevalence or the sequences of T-circle border junctions, and apply these results to understand the role of these pathways in T-DNA integration into the plant genome.

Research Mentor: Dr. Stanton B. Gelvin

Department of Biological Sciences

College of Science;

Poster Number: 184a :: Mathematical/Computational Sciences

College of Science

Reflection learning with Neural Network Ensemble

Author:

Mars Gao

Abstract:

For the current architecture of neural networks, it usually requires a high training cost in time and computation. From our perspective, the current methods in deep learning might not be optimal in architecture and it fails to have an effective learning strategy. To solve these problems, in this paper, we would like to introduce the Collaborative Neural Network Group (CNNG). CNNG is a series of neural networks that work collaboratively to handle different tasks separately in the same learning system. It is evolved from a single neural network by our designed algorithm — Reflection. In this way, based on different situations extracted by the algorithm, the CNNG is able to perform different strategies when predicting the input data. In our implementation, the CNNG is combined with several relatively small neural networks. We provide a series of experiments to evaluate the performance of CNNG compared to other learning methods on three public datasets. The CNNG is able to get a higher accuracy with a much lower training cost. With CNNG by reflection, we can reduce the error rate of 74.6% by average and reach a high accuracy for many tasks, which is superior to VGG and ResNet on the tested datasets. For Fashion-MNIST and EMNIST, it can reach 98.81% and 90.88% which is the best performance currently. Moreover, the required training time is usually less than 40 minutes in our experiments. Details can be found in the experiment part.

Research Mentor: He Wang, Computer Science Department, Purdue;

Poster Number: 185a :: Life Sciences

College of Science

Structural Analysis of the BamB Lipoprotein in *Acinetobacter baumannii*

Author:

Abigael Gichaba

Abstract:

Gram-negative bacteria have both a plasma membrane and an outer membrane, whereas gram-positive bacteria only have a plasma membrane. The outer membranes of gram-negative bacteria have outer membrane proteins (OMPs) which are essential for the bacteria's survival. Folding and insertion of OMPs into the outer membrane is facilitated by the multi-component beta-barrel assembly machinery (BAM) complex. The BAM complex is comprised of an integral membrane, BamA, and four periplasmic lipoproteins BamB-E. Although not an essential part of the complex, BamB is required for proper folding of OMPs and its disruption leads to decreased virulence in various pathogenic bacteria. *Acinetobacter baumannii* is a gram negative and multi-drug resistant bacteria that is responsible for a major fraction of hospital-acquired infections. Previous studies have shown that BamB is a potential target for novel anti-microbial therapies against *A. baumannii*; therefore, a proficient understanding of its structure may aid in the development of such therapies. In this study, *A. baumannii* BamB was expressed and purified from *Escherichia coli* using nickel affinity chromatography and size exclusion chromatography. Protein crystals were obtained using the hanging drop crystallization method and diffracted at a resolution of 2.14 angstroms. We have yet to solve the structure, but ongoing research is underway using molecular replacement and experimental phasing.

Research Mentor: Nicholas Noinaj, Biology, College of Science; Robert E. Stephenson, Biology, College of Science

Poster Number: 186a :: Physical Sciences

College of Science

Finding a Mechanism for Cell Size Homeostasis

Author:

Adam Guerin

Abstract:

Redacted.

Research Mentor: Srividya Iyer-Biswas, Physics and Astronomy, Science;

Poster Number: 186.5a :: Life Sciences

College of Science

Evidence of genetic erosion in a North American game bird: the Montezuma quail

Author:

Ashlyn Heniff

Abstract:

Conservation and management efforts for a species occur at multiple scales, requiring a robust understanding of the species' evolutionary history, genomic architecture, and between- and within-population genetic variability. This project used a genetic approach to better understand the biology of the Montezuma quail (*Cyrtonyx montezumae*), a gamebird found in the Southwestern United States and Mexico. This species is considered vulnerable to extirpation in Texas, but populations in Arizona and New Mexico are robust and have the potential to serve as a source for active management actions such as translocations, assisted gene flow or genetic rescue. We analyzed molecular evolution, and spatial genetic variation of Montezuma quail using both high coverage whole genome sequencing (WGS) and SNP array genotyping techniques. Our SNP results indicate the isolated Texas population exhibits a very small effective population size, is genetically distinct from our Arizona and New Mexico samples, and has reduced heterozygosity at fitness-related markers, exacerbating its risk for local extirpation.

Research Mentor: Samarth Mathur

Biology

College of Science;

Poster Number: 187a :: Social Sciences/Humanities

College of Science

Purdue Honors Retention Study - Why Students Remain in the Purdue Honors Program

Author:

Lucy Hilarides

Kasha Halbleib

Samuel Wernert

Abstract:

This project was conducted to evaluate the motivations for why current juniors and seniors within the Purdue Honors College continue their enrollment in the program. In doing so, the goal was to provide the Honors College with a list of factors that contribute to enrollment persistence. Related research projects have focused on specific honors college programs in other universities and the pros and cons of their specific programs, the most common benefits cited being smaller class size, relationships to faculty, the living community, a rigorous curriculum, and peer interaction. However, no such research had been done for the Purdue University Honors College. Our research team dispersed a survey to current junior and senior honors students at Purdue in spring of 2019, asking our participants why they elected to complete the Honors College curriculum and how their values had changed over the course of their college experience. Results are currently being evaluated, however, we expect a small number of “core” reasons for staying in the Honors College to emerge in our data. We also expect those reasons to change over time, such as decreasing value for seniors. Once we have a sufficient population, data will be analyzed by finding majority reasons for continuing with the curriculum and adapting to the Honors College. Any pertinent trends within those majorities related to demographics of the population will be highlighted.

Research Mentor: Dr. Jason Ware, Clinical Assistant Professor and Director of Assessed Learning, Purdue Honors College;

Poster Number: 188a :: Social Sciences/Humanities

College of Science

Patient-Physician Communication on Tapering Opioid Medication Dosage

Author:

Kiara Hughes

Abstract:

In 2017, 70,237 people died from opioid overdoses according to the National Institute on Drug Abuse. Opioids are ineffective for long term treatment of chronic pain, numerous providers continue to prescribe these medications to their patients. Conversations about tapering off of these drugs can be difficult and frustrating. Dr. Shields (Purdue) and Dr. Mathias (IUPUI) designed a study to observe the communication between patients and their primary care physicians about pain management and opioids. This study consisted of nine primary care physicians and 37 patients with chronic pain from Eskenazi Hospital outpatient clinics. Three consecutive visits were recorded and transcribed. We report on a study of shared decision-making (SDM). Undergraduate research assistants rated each visit on nine factors of SDM from 1 to 5. The topics evaluate the interaction between the patient and physician to observe the amount of shared decision making. We will present preliminary data from our coding.

Research Mentor: Dr. Cleveland Shields, Human Development and Family Studies, College of Health and Human Sciences;

Poster Number: 189a :: Life Sciences

College of Science

Defining Substrate Access Pathways in Ste24

Author:

Nisreen Islaih

Abstract:

Mutations in the lamin A processing enzyme ZMPSTE24 have been implicated as a cause of progeroid diseases. Biochemical characterization of the yeast homolog Ste24 will help elucidate the catalytic mechanism and function of human ZMPSTE24. The yeast zinc metalloprotease Ste24 is an integral membrane protein localized to the endoplasmic reticulum and inner nuclear membranes. The main function of Ste24 is to mediate two cleavage events in the maturation of the yeast α -factor mating pheromone. This enzyme first catalyzes the endoproteolysis of C-terminal -aaX residues and a second upstream N-terminal cleavage of the α -factor substrate. Ste24 is unique in structure, as it comprises seven membrane-spanning helices to form a hollow catalytic chamber containing four portals, which are suspected to be sites for the α -factor substrate entrance and release.

To examine the role of portal 1 as the substrate entry point, Ste24 double cysteine mutants were generated around the portal, chosen for its proximity to the enzyme active site. Membrane-permeable disulfide crosslinkers were then used to block the portal to substrate entry. The AAX cleavage activity was subsequently examined by a radioactive endoprotease-coupled methylation assay. After crosslinking, the radioactive assay revealed lower activity in the crosslinked proteins, as expected due to portal occlusion. These results indicate the importance of portal 1 in C-terminal cleavage and suggest a major role for portal 1 as the entry site for α -factor.

Research Mentor: Christine Hrycyna

Department of Chemistry

Purdue University;

Poster Number: 190a :: Physical Sciences

College of Science

Measuring the Biometric Image Quality Score in Infants Iris' Overtime

Author:

Hannah Jones

Abstract:

Biometrics are used to identify subjects using modalities such as iris, fingerprint, facial recognition. Identification is determined through matching a scan/photo back to a template of the original subject through quality metrics. As subjects age, there is a possibility that matching back to the template could become more difficult because of changes to the body. Humans go through the most rapid physical and developmental changes during early childhood, particularly from ages zero months to eight years. This project focused on the impact on iris quality scores for 80 participants as they age. Participants' ages ranged from 2 to 75 months and iris data was collected from three biometric devices: VistaEY2H (556 images), M6 (1361 images), M6-Dim (982 images), and AOptix (2304 images). Subjects visited up to 12 times for image captures. Data from subjects were collected by the International Center for Biometrics for a study of iris identification for the Global Good Foundation. All the statistics from the iris image captures are from NeuroTechnology VeriEye. Quality score is the focus statistic for this project. Presented is preliminary analysis that shows a weak correlation between the statistics. I hypothesize an increase in image quality scores as subjects age due to their cognitive understanding and rapid growth.

Research Mentor: Stephen Elliott, Polytechnic Institute; Kevin O'Connor, Polytechnic Institute

Poster Number: 191a :: Life Sciences

College of Science

Genome Analysis Of The 3' End Of Mycobacteriophage Corazon

Author:

Gwenyth Joseph

Korie McCrea

Emily Sanders

Melanie Martinez

Abstract:

Bacteriophages are responsible for hijacking a bacteria's transcription and replication machinery in order to kill the bacteria or use it as a host to transcribe copies of viral DNA. Phages are extensively studied so that they can act as potential alternative to antibiotics. The purpose of this study is to examine a phage DNA sequence and identify possible genes by using a variety of software and comparing its genome to known conserved sequences. DNA Master was used to perform an auto-annotation of the Mycobacterium bacteriophage of the 3' end of Corazon, specifically genes 93-108 (56145-64744 bp) of the genome. These results were compared to start sites recommended by GeneMarkS, Starterator, NCBI BLAST, and Phamerator. Corazon has 108 genes before editing the auto annotation, and we added genes 93.5 and 106.5, which is a total of 18 genes. For this study, 16 genes were annotated at the 3' end of the Corazon draft; most of the genes were reverse genes with no associated functions. Each start site for the 16 genes found was supported with evidence from the software. In the future, the work done with the Corazon genome can be compared to other phage genomes under annotation to help generate the correct gene calls. Because the majority of gene functions are NKF, future research would require using reverse genetics to knock out the genes of interest in order to observe the mutated phenotypes of the phages.

Research Mentor: Kari Clase, Department of Agricultural and Biological Engineering, College of Agriculture;

Poster Number: 192a :: Life Sciences

College of Science

Genome-wide Analyses of Small Nucleotide Polymorphisms in the Lyme disease tick provide insight to population diversity

Author:

Sarah Komanapalli

Abstract:

The black-legged tick *Ixodes scapularis* is a vector of pathogens that cause Lyme disease, Powassan encephalitis and granulocytic anaplasmosis. Insecticide resistance has made it difficult to control ticks and the diseases they transmit. Studying the IscaW1 genome assembly of *I. scapularis* can provide insights to genetic factors related to vector competence and acaricide targets. Here we analyzed genetic variation in populations of *I. scapularis* collected from sites in Indiana and Northeast regions. Heterogeneity among the individual ticks was analyzed using small nucleotide polymorphisms (SNPs) markers previous identified in genes from the IscaW1 genome assembly. Variation between different regions was analyzed using genomic DNA pools composed of several different ticks. Primer pairs were designed to amplify SNPs predicted in multiple *I. scapularis* genes potentially associated with tick parasitism or identified as under positive selection pressure. Following PCR amplification, amplicons were analyzed and purified on 1.5% agarose gel, and excised bands were gel purified and sequenced. Heterogeneity at SNP loci was determined by comparing sequences to the IscaW1 reference assembly via multiple alignment software. One SNP predicted in a hypothetical protein gene was confirmed in ticks collected from Indiana, Massachusetts, and New Hampshire, suggesting little heterogeneity at this locus in ticks from Midwest and Northeastern states. PCR revealed that bioinformatic analyses were most predictive for SNP loci in Southeastern *I. scapularis*, and less predictive for loci in Midwestern and Northeastern ticks. For the loci analyzed in this study, our data suggests greater genetic variation in Midwest and Northeast *I. scapularis* populations, consistent with theories regarding the evolution of this vector in North America. The SNPs identified in this study provide insights to genetic structures of *I. scapularis* populations. This is essential for the identification of genes to target for more effective control tick-borne diseases.

Research Mentor: Dr. Catherine Hill

Department of Entomology

College of Agriculture;

Poster Number: 193a :: Social Sciences/Humanities

College of Science

The Historical Recreation of Omaha Beach in a Virtual Environment

Author:

Matthew Konkoly

Abstract:

Omaha beach is one of the most notorious battlegrounds of the second World War. Not only is it notorious for its casualty rate, but also for the sheer amount of planning and preparation on both sides. The allies with their bombing raids, and false flag operations to sow confusion, and the axis with their formidable Atlantic wall defenses and veteran troops, this was a battle doomed to end violently. And that it did, with almost three thousand allied losses, this was one of the bloodiest battles of World War Two for the American forces. The documentation for this battle has been carefully recorded and expanded upon over the years in many publications. However, the lack of a truly convincing visual representation is apparent. Many films and video games have tried to replicate Omaha beach to varying degrees of success. Films are usually highly detailed and historically accurate, but are only visible to the public in predetermined shots and sequences. Videogames on the other hand have the opposite problem, they are detailed enough and easily explored by the player, but often fall flat in terms of the scale and true historical layout of Omaha. Not to mention the player will find himself dodging bullets while trying to get a good view of the terrain.

To solve these limitations, we have decided to take a hybrid approach to bring Omaha beach to the public as a general purpose, educational, and open source model. With full freedom to explore in a virtual environment, this model will be the ultimate educational tool. Using real-world terrain data that accurately reflects the topographical conditions of 1944, and fortifications as they looked on the fateful morning of June 6th, this project will be the principle recreation of Omaha beach.

Research Mentor: Sorin Adam Matei, Associate Dean for Research – Liberal Arts;

Poster Number: 194a :: Life Sciences

College of Science

Poster

Author:

Zhengming Li

Abstract:

The main thesis for the analysis is how prosthetic devices solve the problem in the medical field. The reason why I picked this topic is I read a chapter from my hist 313 class which indicate the prosthetic devices helping and improving a lot of people who lose an arm or leg. So they can do things after the prosthetic devices are installed. It is a significant change in the world.

Research Mentor: Sharra L Vostral;

Poster Number: 195a :: Social Sciences/Humanities

College of Science

The effects of crop insurance on agricultural producers' adoption of conservation practices

Author:

Ashlyn Lythgoe

Abstract:

With the growing impact of climate change in the coming decades, agricultural producers face more risks, which include extreme weather events such as drought and flooding. In some research, there is indication that adoption of conservation practices improves producers' abilities to withstand these events, as well as benefit the environment overall. Adoption of these practices requires awareness from the producer, as well as the understanding that these practices may be used as a risk management strategy. It is largely unknown what impact the presence of crop insurance has on producers' long-term risk management strategies, and whether conservation practices are included as risk management. To determine this, we developed a survey assessing producers' views on crop insurance, risk management, and the adoption of conservation practices. This survey was then sent out to 2000 producers throughout Indiana and Iowa, with a response rate of 38%. Results from this survey indicate that while producers do not directly associate crop insurance as limiting, there is indication that producers' reliance on crop insurance may have a nuanced effect on their risk management decisions and view of conservation practices, which may impact their security in the face of climate change.

Research Mentor: Michelle Hemler, Forestry and Natural Resources, College of Agriculture; Linda Prokopy, Forestry and Natural Resources, College of Agriculture

Poster Number: 196a :: Life Sciences

College of Science

Role of NADPH Oxidases in Growth and Guidance of Zebrafish Retinal Ganglion Cells

Author:

Saron Manikam Bhoopathy

Abstract:

Role of NADPH oxidases in growth and guidance of zebrafish retinal ganglion cells

Saron Bhoopathy, Aslihan Terzi, Haley Roeder, and Daniel M. Suter

Department of Biological Sciences, Purdue Institute for Integrative Neuroscience, Purdue University, West Lafayette, IN 47907

The NADPH oxidase (Nox) family of enzymes is composed of membrane-bound, multi-subunit proteins which produce reactive oxygen species (ROS). Though ROS are typically associated with oxidative stress, there has been emerging evidence that ROS regulate neuronal development. It is, however, presently unknown whether Nox enzymes act downstream of growth and guidance cue receptors. Previous work in the lab has shown that neurite growth and guidance in response to specific guidance cues is abolished when Nox enzymes are inhibited or mutated. In order to test the hypothesis that growth cone ROS levels are altered in response to guidance cues, we will express the ROS biosensor roGFP2-orp1 in developing zebrafish embryos. We will then culture retinal ganglion cells (RGCs) from these zebrafish embryos and treat them with the guidance cues netrin-1, BDNF, and slit2. It is hypothesized that guidance cues alter ROS levels in the RGCs and that this would be hindered when Nox enzymes are inhibited.

Research Mentor: Daniel M. Suter

Department of Biological Sciences, Purdue Institute for Integrative Neuroscience, Purdue University, West Lafayette, IN 47907; Aslihan Terzi

Department of Biological Sciences, Purdue University, West Lafayette, IN 47907

Poster Number: 197a :: Life Sciences

College of Science

Modulation of Infant Gut Microbiome

Author:

Zachary McGuire

Abstract:

Breastfed babies have shown to be healthier than those fed with infant formula. The earliest bacterial colonization of the infant's intestines can determine the fate of the gut microbiome for the rest of the life and even though the infant formula is fortified with nutrients, its effect on the gut microbiome remains to be addressed. We hypothesize that the nutrient composition of infant formula will control the composition, abundance, and function of the gut microbiome in developing infants, which could impact short and long-term health. The impact of carbohydrates, fats, and proteins as sources of nutrition are determined based on how they modulate the abundance and composition of the bacteria in the gut microbiome. These nutrients are individually tested in vitro in a chemically defined medium. The environment is anoxic and held at a 37°C to mimic the conditions found in the lower digestive tract. These experiments will highlight the importance of the bio-chemical link between the infant gut microbiome and infant diet.

Research Mentor: Dr. Mohit Verma, Agricultural and Biological Engineering, College of Engineering;

Poster Number: 198a :: Life Sciences

College of Science

Identifying genes and microRNAs that when lost can potentiate transformation of KRASG12V P-53-knocked-down human bronchial epithelial cells

Author:

Abigail Mesfin

Andrea Kasinski

Abstract:

In the United States, cancer is the second leading cause of death. This prevalence can be attributed to both a lack of prognosis and prevention. Therefore, it is important to identify biomarkers that can accurately predict and diagnose the onset of early-stage development of cancer. One way to possibly prevent lung cancer onset is through targeting a class of genes called cancer drivers. A cancer driver is defined as any genetic factor that can itself cause cancer. By targeting these drivers, we will have a better chance of controlling the transformation of a normal cell to a cancerous cell.

MiRNAs are small non-coding RNA molecules that regulate cellular processes by repressing target gene expression by either inhibiting protein translation or cleaving the messenger RNAs. While miRNAs regulate normal cellular behavior, the deregulation of miRNA expression is associated with the initiation and progression of human cancers where they act as oncogenes or tumor suppressors contributing to tumorigenesis. The overarching aim of this project is to identify the driver genes and miRNAs that when knocked out, drive transformation of the non-cancerous HBEC-KP cells. Cas9 and a CRISPR small guide RNA library were co-transduced in cells for generating genome-wide knockouts and three different assays were performed for selecting cells with transformed phenotypes. The overall hypothesis of this project is that the loss of certain genes or miRNAs can potentiate the transformation of human bronchial epithelial cells that carry KRAS G12V; p53 knock-down (HBEC-KP).

Research Mentor: Chennan Li, Department of Biological Sciences, and Purdue University;

Poster Number: 199a :: Life Sciences

College of Science

Bioavailability of Magnesium Chloride from a Liquid Supplement and a Traditional Salt

Author:

Ayana Morris

Abstract:

Currently, magnesium deficiencies are common within the U.S. population, with nearly 4% of men and 7% of women having been diagnosed with hypomagnesemia. Despite this, magnesium deficiencies are often overlooked. This project evaluated the bioavailability of Remag[®], a magnesium chloride supplement, by comparing the bioavailability of magnesium in healthy, adult, participants taking this product versus a magnesium oxide or magnesium citrate supplement. It was hypothesized that Remag[®] will be better absorbed as compared to the other supplements because the company has marketed it's product as being a molecularly smaller form of magnesium than it's competitors. Participants were eligible if they were between the ages of 18-65 years, fell within an 18-35 kg/m² range for body mass index (BMI), and blood pressure \leq 130/85 mm Hg. Analysis of each participant's blood and urine were used to determine magnesium status. Total magnesium in serum, red blood cells, and urine were assessed using atomic absorption spectrometry (AAS). Ionized magnesium in whole blood and urine were determined using a magnesium selective electrode using a clinical analyzer. Serum parathyroid hormone (PTH) in serum was analyzed using an antibody-based assay. Lastly, urinary creatinine was measured to control for kidney function and urine volume. Currently, the first 15 participants to complete this study have been given Mg citrate (NatureCalm). While that last 15 participants to complete the study will be given a supplement by the company NOW, but this sample has not been tested yet.

Research Mentor: Nana Gletsu-Miiler, Department of Nutrition Science, College of Health and Human Sciences; Sarah Butts, Department of Nutrition Science, College of Health and Human Sciences

Poster Number: 199.5a :: Life Sciences

College of Science

Mushroom Classification Application

Author:

Syed Mudabbir

Abstract:

Many species of mushrooms exist on our planet, where many of those are highly prized and exotic delicacies, some are also very deadly and dangerous. Mushroom poisoning, a problem commonly related with mushrooms occurs due to misidentification of mushrooms. To accurately identify field mushrooms, rely on several morphological traits to discriminate between taxa, and on an understanding of how mushroom growth and development changes through time, climates, and environments. Here we have developed an application based on machine learning. We used Google's tensorflow library with to create our android application. The applications responsibility is to classify images into its respective classes of mushrooms. For this purpose, we collected hundreds of images of mushrooms were collected, sanitized and then used in our machine learning algorithms. The resulting graphs were then converted into mobile version and transported over to the android platform. As a proof-of-principle, we trained our application on the genuses, Gyromitra and Morchella and then tested. For our testing purposes we kept 20 images from the training sample as our unseen data. Afterwards the application was tested against these images and application returned the correct diagnosis as follows. Gyromitra in all test cases (100% sensitivity, and 90% specificity) and Morchella in all but one test cases (90% sensitivity and 100% specificity). To expand our research we will implement the same example with multiple common genera such as Amanita, Agaricus, Tricholoma, and Cantharellus.

Research Mentor: Euiwon Bae, Ph.D., School of Mechanical Engineering

Poster Number: 200a :: Life Sciences

College of Science

Cisplatin Electrochemotherapy as an Alternative Treatment for Triple Negative Breast Cancer

Author:

Alexis Musleh

Ignacio Camarillo

Rajeswari Sundararajan

Abstract:

Triple negative breast cancer (TNBC) is a phenotype of cancer, which lacks the expression of three main receptors (ER, PR, Her2/neu), targeted by conventional therapies. Presently, there is no targeted therapy against TNBC, and the survival rate of patients is poor. This low survival rate highlights the need of novel therapies, which can target TNBC effectively. Towards this, electrochemotherapy can be an attractive alternative because it utilizes the synergy of electrical pulses and chemotherapeutics to target cancer cells which does not depend upon the receptors for its effects.

We evaluated the effects of electrochemotherapy with cisplatin on the viability profile of MDA-MB-231 cells, an aggressive, metastatic and drug resistant TNBC cell line. We applied electric field intensity of 600V/cm and 800V/cm with different cisplatin concentrations of 10 μ M, 50 μ M, and 100 μ M and evaluated cell viability profile using the MT assay.

Our results indicate that the viability loss in MDA-MB-231 cells directly correlates with the increase in the electrical pulse energy and cisplatin dosage. At 4 hours, the viability decreased by 46.5% at 800V/cm and 100 μ M of cisplatin, while the viability decrease was 28.6% for 600V/cm and 100 μ M of cisplatin. These results highlight that it is possible to tune the cell death in TNBC cells, by refining the electrical pulse parameters and cisplatin dosage to effectively target TNBC cells.

Research Mentor: Lakshya Mittal, School of Engineering Technology, Purdue University;

Poster Number: 201a :: Life Sciences

College of Science

Investigating the Roles of uPA and uPAR in Pancreatic Ductal Adenocarcinoma Tumor Growth

Author:

Erin Paul

Abstract:

There has been minimal progress in the treatment of pancreatic ductal adenocarcinoma (PDAC) over recent decades, with the five-year survival rate having yet to exceed nine percent. PDAC is associated with robust coagulation system activity evidenced by high expression of the coagulation genes Protease Activated Receptor 1 (PAR-1), Urokinase plasminogen activator (uPA), and its receptor uPAR in PDAC patient samples. Previous studies in the lab have discovered that knocking down PAR-1 in a mouse PDAC cell line (KPC2) drastically reduced tumor growth in vivo and uPA and uPAR expression were significantly decreased in these tumors. In addition, uPA and uPAR knockout KPC2 cells (uPAKO and uPARKO) also had diminished tumor growth in vivo. Thus, we hypothesized that PAR-1 promotes PDAC tumor growth through upregulating uPA and uPAR. To test this hypothesis, PAR-1 knockout KPC2 cells (Par-1KO), uPAKO, and uPARKO cells were transfected with a Tet-inducible construct of the respective uPA or uPAR transgene to generate stable transfected cell lines Par-1KO TetuPA, Par-1KO TetuPAR, Par-1KO TetuPA/uPAR, uPAKO/Tg, and uPARKO/Tg. Each transgene was successfully induced in each cell line upon doxycycline treatment in vitro. In allograft studies to test tumor growth, induction of either uPA, uPAR, or both in PAR-1KO cells failed to rescue tumor growth properties. In addition, restoration of either uPA or uPAR in both the uPAKO and uPARKO cells did not rescue tumor growth in both subcutaneous and orthotopic allograft models. Further analysis of expression patterns in these inducible cell lines revealed a 60-fold increase in induced uPA and uPAR expression levels when compared to the treatment control or parental cell lines. In summary, restoration of uPA and uPAR expression upon doxycycline treatment was achieved in the respective cell lines. However, they were unable to rescue tumor growth properties of Par-1KO, uPAKO, and uPARKO cells in vivo, possibly owing to the very high levels of expression obtained in our inducible cell lines.

Research Mentor: Dr. Stephen Konieczny, Department of Biological Sciences, College of Science; Yi Yang, Department of Biological Sciences, College of Science

Poster Number: 202a :: Life Sciences

College of Science

Antibiotic effects on Parasite-Host Dynamics in Freshwater Ecosystems

Author:

David Prather

Abstract:

Antibiotics in the water supply are becoming more prevalent as the use of pharmaceuticals increases, particularly from hospitals and agriculture. These antibiotics may have unintended consequences for the aquatic organisms that live in these water bodies. We investigated the effect of antibiotic exposure on disease dynamics using a freshwater zooplankton *Daphnia dentifera* and its fungal parasite *Metschnikowia bicuspidata*. In a series of experiments, antibiotics were first introduced to either the host or the parasite, followed by exposure of *D. dentifera* to *M. bicuspidata*. We hypothesized that the antibiotics would either allow the host's immune system to allocate its resources to combat *M. bicuspidata* infection, which would reduce rates of infection, or interfere with *D. dentifera* metabolism, which would increase rates of infection. Host exposure and parasite exposure to antibiotics were analyzed separately to better identify where antibiotics affect this system. Tetracycline significantly reduced infection prevalence when hosts were exposed ($p < 0.05$) but not when the parasite was exposed ($p = 0.22$) suggesting that the presence of tetracycline may affect the host rather than the parasite. This interaction prompted a subsequent large-scale population experiment aimed to observe the overall effect of both *M. bicuspidata* and tetracycline on *D. dentifera* populations. The presence of tetracycline significantly reduced population levels ($p < 0.001$) and infection density ($p < 0.001$) but increased infection prevalence ($p = 0.005$). Therefore, tetracycline reduced infection prevalence individually but increased infection prevalence when we studied the whole population. The reduction in infection prevalence in the population-level experiment may have been caused by tetracycline-induced changes in demography; populations exposed to tetracycline had lower fecundity, which resulted in older populations that are more likely to exhibit high infection prevalence. This change in interaction shows how the introduction of antibiotics into naturally water systems via increased usage could impact aquatic organisms on a community scale over time.

Research Mentor: Catherine Searle, Department of Biological Sciences, College of Science; Kacie Jonassen, Department of Biological Sciences, College of Science

Poster Number: 203a :: Life Sciences

College of Science

Investigating Fic Proteins as Possible Virulence Factors in *Helicobacter Pylori*

Author:

Vandana Reddy

Alexandra Stiffler

Abstract:

Fic (Filamentation Induced by Cyclic AMP) proteins, are a class of evolutionary diverse enzymes known to regulate cell signaling by carrying out post-translational modifications, commonly through AMPylation, the process of adding an AMP molecule to a substrate. This strategy is used by some bacterial toxins to destabilize immune cells and evade the host's immune response. Fic proteins are evolutionarily conserved, with most bacteria encoding a single protein. *Helicobacter Pylori*, the Gram-negative bacteria associated with gastric ulcers and cancer in humans, encodes up to five fic proteins. We cloned and purified two of these fic proteins from the Puno120 strain of *Helicobacter* and confirmed them to be enzymatically active proteins. We next asked if these two proteins could be involved in *Helicobacter* pathogenesis. Pathogenic strains of the bacteria utilize a dedicated Type IV toxin secretion system that is encoded by the Cag pathogenicity island. *Helicobacter* translocates virulence factors into host cells using the Cag apparatus. Using colorimetric assays, we are assessing whether the two fic proteins are translocated via the Type IV secretion system.

Research Mentor: Seema Mattoo, Department of Biological Sciences, College of Science

Poster Number: 204a :: Mathematical/Computational Sciences

College of Science

Reducing Overhead of Automatic Garbage Collection

Author:

Logan Kulinski

Chaolun Shao

Anthony Niemiec

Amol Jha

Abstract:

Modern server applications in Java often use garbage collected heaps with sizes in the order of hundreds of Gigabytes. Current versions of the Java Virtual Machine (JVM) impose write barriers on a running program in order to perform automatic garbage collection, to make sure that the running program does not interfere with marking up the heap. Not only does this slow down a program's execution time while the garbage collector is running, it also creates a "tax" during normal program runtime, via numerous checks to see if a write-barrier currently needs to be enforced.

The goal of this research is to develop and implement algorithms of garbage collection that reduce this overhead, via copy-on-write methods. To accomplish this, snapshot-at-beginning approaches using virtual memory techniques will allow a program to continue executing while the snapshot is scanned for unused memory. This will allow the marking phase of garbage collection to run concurrently with an executing program, significantly reducing the overhead imposed with traditional write-barrier methods. This copy-on-write method is applied to the Java Virtual Machine, and analyzed with benchmarks such as DaCapo and SPECjvm.

Research Mentor: Dr. Gustavo Rodriguez-Rivera, Computer Science Department, Purdue University

Poster Number: 205a :: Life Sciences

College of Science

Comparison of Agrobacterium and Ensifer-mediated genetic transformation of Arabidopsis thaliana

Author:

Caleigh Roleck

Abstract:

Agrobacterium tumefaciens is a plant pathogen that can transfer a piece of DNA, T(transferred)-DNA to plant cells. Virulence effector proteins transferred into the plant cell help the T-DNA traffick through the cytoplasm to the nucleus. Plants may recognize a bacterial pathogen, such as *Agrobacterium*, as a threat and trigger defense responses. *Ensifer adhaerens*, a soil bacterium, can also genetically transform plants when harboring a plasmid containing virulence genes and T-DNA. In nature, *Ensifer* is non-pathogenic to plants, and therefore, may not be perceived as a threat. We separately introduced the plasmid pCAMBIA 5105, which contains virulence genes and T-DNA with a plant-expressible GUS reporter and a hygromycin-resistance gene, into *A. tumefaciens* and *E. adhaerens*. These strains were then used to infect *Arabidopsis* roots. RNA sequencing data indicate that *Ensifer* induces expression of defense genes to a lesser extent than does *Agrobacterium*. Therefore, we compared the ability of *Agrobacterium* and *Ensifer* to transform different *Arabidopsis* defense mutants, including plants lacking either the PAMP receptor EFR1 or the Botrytis-induced kinase 1 (BIK1) protein. EFR1 appears to defend plants against *Agrobacterium*- but not *Ensifer*-mediated transformation. However, several other proteins important for defending against *Agrobacterium*-mediated transformation, including BIK1 and the flagellin receptor FLS2, appear to have similar functions in *Ensifer*-mediated transformation. In addition to testing the role that defense proteins play in *Ensifer*-mediated transformation, we also investigated whether plant proteins known to assist in *Agrobacterium*-mediated transformation also assist in *Ensifer*-mediated transformation. Current results indicate that *Ensifer* does not transform plants as well as *Agrobacterium*, but tends to follow the same transformation efficiency pattern with different *Arabidopsis* ecotypes. A better understanding of how plant proteins potentiate *Agrobacterium* and *Ensifer*-mediated transformation could lead to the development of *Ensifer* as a tool for plant genetic engineering.

Research Mentor: Dr. Stanton B Gelvin, Department of Biological Sciences, College of Science; Rachelle Lapham, Department of Biological Sciences, College of Science

Poster Number: 206a :: Physical Sciences

College of Science

Using Technology to Explore Solubility Concepts in the General Chemistry Laboratory

Author:

Nur Adilah Rosli

Abstract:

This technology-enhanced laboratory experiment uses digital teaching methods to help General Chemistry students understand molecular properties of solutions. We developed a lab that allows students to interact with a variety of solutions in saturated, supersaturated, and unsaturated conditions. Specifically, students measure the enthalpy of dissolution and qualitatively and quantitatively determine the effect of temperature on solubility. Students produce supersaturated solutions of sodium acetate as well as create a solubility graph for potassium chloride in water. Additionally, students will be able to determine the heat of solution of potassium chloride. In our work, we obtain an enthalpy value of 15.59 kJ/mol, which is within 9.5% of previously reported literature values. Our potassium chloride temperature-dependent solubility curves are also similar to solubility graphs previously reported. We believe that this lab will give General Chemistry students hands-on experiences with fundamental concepts of solubility and solution chemistry.

Research Mentor: Dr. Jon Rienstra-Kiracofe

Department of Chemistry

College of Science; Dr. Gudrun Schmidt

Department of Chemistry

College of Science

Poster Number: 207a :: Mathematical/Computational Sciences

College of Science

Genetic Algorithm for Subcorpora Selection

Author:

Andrew Rothwell

Abstract:

In many domains, it is important to select representative samples from large datasets. This extends into linguistics with a subcorpora selection problem which attempts to balance the representation of all genres and years within a selection. This project proposes a Genetic Algorithm to find a valid representative sample in minimal time. The algorithm involves minimizing a fitness function which evaluates differences in a selection's representation from each year and genre in the sample and how different the total number of words in each genre is from a predetermined word count goal. This minimization is done with "breeding" and "mutation" of binary vectors. The vector's length is equal to the total number of texts from which to choose. Each entry (gene) in the vector represents if a text was included in the selection. Breeding occurs between the top 33% fittest individuals and a another randomly chosen individual. Genes of both individuals are spliced together at a randomly chosen splice point to create a new individual. This new individual then goes through mutation. With a given probability that a gene will mutate, mutation attempts to only flip genes that will allow the individual to trend closer to the word count goal for each genre. This allows for the algorithm to quickly reach the word count goal and then focus on minimizing differences in representation as described in the fitness function. After mutation, the new generation breeds again until a certain number of generations have existed. This algorithm was able to outperform 85% of handpicked samples from each decade between the 1820s to the 2000s with only 64 individuals 1000 generations and 95% of handpicked samples with only 64 individuals and 2000 generations. This algorithm allows researchers to validate their handpicked selections and quickly generate new selections. This algorithm could be used to find disjoint selections that have similar fitness within a set of years. This could be useful in linguistic studies to find multiple samples to use in confirming theories.

Research Mentor: John Sundquist, Linguistics, College of Liberal Arts;

Poster Number: 208a :: Life Sciences

College of Science

Mutagenesis on Rate Limitations of Cytochrome b6f Complex in Photosynthetic Bacteria

Author:

Eryn Sale

Abstract:

Under high CO₂ levels and low light intensity, there is a rate limitation in photosynthesis at the protein cytochrome b6f complex (b6f). It is proposed that changes to this rate-limiting step could increase or decrease the rate of photosynthesis in cyanobacteria. b6f is responsible for mediating electron transfer between two proteins, photosystem II and photosystem I. The rate limitation in b6f arises from a molecule, called plastoquinone, giving up its electrons to a part of b6f called the iron-sulfur cluster, which is buried in the protein. To reach the iron-sulfur cluster, plastoquinone enters through a narrow entry/exit portal. This portal is partially defined a structure called the f helix. The f helix is created from amino acids of the protein twisting on themselves. The amino acid proline has an unusual structure that causes the f helix to bend, resulting in the existence of the portal. Previous research from our lab has changed the two prolines to different amino acids through mutagenesis. These changes have resulted in a smaller portal size, slower donation of electrons to b6f, and a slower rate of photosynthesis. Through the same process, I am currently developing two subtypes of cyanobacteria. One subtype has one additional proline, and the other has two extra prolines. The added prolines should cause the entry/exit portal to be larger, leading to a faster rate of electron donation to b6f, and a faster rate of photosynthesis. If successful, this same technique could be applied to crops, shortening the growth time.

Research Mentor: Dr. William Cramer, Biological Sciences, College of Science;

Poster Number: 209a :: Life Sciences

College of Science

Extraction and Purification of Elastin-like Polypeptide Fusion Protein

Author:

Mollie Shinkle

Abstract:

Elastin-like polypeptides (ELP) are a class of protein often utilized in biomedical applications such as drug delivery due to their biocompatible nature and low toxicity within the body. Unfortunately, protein production and purification are often not robust enough for medical applications. However, recent advancements have shown the ability to purify ELPs by organic solvent extraction from *E. coli* using mixtures of short chain alcohols. This method is advantageous due to its ability to shorten processing time of purification to under an hour while maintaining high concentrations of ELP with little to no macromolecular contamination. Though this allows for a more efficient procurement of pure protein, it exhibits a bottleneck in residual organic solvent. The protein expression of this ELP fusion was optimized through exposure to varying concentrations of Isopropyl β -D-1-thiogalactopyranoside (IPTG), induction/growth times, and temperatures. Once ample ELP fusion protein had been produced, a variety of approaches to eliminate excess organic compounds were taken through the incorporation of additional organic solvents, chromatography, and dialysis in order to increase purity and yield of ELP fusion proteins. Data was collected through SDS PAGE, BCA assay, UV-Vis, and visual analysis for protein aggregation. Future work will aim to test effectiveness of the fusion protein in its selective binding to murine bladder cancer cells.

Research Mentor: Dr. David Thompson, Department of Chemistry, College of Science;

Poster Number: 210a :: Life Sciences

College of Science

Microtubule assembly is necessary for dynein-mediated microtubule translocation and neurite elongation

Author:

Jessica Stone

Abstract:

Axonal navigation is driven by highly motile structures located at the distal tips of elongating axons, called growth cones. These sensory vehicles detect substrate and chemical cues and transduce them towards the dynamic cytoskeleton that drives their motility. Axonal elongation has been previously shown to require both microtubule assembly and dynein-mediated microtubule translocation; however, the relative contributions of these processes to axonal elongation are not fully understood. To address this, we investigated the relationship between microtubule assembly, microtubule movement, dynein activity, and axonal elongation in *Aplysia* neurites using phase contrast, differential interference contrast and fluorescent speckle microscopy as well as immunolocalization. We found that pharmacologically inhibiting either microtubule assembly or dynein activity resulted in reduced neurite growth and microtubule translocation. Simultaneously suppressing both processes produced similar results, but to a lesser degree. Our results indicate microtubule assembly is necessary for dynein-mediated microtubule translocation and neurite elongation.

Research Mentor: Dr. Daniel Suter, Department of Biological Sciences, College of Science; Kristi McElmury, Department of Biological Sciences, College of Science

Poster Number: 211a :: Life Sciences

College of Science

Gross Placenta Morphology and Infant Health

Author:

Kayla Stradford

Abstract:

The placenta plays a major role in fetal health and development (Annemiek et al., 2017). Cord characteristics, placenta shape, vein structure, external film, and occurrence of lesions and discolorations have each been linked to abnormal fetal/infant development (Ismail et al., 2017; Peng et al., 2006; Stanek, 2013; Yampolsky et al., 2008). Given the crucial role of gross placenta morphology (GPM) for development, the present study hypothesized that GPM would be correlated with child health outcomes at 6-months of age.

Data are from a longitudinal pilot study of prenatal maternal experiences. N=17 pregnant women (87% White; 74% Married) completed the study (including prenatal questionnaires on demographics, health, and prenatal stress measures, placenta collection at birth, and a 6-month post-partum questionnaire). Placentas were collected, photographed, and coded for GPM. The post-partum questionnaire assessed parents' perception infant's general health, medical conditions (e.g., eczema), stomach/gastrointestinal issues, food allergies, and infant prescription usage. Given that this is a pilot sample, practical significance was assessed using estimates of effect size (Cohen's d/Cramer's v).

GPM was linked to child health outcomes as indicated by medium-to-large effect sizes. Chi-square tests indicated that when placental lesions were present, infants were more likely to have experienced special medication conditions and increased stomach and gastrointestinal issues, $\chi^2(1)=4.96, v=.54$. Independent t-tests indicated infants with flatter cords, $t(15)=1.63, p<.001, d=.88$, thinner cords, $t(15)=-1.83, p<.001, d=.88$ and larger cord bases, $t(15)=1.24, p=.03, d=.57$, had poorer parent-reported general health. These findings provide preliminary evidence that variation in GPM may be an important predictor of infant health.

Research Mentor: Dr. Kristine Marceau, Human Development & Family Studies, College of Health and Human Sciences; Emily Roland, Human Development & Family Studies, College of Health and Human Sciences

Poster Number: 212a :: Life Sciences

College of Science

Investigating the role of microenvironmental stress in transcriptional regulation and breast cancer progression

Author:

Rachel Stucky

Abstract:

Investigating the role of microenvironmental stress in transcriptional regulation and breast cancer progression

Rachel A Stucky^c, Shirisha Chittiboyina^{a,b}, Sophie A. Lelièvre^{a,b,d}

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Microenvironment-mediated oxidative stress (OS) resulting from an imbalance in reactive oxygen species is involved in cancer progression; yet its impact on chromatin and the epigenome known to drive cancer phenotypes remains obscure. We have identified that the nuclear mitotic apparatus protein (NuMA), a chromatin organizer, interacts with transcriptional coactivator, lens epithelium derived growth factor (LEDGF) and remodeling and spacing factor (RSF-1) protein that under OS is overexpressed and is associated with H3K9me₂, a known suppressor of LEDGF. Our central hypothesis is that NuMA-LEDGF-RSF1 interaction controls cancer progression under stress by influencing transcriptional regulation. We use the HMT-3522 model of triple negative breast cancer progression that in 3D cell culture mimics the phenotypically ductal carcinoma in-situ (S2 cells) and invasive ductal carcinoma (T4-2 cells). Acute OS has been induced with exposure to 250 μ M H₂O₂ for four hours. NuMA, LEDGF and RSF-1 show lower expression in T4-2 cells compared to S2 cells. However, prolonged exposure to ROS (25 μ M H₂O₂ for four weeks) results in a loss of NuMA and LEDGF and increased RSF1 expression in S2 cells, hence mimicking the changes observed in vivo. In addition, size of the nucleus increases in NuMA silenced S2 cells but not in those silenced for LEDGF under OS. These results highlight the need to investigate the role of NuMA and LEDGF in response to oxidative stress in cancer progression. To further understand the role of NuMA under chronic OS in influencing cancer cell phenotype, we will explore NuMA silencing using CRISPR in S2 cells.

Research Mentor: Dr. Sophie Lelièvre, Department of Basic Medical Sciences, College of Veterinary Medicine;

Poster Number: 213a :: Life Sciences

College of Science

Relationship Between Reactive Oxygen Species (ROS) and the Rate of Neurite Growth in *Aplysia californica* Neurons

Author:

Halie Szilagy

Abstract:

In the field of neurobiology, the role of the neuronal growth cone is relatively well understood: located at the tip of neuronal processes, it is a highly motile structure that uses cell surface receptors to detect the surrounding environment. However, what is less known are the underlying biochemical mechanisms of signal transduction which the growth cone employs during directional migration. The goal of my research, specifically, is to understand the role of reactive oxygen species (ROS) in neuronal growth. ROS are derived from molecular oxygen in the atmosphere; however, mitochondria and NADPH oxidase (Nox) enzymes are the main sources of intracellular ROS. ROS have long been considered as a toxic molecule and an unavoidable side effect of these cellular processes for several years. However, recent studies have revealed that ROS should be regarded as second messengers in numerous signaling pathways in health and disease. ROS have been linked to neurogenesis, polarization, and maturation of neurons. Yet, this needs to be distinguished from oxidative stress, which can compromise homeostasis. Therefore, the source, timing, localization, and targets of ROS are important when evaluating its effects on neural physiology. Specifically, I would like to determine whether there is an optimal level of ROS in the growth cone with respect to neurite outgrowth. A better understanding of ROS and their physiological roles will allow for improvement of antioxidant treatments of neurodegenerative diseases and injuries in the nervous system.

Research Mentor: Dr. Daniel Suter, Biology Department, College of Science

Poster Number: 214a :: Life Sciences

College of Science

Combination drug repurposing by targeting neuroinflammation to treat Alzheimer's disease

Author:

Dawn Tilley

Abstract:

Alzheimer's Disease (AD) is a neurodegenerative disorder which currently has no effective cure or treatment, and it is characterized by the toxic buildup of amyloid beta(A β) peptides that disrupt cell signaling and cause neuronal death. The resident immune cells in the brain called microglia become activated and produce inflammatory factors such as nitric oxide (NO) leading to neuroinflammation. Due to its chronic activation, microglia fail to clear the toxic A β plaques and the dying neurons from the brain. Therefore, reducing the NO production by microglia along with preventing neurotoxicity is essential for formulating a treatment for AD.

All previous attempts to formulate a treatment for AD have failed in clinical trials because they focus on targeting a single protein which can have unintended effects on other cells. Thus, we hypothesize that a multi-targeted approach (targeting more than one functional pathway) may prove to be a better method. To test our hypothesis, we utilize an in vitro model of BV2 cells – a mouse microglial cell line – and HT-22 cells – a mouse neuronal cell line – for the desired phenotypes of decreased microglial NO production and reduced neurotoxicity.

The ability of various compounds to reduce microglial NO production is evaluated using a Griess assay at different concentrations, and the toxicity of the “positive” leads from this assay is tested on HT-22 cells using an MTT assay. Compounds that reduce NO that are also neuroprotective will be taken for further in vitro and in vivo analysis. Our data suggests that utilizing approved drugs for multi-targeted drug discovery shows promise for AD.

Research Mentor: Professor Gaurav Chopra

Department of Chemistry

College of Science; Priya Prakash

Department of Biological Sciences

College of Science

Poster Number: 215a :: Life Sciences

College of Science

Comparative Studies of Dengue and Zika virus NS1

Author:

Ena Tully

Abstract:

Dengue virus (DENV) is a serious health concern with worldwide prevalence, mainly in tropical regions. Furthermore, there is currently no licensed vaccine available in the US and dengue hemorrhagic fever can occur upon second infection with a different serotype of the virus. DENV is a type of flavivirus, a family of viruses that have a positive-sense RNA genome which encodes for a single viral polyprotein composed of three structural proteins and seven nonstructural proteins. Of these ten proteins, nonstructural protein one (NS1) has significant roles in viral pathogenesis and host immune evasion. NS1 exists as a membrane-associated dimer and a secreted hexamer. The dimer contains a hydrophobic and hydrophilic face which promotes association with membranes during replication and interaction with the host innate immune system when secreted, respectively. While NS1 has a known function in viral replication, little is known about the molecular mechanisms that NS1 uses to accomplish this task. NS1 from Zika virus (ZIKV), another flavivirus, has high sequence identity and structural similarity with DENV NS1. Using this information, chimeras of DENV and ZIKV NS1 were designed and generated as a way to probe NS1's role in viral replication. Results from assays using the NS1 clones will reveal novel information on NS1's function in the flavivirus lifecycle.

Research Mentor: Richard J. Kuhn, Department of Biological Sciences, College of Science;

Poster Number: 216a :: Physical Sciences

College of Science

Determination of Nitrate, Sulfate, and Chloride Concentration in the Mojave Desert, California and Rio Seco, Peru.

Author:

Silvana Villela

Abstract:

Particles suspended in the atmosphere, also known as aerosols, can be emitted through a variety of natural outputs (sea spray, "mineral dust"). However, there is growing concern from the scientific community with regards to excessive aerosol concentrations, particularly due to anthropogenic activity (fossil fuel combustion, deforestation, irrigation and more). An excess in aerosols, especially in urban environments, pose a threat to human health and have serious environmental impacts. This study investigates the concentration of certain aerosols in the sites of Mojave, California and Rio Seco, Peru. California and Peru are similar in that both are located in desert environments. The samples from California and Peru were collected by placing an air filter outside, allowing it to filter out the total suspended particles in the air over the course of 24 hours. These filters were then diluted in deionised water and analyzed for anion and cation concentration via ion chromatography (IC). The results of the study showed that the minimum sulfate concentration was $3.4\mu\text{m}^3$ in Mojave and $2.6\mu\text{m}^3$ in Rio Seco, while the maximum sulfate concentration was $2.59\mu\text{m}^3$ in Mojave and $9.7\mu\text{m}^3$ in Rio Seco. Additionally, the minimum nitrate concentration was $0.2\mu\text{m}^3$ in Mojave and $0.5\mu\text{m}^3$ in Rio Seco, while the maximum nitrate concentration was $1.78\mu\text{m}^3$ in Mojave and $6.3\mu\text{m}^3$ in Rio Seco. Finally, the minimum chloride concentration was found to be $0.04\mu\text{m}^3$ in Mojave and $0.6\mu\text{m}^3$ in Rio Seco, while the maximum nitrate concentration was $0.47\mu\text{m}^3$ in Mojave and $3.5\mu\text{m}^3$ in Rio Seco. Rio Seco in Peru, although similar to the Mojave Desert, contains a larger concentration of sulfate, nitrate and chloride aerosols. This may be attributed to Rio Seco being used for more industrial purposes, with little government regulation, while Mojave is more characteristic of an undisturbed desert characteristics and has nonindustrial activity.

Research Mentor: Dr. Michalski. Earth Atmospheric Planetary Sciences, College of Science.; Dr. Elizabeth Olson. Earth Atmospheric Planetary Sciences, College of Science.

Poster Number: 217a :: Physical Sciences

College of Science

Effects of Evaporation on Rain Water Isotope Composition

Author:

Brianna Westerberg

Abstract:

Isotopes are very useful in understanding hydrologic processes. When water evaporates, the lighter isotopes will evaporate more quickly than their heavier counterparts. When collecting water samples in an open environment, we want to make sure that what we are sampling is what fell. The purpose of this study was to test two techniques to limit evaporation and observe the isotope composition of water before and after evaporation, and how the weights of the isotopes effect the water composition before after a test period. Various methods were used to test how evaporation can be slowed. Nine collectors were filled with various volumes of deionized water and left in an open area. Three were left open to the air, three were covered with a ping pong ball, and three had a thin layer of mineral oil. The initial samples were collected as well as the masses, then analyzed for isotope composition. The collectors were then left for almost a month to evaporate. The final samples were weighed and taken to analyze the isotope composition. The open collectors (control) had the greatest evaporation rates, followed by the ping pong balls, then the mineral oil. The data showed that after evaporation, the heavier isotope of ^{18}O were more abundant than the lighter isotope of ^{17}O . The data suggested a collector could be left open for 1 month if oil is used to limit evaporation and the isotopes would not be affected. These collectors can be used to collect fog on or near coastlines and will be deployed in Arequipa Peru for an upcoming project. The mineral oil layer had the best results in hindering evaporation and halting the change in the isotope composition of the water.

Research Mentor: Dr. Greg Michalski, EAPS, College of Science;

Poster Number: 218a :: Social Sciences/Humanities

Krannert School of Management

Public Sector Unions and their Economic Effects

Author:

Schuyler Frashier

Abstract:

With a single Supreme Court case, the years of precedent and laws on public sector unions were reversed. The power of the Supreme Court does not become illuminated as clearly as when decades of precedents are wiped away with a single case. In 1976, *Abood v. Detroit Board of Education* was decided by the highest court in the United States. The decision built upon three other Supreme Court cases. This decision allowed public sector unions to collect dues from all public employees, even if they were not union members to avoid the economic problem known as “free riders”. “Free riding” is the idea that people who are not contributing to the cause are still benefiting from the hard work of others. By allowing public sector unions to collect from non-union members, this problem was avoided.

However, in 2018, the case *Janus v. American Federation* reversed the *Abood* decision from 1976. The composition of the court along with other factors led to the reversal of an earlier decision. Using this rare occurrence, the function of the Supreme Court can be analyzed to determine the evolving nature of a branch of our federal government that generally gets little attention from the public. The economic impact of a dramatic change in policy can be seen by analyzing these two cases and the effect they have on both members and non-members of public sector unions.

Research Mentor: Cara C Putman, Krannert School of Management;

Poster Number: 219a :: Social Sciences/Humanities

Krannert School of Management
Bankruptcy Inefficiencies in Healthcare Corporations

Author:

Kristen Frohning

Abstract:

This poster analyzes the acquisitions of bankrupt healthcare facilities, including a look at present proceedings, historical legal precedent, and how Medicare and Medicaid payments affect liabilities.

This study followed five hospitals through bankruptcy proceedings and utilized legal research developed through proceedings within the U.S. The proceeding of bankruptcy in itself requires a corporation, whether non-profit or for profit, to shift focus from shareholders, owners, or customers to the creditor. In healthcare, transitioning the focal point means shifting away from patient care. As healthcare corporations file for Chapter 7 bankruptcy, attracting a buyer becomes challenging due to the affiliation with historical liabilities related to Medicare and Medicaid licensing. Healthcare being considered a public commodity with influences in both the private, public, and governmental sector, create a unique set of obstacles.

These hospitals and historical legal precedence show that Medicaid and Medicare do not allow healthcare corporations to use bankruptcy proceedings as a way to restructure. Bankruptcy declarations in the last year have increased in hospitals, predominately in rural areas. The analysis showed that the way that bankruptcies are carried out now, hospitals have a low chance of being acquired or paying off liabilities. The structure is misunderstood and has led to patient care neglect in many cases. Research suggests that there are steps before declaring bankruptcy, from a financial perspective, that could help alleviate the uptrend in closures. A different structure to bankruptcy proceedings, with focus on packaging liabilities, the maintenance of strong governmental connections, Medicare and Medicaid status, could enable corporations and hospitals to sustain viability for repurchase. Fundamentally, healthcare's inability to adapt quickly to payment plans and policy changes poses financial risk that cannot be mitigated without substantial economic analysis for each potential change in policy.

Research Mentor: Cara Putman, Business Law, Krannert School of Management;

Poster Number: 220a :: Innovative Technology/Entrepreneurship/Design

Krannert School of Management

Aligning Student Design Projects to Government Design Challenges through Collaboration with the Virtual Student Federal Service Program

Author:

JJ Jeongjin Park

Abstract:

The capstone projects that are currently implemented typically lack the crucial link between the theoretical book topics and the real-world. Also, there are limited opportunities for the undergraduate students to get involved in service learning or civic engagement in the STEM classroom. Therefore, this research project aims to test out a new approach to class projects through collaboration with the Virtual Student Federal Service Program.

The study will be implemented by using two methods: intervention and participatory action research. The first method, intervention, involves undergraduate researchers actually participating in the VSFS program as interns in order to pilot the program to determine the feasibility of incorporating VSFS into a classroom environment. The second method deals with data collection through the use of participatory action research, specifically, photovoice. By using 8 photos collected from each undergraduate researcher, our research team will analyze the gathered data into three perspectives: benefit, challenges, and recommendations for effectively incorporating VSFS service learning projects in the STEM classroom. Although the virtual barrier, including limited face-to-face communication between VSFS participant and the agency is expected, it is also anticipated that there will be a benefit to learning to communicate in alternative ways. Student participants will be motivated in their both academic career and future career preparation, and the agency such as U.S. Agency for International Development, will experience work efficiency from the help from valuable student workforce, at a low cost. Overall, this study will clarify the both benefit and barrier to the students, university and industry in utilizing service learning project and will observe the causation relationship between the service learning project and the generating of T-shaped future engineers and scientists.

Research Mentor: Prof. Lisa Bosman, Polytech, technology and innovation center;

Poster Number: 221a :: Mathematical/Computational Sciences

Krannert School of Management

Applying Business Analytics to Improve Competitive League of Legends (LoL) Decision-Making

Author:

Aaron Rush

Abstract:

In this study, we developed a model to assist competitive League of Legends (LoL) eSports players in their pre-game decision making process, particularly in how to select in-game characters, colloquially known as “champions”, based on certain game-winning factors. We complemented this decision model with a predicative model to accurately forecast match results based on known game factors (i.e. champion selection and historical data). The motivation for this study is that applications of analytics to support decision-making in eSports is sparse. Specifically, there has been little research to date in academic journals. We found no LoL studies that investigated competitive play decision-making and game outcomes regarding pre-game decisions. Today, eSports is a massive industry that is estimated to generate \$1.1 billion in 2019. Moreover, the 2018 LoL World Championships saw nearly 100 million unique viewers, with 44 million of them concurrent. Growing in popularity by the day, eSports, especially high stakes events with high prize pools, are proving to be a consistent cultural phenomenon, that could use analytics to improve outcomes. In our study, we interviewed a multitude of highly ranked LoL players and had them assist us in creating mapping hypotheses of an individual profile for each champion in a game for five distinct core competencies (Engage, Catch, Poke, Split, Protect). Subsequently we collected competitive match data over a period of roughly 1.5 years with Sportradar’s API to determine which types of strategies perform best against others. In conclusion, we found that teams that have equal or superior pre-game team compositions have a 56.5% win-rate (given that League is an 50/50 game ideally). This equates to a 6.5% advantage to a team with an equal or better overall rating before a round even begins.

Research Mentor: Matthew A. Lanham, Quantitative Methods, Krannert School of Management; Andy Alexander, Quantitative Methods, Krannert School of Management

Poster Number: 222a :: Social Sciences/Humanities

Polytechnic Institute

Design Thinking in Middle School Classroom

Author:

Sakhi Aggrawal

Abstract:

Engineering design is an iterative process that supports the solution of problems by applying scientific knowledge to make informed decisions. Assessing different levels of expertise in experimentation is a difficult task since these are not usually visible as part of a student's final design solution. The purpose of this research is to investigate and characterize students' experimentation strategies while working on a design challenge. This paper explores the various aspects of engineering design behaviors in middle school students. Questionnaires, observations, CAD software logs and focus group methodology are employed for qualitative and quantitative data collection. R scripts models are used to visualize and characterize patterns within educational data and validate them using statistical techniques. This study reveals interesting aspects of design thinking processes in students, provides recommendations and opens the discussion to engineering educators and researchers who are interested in understanding and assessing students' experimentation strategies in engineering design.

Research Mentor: Alejandra J. Magana, Computer and Information Technology, Polytechnic Institute; Ying Ying Seah, Computer and Information Technology, Polytechnic Institute

Poster Number: 223a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Integrating Civic Engagement through Virtual Learning in the STEM Classroom

Author:

Keita Arakawa

Abstract:

Currently there is a lack of real-world projects/clients integrated into higher education classrooms. Although there has been a recent uptick in the need to integrate the humanities into the STEM classroom, service learning and/or civic engagement focused projects are limited. This research is to investigate methods for incorporating authentic learning experiences into the post-secondary STEM classroom guided by the follow research question: How can we increase access to authentic learning in the higher education classroom? To answer the question, the pilot study will engage six undergraduate students of varying age, major, and genders in a two-phase approach. First, the students will participate in a group-like virtual internship offered by the U.S. government sponsored Virtual Student Federal Service (VSFS). Traditionally, these types of internships go to individuals rather than teams. The research will focus on team functions as well as project deadlines. The second phase is to use Participatory Action Research (PAR) and Photovoice to evaluate this new approach to VSFS internships. Qualitative data such as photos, narratives, and transcripts will be analyzed using the NVivo software. The team will investigate the data and identify themes related to what went well, what did not go well, what could be improved, and what lessons were learned. New knowledge from this research will be captured by usage of Photovoice and the team's insights from the experience. If VSFS works well as a team project, it could provide another option for the higher education classroom. Other programs such as service learning student organizations, industry-sponsored capstone projects, and co-ops all have implications that VSFS does not. The results have the potential to transform higher education, producing graduates more prepared to enter the workforce, improving educational institution's completion and placement rates, and increasing return for parents who help finance their children's tuition.

Research Mentor: Lisa Bosman

Technology Leadership and Innovation

Polytechnic Institute;

Poster Number: 224a :: Life Sciences

Polytechnic Institute

Innovative Information Visualization of Symptom Cluster Management Data: A Systematic Literature Review

Author:

Benjamin Carpenter

Kalika Lacy

Abstract:

Systemic lupus erythematosus, also known as lupus, is a heterogenous disease in nature due to the possibility of it affecting any part of the body. There is a wide range of symptoms that can manifest from lupus. This causes difficulty, as that range can often lead to misdiagnosis by making lupus look like another disease. To assist with improving this problem, we are conducting a systematic literature review with the goal of investigating innovative data visualization techniques that use symptom cluster data. Our current research shows significant research in the area of cancer symptom cluster management using basic visualization techniques, like bar charts, tables and scatter plots, but minimal to no published works in the area of lupus symptom cluster management. Results from the systematic review will inform the use of data visualization and visual analytics techniques in the analysis of symptom clusters. Our results will provide insight into the different kinds of data visualization techniques currently used in symptom cluster management and the lack of innovative visualization techniques that could assist in the decision-making process for disease diagnosis and treatment.

Research Mentor: Dr. Vetricia L. Byrd,

Department of Computer Graphics Technology,

Purdue Polytechnic Institute;

Poster Number: 225a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Confronting Transdisciplinary Complexity through the Development of Design Leadership Competency

Author:

Hayley Farmer

Abstract:

With the rise of the “Hybrid Age” diverse technological fields are increasingly converging and mutually reinforcing each other, creating a shift in occupational identity, societal expectations of learning, and competence. In order to enhance students’ ability to thrive in this collaborative environment, new pedagogies are needed to foster collaborative and transdisciplinary skills. In this submission, we explore how students take an active role in building their own educational experiences in one emerging, transdisciplinary context: User Experience (UX) Design. UX Design exists as a trans-discipline, drawing from multiple disciplinary roots, such as psychology, cognitive science, anthropology, and industrial engineering, but reassembling these perspectives as an integrated whole. We deeply engaged with students in a novel undergraduate UX Design program to describe how students learn to construct their own integrative and discipline-specific competency in relation to leadership, analyzing their development as designers as they interact in physical and virtual learning environments. Using a bottom-up thematic analysis approach, we conducted a series of paired interviews with six UX Design students of varied backgrounds, cohorts, and perceived competency. Through our analysis, we have found varying patterns of students’ engagement in their own learning, which impacts their description of their developing design identity and their ability to cope with transdisciplinary complexity. We identify opportunities for supporting design leadership competency through approaches such as self-disclosure, design advocacy, and tracking students’ expertise vs. their evolving identity.

Research Mentor: Dr. Colin Gray, CGT, Purdue Polytechnic;

Poster Number: 226a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

The Biowall Research

Author:

Aaron Manio

William Longsworth

Taylor Sorrell

Abstract:

This proposal aims to explain the current undergraduate research of the Biowall. The Biowall is a botanical filtration device that filters out Volatile Organic Compounds (VOCs). This is accomplished by attaching it to HVAC system in a home. Throughout the years of research and testing, continuous improvements are made. This presentation will include a description and overview of the research done by the 2018-2019 Biowall Team. The Biowall Team consists of three members that focused on different areas of the Biowall research.

A series of questions are proposed by the current undergraduate team to help improve the current Biowall and help future research teams.

1. Biowall Plants – Which plants are best for aesthetics and IAQ?
2. Automation System – Is an economical and smaller controller possible to automate Biowall?
3. Maintenance - What combination of automation and human intervention is needed to maintain a healthy Biowall?
4. Next Generation Biowall – What modification are needed to reduce the flaws noted with current Biowall?

Research Mentor: William Hutzler, Mechanical Engineering Technology, Purdue Polytechnic Institute; Daniel Alloca, Mechanical Engineering Technology, Purdue Polytechnic Institute

Poster Number: 227a :: Social Sciences/Humanities

Polytechnic Institute

“Asshole Design” in the Wild as an Area of Sociotechnical Concern

Author:

Lucca McKay

Abstract:

Researchers are increasingly interested in describing ethics and values relevant for design practice, including the formulation of methods to guide value application. However, little work has addressed ethical considerations as they emerge in everyday conversations about ethics outside of academia, within venues such as social media. We describe online conversations about a concept known as “asshole design” on Reddit, and the relationship of this concept to another practitioner-focused concept known as “dark patterns.” In order to precisely define ethical concerns in this online space, we analyzed 1002 posts from the subreddit `'/r/assholedesign'` to identify the types of artifact being shared and the interaction purposes that were perceived to be manipulative or unethical as a type of “asshole design.” Each artifact and its associated post information were coded to confirm whether it was an example of “asshole design” by the subreddit's definition, as well as being coded for the type of modality present. We identified a subset of these posts relating to dark patterns, and quantified their occurrence using an existing dark patterns typology, including: nagging, obstruction, sneaking, interface interference, and forced action. We found substantial evidence of conversation about ethical concerns, indicating some level of interest in discussing ethical phenomena and complexity using real-world artifacts. These results indicate opportunities to expand the study of dark patterns beyond digital interfaces to investigate ethical concern in relation to physical artifacts.

Research Mentor: Colin Gray, CGT, Polytechnic;

Poster Number: 228a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Forensic Analysis of Vault Applications

Author:

Kayla Rux

Abstract:

The world has become dependent on digital sources of information, and the use of computer-based systems have been common in practices of storing, processing, and transmitting data. A drive for the progress of technology is correlated to an increase in public dependency. As the amount of solutions provided by technology increases, the amount of information stored about an individual increases. This has raised concerns for security and privacy for the vast amount of generated user data. While ways to secure and hide data are consistently being developed, one such implementation is 'vault applications'.

Research Mentor: Research Menton: Kathryn Seigfried-Spellar

Department: CIT

College: Polytechnic; Name: Siddharth Chowdhury

Department: CIT

College: Polytechnic

Poster Number: 229a :: Social Sciences/Humanities

Polytechnic Institute

Qualitative, Quantitative, and Biometrics: Data Triangulation in Social Sciences

Author:

Andres Santiago

Abstract:

The business world is continuously changing due to technology and globalization. Because of these changes there is a strong need for companies to train employees to be ready for cross-cultural communication. Virtual Reality (VR) may be one of these tools companies can use to help train employees, however, there is not a lot of data about how VR can effect cross- cultural communication. For this lab we ran randomly assigned participants into two conditions, which was either the control or VR condition. For the control condition participants just watched a video then answered a survey afterwards. For the VR condition participants were run through simulations in which they were transported to another country to close a business deal for their company. In the VR condition participants would answer scenario questions during the simulation which were recorded. Then they would be asked to complete a survey to record their experience. Finally, participants where attached with shimmers that helped to read their biometrics during the simulations. These biometrics help us to see someone's arousal levels. The recorded questions is our quantitative data, the survey participants completed is our qualitative data, finally the shimmers gives us our biometric data. Using quantitative, qualitative, and biometrics we can triangulate the data. This gives us a good idea of how immersive VR is in comparison with video. For the most part, participants seemed to be more engrossed in VR reality then in the control condition.

Research Mentor: Dr. Mesut Akdere; Dr. Mesut Akdere

Associate Professor & Director, Purdue HRD VR Lab

Poster Number: 230a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Predicting Photovoltaic Power Output with Weather Forecasting

Author:

Elijah St Angelo

Abstract:

As the U.S. incorporates more renewable energy sources into the electrical grid, the public becomes more dependent on weather-affected intermittent power sources. An increasing number of Americans self-generate photovoltaic (PV) power and sell excess power back to utilities through a process called net metering. Considering weather fluctuates daily, utilities cannot accurately predict incoming supply and demand of PV-generated power. As a result, they will over and under-purchase power, which costs them money and ultimately, the expense is passed onto the American public. To efficiently incorporate PV power into the grid, the challenges of local short-term weather and solar irradiance forecasting must be addressed.

By reviewing existing literature and proposing a new approach, we will answer the question of how to better predict PV generation and its impacts on the grid. In this research we look at the current approaches to weather prediction, including how weather station parameters impact PV energy production. Also, the challenges of weather forecasting such as random weather parameters and accuracy of shorter time scale prediction are addressed. After reviewing existing approaches, this research demonstrates the potential for estimating individual PV system generation with weather stations and grid supply and demand. Weather data from local stations, long term weather data, and energy production data is used to forecast and assess short term future solar energy production. This will benefit both utility companies to balance load supply and demand as well as PV system owners to assure the effectiveness of their system. The lasting impact will be a more stable grid and lower, less volatile energy prices for the public.

Research Mentor: Lisa Bosman, PhD, Department of Technology Leadership and Innovation, Polytechnic Institute;

Poster Number: 231a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Exploring Virtual Reality Technology in Simulated Training: Developing Employee Intercultural Knowledge and Competence

Author:

Isaiah Thomas

Abstract:

The current workforce has become increasingly diverse when compared to the workforce of the past. Skilled workers in today's workforce are finding themselves in situations and work environments where their social norms are not shared by others because of a different cultural upbringing. While these relationships harbor untapped potential for innovation and success, many workers find it hard to communicate and engage in teamwork with those from different social backgrounds. The lack of effective teamwork hinders productivity of global business world. Cultural competency, or more specifically intercultural competency, may help organizations address such challenges. Intercultural competence is the ability to communicate effectively and appropriately in intercultural situations based on one's intercultural knowledge, skills, and attitudes (Deardorff, 2004).

In the Purdue HRD Virtual Lab, I am part of an ongoing research supervised by Dr. Mesut Akdere, an associate professor of Human Resource Development, studying the development of intercultural knowledge and competence through simulated virtual reality (VR) training environment. VR-based training simulations are developed with advanced 360-degree cameras and a special computer software to develop the simulations in specific format. Through simulated VR training, employees interact in strategically planned business and organizational scenarios where they learn about other cultures, engage in conflict resolution, and handle cultural differences throughout the simulations taking place in another country and cultural background.

Intercultural competence allows employees from different backgrounds to come together to effectively engage in teamwork, regardless of their cultural, ethnic, or racial backgrounds. Businesses across the worldwide are in dire need to help their employees develop such skills sets in a cost-effective way (Akdere & Acheson-Clair, 2018); and, we believe that VR technology may provide a solution to address this gap through providing an immersive, safe, and scalable learning environment. This presentation will explore intercultural knowledge and competence development through VR learning environment and discusses its effectiveness for simulated training.

Research Mentor: Dr. Mesut Akdere, Technology Learning & Innovation, Polytechnic Institute;

Poster Number: 232a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Three Dimensional Scan of Manufactured Product for Quality Control

Author:

Vincent Tyson

Abstract:

Is there a low cost method of collecting data from industrial controls machines where quality and process can be monitored and controlled by taking a 3D scan of a part as it comes from a machine and then compared to a design model?

Professor Piller has been working with a company in Indiana that is looking to identify quality of dimensions of a part that is produced. Initially they look to identify rough geometry with width and height. The product has an embossed design that simulates grain in wood that would be interesting to confirm the quality. These two points will be the focus on how to identify the resolution required. Other significant quality features will be inspected such as a "W" formation of the part that can be created with inappropriate tooling. Three dimensional scanning is not new. Companies such as Cognex have cameras and scanners available to industry right now. The effort here is to create a low cost scanner that medium manufacturers can use and one of low power so that it can be used in the field on parts that have been in use. This way a technician can scan a part and add to the total life cycle of that specific part.

The final outcome, and the portion of research Vince Tyson has worked on over the past two semesters, of this project is to develop create a surface map of that object that can be compared to a virtual model. Physical deliverables will be a prototype of the device as described in this application. Industry has a vast amount of data that is contained in machines on the factory floor. Quality scans of product can be used to create a live model of each piece as it is made. Scanning equipment is available, one system that has been identified is \$20,000. The design of this project is to leverage the lower cost of single board computers to minimize the scanning costs and increase the availability of this technology to medium sized manufactures. This supports the idea of bringing more intelligence to the whole enterprise.

Research Mentor: John Piller, SOET, Purdue Polytechnic;

Poster Number: 233a :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Machine Learning in 3D Cerebral Angiography

Author:

Yuanxun Wang

Abstract:

3D cerebral angiography based on CT acquisition has been widely used to image aneurysms and other vascular diseases. However, reducing image artifacts that result in visual deviations and improving efficiency still need to be conquered in order to provide a better view of cerebrovascular system to doctors. The method of machine learning, enabling a program to be trained with data and improving performance on certain tasks used for training, has been proved to be an effective tool in many medical imaging applications. For our study we use convolutional neural network (CNN) method of machine learning that is used to classify tissue types. The CNN architecture was constructed with multiples convolutions layers, as well as an input and an output layers. CT image voxels served as an input to the network. A convolutional layer then applied operation to the input and processed the result to next layer until reached the output layer. Thus the output layer produced a classification of the tissue type in different regions. The trained algorithm can then be applied to generate a 3D model model of cerebral vasculature.

Research Mentor: Dr. Julia Rayz, The Department of Computer and Information Technology, Polytechnic Institute; Dr. Vitaliy Rayz, Biomedical Engineering, College of Engineering

Poster Number: 234a :: Social Sciences/Humanities

Polytechnic Institute

Civic Engagement Projects in Undergraduate Classrooms

Author:

Shuning Yin

Abstract:

Many undergraduate college students worry about being unprepared for their future career or further study as they near graduation. Lack of real-world work experience or civic engagement opportunities in school may be the trigger for the problem. The main purpose of this study is to help undergraduate students prepare for work or graduate school with real-life experience by determining whether or not civic engagement activities benefit students and how to incorporate civic engagement projects in the undergraduate classrooms. The basic design of the study involves reviewing the previous relevant literatures and studies to be clear about the advantages of undergraduate students doing civic engagement projects as well as the possible methods to set up the civic participation projects in classrooms. Most of the studies showed the evidence that the college students who graduated with more experience in civic engagement activities adapt better and more easily to their careers because they are better informed about current events. The main barrier to incorporating civic engagement projects in the classroom is finding the appropriate community partners.

Research Mentor: Lisa Bosman, Department of Technology Leadership and Innovation, Purdue Polytechnic Institute; N/A

AFTERNOON SESSION POSTER ABSTRACTS

1:00pm-3:30pm

College of Agriculture			
1b	<i>Benjamin Anderson</i> Mentors: Vikki Weake, Eliana Torres-Zelada	17b	<i>Danielle Klawitter</i> Mentors: Michael Mashtare, Rooney Kim Lazcano
2b	<i>Katelyn Bormett, Madeline O'Neill, Misbah Chagpar, Cindy Jiang</i> Mentors: Kari Clase, Ikenna Okekeogbu	18b	<i>Emma Lietzke, Shruthi Garimella, Bach Vu, Davide Delisi, Brittney Mavrenovic</i> Mentor: Kari Clase
3b	■ <i>Rebecca Carr</i> Mentor: Luis Escobar	19b	<i>Jianheng Ling</i> Mentors: Jeremy Lohman, Aaron Benjamin
4b	<i>Janice Chan</i> Mentor: Abigail Engelberth	20b	<i>William Maniscalco</i> Mentor: Brianna N. Gaskill
5b	<i>Christine Charles</i> Mentor: Eileen Kladviko	21b	<i>Marina Mehling</i> Mentor: Kari Clase
6b	<i>Abigail Clifford</i> Mentors: Craig Goergen, Arvin Soepriatna	22b	<i>Edward Moncada</i> Mentor: Lavanya Reddivari
7b	‡ ■ <i>Julianne Dejoie, Sarah Liu, Ben Howard, Abby Murphy, Liam Johnson</i> Mentors: Kari Clase, Ikenna Okekeogbu	23b	■ <i>Joshua Randall</i> Mentor: Scott McAdam
8b	■ <i>Jennifer Fishburn</i> Mentor: John Cavaletto	24b	<i>Stephen Schwartz</i> Mentor: Shalamar Armstrong
8.5a	<i>Qijue Chen</i> Mentor: Sara McMillan	25b	<i>Robert Shrote</i> Mentors: Mohsen Mohammadi, Xiangjun Zhou
9b	<i>Kevin Fitzgerald</i> Mentor: Kevin Solomon	26b	<i>Alexis Sosa</i> Mentor: Landon Jones
10b	Wenyi Fu Mentors: Qin Xu, Shusheng Wang	27b	<i>Claire Stamper</i> Mentors: Vikki Weake, Spencer Escobedo
11b	■ <i>Bailey Goff</i> Mentor: Kara Stewart	28b	<i>Ashwin Sunderraj</i> Mentor: Mathew Tantama
12b	<i>MaryKate Harrod</i> Mentor: Paul Ebner	29b	<i>Lina Trigg, Rachel Damge, Estefania Martinez, Jenna Ischinger</i> Mentor: Kari L. Clase
13b	<i>Makenna Houston</i> Mentors: Danny Haelewaters, Catherine Aime	30b	<i>Kess Turner, Serena Birdinc, Gabrielle Selvia, Lauren Oparah</i> Mentor: Kari Clase
14b	<i>Juya Jeon, Mrugesh Parasa</i> Mentors: Kevin Solomon, Mrugesh Krishna Parasa	31b	<i>Quin Waterbury</i> Mentors: Laura Bowers, Audrey Goldbaum
15b	‡ <i>Archana Kikla</i> Mentors: Kevin Solomon, Kok Zhi Lee	32b	<i>Erin Will</i> Mentors: Brad Kim, Jacob Tuell
16b	<i>Eung Baek kim, Eunhui Yoo, Mai Liu, Chao Fu, Yejin Jang</i> Mentor: Kari Clase	33b	<i>Ryan Wollensak, Kylie Snyder, Alex Murfee</i> Mentor: Kari Clase
		34b	Maiqi Zhang Mentor: Amanda Limiac

◇ = Uses Archival Material

‡ = Interdisciplinary Research Project

■ = Honors College Student Researcher

35b *Neil Zhao, Julio San Martin, Matt Jaeger, Alex Harris*
Mentor: Kari L. Clase

36b *Daniel Zuercher*
Mentor: Aaron Thompson

College of Education

37b *Julie Kim, Madeline Gavin*
Mentors: Youli Mantzicopolous

38b *Jane Sherfey*
Mentors: Panayota Mantzicopoulos-James

College of Engineering

39b *Fares Alqassim*
Mentor: Morteza Karimzadeh

40b *Zeinab Aly, Molly Cromer, Alison Jeffries*
Mentors: Ulrike Dydak, Eric Cameron

41b *Christopher Arnold, Diana DiPretoro, Michal Chrapek*
Mentors: Michael Mashtare

42b *Mridul Arora, Peter Huang*
Mentor: Yung-Hsiang Lu

43b *Maizey Benner*
Mentor: Daniel Ferguson

44b *Andrew Beutler, Noah Curran, Ruihong Lyu, Weiqing Huang, Yuting Guo*
Mentors: Yung-Hsiang Lu, Ryan Daily

45b *Evan Bouillet, Aryan Tyagi, Shuhao Xing, Faisal Aljishi, Qi Dai, Ayomide Akande*
Mentors: Edward Delp, Carla Zoltowski

46b ■ *Kacie Bradfish*
Mentor: Stephen P. Beaudoin

47b *Rachel Casetti*
Mentors: Clarence Maybee, Andrew Zehner

48b *Erica Chadwell, Ian Carr, Labonno Zaman*
Mentor: Paul Parsons

49b *Haozhi Chen*
Mentor: Denny Yu

50b *Songlin Chen, Yidi Du*
Mentors: James G. Ogg, Aaron Ault

51b ‡ *Ivy Crank, Trang Dieu, Elizabeth Tedder, Brittany Reyes*
Mentor: Bruce Applegate

52b *Daniel Espinoza*
Mentor: Marika Santagata

53b *Nathan Everett, Connor Jones, Bridgette Burke, YinTae Wyss*
Mentor: Kari Clase

54b *Rachel Harmon, Hamed Asadi*
Mentors: Hamed Asadi, Denny Yu

55b ‡ *Gore Kao, Xiao Hu, Haobo Wang, Pranjali Raturi*
Mentors: Yung-Hsiang Lu, Ming Yin

56b *Seo Young Kim, Menna Hassan, Fischer Bordwell, Arjun Balasubramania, Jiahao Sun*
Mentor: Yung Hsiang Lu

57b *Deepa Korani*
Mentor: Md Nuruddin

58b *Sidharth Krishnamoorthi*
Mentors: Xinghang Zhang, Ruizhe Su

59b *Megan Lyons*
Mentors: Linsey Steege, Denny Yu

60b *Kalyan Mada*
Mentors: David Ebert, Morteza Karimzadeh

61b *Alexandra Gray, Cecelia Maginot, Kelsey Vought*
Mentors: Dulcy Abraham, Srinath Kumar

62b *Joshua Majors*
Mentor: Yung-Hsiang Lu

63b *Hannah McGinness*
Mentors: Rajamani Gounder, Elizabeth Bickel

64b *Daniel Merrick, Karthik Maiya, Kirthi Sivamani, Rui Wang*
Mentor: Yung-Hsiang Lu

65b ‡ *Daniel Meulbroek*
Mentor: Dan Ferguson

66b *Julia Meyer*
Mentor: Ivan Christov

67b *Abhipri Mishra*
Mentor: Mathew Tantama

68b *Laura Mudge, Fajar Ausri*
Mentors: Denny Yu, A. J. Schwichtenberg

- 69b ‡ *James Muskat*
Mentors: Kari Clase, Stephen Miloro
- 70b *Molly Newquist, Charles Guinn*
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- 71b ‡ *Andrew Nguyen*
Mentor: James L. Garrison
- 72b *Quynh Nguyen, Kiersten Troyer, Ivy Crank, Nikita Patil*
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- 73b *Lauren Novak*
Mentor: Kari Clase
- 74b *Rohan Prabhu, Moiz Rasheed, Sumati Gupta, Ethan Glaser, Juanda He, Ian Haggerty, Paul Chang, Ashita Bawankule*
Mentors: Yung-Hsiang Lu, David Barbarash
- 75b *Raghul Prakash, Siddharth Inani, Yuichiro Suzuki, Krister Ulvog, Fiyi Ogunkoya*
Mentor: Barret Robinson
- 76b *Unnati Pulla, Trisha Zalani, Quang Nguyen, Binoy Shah*
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- 77b *Yaodong Shen, Luke Thoma, Jongwon Min, Young Sun Kim, Hojung Ryoo, Brandon Skiles*
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- 78b *Elizabeth Shu*
Mentors: Daniel Ferguson, Matthew Ohland
- 79b *Wil Stuckey, Nicholas Tomlin, Tom Cody, Hamza Tanzeem, Nate Eckhart, Dan Irby, Rochan Nachiketa Yakkundi, Shynggys Menglibay, Sayed Hashem Had Alaali*
Mentors: Hossein EbrahimiNejad, Catherine E. Brawner
- 80b *Brooke Walsh, Kevin Phelps, Peymon Dalirifar, Nazura Ramli*
Mentor: Mohammad Reza Jahanshahi
- 81b *Jiaxin Wang, Lalit Maharjan, Zhan Gao, Brian Cardon, Jia Cheoh, Koustav Samaddar, Zhibo Hou*
Mentor: Daniel Ferguson
- 82b *Yuanhao Wang, Yunlei Yan, Yuan Liu*
Mentor: Guang Lin
- 83b *Feidi Xie*
Mentor: Guizhen Wang
- 84b ‡ *Yuxin Zhang, Karan Oberoi, Songlin Chen, Yidi Du, Charles Franchville*
Mentor: Andy Khan

College of Health & Human Sciences

- 85b *Zoe Carlson-Stadler*
Mentor: Amy Brewster
- 86b ■ *Shelby Claflyn*
Mentor: Brandon Keehn
- 87b *Jacob Cole*
Mentors: Margo Monteith, Laura Hildebrand
- 88b *McKenna Deckard*
Mentor: Heather Eicher-Miller
- 89b ‡ *Soyol Enkh-Amgalan*
Mentor: Vetricia L. Byrd
- 90b *Shuyu Gao, Emily Rolan, Nayantara Nair, Kristine Marceau*
Mentors: Kristine Marceau, Emily Rolan
- 91b *Yuankai Ge*
Mentor: Jiong Sun
- 92b *Naomi German*
Mentors: Jason Harris, Marcia Robinson
- 93b *Katherine Goulden*
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- 94b *Tiarra Harney*
Mentor: Sulma Mohammed
- 95b *Chace Henning*
Mentors: Mathew Tantama, Emily Haynes
- 96b *Courtney Isgett*
Mentors: Shelley MacDermid Wadsworth, Christine McCall
- 97b *Kathryn Jamieson, Emily Ball, Scotlyn Sunkel*
Mentors: Andrea DeMaria, Stephanie Meier
- 98b *Derek Kahng*
Mentor: Viola Zheng
- 99b *Jim Kanani*
Mentor: Yumary Ruiz
- 100b *Christina Kaucic*
Mentors: Jennifer Freeman, Keturah Kiper
- 101b ■ *Emma Kaye*
Mentor: Jonathan Day
- 102b *Kayla Kollmann, Joey Shin, Liberty-Ann Shelton, Patricia Aguilar*
Mentors: Nicole Witthuhn, Bridgette Tonnsen

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‡ = Interdisciplinary Research Project

■ = Honors College Student Researcher

103b *Vera Kotelnikova*
Mentor: Olga Lyanda-Geller

104b *Maya Kumar*
Mentors: Kristine Marceau, Emily Rolan

105b *Zhengliang Lan*
Mentor: Susan E. Swithers

106b *Rebecca Lapidés*
Mentor: Dennis Savaiano

107b *Zian Liu*
Mentors: Michael Wendt, Saeed Akhand

108b ■ *Andi Long*
Mentor: Jonathan Bauchet

109b ‡ *Christine Medin*
Mentors: Stephen Lindemann, Riya Thakkar

110b *Leroy Medrano*
Mentor: Cleveland Shields

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Mentor: Douglas Samuel

113b *Claudia Nieves*
Mentors: Jason Canon, Shreesh Sammi

114b *Huong Pham*
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115b ■ *Alyssa Pierotti, Jacob Herr, Sarah Cook*
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116b *Elizabeth Roach*
Mentor: Carlos Perez Torres

117b *Carissa Serratos*
Mentors: A.J. Schwitchenberg, Ashleigh Kellerman

118b *Emily Stahly*
Mentor: Ximena B. Arriaga

119b *Amber Swint, Samantha Howell, Breanna Martin-O'Dell*
Mentors: Taylor Halligan, Bridgette Tonnsen

120b *Lucas Turner*
Mentor: Jennifer L. Freeman

121b *Emma Wallens*
Mentors: Linda Nie, Xinxin Zhang

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Mentors: Xintan Lehto, Alei Fan, Lihan Huang

123b ‡ *Carlie Wilson*
Mentors: Aura Ankita Mishra, Sharon Christ

124b *Frank Yanko, Chloe Rivers*
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125b *Yichuan Yin*
Mentor: Kipling D. Williams

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126b ◇ *Manuel Arauz*
Mentor: Tara Johnson

128b *Matthew Ball*
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129b *Ellen Deemer*
Mentor: Trenton Mize

130b *Gabe Cassala*
Mentor: Doug Osman

131b *Alicia Geoffray*
Mentor: Dino Felluga

132b *Amanda Gozner, Corissa Meyer*
Mentor: Erik Otarola-Castillo

133b ‡ *Dalton Griffin*
Mentor: Doug Osman

134b *Dingdan Hou*
Mentor: Hongjian Wang

135b *Navni Kharde, Ellen Deemer*
Mentor: Trenton Mize

136b *Paige Kinder*
Mentor: Elizabeth Hoffman

137b *Rachel King*
Mentors: Laura Zanotti, Elizabeth Wirtz

138b *Grace Long*
Mentor: Laura Zanotti

139b *Joshua Martin*
Mentor: Elena Benedicto

140b *Emily Mast, Brendan Robb, Ashlie Clark, Korbyn Torres*
Mentor: Jennifer Bay

141b *Sarah Merryman*
Mentors: Elizabeth Geib, Harry Denny

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■ = Honors College Student Researcher

- 142b *Claire Meyer*
Mentor: Torsten Reimer
- 143b *Brenae Newhard*
Mentor: Elizabeth Mercier
- 144b *L. Nikolai*
Mentor: Ronnie B. Wilbur
- 145b ◊ ■ *Isabelle Ortt*
Mentor: Michele R Buzon
- 146b *Alexandra Paoli*
Mentor: Allegra Smith
- 148b ◊ *Scott Straight, Khalil Williams*
Mentor: Stacey Holden
- 149b *Jay Tockstein*
Mentor: Elizabeth E. Mercier
- 150b *Nicole Williams*
Mentor: Jennifer Bay
- 152b *Isabella Zuffoletti*
Mentors: Erik Otarola-Castillo, Melissa Torquato

College of Pharmacy

- 153b ‡ *Julia Czarnik*
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- 154b *Athena He*
Mentors: Tony Zhou, Nivedita J. Shetty
- 155b ‡ *Megan Routh*
Mentors: Robert Duncan, Yemimah King
- 157b ■ *Shannon Zhou*
Mentor: Madduri Srinivasarao

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- 158b *Brent Bachman, Anna Hallowell*
Mentors: Kimberly Kinzig, Elizabeth Sahagun
- 159b *Sidnie Bienz*
Mentor: Gudrun Schmidt
- 160b ‡ *Antonio Bonifasi*
Mentors: Greg Michalski, Elizabeth Olson
- 161b *Jacob Brejcha*
Mentor: Jianghanyang Li

- 162b *Sara Carpenter*
Mentors: Dennis Minchella, Jonathon Vannatta
- 163b ■ *Kaitlyn Cooper*
Mentor: Dennis Cladis
- 164b *Emre Coskun*
Mentors: Yuk Fai Leung, Logan Ganzen
- 165b *Taryn Coyle*
Mentor: Seema Mattoo
- 166b *Elisabeth DeMarco*
Mentor: Estuardo Robles
- 167b *Tong Ding*
Mentors: Jingwei Hu. Math department
- 168b *Jeffrey Dorsch, Vincent Phillips, Claudia Li*
Mentors: Alexander Chubykin, Alexandr Pak
- 169b ‡ *Jocelyn Elgin*
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- 170b *Benjamin Flueckgier*
Mentors: Kavita Shah, Hanan Haymour
- 171b *Emily Godollei*
Mentor: Landon Jones
- 172b *Anna Hallowell, Brent Bachman*
Mentors: Kimberly Kinzig, Elizabeth Sahagun
- 173b *James Haydock*
Mentors: Jordyn Miller, Marty Frisbee
- 174b *Brody Connor*
Mentors: Dan Milisavljevic, John Banovetz
- 175b ‡ *Bode Hoover*
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- 183b ‡ *Jayla Langford*
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Mentor: Mark Hall
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- 186b *Kiersten Nelson*
Mentors: Hector Zumbado-Ulate, Catherine Searle
- 187b ‡ *Paula Pandolfi, Mikaela Hand, Avantika Bhardwaj, Sharonluz Torres*
Mentor: Kari Lynn Clase
- 188b ‡ *Paula Pandolfi*
Mentors: Michael Mechikoff, Kok Zhi Lee
- 189b *Alexa Parker*
Mentor: David A. Sanders
- 190b *Alex Piroozi*
Mentor: Christine Hrycyna
- 191b *Alexis Pittman*
Mentor: Trevor Stamper
- 192b *Sasmita Rout*
Mentors: Philip Low, Fenghua Zhang
- 193b *Emily Sanders*
Mentor: Sharra L Vostral
- 194b ■ *Ruhani Sansoya*
Mentor: Panae Noomuna
- 195b *Abby Sebol*
Mentor: Ernest Agee
- 196b *Hannah Smith*
Mentors: Marisol Sepulveda, Michael Iacchetta
- 197b *Xinyi Tan*
Mentors: Harsha Honnappa, Anna Tataro
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Mentor: Robin Tanamachi

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Mentor: Richard Kuhn
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Mentors: Andreas Jung, Souvik Das
- 205b *Justin Shing Him Wong*
Mentors: George Agbeworvi, Corey Thompson
- 206b *Jessyca Woods, Lawrence Fung, Jonathan Wilker*
Mentor: Gudrun Schmidt
- 207b ‡ *Jiexiong Xu, Zixin Xiong, Andrew Wildridge, Ethan Zweig*
Mentor: Andreas Jung
- 208b ■ *Zijie Zhou*
Mentor: Jonathon Peterson

College of Veterinary Medicine

- 209b *Colin Harris*
Mentor: Laurent Couetil

College of Exploratory Studies

- 210b *Rod Van Pelt, Tyler Lim*
Mentor: Libby Chernouski
- 211b *Rod Van Pelt*
Mentor: Libby Chernouski

Krannert School of Management

- 212b *Matthew Campbell*
Mentor: Cliff Fisher
- 213b *Kelsey Hoke*
Mentor: Cara Putman
- 214b ■ *Lindsey Prommer*
Mentor: Melissa Swisher

Purdue Polytechnic Institute

- | | | | |
|--------|--|--------|---|
| 215b ■ | <i>Daphne Fauber</i>
Mentor: Hsin-Yi Weng | 224b | <i>Mohammad Javad Mirshojaeian Hosseini, Shih Hung</i>
Mentor: Robert Nawrocki |
| 216b ‡ | <i>Anna-Nikol Georgiev, Kathryn Myers, Kierra Jammer, Morgan Callin, Taylor Sorrel</i>
Mentor: Kari Clase | 225b | <i>Saw Yan Naung</i>
Mentor: Robert Nawrocki |
| 217b ‡ | <i>Qingyuan Hu, Alexander Mullenix, Christine Wang</i>
Mentor: Julia Rayz | 226b ‡ | <i>John Phan</i>
Mentors: Julia Taylor Rayz, Kanishka Misra |
| 218b | <i>William Hubbard</i>
Mentor: Kereshma Afsari | 227b ‡ | <i>William Rowe</i>
Mentor: Scott R Bartholomew |
| 219b ‡ | <i>Renee Keilman</i>
Mentors: Lisa Bosman, Julius Keller | 228b | <i>Vanessa Santana</i>
Mentor: Scott R. Bartholomew |
| 220b ‡ | <i>Christopher Lacny</i>
Mentor: Jiansong Zhang | 229b ‡ | <i>Michael Staats, Maxwell Williams</i>
Mentor: Anthony Bushner |
| 221b | <i>Edith Mauro</i>
Mentor: Vetricia L. Byrd | 230b | <i>Aaron Teo</i>
Mentors: Julius Keller, Flavio Mendonca |
| 222b | <i>Natalie McGuckin</i>
Mentor: Mark Daniel Ward | 231b | <i>Zach Vallow</i>
Mentor: Vetricia L. Byrd |
| 223b ‡ | <i>Elizabeth McGuckin</i>
Mentor: Vetricia L. Byrd | 232b | <i>Daniel Young</i>
Mentor: Lisa Bosman |
| | | 233b | <i>Qiuhan Zhang</i>
Mentor: Vetricia L. Byrd |

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Interdisciplinary research poster awards are chosen and presented by the Purdue University Libraries & School of Information Studies.

Poster Number: 1b :: Life Sciences

College of Agriculture

Identifying New *Drosophila melanogaster* Cdc7 Regulatory Subunits

Author:

Benjamin Anderson

Abstract:

Cell Division Cycle 7 (Cdc7) is a serine/threonine kinase required for the activation of minichromosomal maintenance complex 2-7 (Mcm2-7) helicase and therefore DNA replication. Cdc7 itself must be bound to Dumbbell-Former 4 (Dbf4) to function. Cdc7 and Dbf4 are well conserved across many eukaryotic species, such as humans, *Xenopus*, yeast, and *Drosophila melanogaster*. This study focuses on *D. melanogaster* Cdc7 and its Dbf4 like regulator Chiffon. Recent studies have suggested that Chiffon may not be the sole regulator of Cdc7 and that a second regulatory protein might exist, and we hope to identify them. Human Dbf4 was discovered because of similarities to yeast Dbf4, thus by identifying *D. melanogaster* Cdc7 regulators it is possible that new human Cdc7 regulators could be identified. Cancer is caused by improper cell cycling, so perhaps by identifying Cdc7 regulators new targets for cancer medicines could be found. To find the new subunits a Yeast 2-Hybrid Mating Assay was performed, which identified two interactors, Tubulin Binding Cofactor B (TBCB) and Maf1. These proteins will be further analyzed for activity as Cdc7 regulators.

Research Mentor: Dr. Vikki Weake, Department of Biochemistry, College of Agriculture; Eliana Torres-Zelada, Department of Biochemistry, College of Agriculture

Poster Number: 2b :: Life Sciences

College of Agriculture
Mycobacterium bacteriophage Discovery and Genomic Annotation

Author:

Katelyn Bormett

Madeline O'Neill

Misbah Chagpar

Cindy Jiang

Abstract:

This project centers around a global effort to discover and annotate the draft genomes of bacteriophage (phage), which are a family of viruses with bacterial hosts. This distinct feature of phages makes them a suitable alternative to antibiotics in tackling antibiotic resistance bacteria causing infectious diseases. Phages were isolated from soil samples in the wet lab, and their DNA amplified for genome sequencing.

The second part of the project involved the comprehensive annotation of genome segments, such as Corazon genes 75 through 86 and portions of Krili and Smooch. All three phages belong to the Siphoviridae morphotype. Corazon was isolated through the process at Lafayette College [40.698 N, 75.2102 W], and its data sequencing was completed on December 15, 2017. Corazon belongs to the S cluster (lytic life cycle), and Krili and Smooch belong to the O cluster. DNA Master and PECAAN, genome annotation tools, were used to analyze the genomes. Starterator and Phamerator were also used to compare these genomes with published phages in the same bacteriophage cluster. Start sites were selected for each gene and functions were determined through databases such as NCBI, HHPred, Phamerator-Synteny, and PhagesDB, which compared the draft genes to functions of existing, published genes. By comparing to published genes, four functions were determined for Corazon draft genes 75 through 86: glycosyl transferase, o-methyltransferase, methyltransferase, and galactosyltransferase. This project contributes to the nation-wide SEA-PHAGES program that works to discover unique bacteriophages.

Research Mentor: Dr. Kari Clase, ABE, College of Agriculture; Ikenna Okekeogbu, ABE, College of Agriculture

Poster Number: 3b :: Life Sciences

College of Agriculture

15q11.2 Deletion Syndrome: Expanding the Phenotype

Author:

Rebecca Carr

Abstract:

Although multiple reports exist in the literature of patients with 15q11.2 deletion syndrome, the variability of the phenotype has made clinical delineation difficult. In addition, 15q11.2 deletion syndrome appears to present not only with variable expressivity but also variable penetrance. We present clinical findings in a group of 16 patients with 15q11.2 deletion syndrome confirmed by microarray analysis. The group consisted of 10 male and 6 female patients between the ages of 3 and 15 years. The most common clinical findings included developmental delay (94%), hypotonia (88%), ADHD (75%), anxiety (50%), feeding difficulties (44%), autism (31%), dolichocephaly (25%), 2-3 toe syndactyly (19%), seizure activity (19%), and congenital heart disease (13%). Additional findings included prominence of the metopic suture, epicanthal folds, micrognathia, ankle torsion, incontinence, and sleeping difficulties. Our developmental evaluation by the Bayley Scales of Infant Development indicated an average Mental Developmental Index of 75 (NL = >85) and Motor Developmental Index of 75 (NL = >85). Close to 43% of patients had an occipito-frontal circumference (OFC) greater than or equal to the 97th percentile which suggests relative macrocephaly as a prominent feature in this group of patients. About 86 % of the cases required medical intervention of their neurobehavioral difficulties, and all responded well to treatment showing improvement of their neurocognitive functioning as evidenced by school reports and resolution of symptoms. The data provided here intends to expand the phenotype of the 15q11.2 deletion syndrome and contribute to the recognition of affected patient needs of treatment.

Research Mentor: Dr. Luis Escobar, Medical Genetics and Neurodevelopmental Center, Peyton Manning Children's Hospital;

Poster Number: 4b :: Life Sciences

College of Agriculture

Measuring the Effects of pH on Fungal Growth in the Presence of Lead

Author:

Janice Chan

Abstract:

According to the United States Environmental Protection Agency, at least twenty percent of the total exposure to lead for an individual comes from drinking water. Consuming lead causes damage to the nervous system in both adults and children, and can affect blood pressure and kidney function in adults. The amount of lead in water not only affects human health, but is also toxic to animals as well. Current methods of decreasing the amount of lead contamination in water consists of filtration methods that can be expensive when implemented in larger bodies of water. A cheaper method of decreasing lead in water is through using corn stover lignin and the fungus *Pleurotus ostreatus*. Corn stover lignin effectively removes lead from water through absorption and is degraded by the fungus, which leads to the decrease in lead contamination. However, the effect of pH on the growth of the fungus in the presence of heavy metals such as lead is unknown. The purpose of this study is to determine the survival rate of *P. ostreatus* in varying concentrations of lead and pH. The expected results from this research will help determine whether or not the fungus can be used as a successful biological means of metal recovery in water. The methods used in this research can serve as a stepping stone into decreasing other heavy metals in water.

Research Mentor: Dr. Abigail Engelberth, ABE, College of Engineering;

Poster Number: 5b :: Life Sciences

College of Agriculture

Cover crop aggregation cycle in first year cover crop treatments

Author:

Christine Charles

Abstract:

Strongly bound groups of soil particles, known as soil aggregates, are formed through biological, chemical, and physical mechanisms and are measured through aggregate stability tests. Increasing aggregate stability improves the structure of the soil and thus plays a significant role in improving the capacity of soil to act as a living ecosystem that sustains plants, animals, and humans. One way to improve aggregation is by growing cover crops. Cover crops are planted between cash crop growing seasons in order to provide year round cover for the soil, thus incorporating some attributes of natural ecosystems.

The experiment tested the influence of cover crops on soil aggregation over a growing season. Cover crops were planted in fall of 2018 at the Purdue Agronomy Center for Research and Education in West Lafayette, IN. Three treatments were tested: no cover, 14 species cover crop mix, and oats. Each treatment had seven replicate plots in a randomized block design. Observations on cover crop growth were regularly taken to track cover crop emergence, growth, and death. Cover crop biomass samples were harvested periodically to quantify aboveground biomass growth. Aggregate stability was tested using wet sieving analysis to test soil resistance to erosive forces. Aggregation changes over time due to seasonal weather changes and as cover crops grow, exude carbon, die, and decay. Thus, soil aggregate stability will also be measured before planting in the 2019 season to observe the influence of fall cover crop treatments on soil aggregate stability in the spring compared to the fall.

Research Mentor: Dr. Eileen Kladvko, Agronomy, College of Agriculture;

Poster Number: 6b :: Life Sciences

College of Agriculture

Characteristics of Myocardial Infarction Post Heart Attack

Author:

Abigail Clifford

Abstract:

Coronary artery disease continues to be the leading cause of death in the United States. Despite many medical advances, there is still a need for a reliable, non-invasive technique to accurately assess the structural ramifications of a heart attack. This project aims to use 4D ultrasound imaging to analyze changes in myocardial function and monitor cardiac remodeling after a heart attack. Fifteen adult, male C57BL/6 mice were separated into three equal groups: sham, myocardial infarction (MI) and ischemia-reperfusion (IR). Heart attacks were induced by permanently ligating the left coronary artery (MI) or temporarily ligating the artery for thirty minutes (IR). Ultrasound images were collected using a Vevo2100 ultrasound system at baseline and on days 1, 2, 3, 5, 7, 14, 21, and 28 post-surgery. Green-Lagrange myocardial strain was calculated with a noise-insensitive strain mapping technique. Cardiac tissue was harvested and stained with Masson's Trichrome. Analysis showed unremarkable changes in cardiac geometry and function between sham and baseline results. Both MI and IR showed significant decreases in ejection fraction, myocardial strain and E/A wave ratios, as well as increased chamber volume and collagen content. The MI group displayed more severe remodeling and impaired function when compared to IR. This project identifies several key findings that can potentially be used for early prediction of heart failure following a heart attack. Myocardial strain analysis offers a noninvasive estimation of the heart's mechanical function and may be used to create early prognoses for coronary artery disease patients.

*Research Mentor: Dr. Craig Goergen, Biomedical Engineering, Weldon School of Biomedical Engineering;
Arvin Soepriatna, Biomedical Engineering, Weldon School of Biomedical Engineering*

Poster Number: 7b :: Life Sciences

College of Agriculture

Exploring the Genome of the Unique S Cluster Mycobacteriophage Corazon

Author:

Julianne Dejoie

Sarah Liu

Ben Howard

Abby Murphy

Liam Johnson

Abstract:

Mycobacteriophages have come to represent a significant portion of classified bacteriophages in recent decades. They are of particular interest as they interact with the member of the genus *Mycobacterium* which contains many bacteria associated with dangerous diseases such as tuberculosis and leprosy. Understanding phages are thus advantageous for developing potential treatments for diseases associated with *Mycobacteria*. Within the grouping of phage, there are many different clusters that represent a smaller grouping of similar phages.

This project will specifically look at the S cluster phage Corazon and a recently created map of the functions, start sites and final calls made on various genes within the genome. Corazon was found in Easton, PA at Lafayette College, and was sequenced at the Pittsburgh Bacteriophage Institute. Corazon is a siphoviridae morphotype of the S cluster and currently doesn't belong to a subcluster. This paper will not explore the entire genome of Corazon, rather take a more detailed look at the center of the Corazon genome, genes 39 to 57 to be specific.

The program DNA Master was used in order to annotate the different genes of Corazon. DNA Master displays and produces auto-annotation and recommended site suggestions. DNA Master contains a program that allows us to see the open reading frames, the strength of a start site as well as a genome comparison for those in the same cluster or sub-cluster as Corazon.

Research Mentor: Dr. Kari Clase, ABE, College of Agriculture and College of Engineering; Ikenna Okekeogbu, ABE, College of Agriculture and College of Engineering

Poster Number: 8b :: Life Sciences

College of Agriculture
Homeschool Outreach Program - Immersing Students into the Plant Sciences

Author:

Jennifer Fishburn

Abstract:

Homeschool students have little exposure to hands on experiences within STEM related subjects. The sciences are much easier to grasp when a hands on component is incorporated, but due to the high cost of science equipment, most homeschool students do not have access to it. Through my project, I have introduced nearly 20 homeschool students to beginning plant science topics through a middle school outreach program. Through this program, the students have been exposed to modern equipment, such as microscopes, by participating in lab type procedures, experiments, as well as botany lessons. They will also have the availability to work within greenhouses with various plant materials that are available within the Purdue Botany Department. The experiences the students gain in this program will better prepare them for post-secondary education and encourage them to explore careers in STEM related fields. As time progresses, more and more STEM jobs are available that need knowledgeable individuals to fill them. This experience will hopefully allow the students to discover their interests within such areas of work.

The actual research component of this project is a post program survey evaluating the students' interest and enjoyment of the program, their thoughts on how valuable or useful the program was, their effort within the program, and their career or study interests after participating in this program. The goal of this survey is to determine if this program was, in fact, beneficial to the participants and if it affected their interest within the plant sciences. Ultimately, we will learn if the program had a positive impact and if it is worth continuing in the future.

Research Mentor: John Cavaletto, Botany and Plant Pathology, College of Agriculture;

Poster Number: 8.5b :: Life Sciences

College of Agriculture

The Influence of Freeze-Thaw Cycles on Floodplain P Release

Author:

Qijue Chen

Abstract:

Freeze-Thaw Cycles (FTC) are one of the abiotic perturbations experienced by floodplain soils that affect the release of phosphorus (P). It is acknowledged that overwhelming dissolved P is responsible for eutrophication of aquatic systems which is a local and regional water quality problem found worldwide. Currently, there has been an increasing interest in understanding what factors affect phosphorus release and how. P is found to be highly susceptible to abiotic perturbations experienced by soil, and various environmental characteristics such as soil type and land practice will influence this susceptibility. Thus, this experiment determines the impact of soil characteristics and land use on P release following a FTC in the floodplain. Soil cores were taken from four sites, each with nine subsites in different locations, with various soil types and land practices alongside the Wabash River. Two treatments of flooded soil incubations were established, one after FTC and the other as a control. Variables such as soluble P (PO_4), temperature, dissolved oxygen, and pH were measured periodically over the course of 21 days. It is hypothesized that FTCs in floodplains will cause increases in P release that vary in magnitude with land use and soil type as the result of microorganism death and root/plant cell lysis.

Research Mentor: Sara McMillan, Agricultural & Biological Engineering, Agriculture;

Poster Number: 9b :: Life Sciences

College of Agriculture

Directed Evolution of ASGARD, a Guide-Dependent Targeting Endonuclease

Author:

Kevin Fitzgerald

Abstract:

Genome editing tools are necessary for the efficient manipulation of desired traits to create new medicines, therapies, biofuels and agricultural products. Although the popular CRISPR systems have been used as tools for the mediation of guide-specific DNA cleavage, the need for a protospacer adjacent motif (PAM) near targeted domains continues to limit their modularity in various applications. A different endonuclease, ASGARD, has demonstrated the ability to mediate targeted DNA cleavage in bacteria but without the need for a PAM site. ASGARD, however, displays high off-target activity that is potentially lethal to engineered cells. Thus, a library of mutants will need to be created and screened for more efficient activity. Here, I describe two screening methods to select for highly specific ASGARD mutants. The first method features a plasmid encoding the CcdB toxin which will kill the cell should ASGARD fail to cleave the parent plasmid. The second method features a competing endonuclease system using I-SceI to cleave the host genome and kill the cell. In both systems, efficient and on-target ASGARD activity will rescue the cells, directly linking cell survival to the generation of an improved ASGARD mutant. Surviving cells can be recovered and used in the next iteration of directed evolution until a mutant with the desired level of activity is acquired. This highly functional mutant can then serve to effectively edit genomes for various applications.

Research Mentor: Dr. Kevin Solomon, Agriculture & Biological Engineering, College of Agriculture/College of Engineering;

Poster Number: 10b :: Life Sciences

College of Agriculture

Optimization of Ultrasound-assisted Extraction of Phenolic Compounds from Walnut Shells by Response Surface Method and Test Their Antioxidant Activity

Author:

WENYI FU

Abstract:

Walnut is one of nature's more waste-heavy products. 67% of nuts are shells and husks. In most of time, a large amount of walnut shells are disposed as waste. Phenolic compounds are potentially good natural sources of antioxidants; in addition, they prevent diseases that are associated with obesity and cancers. Therefore, if the phenolic compounds can be extracted from walnut shells, those walnut shells are able to turn from waste into treasure. Ultrasound-assisted extraction is the unique process to increase the extraction of phenolic compounds, because it able to shorter the time and increase the extraction efficiency. Response surface methodology was applied in this research for optimizing ultrasound-assisted extraction of phenolic compounds from walnut shell. The 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging activity and ferric reducing antioxidant power (FRAP) assay were used to test the antioxidant activity of the phenolic compounds, which for the determination of whether walnut shell is a good candidate for natural antioxidant material or not.

Research Mentor: Qin Xu, Food Science Department, College of Agriculture, Purdue; Shusheng Wang, College of Life Science,

Jilin Agricultural University

Poster Number: 11b :: Life Sciences

College of Agriculture

Effects of Drying and Warming on Teat-Seeking Success of Neonatal Piglets

Author:

Bailey Goff

Abstract:

With 50% of pig mortality transpiring within the first three days after birth, the access of the newborn piglet to the teat is the most crucial element post-parturition. Mortality losses following birth largely contribute to profit reductions in commercial swine management. Experimental procedures aimed to decrease piglet mortality by increasing chances of successful suckling and decreasing heat loss due to chilling have been performed to test this theory. By artificially drying the piglets with towels directly following parturition, body temperatures can be controlled and raised, and overall teat-seeking success of the offspring is expected. The objective of this study aimed to evaluate fluctuations in body temperature and overall time-to-nurse when comparing piglet groups per sow that were artificially towel dried vs. not. Flank and ear (external) along with internal body temperatures at birth, 30 minutes, and 60 minutes were recorded for 102 piglets across 13 sows / gilts. Additionally, the amount of time between time birth to successful latching on the teat was measured. Generally, flank and internal temperatures were higher in the test piglets (dried) vs. control piglets (non-dried); ear temperatures were relatively unchanged. Further groupings of high-body-weight piglets and low-body-weight piglets on the dried vs. non-dried trials was needed, as larger piglets tend to reach the teat faster despite drying. Overall, time from birth to first nursing event was decreased in dried piglets; however, this data was not conclusive enough to insinuate that drying piglets was ultimately effective. It is important to note that this procedure is routinely practiced in large commercial swine farms despite the evidence gained through this study.

Research Mentor: Dr. Kara Stewart, Department of Animal Sciences, College of Agriculture;

Poster Number: 12b :: Life Sciences

College of Agriculture

Reducing Serratia Contamination of Boar Semen with Bacteriophages

Author:

MaryKate Harrod

Abstract:

Almost all commercial pigs in the US are produced through artificial insemination. Boar semen, however, often becomes contaminated with bacteria during the collection process through environmental factors, resulting in the transmission of disease, piglet loss, and significant economic losses across the industry. Among bacteria regularly isolated from boar semen, *Serratia* is among the most problematic. As an opportunistic pathogen, *Serratia* contamination decreases semen motility, increases semen clumping, and decreases the shelf life of dosages resulting in lower conception rates and the possibility of disease transmission. Confounding the issue, *Serratia* is also resistant to many of the antibiotics approved for use in semen extenders. Bacteriophages are viruses that target and lyse specific bacteria and we hypothesized that bacteriophages could be employed to reduce *Serratia* in stored boar semen. We isolated wild-type *Serratia* phages from wastewater samples and screened isolated phages for their ability to lyse different types of *Serratia*. We then compared the bactericidal capacity of phages to a battery of antibiotics (ampicillin, chloramphenicol, ciprofloxacin, erythromycin, gentamicin, nalidixic acid, streptomycin, and tetracycline nalidixic acid) by micro-broth dilution assay. Our results showed several bacteriophages alone were effective in reducing *Serratia* growth in a dose-dependent manner where high concentrations prevented all visible bacterial growth. In some cases, co-treatment with bacteriophages and antibiotics together reduced the minimum inhibitory concentration of several antibiotics (e.g., 16 µg/mL to 2 µg/mL), producing an additive antibacterial effect. Taken together, the data demonstrate the potential for bacteriophages to be used as a biocontrol agent in stored boar semen with or without accompanying antibiotics; however, the potential impact of bacteriophages on semen itself, remains to be studied.

Research Mentor: Dr. Paul Ebner;

Poster Number: 13b :: Life Sciences

College of Agriculture

Romaine Lettuce: A Source of Undescribed Fungal Diversity

Author:

Makenna Houston

Abstract:

Abstract

Makenna L. Houston, Danny Haelewaters, M. Catherine Aime

Department of Botany and Plant Pathology, Purdue University, 915 W. State Street, West Lafayette IN 47907

Romaine lettuce is becoming increasingly known for its pathogenic outbreaks caused by *E. coli* bacteria that are causing numerous illnesses and deaths. Despite these outbreaks, very little is known about the naturally occurring microbiome on the phylloplane of Romaine lettuce and its interactions with human pathogens. This project investigates the fungal microbiome of Romaine lettuce. We purchased 63 Romaine lettuce plants from 16 different stores throughout Illinois, Indiana, Ohio, and Virginia. Homogenized samples were plated onto corn-meal agar and individual cultures were isolated using axenic techniques, in an attempt to isolate individual species and observe and describe them. Polymerase chain reaction (PCR) was used to amplify specific regions of ribosomal DNA, more specifically the internal transcribed spacer (ITS) fungal barcode region and the large subunit (LSU). We were able to isolate 330 cultures in total, representing 63 species based on comparisons with public and in-house ITS sequence databases. Of the 330 cultures, 254 were ITS barcoded. The process of sequencing the LSU locus is just now being started. At least 9 of the 63 species are new to science, in the following basidiomycete genera: *Cystofilobasidium*, *Holtermanniella* (Agaricomycotina); *Rhodotorula*, *Sampaiozyma*, *Sporobolomyces* (Pucciniomycotina); and *Tilletiopsis* (Ustilaginomycotina). Next, we plan to generate two protein-coding genes, cytochrome b (*cytb*) and translation elongation factor 1-alpha (*tef-1a*). With select cultures of new species, physiological tests are being run to determine which environments and nutrients these species grow well in and what they need to survive. Some species will grow better in certain carbon and nitrogen sources than others. This will give us insight to understand and describe the new species, possibly attributing to future research. The combination of molecular phylogenetic analyses, physiological tests, and morphological characterizations, will allow us to generate a formal description for each new species.

Research Mentor: Danny Haelewaters, Department of Botany and Plant Pathology, College of Agriculture; M. Catherine Aime, Department of Botany and Plant Pathology, College of Agriculture

Poster Number: 14b :: Life Sciences

College of Agriculture

Increased production of a drug precursor in E. coli using gene regulators

Author:

Juya Jeon

Mrugesh Parasa

Kevin Solomon

Abstract:

Bacteria have the ability to produce valuable drugs, chemicals, and biofuels. However the yields obtained are not commercially viable. In order to improve the yields, we developed an auto-gene regulator system, which can prolong cellular health by decreasing the amounts of toxic intermediates accumulated during the production of valuable products. The regulator is made up of elastin-like polypeptides (ELPs) attached to transcription factors. ELPs can sense the health of the cell and respond to changes in temperature and intracellular pH by aggregating. The goal of the project is to increase the yields of mevalonate, which is a precursor to several drugs, using our regulator. As proof of concept, we show that E. coli transformed with the mevalonate pathway and our regulator system, produce higher yields when grown at 30C compared to 37C.

Research Mentor: Mrugesh Krishna Parasa;

Poster Number: 15b :: Life Sciences

College of Agriculture

Evaluating off-target activity of programmable endonucleases for gene-editing tool development

Author:

Archana Kikla

Abstract:

Gene-editing tools that can cure disease, increase the sustainability of bioprocesses, and much more rely on our ability to cut DNA at specific programmed sequences. However, the current standard, CRISPR/Cas9, can only edit DNA adjacent to a sequence-specific motif. Prokaryotic Argonates (pAgo) have been proposed as a more flexible gene-editing tool that does not require these motifs. One of the pAgo members developed in our lab, ASGARD, has been shown to cut DNA with programmable guides, allowing for gene-editing. Despite its cutting capability, ASGARD's ability to be used as a precise editing tool is limited by its off-target activity. Here, we engineered ASGARD and evaluated its off-target activity with a cell-free system. Through protein structure comparison, we identified candidates with potential reduced off-target activity and created mutants for subsequent evaluation with a cell-free system. Using a cell-free system eliminates complex interactions in a cell that confound the effects of off-target activity. We have developed a system containing three circular pieces of DNA harboring genes for T7 RNA Polymerase (T7RNAP), ASGARD, and a green fluorescent protein (GFP), individually. T7RNAP induces ASGARD expression, which in turn reduces GFP expression if there is off-target activity. By measuring the GFP output, these assays can be used to assess the off-target activity and select an ASGARD mutant with limited off-target activity for genome editing. Identifying mutants with reduced off-target activity may lead to more precise gene-editing tools that can be used to extend the impact of genome engineering by editing any genetic region.

Research Mentor: Dr Kevin Solomon, Agricultural and Biological Engineering, College of Agriculture; Kok Zhi Lee, Agricultural and Biological Engineering, College of Agriculture

Poster Number: 16b :: Life Sciences

College of Agriculture
Corazon Genome Annotation Project

Author:

Eung Baek kim

Eunhui Yoo

Mai Liu

Chao Fu

Yejin Jang

Abstract:

Corazon Genome Annotation Project

Mycobacterium phage, Corazon, was found at Lafayette College in Easton, Pennsylvania in 2017. Its plaque was small, round and clear with siphoviridae morphology type. The approximate length of Corazon is 64931 bp with 3' sticky overhang. The overhang had 11 base length with 'GCGCGCAGCGC' sequence. To perform a manual inspection of Corazon, we performed gene annotation by reviewing and revising the prediction and identifying any missing genes using DNA Annotation programs such as DNA Master, GeneMark, BLAST, Phamerator, and HHPred. We annotated the Corazon genome in three distinct steps. First, we established a relationship with our phage, Corazon, and other phages to understand the overall genomic architectures. Second, we ran automated gene prediction proteins and functional data on the predicted gene. Third, we reviewed the prediction and made necessary changes to delete or identify any missing genes. The group annotated the mycobacterium Corazon genes 33-48. Based on the evidence supported by the programs, most of the Corazon genes from 33 to 48 were forward genes with functions such as terminase, portal protein, capsid maturation protease, scaffolding protein, head decorate protein, major capsid protein, portal protein, major tail protein, and tail assembly chaperone. Tail assembly chaperones are only shown in frameshift genes, in this case, Gene 47. Gene 47 is a frameshift gene which a nucleotide reads more than once or omitted to have two genes in the same space. Since Gene 47 is a frameshift gene, Gene 46 and 47 are overlapping. Based on the predicted functions, the segment of genes 33 to 48 of Corazon mainly consists of structural genes that are largely responsible for the formation of the phage structure. By annotating the gene in this project, it will determine the known functions of the newly discovered phage, and it will contribute to the exploration of phage genomes.

Keywords: Corazon, DNA Annotation, DNA Master, Genemark, gene, portal protein, major tail protein, tail assembly chaperone, capsid maturation protease.

Research Mentor: Dr. Kari Clase, Agricultural & Biological Engineering, College of Agriculture , College of Engineering;

Poster Number: 17b :: Life Sciences

College of Agriculture

Plant Uptake of Perfluoroalkyl Acids from Commercially Available Biosolid-based Fertilizer

Author:

Danielle Klawitter

Abstract:

The use of commercially available biosolids-based fertilizers is increasing in urban and suburban settings due to their high organic matter and nutrient contents. Previous research has confirmed the presence of contaminants including perfluoroalkyl acids (PFAAs) in biosolids-based fertilizers, raising concern over the risk of contaminating food sources. In this study, the uptake of 17 PFAAs in a commercially available biosolids-based fertilizer (Milorganite) was investigated in turnip plants (*Brassica rapa*). The plants were cultivated in a greenhouse setting, with a control (no amended biosolids) and two biosolids treatments: the recommended application rate and four times the recommended application rate. At maturity, the plants were harvested and the leaves, bulbs, and peel were analyzed separately. PFAAs were extracted from plant samples using ion-pair extraction and analyzed via liquid chromatography-tandem mass spectrometry. The biosolids and biosolids-amended soils were also extracted to quantify the level of PFAAs and to perform a mass balance analysis. In order of increasing application, the mean total PFAS concentrations in: the bulbs were 0.6 \pm 1.0, 2.7 \pm 0.4, and 4.8 \pm 1.4 ug/kg;; the leaves were 3.8 \pm 1.3, 13.8 \pm 1.2, and 18.6 \pm 3.9 ug/kg;; and the peels were 2.0 \pm 1.7, 7.4 \pm 1.8, and 13.1 \pm 4.7 ug/kg.. For each application rate, the PFAA concentrations were highest in leaves > peel > bulb. Higher application rates resulted in higher PFAA concentrations in the plants, but the four-fold increase of biosolid treatment was not directly proportional to the PFAA concentration. PFBA, PFPeA, and PFHxA were detected in higher concentrations for all treatment levels and plant parts, suggesting that short-chain PFAAs have a higher mobility than longer-chain PFAAs. This study suggests that PFAAs from biosolids-based fertilizers have the potential for uptake and partitioning into different portions of the turnip plant. More research is needed to fully understand the potential risk of PFAAs plant uptake to human and environmental health from biosolids-based fertilizers in urban and suburban gardening.

Research Mentor: Dr. Michael Mashtare, Agronomy and Environmental and Ecological Engineering; Rooney Kim Lazcano, Department of Agronomy, Ecological Sciences and Engineering Interdisciplinary Graduate Program

Poster Number: 18b :: Life Sciences

College of Agriculture

Discovery of start sites and gene functions in annotated Corazon genome

Author:

Emma Lietzke

Shruthi Garimella

Bach Vu

Davide Delisi

Brittney Mavrenovic

Abstract:

Bacteriophages (phages) are viruses that infect and replicate inside of specific bacterial hosts. Thus, scientists have analyzed thousands of phages to see if there are potential new treatments for bacterial infections. In order to understand the function and properties of a phage, its genome must be analyzed. The purpose of this particular study was to completely annotate a set of genes (Genes 17-32) within the unique bacteriophage, Corazon, isolated from 5387-10351 bp. Corazon is a lytic bacteriophage in the S cluster belonging to the family Siphoviridae. Corazon's genome originally consisted of 108 genes, for a total length of 64931 base pairs (bp).

This study utilized a DNA annotation software, DNAMaster, and several online resources, including PhagesDB, HHPred, Phamerator, and Starterator, to determine optimal gene start sites and to predict respective functions. This was done by comparing the genome of Corazon to the phages in the S cluster. The start sites for Genes 19 and 21 were changed after comparing BLAST results of potential start sites. Gene 24 was deleted because the gene was not conserved in phages from the S cluster. Among the 15 annotated genes, functions were identified in two reverse genes. Gene 23's function is "helix-turn-helix DNA binding domain protein," which modulates the process of transcription. Gene 32's function is "DNA-methylase," which adds methyl groups to alter DNA activity. The remaining genes had unknown functions, deemed "no known function."

These annotations will help identify start sites and functions of similar S cluster genes discovered in the future. This research aids in further understanding of how bacteriophage genomes have unique properties that can be applied to modern day medical techniques and phage therapy.

Research Mentor: Kari Clase

Department of Agricultural & Biological Engineering

College of Agriculture;

Poster Number: 19b :: Life Sciences

College of Agriculture

Synthesis and Validation of Acetyl- and Malonyl-CoA Analogs for the Study of Substrate Specificity and Mechanism of Acyltransferases

Author:

Jianheng Ling

Abstract:

Acyltransferases (AT) are seen in a wide variety of metabolic functions. These include enzymes in polyketide synthase pathways (PKSs), fatty acid biosynthesis, energy production, and secondary metabolism. The products from these enzymes often include pharmaceutically important natural products. ATs can transfer a variety of metabolites, such as acetyl, malonyl, succinyl, and larger chain fatty acyl groups using Coenzyme A (CoA). The reactivity of the thioester sulfur allows for transfer of these metabolites to secondary metabolites or enzymes.

One such example of an AT is type III chloramphenicol acetyltransferase (CATIII) from *E. coli*. CATIII attaches the acetyl moiety of acetyl-CoA to a hydroxyl group on the antibiotic chloramphenicol, thus conferring chloramphenicol resistance to bacterial cells via O-acetylation. Previously, the structure of CATIII had been solved with its first substrate, chloramphenicol, bound. However, the interaction between CATIII and its second substrate, acetyl-CoA, is not understood very well. Through x-ray crystallography and the synthesis of analogs of acetyl-CoA, this project aims to elucidate the interaction between CATIII and both of its substrates (chloramphenicol + acetyl-CoA). This will validate the usefulness of a wide variety of acyl-CoA analogs for use in other acyltransferases.

Research Mentor: Jeremy Lohman, Biochemistry, Agriculture; Aaron Benjamin, Biochemistry, Agriculture

Poster Number: 20b :: Life Sciences

College of Agriculture
Grinding behavior in mice

Author:

William Maniscalco

Abstract:

Some laboratory mice exhibit abnormal behaviors such as grinding their food pellets into crumbs without ingesting the ground material, indicating poor welfare. This material is referred to as orts. Previous studies have demonstrated that giving mice sunflower seeds reduces ort production. However, it is unknown if the seeds help because of the natural shelling behavior they let mice express or if grinding is driven by nutritional needs. We hypothesize that that nutritional components are driving grinding behavior and therefore both treatments will similarly reduce ort production compared to controls. A total of 24 mouse cages (CrI:CD1; 4 mice per cage; 12 male and 12 female cages) were randomly allocated to a treatment: control, sunflower seeds (nutrition+behavior; 50g), or a pelleted diet nutritionally like sunflower seeds (nutrition; 25g). All cages received these treatments in addition to their regular diet. Bedding was collected once a week for 2 baseline weeks, 3 treatment weeks, and finally 2 weeks after the treatments were removed. Bedding was dried then sifted to determine weekly ort production. The difference in ort weight from baseline was calculated and averaged for each time point. Surprisingly, when given the nutrition only treatment, average ort production increased compared to control cages. The nutrition+behavior treatment was not different than other treatments. Overall, average ort production decreased during the treatment period compared to after the treatment was removed, regardless of treatment the cage received. This suggests that nutritional value of the seeds may not explain the motivation for food grinding behavior.

Research Mentors:

Dr. Brianna N Gaskill, Animal Behavior and Welfare, Department of Animal Science

Research Mentor: Brianna N. Gaskill

Animal Sciences

College of Agriculture;

Poster Number: 21b :: Life Sciences

College of Agriculture

An Investigation of a Cluster S Mycobacteriophage Genome, Corazon, Genes 4-16: Location and Function

Author:

Marina Mehling

Abstract:

Mycobacteriophages are a type of virus particle that specifically attack mycobacteria. This attribute can be exploited to fight antibiotic resistance mycobacteria. As of February 2019, only 14 Cluster S types (a specific group of mycobacteriophage) have been completely sequenced and published in the Actinobacteriophage Database. The purpose of this investigation is to establish the presence, location, and function of genes within the genome of a novel bacteriophage, Corazon and add to this database.

Corazon, isolated from a soil sample collected in Lafayette, Indiana, is a member of Cluster S and belongs to the Siphoviridae morphotype. It has 109 genes and a 64kbp genome size. The genome was analyzed with the program DNA Master and a variety of sources such as NCBI BLAST, HHPred, and Phamerator to determine the location and function of genes within the auto-annotated range of genes 4-16. Within the investigated range, only one gene was assigned a function (MazG-like nucleotide pyrophosphohydrolase, which interacts with an essential GTPase in bacteria). The other 13 genes were annotated as genes with no known function. The investigation of significant gaps in the genome resulted in an additional gene (14.5) being added.

Contributing to the global understanding of bacteriophages is of interest since the phage-bacteria model has expanded scientists' capabilities of studying evolution and exploring novel medical applications. Publishing these annotations will allow generations of researchers to compare their results to this member of Cluster S and potentially identify a new candidate for phage-mediated transduction, phage therapy, or other application.

Research Mentor: Dr. Kari Clase, ABE, College of Agriculture/College of Engineering;

Poster Number: 22b :: Life Sciences

College of Agriculture

Effect of Cultural Practices on Organic Onion Phytochemicals

Author:

Edward Moncada

Abstract:

Effect of Cultural Practices on Organic Onion Phytochemicals

Allium leaf miner (ALM) is one of the new invasive pest that severely reduces the marketability of organic onions . Several cultural practices have been evaluated for managing this pest as available options for registered organic pesticides are limited. The purpose of this study was to determine the influence of cultural practices designed to reduce ALM population, on the post harvest pungency, sugar content, antioxidant activity and total phenolic content of onions. To achieve this, the study followed different variables such as cover crop mixtures (crops associated- or not-associated with mycorrhizal fungi), onion variety (Talon, Cortland, and Sedona), floating row covers during different periods of time (0, 1, and 2 months) and planting technique (bare ground and use of different plastic colors). According to the preliminary data, it suggests that cultural practices significantly alter the phytochemical content of the onions. We are still measuring the pungency and sugar content of post-harvest onion bulbs. Considering there is a lack of scientific-based information on viable practices that detect or avoid the ALM population, and their effect on phytochemicals, this project will assist onion growers in determining how to manage ALM in order to improve onion yields and the nutritional quality.

Research Mentor: Lavanya Reddivari, Food Science.;

Poster Number: 23b :: Life Sciences

College of Agriculture
Stomata in Bryophytes

Author:

Joshua Randall

Abstract:

Bryophytes, including mosses, are the oldest living group of land plants; therefore, they can be used to understand the origins of the organs that allowed the colonization of land. Stomata are small openings found on the leaves of vascular plants to allow for water and carbon dioxide transfer, but in bryophytes the sexual organ, or sporophyte, has been found to also have stomata. Using collected mosses from central Indiana, this study is intended to determine the presence of stomata across different moss lineages and their anatomy. Mosses were keyed out using a dichotomous key according to gametophyte characteristics, and stomata were examined using a compound microscope to determine size and shape. Afterwards, a simple parsimony tree was created using this information to determine when stomata likely evolved. Additional genomic information was collected from the 1000 Plant Project and BLASTPed against the SPEECHLESS (SPCH) transcription factor in *Arabidopsis thaliana* to find species across all lineages with similar proteins. The SPCH transcription factor has been confirmed to allow for the development of guard cells that form stomata, and its presence in various moss lineages was used to build another phylogenetic tree. Together, the physiological information and genomic analysis support the theory that modern stomata originated in non-vascular plants, but the history appears to be more complicated than previously thought. Stomata are present in numerous lineages of moss with varying amino acid content and structures. The hypothesis of multiple losses and gains across mosses was supported.

Research Mentor: Dr. McAdam, Botany and Plant Pathology, Agriculture;

Poster Number: 24b :: Life Sciences

College of Agriculture

Manure Applications Impacting Cover Crop Composition Dynamics

Author:

Stephen Schwartz

Abstract:

Cover crops are increasing in popularity among Midwest farmers because of both potential on-farm (soil health) and off-farm benefits (reduced nutrient losses). Specifically, there is interest in using cover crop mixtures (cocktails) to maximize these ecosystem services on an annual basis. Additionally, there is growing interest in mixing winter-kill cover crop species with over-wintering legumes species (red clover) to improve the potential of soil N cycling. However, there is a dearth of knowledge examining how individual cover crops species perform in a mixture. The results of this study will help guide Indiana corn and soybean grain growers in determining the most appropriate mixtures to maximize potential N cycling. This is essential to providing short-term benefits that will encourage cover crop adoption.

Research Mentor: Shalamar Armstrong, Agronomy Department, College of Agriculture;

Poster Number: 25b :: Life Sciences

College of Agriculture

The SLOW GROWTH4 Locus Encodes a Pentatricopeptide Repeat Protein Required for Plant Development in Arabidopsis thaliana

Author:

Robert Shrote

Abstract:

Pentatricopeptide repeat (PPR) proteins are a large class of RNA-binding proteins that are involved in post-transcriptional processing of organellar RNA. In Arabidopsis alone, there are approximately 450 members of this protein family. PPR proteins associate with plant editosomes and facilitate RNA editing, splicing, processing, and stability. We have identified a gene SLOW GROWTH4 (SLO4) encoding an E/E+-motif containing PPR protein. This protein is predicted to be localized in the mitochondria. We developed homozygous knockout mutants and observed their growth using the agar-plate method. slo4 mutants are characterized by retarded plant growth and development. We hypothesize that SLO4 is required for carbon energy balance and plays an important role in the maintenance of the mitochondrial electron transport chain.

Research Mentor: Mohsen Mohammadi, Department of Agronomy, College of Agriculture; Xiangjun Zhou, Department of Agronomy, College of Agriculture

Poster Number: 26b :: Life Sciences

College of Agriculture

Road mortality and bow hunter observations show bobcat (*Lynx rufus*) population expansion in Indiana counties

Author:

Alexis Sosa

Abstract:

Following widespread declines of bobcats (*Lynx rufus*) in the Midwestern U.S., the species was apparently restricted in Indiana to forested areas of the south-central part of the state. To understand the dynamics of population recovery in Indiana, we tracked bobcat expansion at the county level by collecting data from road mortalities from 1993-2012 and from observations made by deer hunters during bow hunting season from 1995-2017. We created maps for 1) bobcat mortality and 2) bow hunter observations by county for each year within the ranges of respective data sets in ArcMap 10.5. Maps of road mortality and bow hunter observations indicate that bobcat expansion in Indiana began in the southwestern portion of the state and expanded east along the Kentucky border and also north up to the border of Lake Michigan and Michigan state. The patterns of expansion from these data sets at the county level seem to positively correspond to forested habitat and corridors and negatively correspond to agricultural habitat in Indiana. Assessing the environmental covariates of bobcat expansion in the state will be the focus of our next analyses. Understanding these patterns of bobcat expansion in Indiana will aid managers in the conservation and potential harvest of this species in the future.

Research Mentor: Dr. Landon Jones

Department of Forestry and Natural Resources

College of Agriculture;

Poster Number: 27b :: Life Sciences

College of Agriculture

Visual Behavior of *Drosophila* in the Morning and Afternoon.

Author:

Claire Stamper

Abstract:

In this experiment the visual behavior of *Drosophila melanogaster* at different times throughout the day was characterized. The circadian rhythms of *Drosophila melanogaster* are known to dictate the organism's behavioral cycles, particularly as they relate to vision, and locomotor rhythms (such as movement in response to light) [4]. The aim of this experiment was to measure the visual behavior trends of the genotype UAS-Dcr;; Rh1-Gal4, UAS-GFP-Msp300KASH at 10-days post-eclosion in the morning versus the afternoon. It was anticipated that flies assayed in the morning would have greater phototactic behavior than flies assayed in the afternoon because the activity of flies in their circadian rhythm peaks at dusk and dawn [1]. Phototaxis assays were performed on male, 10-day post-eclosion flies in order to test this hypothesis. It was found that flies assayed in the afternoon had greater phototaxis than flies assayed in the morning. The phototactic behavior for flies assayed in the morning was not only lower but also highly variable. These results suggest that there is a difference between phototactic response of flies in the morning as compared to the afternoon.

Research Mentor: Dr. Vikki Weake, Department of Biochemistry, College of Agriculture; Spencer Escobedo, Department of Biochemistry, College of Agriculture

Poster Number: 28b :: Life Sciences

College of Agriculture

Characterizing Bradykinin Neuropeptide Binding Domains for Fluorescent Sensor Design

Author:

Ashwin Sunderraj

Abstract:

Parkinson's Disease is the second most common neurodegenerative disorder in the world, typically presenting with symptoms such as restricted movement and the hallmark resting tremor. A dysregulation of inflammation has been implicated in the progression of this disease, but the role of inflammatory neuropeptides such as bradykinin is not understood. Monitoring the alterations to neuropeptide signaling could reveal further insights into the pathophysiology underlying Parkinson's Disease. However, there is currently a lack of tools with sufficiently high spatial and temporal resolution to track these changes in real-time across large regions of the nervous system. One potential method of addressing this demand is to develop a genetically encoded fluorescent neuropeptide sensor. An approach to developing these sensors uses a "Venus Flytrap", which is a dedicated neuropeptide binding domain that binds target neuropeptides and undergoes a conformational change from an open to a closed state. When fused to an engineered fluorescent protein, neuropeptide binding to the flytrap protein induces a change in the fluorescence emission. Changes in the fluorescent emission of these sensors can act as readouts for changes in neuropeptide signaling that occur during the progression of Parkinson's Disease, with both high spatial and temporal resolution. The purpose of this investigation is to identify neuropeptide sensing domains that can bind bradykinin with high affinity and retain functionality under physiologically relevant pH and temperature. Three candidate sensing domains were investigated: BsAppA, ScOppA2, and TmOppA. We optimized the expression and purification of these sensing domains in *E. coli*, in preparation for future characterization of binding affinities and heat stability with competitive fluorescent anisotropy binding assays and circular dichroism temperature ramps.

Research Mentor: Mathew Tantama, Department of Chemistry, College of Science;

Poster Number: 29b :: Life Sciences

College of Agriculture
Investigation of Bacteriophage Genomes

Author:

Lina Trigg

Rachel Damge

Estefania Martinez

Jenna Ischinger

Abstract:

Bacteriophage (phage) was first found in the 1900s by Frederick Twort on accident, with the average size of a phage ranging from 3.4kb to almost 500kb (Keen 2015). Phage have become the most abundant organisms on earth and have been used for over 90 years in the treatment of bacterial infections in humans. However, there are many types of phages that are still undiscovered and researched. Discovering and annotating new phages will expand the scientific knowledge of bacteriophage and contribute to new infection treatments.

In this project, the unique phage Corazon was investigated. This phage was discovered in Easton, PA at Lafayette College. Corazon is in the S cluster and belongs to the Siphoviridae family, which means it has a non-contractile tail. For this project, Corazon was annotated with an annotation tool called DNA Master to call individual genes and decide their start positions. This decision was supported using programs including Phamerator, Starterator, and GeneMarkS maps. Once a start position was found, the gene was analyzed to determine its function. Programs like NCBI and HHPred were used to compare the potential functions of Corazon genes with other genomes in the database.

Overall, our group received 18 auto annotated genes, and two more were discovered in the large gaps of over 30bp, totaling 20 genes that were identified for a start site, function and coding potential. Specifically, we annotated genes 57.5 through 75 (34135-43828 bp). Due to the location of our genes, most of the gene functions were unable to be determined. This genome is a member of the S cluster, which has fewer genomes with known functions, making it difficult to call functions for our genes. The functions we had were HNH endonuclease, exonuclease, hydrolase, DNA binding domain protein and WhiB family transcription factor .

Our contributions to the data of this genome will be added to a large database to assist more research regarding bacteriophage. These findings will contribute to understanding the different functions of genes in S cluster genomes. By expanding scientific knowledge on different functions of genes we can potentially contribute new phage therapies in the future.

Source: Keen, E. C. (2015, January). Retrieved from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4418462>

Research Mentor: Dr. Kari L. Clase, ABE, Purdue University;

Poster Number: 30b :: Life Sciences

College of Agriculture
Annotating a Bacteriophage Genome

Author:

Kess Turner

Serena Birdinc

Gabrielle Selvia

Lauren Oparah

Abstract:

Antibiotic resistance occurs when a bacteria is no longer susceptible to the effects of an antibiotic. Antibiotic resistance has surged in recent years due to long-term antibiotic misuse and the unique ability for bacteria to share resistant DNA with surrounding bacteria. This resistance makes the process of treating illnesses longer and more difficult. In order to combat this rising issue, scientists have resumed research on bacteriophages. Bacteriophages are viruses that infect bacteria, and then use them as a host for replication before ultimately killing the bacteria. Researchers seek to use bacteriophages as a type of “new antibiotic” due to their parasitic nature. The first step in this research is to isolate new and unique bacteriophages from the environment. After isolating these bacteriophages, the next step in is to annotate their genomes. This annotation is meant to provide more information on the genes within a specific bacteriophage, including their predicted functions. This can then be used to create better treatments, to replace antibiotics, and to fight illness.

For this semester, the specific research focused on the annotation of the novel mycobacteriophage Corazon. The section of interest was the final set of genes in Corazon, Gene 99 through Gene 109. Using the suggested start sites given by DNA Master as a template, it was necessary to determine and confirm which start site was the most likely start site for the gene. It is important to determine the appropriate start site for each gene as the respective start sites can significantly influence the function of the gene. As a group, it was also imperative to check the possibility that DNA Master may have missed a gene in the genome. In order to do this, several different phage databases were used to determine the location and function of each gene. These databases included, but were not limited to, Starterator, Phamerator, and HHPred.

Each of these programs store information about other previously-annotated genes from the same pham. In general, the majority of the genes placed at the end of the genome did not showcase many functions. Only two out of the eleven genes annotated demonstrated a function, and the function listed by both of these genes was amidotransferase. Amidotransferase is an enzyme that catalyses the removal of the ammonia group from a glutamine molecule and transfers it to another substrate, which creates a new carbon-nitrogen group. Most of the genes in this section of the genome were reverse genes and the gaps in between them were could be very large. This was especially noted in the gaps between forward and reverse genes or vice versa.

This information, along with the rest of the research gathered this semester, can be applied to future research that will increase the understanding of bacteriophage and how they can be applied to future medicine. These medical advancements can help with the current antibiotic epidemic which is vitally important as more bacteria and illnesses are becoming antibiotic resistant.

Research Mentor: Kari Clase, ABE, College of Engineering;

Poster Number: 31b :: Life Sciences

College of Agriculture

Fatty acids affect murine colon cancer cell viability

Author:

Quin Waterbury

Abstract:

Several epidemiological studies point to a strong correlation between nutrient composition of the diet and colorectal cancer. There is a positive relationship between the dietary intake of saturated fats and colon cancer risk, and a negative relationship between intake of unsaturated fatty acids and colon cancer risk, thus the role of dietary fats in colorectal cancer etiology is apparent, but not well understood. There are various ways that fat composition in the diet may be modulating cancer outcomes. One way is by modulating the types of fatty acids (FA) available to the tumor cells. We used the MC-38 mouse colon adenocarcinoma cell line as a model for studying the effects of FA availability on MC-38 colon cancer cell viability. We hypothesized that palmitate treatment would be positively correlated with viability and that oleate would be negatively associated with viability. Results from an MTT assay show that compared to the control, MC-38 cells have higher viability in media containing palmitate and have lower viability in media containing oleate. Imaging of the cells after Oil Red O staining show that the cells are not accumulating the FA, suggesting they are being utilized, and results from quantitative TAG assays confirm this. While FA can be used for energy metabolism, they also can be potent pro- and anti-inflammatory signaling molecules. Results from qRT-PCR show that both oleic and palmitic acid alter the inflammatory cytokine profile of the cells.

Research Mentor: Dr. Laura Bowers, Nutrition Science, Health and Human Science; Audrey Goldbaum, Nutrition Science, Health and Human Science

Poster Number: 32b :: Life Sciences

College of Agriculture

Effect of Photoperiod on Meat Quality Attributes and Oxidative Stability of Postmortem Broiler Fillet Meat

Author:

Erin Will

Abstract:

Effect of Photoperiod on Meat Quality Attributes and Oxidative Stability of Postmortem Broiler Fillet Meat

Erin Will, Jacob R. Tuell*, Jun-Young Park*, Weichao Wang†, Heng-Wei Cheng‡, Yuan H. Brad Kim*

*Meat Science and Muscle Biology Laboratory, Department of Animal Sciences, Purdue University, West Lafayette 47907, IN, USA

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Poster Symposium Abstract

In the broiler industry, high duration of light exposure has been utilized to maximize broiler growth efficiency and breast meat yield. However, adverse effects, including stress and leg abnormalities, can also result from increased photoperiod. Currently, little information is available on the impacts on meat quality and oxidative stability of broiler meat. Thus, the objectives of this study was to evaluate the effects of photoperiod on quality attributes and oxidative stability of broiler fillet meat (*M. Pectoralis major*). A total of 432 broiler chicks was split among 6 pens per treatment and were subjected to one of 4 photoperiod treatments: 20L:4D, 18L:6D, 16L:8D and 12L:12D(hours light:dark). At 42 days of age, 2 broilers per pen (12 broilers per treatment) were randomly selected and slaughtered under standard conditions. Fillets were removed, packaged with overwrap-PVC film and displayed for 7 d under light. Measures for meat and carcass quality, instrumental color stability and lipid/protein oxidation were taken. A significant increase in moisture loss during carcass chilling was found in the samples from broilers assigned to the 20L:4D compared to 16L:8D and 12L:12D treatments ($P < 0.05$). The 20L:4D fillets maintained highest lightness and instrumental discoloration, and least redness, throughout display compared to all other treatments ($P < 0.05$). A significant increase in lipid oxidation was found in the samples from the broilers assigned to 20L:4D and 18L:16D compared to the 12L:12D ($P < 0.05$). These findings indicate that high photoperiod may be detrimental to the final meat quality and oxidative stability of fillet meat.

Research Mentor: Brad (Yuan H) Kim

College of Agriculture, department of Animal Sciences; Jacob Tuell

College of Agriculture, department of Animal Sciences

Poster Number: 33b :: Life Sciences

College of Agriculture

Gene Annotation and Functional Analysis of Mycobacteriophage Corazon

Author:

Ryan Wollensak

Kylie Snyder

Alex Murfee

Abstract:

Mycobacteriophage (phage) can be described as a mycobacterial-attacking virus composed of a capsid head encapsulating the genome, and a tail. This study annotates the 36,500-43,500 bp region of the Corazon genome in conjunction with the SEA-PHAGES program. Corazon belongs to the Cluster S family, lytic phage that boast an average genome length of 65,000 bp and 107 genes. An auto-annotation was run on DNA Master followed by manual analysis, which was performed using the phagesDB database, DNA Master, NCBI BLAST, HHPred and Phamerator. Information such as high alignment percentages, matching query to target ratios and low e-values were used to call genes, identify gaps, and assign functions to genes within the region. Upon analysis, 14 total genes were called in the analyzed section, 13 of which were identified in the auto-annotation. The majority of these matched the original DNA Master call, except the start site of gene 62. Although most of the genes called in the aforementioned region do not have a known function, gene 64 is known to encode for a helix-turn-helix protein, while gene 65 and 68 are known to encode for an exo- and endo- nuclease respectively, indicating this section encodes for DNA regulation. Data generated from annotating the later mid-region of novel Corazon adds to the network of phage research. An understanding of gene and protein interactions of Corazon expands upon the scientific communities understanding of bacteriophages. This base knowledge supports further research, such as anti-bacterial application of phage, that has real-world impact.

Research Mentor: Kari Clase, Agricultural and Biological Engineering, College of Agriculture/College of Engineering;

Poster Number: 34b :: Life Sciences

College of Agriculture

Data Science Applications in Analyzing Water Quality in St.Mary's River Watershed

Author:

MAIQI ZHANG

Abstract:

Non-point source nutrient pollution can lead to eutrophication, a widespread problem in rivers, lakes, estuaries, and coastal oceans, caused by over enrichment with phosphorus and nitrogen in receiving waters, such as the Great Lakes. The aspect of non-point source pollution I will focus on is nutrient loss from agricultural fields, greatly affected by tile drainage. Tile drainage is a drainage system widely implemented in Midwestern area in the US, aiming to remove excess water from soil below its surface. The objective of this study is to determine effects of field scale and edge of field best management practices, such as grass waterways and cover crops, no-till on water quality and quantity. Monthly discharge data from streams and tiles, and water samples will be collected from streams and tiles in two subwatersheds of the St.Mary's River watershed, which will drain into the west basin of Lake Erie. I will analyze the concentrations of nutrients, sediment and E.coli bacteria from the collected water samples. Using the analyzed data, I will explore if there is a statistically significant relationship between implemented management practices and implications to water quality. I will examine whether the relationships we find scale up to the greater watershed by utilizing publicly available data. Through statistical analysis, I will evaluate the effectiveness of these management practices which can help managers and local educators improve the education about water quality protections.

Research Mentor: Research Mentor: Amanda Limiac

Department: Agricultural and Biological Engineering

College: College of Agriculture;

Poster Number: 35b :: Life Sciences

College of Agriculture

Novel Bacteriophage Genome Characterization for *Mycobacterium smegmatis*

Author:

Neil Zhao

Julio San Martin

Matt Jaeger

Alex Harris

Abstract:

Mycobacterium smegmatis mc2155 is a common microorganism that is examined for research laboratory experimentation. Mycobacteriophage research findings seek to provide invaluable information towards medical, industrial, and food safety prevention applications. Due to host species specificity, manifesting bacteriophage cultivars could also implicate profound future impact towards combating antibiotic-resistant pathogenic bacterial strains.

The purpose of this study was to analyze, discover, and share a segment of the genome of a novel phage, Corazon, isolated at Lafayette College. The genome has a length of 64931 bp, with a total of 109 genes. Specifically, this study examines genes 76 to 92 of the Corazon Draft and utilizes bioinformatics tools and programs, such as PhagesDB, NCBI Blast, DNA Master, Phamerator, Starterator, and HHpred. Genes were respectively characterized into gene families in regards to synteny with other Siphoviridae cluster members. This bacteriophage strain that lysed *m. Smeg.* was previously isolated from soil samples and initially characterized by transmission electron microscopy and gel electrophoresis for morphology. High titer plate methodology and lysate were then utilized to archive and prepare bacteriophage for qualitative genomic analysis. Notably, the functions predicted include O-Methyltransferase, glycosyl transferase, HNH endonuclease, galactosyltransferase, and a myriad of non-conserved or unknown gene functions. As a result, future researchers can benefit from this genomic reference point to mediate phage molecule biosynthesis and assembly.

Research Mentor: Kari L. Clase, Director, Biotechnology Innovation and Regulatory Science (BIRS) Center/Professor, Agricultural and Biological Engineering;

Poster Number: 36b :: Physical Sciences

College of Agriculture

Wildcat Creek Watershed Assessment; Restoring riparian corridors to enhance water quality

Author:

Daniel Zuercher

Abstract:

The Wabash River has been cited to become a world class waterfront and to accomplish this goal, the quality of its waters must improve. If the Wabash River is to improve, so must its tributaries. The Wildcat Creek has been identified as an impaired tributary of the Wabash due to nutrients and E. coli from agricultural runoff. There are two main goals of this assessment; first, identify areas of concern along the Wildcat, such as fields or development that are encroaching along the creek banks and determine best management practices or restoration of these areas, and secondly, identify areas with dense core habitat and strong riparian buffer and seek to improve these healthy systems. Utilizing Lidar data, overlaid with flood maps and land use layers in GIS the Wildcat Creek basin was identified as an area of great concern. Within the basin, areas of development and agriculture were identified as key sources of pollution. The study also utilized GIS tools to identify significant areas of core habitat. With these critical areas identified, best management practices and restoration work are recommended to restore riparian buffer along disturbed banks, resulting in connected habitat and diminished runoff along the Wildcat Creek.

Research Mentor: Aaron Thompson, Landscape Architecture, College of Agriculture;

Poster Number: 37b :: Life Sciences

College of Education

Gifted Assessments and Underrepresented Students: What are the Best Means of Assessment?

Author:

Julie Kim

Madeline Gavin

Abstract:

Evaluating Assessments for Elementary Level Gifted Students In the elementary level, the issue of underrepresentation of gifted students is commonly overlooked. Although we recognize that this issue is multi-determined, we focus on assessments that are currently used and might be considered ideal for detecting giftedness in elementary school students. Through detailed evaluation of six quantitative and qualitative assessments, we examine factors that may limit each assessment's accuracy at identifying gifted students. Our analysis highlights how each measure gauges giftedness by addressing the purpose of each measure, its uses, and psychometric features. We suggest that multiple means of assessment may be the best way to accurately identify gifted students from culturally and economically diverse backgrounds. Incorporating a mix of both quantitative and qualitative assessments in the identification process is needed to reflect the multi-potentiality of students' giftedness. Our findings have implications for practice as well as for the development and use of these assessments for research purposes.

Research Mentor: Youli Mantzicopolous, Educational Psychology, College of Education;

Poster Number: 38b :: Social Sciences/Humanities

College of Education

An Evaluation of NCLB, RTTT, and ESSA

Author:

Jane Sherfey

Abstract:

Policies and opinions about how best to improve the education system in the United States date back to the inception of public education. In the last several decades, enacted policies are No Child Left Behind, Race to the Top, and Every Student Succeeds Act. These policies have permeated schools and likely will continue to affect them for years to come. With each policy iteration, law-makers have attempted to tackle the same problem – e.g., the need to increase student achievement. The real question is; however, do they work? In this study, I examine evidence that targets this question. Data from school's achievement records, researchers, parents, teachers, and politicians challenge the effectiveness of these policies. Nonetheless, these policies have critical (yet largely ignored) implications for students, teachers, and schools. I highlight these implications in order to promote understanding of issues that merit critical examination in research in order to effectively inform policy.

Research Mentor: Panayota Y Mantzicopoulos-James, Educational Psychology & Research Methodology, College of Education;

Poster Number: 39b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Scalable Retrieval of Place Information

Author:

fares alqassim

Abstract:

Searching large datasets of geographical information, specifically place entries in a geographic gazetteer, remains a difficult computational problem. The primary problem with handling large datasets (with tens of millions of records) is the long time it takes to retrieve the desired data based on specified criteria. This study focuses on addressing this problem by using an open source enterprise search platform called Apache Solr that enables effective and efficient data retrieval; due to its indexing, dynamic clustering and database integration features. The dataset used in this study is retrieved from GeoNames.org, which is an open-source dataset composed of 11.5 million records of places with various types of attributes about each place name, such as population, postal codes, spatial hierarchy, and geographic location. The resulting spatio-textual index enables other applications to retrieve desired geographical data in a time efficient manner. One area for improvement and future research is to provide users with a portable platform that does not require users to have to download and configure Apache Solr from scratch.

Research Mentor: Dr Morteza Karimzadeh, Electrical and Computer Engineering;

Poster Number: 40b :: Life Sciences

College of Engineering

Analysis of Manganese Accumulation in the Pituitary Gland, Olfactory Bulb, and Hippocampus of Smelter Workers Using High Resolution 3D T1-Weighted MRI

Author:

Zeinab Aly

Molly Cromer

Alison Jeffries

Abstract:

Chronic exposure to excessive manganese (Mn) has neurotoxic effects. Excessive Mn exposure commonly occurs in the smelting and welding industries, and previous studies have found significant Mn accumulation in the basal ganglia. This study investigates the pituitary gland, olfactory bulb, and the CA2 area of the hippocampus as additional regions of Mn deposition in the brain. Animal studies have shown Mn accumulation in these regions but there are few human studies investigating these brain regions. This study analyzed high-resolution 3D T1-weighted (1x1x1.25 mm³) MRI data from a former study on 10 smelters from a Mn-Fe alloy factory and 10 controls with no history of Mn exposure. Manual regions of interest (ROIs) were placed in the pituitary gland, olfactory bulb, hippocampus, and tongue (for reference) using ITK-SNAP. The relative intensity of each region was determined by calculating the ratio of the intensities of the brain region to the tongue in order to account for natural variability in the MRI.

While no significant difference in relative intensity between smelters and controls was found in the olfactory bulb or the hippocampus, smelters showed a significant increase ($p = 0.002$) in relative intensity in the pituitary gland compared to controls, indicating increased Mn accumulation in this region. Uptake of Mn into the pituitary gland is physiologically plausible due to the lack of blood brain barrier in the pituitary gland. This study provides preliminary evidence of increased Mn accumulation in the pituitary gland in a human exposed population. This research is supported by NSF Grant DMS-1246818.

Research Mentor: Dr. Ulrike Dydak

School of Health Sciences

Health and Human Sciences; Eric Cameron

School of Health Sciences

Health and Human Sciences

Poster Number: 41b :: Life Sciences

College of Engineering

Evaluating Recycling Within Greek and Cooperative Communities

Author:

Christopher Arnold

Diana DiPretoro

Michal Chrapek

Abstract:

Previous iterations of Purdue's Campus Master Plans have not included sustainable development within the Purdue Greek and Cooperative Life Community, which neglects sustainable development goals for approximately 6000 undergraduates at Purdue. This study is focused on establishing baselines for successful sustainable development programs in the Fraternity, Sorority, and Cooperative Life Houses. One of the key metrics being investigated is the adoption rate and perception of recycling programs within shared community spaces. We hypothesize that convenience (e.g., distance to recycling drop off points) and economic perceptions are the primary drivers impacting individual sustainable practices and broader implementation within Fraternity, Sorority, and Cooperative Life housing. This study will gather information on the successful implementation of existing programs and identify challenges and barriers to those without recycling initiatives. An educational targeted campaign will be implemented within houses. Electronic surveys will be conducted to identify and assess: (1) factors that influence diversion rates; (2) perceived barriers and challenges to implementing recycling programs, and (3) the impact of the educational campaign (i.e., to gauge changing attitudes). In focusing on Fraternity, Sorority, and Cooperative Life students, we hope to utilize this information to implement long-term sustainable practices that will encompass the entirety of Purdue's undergraduate community.

Research Mentor: Michael Mashtare, Agronomy and Environmental and Ecological Engineering, College of Engineering;

Poster Number: 42b :: Mathematical/Computational Sciences

College of Engineering

Evaluating the Consistency of Contemporary Object Detectors

Author:

Mridul Arora

Peter Huang

Abstract:

Object detection neural networks are computer vision programs designed to recognize objects such as cars and humans in any given photo. They can conceivably be used for lifesaving, emergency response applications such as detecting car accidents from realtime traffic camera images. However, in order to fulfill such duties, object detectors need to be reliable. More specifically, they need to be accurate. For example, in a given photo, a car should be detected as a car, and not as anything else. In addition, an object detector should also be consistent. If the same two cars were to appear in a series of very similar, yet slightly different photos, then the two cars should be detected in each of the photos analyzed and detections should not randomly “drop out”. Many published performance metrics of object detectors include some accuracy information such as the mean average precision (mAP) and intersection over union (IoU). However, few of these papers evaluate consistency measurements. We evaluate the consistency/stability of three different object detectors: YOLOv3, ResNet, and VGG16 by generating labels for the images and using a comparison metrics to test for consistency. Some consistency evaluation metrics we will use include average labels per image over time, histograms for the size of bounding boxes provided by each detector, as well as a heatmap of the locations of these bounding boxes. At the software level, we will also evaluate the three models based on metrics such as speed (frames per second), network size (number of parameters), as well as the dataset used to train the network.

Research Mentor: Yung-Hsiang Lu, Professor, ECE Purdue University;

Poster Number: 43b :: Social Sciences/Humanities

College of Engineering

A Comparison of Peer Rating Behavior Between Students in Hard vs. Soft Disciplines

Author:

Maizey Benner

Abstract:

Many researchers believe that students in different majors/disciplines learn differently due to differences in both pedagogical approaches and personal preferences. Whether students of various disciplines behave differently in team contexts or view/perform peer evaluations differently has not been frequently explored. To remedy this, we study the differences in behavior of students in “hard” and “soft” disciplines. The notion of “hard vs. soft” disciplines has been discussed in a scholarly context at least as early as Comte’s work in 1896. Kemp asserts that students who study “hard” (generally positivist) disciplines (like math and engineering) tend to take on a surface level-thinking approach, while students in “soft” disciplines (non-positivist, such liberal arts, business, or law) tend to have a deeper thinking approach in their studies. A surface-level approach refers to concentrating on completing the task at hand, while a deeper approach refers to a deeper understanding of the meaning and interworking of a task. A common theme found in disciplines such as law is that teaching is often teacher-oriented, which is contrasted by behavioral sciences which tend to use a learner-oriented approach to teaching. Lindblom-Ylänne (2010) discovered that law students prefer a high quality lecture and class materials, as well as group work as most important in their learning, while behavioral science students prefer their instruction to build on prior knowledge, encourage the use of critical thinking, and have positive interaction between professor and student. We hypothesize that these differences in expectations for a class may translate to differences in expectations for the behavior of members of a group.

This Work in Progress research focuses on the teamwork behaviors and ratings of students in business, engineering, and liberal arts. We examine whether there are comparable differences in teamwork behavior due to fundamental differences in their particular learning experiences and preferences, as measured by their evaluations in peer evaluation surveys. The hypothesis is that engineering students (“hard discipline students”) will have significant differences in peer evaluation scores from liberal arts or business students (“soft discipline students”). This analysis will use convergence in self and peer ratings, dispersion in ratings across peer evaluation dimensions, and the variances examined in the Social Relations Model as statistical analysis methods.

Research Mentor: Dr. Daniel Ferguson

Engineering Education

College of Engineering;

Poster Number: 44b :: Mathematical/Computational Sciences

College of Engineering

An Evaluation of Modern Code Review in a Research Environment

Author:

Andrew Beutler

Noah Curran

Ruihong Lyu

Weiqing Huang

Yuting Guo

Abstract:

While working within the Continuous Analysis of Many Cameras (CAM²) research group at Purdue University for several semesters we've observed that there is consistent difficulty in merging features. We hypothesize that the lack of proper code review practice is a primary factor affecting the difficulty when incremental updates are made. Our research attempts are made to find and mitigate issues regarding code review within our team through implementing a well-structured code review process. We hypothesize that instilling the methodologies of Modern Code Review through an interactive workshop will cause fewer evolvability defects, leading to a major increase in productivity. After reviewing existing literature, we have produced a 21-question survey that will observe the current state of code review in CAM² before and after an educational workshop. The aforementioned workshop will consist of three consecutive parts: an information session where attendees will be taught how to properly use Modern Code Review; an interactive code review session where common sub-team members will work together to review production code from their own project; and finally, a discussion session to field any questions or comments attendees may have. We will use the collected data from before and after the workshop alongside the general comments at the conclusion of the workshop to determine if the compiled literature works in practice. Our definition of efficiency is achieved when teams avoid evolvability defects that slow down the progress of their individual projects and can instead make productive contributions. Should our findings verify our hypothesis we will further test and manipulate particulars within our code review methodology to continue improving the software development process within our research group.

Research Mentor: Yung-Hsiang Lu, Computer Engineering, College of Engineering; Ryan Daily, Computer Engineering, College of Engineering

Poster Number: 45b :: Mathematical/Computational Sciences

College of Engineering

Lip Reading through Video Processing

Author:

Evan Bouillet

Aryan Tyagi

Shuhao Xing

Faisal Aljishi

Qi Dai

Ayomide Akande

Abstract:

The purpose of this project is to generate live subtitles by detecting and analyzing the movement of the lips from a video source. Currently, subtitles are automatically generated from audio. This project will explore the possibility of generating subtitles by analyzing the lip movement of the people talking in the videos. The team will use a Convolutional Neural Network (CNN) to interpret the speaking and generate proper subtitles. To meet this goal, the team will train the machine with "The Oxford-BBC Lip Reading in the Wild (LRW)" dataset, consisting of up to 1000 utterances of 500 different words spoken by hundreds of different speakers. The team will begin the project by developing a classification algorithm for still images using the MNIST dataset of handwritten digits from 0-9. Methods used for 2D convolution in the digit classification algorithm will be extended to implement a 3D CNN for analyzing the video input from the LRW dataset. A 3D CNN differs from a 2D CNN in that the input is a stack of 2D images arranged in the order of time progression. The network makes changes to its parameters based on these ordered sets of images. The team will begin the project with a simple configuration that detects simple words (eg. "yes" and "no") with a target accuracy of 75%, a metric which has been achieved in similar studies. Later, the design will be expanded to a level that can detect continuous speech. The model can be developed further to achieve higher accuracy, or it can be expanded to cover different languages. This project has several applications, such as aiding those with hearing disabilities and assisting subtitle generation algorithms based on auditory information.

Research Mentor: Edward Delp, ECE, Engineering; Carla Zoltowski, ECE, Engineering

Poster Number: 46b :: Physical Sciences

College of Engineering

Power Characterization: Measuring Adhesion Forces

Author:

Kacie Bradfish

Abstract:

Powder behavior is a complex topic that influences many industrial processes, especially those involved with food and pharmaceutical processing, and has an important role in homeland security and military applications involving explosives and explosive residues. The goal of the research is to be able to predict bulk flow behavior from milligram-level quantities of powder. This is important for designing better industrial processes, and also for measuring forces between explosive particles and binders for controlling detonations. In order to characterize a powder, a centrifuge is used to determine the rotational speed, in RPM, needed to remove particles of different size from a surface of interest. Based on the size of the particles removed at each speed, their adhesion force can be determined. Using a modified van der Waals force model, it is possible to fit a distribution of 'effective' Hamaker constants to the adhesion force data. These constants are matched to the powder's particle size distribution. Using the van der Waals force model with the 'effective' Hamaker constant distribution, the adhesion behavior of the entire powder can now be described based only on the size distribution of the powder. Experiments are performed on flat surfaces with spherical particles to model the ideal case. More complex systems of ideal particles on rough surfaces are being studied to determine how surface roughness will affect the adhesion forces. These experiments will validate the theory that the adhesion force distribution of a powder, which is critically linked to its flow characteristics, can be described using simple experiments, an effective Hamaker constant distribution, and the size distribution of the powder.

Research Mentor: Stephen P. Beaudoin, Chemical Engineering;

Poster Number: 47b :: Social Sciences/Humanities

College of Engineering
University Housing's Impact on Academic Success

Author:

Rachel Casetti

Abstract:

Universities around the U.S. are continuing to grow, and as they do the need for more student housing increases. Determining what type of housing is most beneficial for students in terms of student performance and success is one of the many factors in deciding the type of housing in which to invest. Purdue is in the midst of expanding its campus to accommodate more students. Knowing the benefits and drawbacks between different types of housing can inform the type of housing Purdue chooses to develop. The primary difference is between on and off campus housing, but it is also important to look at the various types of on campus housing. For example, there are some residence halls that have 'living learning communities,' which are groups of students who live in the same residence and take some of the same classes. Figuring out how effective these learning communities are in promoting student performance and success is important so that Purdue can decide whether or not to implement more of them in the future. In this research, cross tabulation methods were utilized on an institutional data set to compare the GPAs of students living both on and off campus. Initial findings suggest that students living on campus had statistically higher GPA than those living off campus. These findings point to the value of on campus housing. Based on student perception data in related literature, living learning communities have increased first year retention rates, promoted learning outside of the classroom, and provided an overall positive first year experience for freshman. As Purdue's incoming class size continues to grow, this research suggests that the university should invest in on campus housing because of its value on academic outcomes.

Research Mentor: Dr. Clarence Maybee, Purdue Libraries; Mr. Andrew Zehner, Office of Institutional Research, Assessment, and Effectiveness

Poster Number: 48b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Examining the Image-Schematic Link Between Designers and Users

Author:

Erica Chadwell

Ian Carr

Labonno Zaman

Abstract:

Data can be interpreted in dramatically different ways based on the types of visualization that designers choose to utilize into their models. One possible way designers can be more intentional with how they develop powerful visualizations is with the use of image schemas. Image schemas can be defined as conceptual structures that are utilized to organize models of understanding. It is reasonable to believe that users can benefit from a catalog of image schemas as it would lead to a better comprehension of information visualizations if the designer understood the strengths and weaknesses of each image schema of interest. Currently, there is little understanding of the cognitive basis of how individuals interpret and reason with various visualizations. One useful cognitive basis of interest is conceptual metaphors as they leverage universal image schemas. Through the development of a standardized catalog, designers of all levels can benefit and gain further aid in the creation of effective information visualizations. The purpose of this research is to create a standardized design catalog that will assist both users and designers by strengthening the visualizations that are produced. This poster illustrates the categorization of specific image schemas, its role in information visualization, and its potential applications.

Research Mentor: Paul Parsons, CGT, Polytechnic Institute;

Poster Number: 49b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

An analysis of care coordination tools in the electronic health record for children with medical complexity: a pilot study.

Author:

Haozhi Chen

Abstract:

The goal of this study is to develop a systematic model for the care coordination of children with complex medical conditions at the Children's Hospital of Wisconsin. The purpose of this model is to be set to better understand the information transfer process in care delivery. Currently two new tools are implemented for the Care Coordination Programs: the "Special Needs Summary Note" and "Patient Care Coordination Note". The two tools reside in the Electronic Health Record as notes to aid information transfer in Care Coordination. This study utilizes text data analysis and process mapping to analyze the structure and content of both notes, the effectiveness of both notes will be assessed by qualitative methods including surveys and interviews with faculties who constantly use the two tools. The log data from the EHR will be used to quantify the frequency of people, by different job role, viewing the two notes. The result includes a descriptive data-driven model which maps the information transfer within the Care Coordination Programs. The current tools fail to build the perfect platform for information transfer due to the limitation of human-editing notes and the rapidly changing Healthcare environment for patients with complex medical conditions. With a focus on inpatient care, ambulatory care, or both, the descriptive model can facilitate better information transfer by categorizing the patient data by the specialty of the care provider. The developed data model for care coordination should aid in identifying the existing data loss and inconsistency in the current database. Combined with the Care Coordination Programs, they will become key strategies for improving the efficiency of care delivery.

Research Mentor: Denny Yu, Industrial Engineering, College of Engineering, Purdue University;

Poster Number: 50b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

World History Visualization, Cloud-based TimeScale Creator for multiple users (Monitoring System)

Author:

Songlin Chen

Yidi Du

Abstract:

The project has few goals including monitoring the stability, and the cause of the crashes, sending notifications when system encounters a problem, and few other minor tasks. Currently the team is focusing on monitoring the stability, and the cause of the crashes. There are two major crashes. One is inside docker container, checking whether application/server is running, which is our priority, and the other one is simply checking if the docker is running or not.

The method used to monitor crash is to create a new bash script inside docker container by using the terminal vim editor and somehow get it done so that it can check if the application (node app.js)/server.sh is running or not. It will also check whether disk and memory monitors are on or not. Then, in order to visualize it on website, a Java Script program must be made to visualize what we have in bash script. In both cases, whenever the server/application is offline, the program will automatically turn them on. Also, as the program is run in the docker, we need to make a file outside the docker to make sure the docker is on. We will also use the same method as the server monitor.

As the future improvement, we will add the email notification function into the system so that it could notify the developer who is in charge of the server that the system had some problem need to be fixed.

If the program is successfully executed, users should be able to get warnings whenever the system has trouble, and the system is able to check crashes whenever it has one and solve the crashes itself. And if the time allows, team members are expected to start on other minor tasks in the project such adding data pack instead of only to replace it as and mapping interface.

Research Mentor: Dr. James G. Ogg, Department of Earth, Atomspheric, and Planetary Sciences

Aaron Ault, Department of Electrical and Computer Engineering, College of Engineering

Andy Zehady, Department of Computer Science, College of Science;

Poster Number: 51b :: Life Sciences

College of Engineering

Use of *L. plantarum* in the Fermentation of Probiotic Apple Juice

Author:

Ivy Crank

Trang Dieu

Elizabeth Tedder

Brittany Reyes

Abstract:

Apple juice is a popular beverage that has potential to be healthy due to the fact that apples are rich in vitamin C and contain high levels of antioxidant properties. However, in most commercial juices, high amounts of sugar and preservatives are added for flavor and shelf life. We have found that a healthier apple juice alternative can be enriched with B2 vitamin probiotic bacteria, *L. plantarum*, to become a natural riboflavin-fortified juice. A natural juice was created with red delicious apples that were boiled for four hours at 60°C and then mashed. The apple mash was strained and the juice was extracted.

L. plantarum was grown in a medium containing only roseoflavin to allow for the identification of strains that can overproduce riboflavin in this environment. These strains were isolated and introduced into additional medium with higher concentrations of 50 µL roseoflavin to mutate the bacteria further. Eventually, a strain grown on a plate containing 100 µL roseoflavin was introduced into riboflavin assay medium to inoculate homemade apple juice. This apple juice was fermented at room temperature and 37°C. The apple juice acts as a fermentation medium for the bacteria over a period of time and riboflavin concentration was monitored via spectrophotometry, where standards were created with acetic acid.

Results showed that *L. plantarum* could successfully ferment apple juice to create a product with increased amounts of riboflavin. Further studies will need to be performed to monitor taste for potential production.

Research Mentor: Dr. Bruce Applegate, Department of Food Science, College of Agriculture;

Poster Number: 52b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Effects of Rotational and Oscillatory Disturbance on the Rheology of Laponite Dispersions

Author:

Daniel Espinoza

Abstract:

Soil liquefaction as a result of geohazards such as earthquakes can cause mass destruction due to the loss in effective stress of the soil and the resulting failure of foundations and soil masses. Previous work at Purdue has focused on the study of clay dispersions and their use for treating soils susceptible to earthquake induced liquefaction. Most recently Laponite has been studied due to its unique rheological response when dispersed in water which behaves as a Newtonian fluid immediately after mixing and over time forms a thixotropic gel. Therefore, when the Laponite dispersion is disturbed, it will revert back to being a liquid and the gelling process will happen all over again. The thixotropic properties of Laponite dispersions are significant in understanding how a significant shearing event such as an earthquake will impact the state of the dispersion. To study the thixotropic nature of the dispersions, amplitude sweeps were performed using a rheometer both prior to and after various oscillatory and rotational disturbances of different magnitudes to study the effect on the rheological properties (i.e. phase angle, storage modulus, and loss modulus). Initial testing shows that when disturbed, the recovery of the dispersions prior to disturbance varies depending on time of aging, clay concentration and concentration of dispersant.

Research Mentor: Marika Santagata, Department of Civil Engineering, College of Engineering;

Poster Number: 53b :: Life Sciences

College of Engineering

Genome Annotation of Novel Cluster S Mycobacteriophages

Author:

Nathan Everett

Connor Jones

Bridgette Burke

YinTae Wyss

Abstract:

The SEA-PHAGES project is an international effort of undergraduate students to record genomes of mycobacteriophages found in environmental samples in order to discover new genes in an effort to learn more about genetics and their potential uses. The work that was completed contributes to the overall research done for mycobacteriophage genomes. The overall objective for this project is to discover new bacteriophages and analyze their genomes; this information can then potentially be used in future research. Last semester, various species of mycobacteriophage were discovered and isolated using wet lab techniques, and this semester the project was continued by analyzing the genetic code and annotating potential genes.

Mycobacterium phage Corazon was discovered in Easton, PA and is a lytic, siphoviridae, Cluster S phage. Using programs such as DNA Master, GeneMark, BLAST, Starterator, Phamerator, and HHPred, the genes of this mycobacteriophage were analyzed to determine which features were genes and the likely functions of these genes. The predictions from these programs and databases are heavily reliant on historical data from other related mycobacteriophages. Our group specifically annotated genes 49 - 61 from the overall gene list of Corazon which contained 109 genes total. Our group's specific set of annotated genes are very similar to mycobacterium phage MosMoris. Based on the functions of the genes found in our gene list, we can make the assumption that our genome segment relates to near the end of the phage reproduction cycle as most of our annotated genes have to do with cell lysis, cell degradation, or are tail proteins. The next step for research is to see whether this new knowledge of phages can be applied to potential applications such as antibacterial resistance or genetic engineering.

Research Mentor: Dr Kari Clase, ABE, colleges of Agriculture and Engineering;

Poster Number: 54b :: Mathematical/Computational Sciences

College of Engineering

Objective Muscular Fatigue Analysis in Minimally Invasive Surgeries

Author:

Rachel Harmon

Hamed Asadi

Abstract:

Researchers are finding that minimally invasive surgeries, such as laparoscopic and robotic surgeries, commonly result in musculoskeletal neuromuscular injuries, muscular fatigue, and arthritic injury and pain. These surgeries allow for a quicker patient recovery time, but pose a hard physical toll on surgeons. If these problems are not prevented, they can impact the healthcare system by affecting operation schedules and the quality of surgeries. Studies were geared towards identifying physical symptoms and reducing pain and discomfort from different surgeries. Physical discomfort, postural stability, ergonomic issues, stress, surgeons' activities, spinal motion, workload, and Electromyography (EMG) data were measured in order to determine the risks and effects of laparoscopic surgeries on surgeons. EMG signals showed that certain muscles are used more frequently than others and therefore have a greater risk of fatiguing suggesting that operations requiring higher accuracy be performed earlier in a surgeon's schedule. It was also found that laparoscopic surgeries have more taxing effects on surgeons due to the high physical muscular workload required of the thumb and forearm muscles, measured by surface EMG during a simulated task. However, studies were limited in measuring fatigue due to identifying a specific point at which an individual is fatigued. Another issue was the difficulty ensuring constant conditions in real workplaces because there may be disturbances from time constraints, cleaning, or changing specifications. The results of this research will provide more insights to the sources of fatigue (tools, procedure, posture, etc.) over the surgery time.

Research Mentor: Hamed Asadi, Industrial Engineering, College of Engineering; Denny Yu, Industrial Engineering, College of Engineering

Poster Number: 55b :: Mathematical/Computational Sciences

College of Engineering

Detecting Bias In Image Datasets By Crowdsourcing

Author:

Gore Kao

Xiao Hu

Haobo Wang

Pranjali Raturi

Abstract:

Biased attributes in training image datasets cause image processing classifiers to have low or false accuracy. This causes a misrepresented view of generalized images within other domains and can lead to significant consequences when the classifier needs to discern specific attributes. This problem is addressed through a crowdsourced measure that will generate a large number of attributes within a given dataset and analyze it for bias; This will provide a corrective solution through identifying the initially biased attributes and significantly reduce any punitive results. Other solutions provide a corrective measure through the restructuring of the intrinsic network so the image classifier may be extended to other image domains; However, the classifier can easily become inaccurate without first identifying the biased attributes and the needed attributes to correct bias. Our crowdsourcing method provides a more reliable means for correcting the existing bias within the initial dataset. The crowdsourcing process design utilizes a gamification process in which players can compare images within a given dataset and provide attributes of similarity. The attributes generated by game players provide a holistic view of the attributes within the dataset, which can be further analyzed for bias through the backend workflow model. The results obtained show a significant improvement in classifier accuracy and a faster convergence of error compared to the unmodified, initial dataset. Overall, the crowdsourcing method presented proves to be a more reliable and efficient means for correcting a training image dataset and improving the distribution of attributes supplied to the classifier.

Research Mentor: Yung-Hsiang Lu, Department of Electrical and Computer Engineering, College of Engineering; Ming Yin, Department of Computer Science, College of Science

Poster Number: 56b :: Physical Sciences

College of Engineering

Reduced Annotation with Data Augmentation Based on Data Similarity

Author:

Seo Young Kim

Menna Hassan

Fischer Bordwell

Arjun Balasubramania

Jiahao Sun

Abstract:

Deep Convolutional Neural Networks have yielded state of the art performance in various applications of object identification problems. In supervised learning, a successful model requires a large scaled annotated data. In our project, we propose to reduce the number of required labeled data by utilizing the relationship between distinctiveness and a model's accuracy. Datasets used to train neural networks contain distinctive properties that require the training process to heavily depend on the source domain. This requires a lot of labeled data while some are not improving the model when trained upon. Our project optimizes the training of deep neural networks by measuring dataset distinctiveness, identifying how distinctiveness impacts a model's accuracy, and performing domain specific data augmentation. Our data augmentation method demonstrates a reduction in the number of required annotations. We perform extensive simulations to show that our method outperforms traditional data augmentation and other GAN-based methods. These results suggest that when training neural networks with data augmentation on a model that is most similar to the targeted dataset, the accuracy and efficiency can be optimized.

Research Mentor: Dr. Yung Hsiang Lu, ECE, Purdue University;

Poster Number: 57b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Improved Gas Barrier Performance of Cellulose Nanocrystals/Citric acid Coated Polypropylene film for Packaging Applications

Author:

Deepa Korani

Abstract:

Scientific and commercial interests in renewable nanomaterials have been receiving increasing attention over the years. Biodegradable films have been produced from a variety of biopolymeric matrices, including polysaccharides. However, polysaccharide films have usually poor tensile properties, besides being highly permeable to water vapor and sensitive to water. Cellulose Nano Crystals (CNC) have gained a wide spectrum of interest in research due to its great barrier performance and tensile strength properties. CNC has also been an interest due to their chiral structure which enhances the barrier performance in packaging application. However, the brittle property of CNC has limited its application for packaging. The objective of our research was to apply thin layer coating of cellulose nano crystals-citric acid on polypropylene substrate for high barrier packaging application. Results suggested that addition of citric acid into coating formulation enhance both oxygen and carbon-dioxide barrier performance because of the enhanced tortuosity of the passage of the gas molecules.

Research Mentor: Md Nuruddin

Department Of Materials Engineering, College of Engineering; N/A

Poster Number: 58b :: Physical Sciences

College of Engineering

Strengthening Mechanisms of Solid Solution Strengthened Fe-Zr

Author:

Sidharth Krishnamoorthi

Abstract:

Iron (Fe) and Fe alloys are widely used in industries. Their properties can be tailored through designed treatments. This study aimed to increase the hardness of Fe by alloying it with zirconium (Zr) solutes. Fabrication of pure Fe films and Fe-Zr films were done through magnetron sputtering deposition. Three different compositions of 2.5%, 5%, and 8% solute were deposited to explore the hardening effect at different compositions. Nanoindentation tests showed the ultra-high hardness (exceeding 9.5 GPa) of Fe-Zr films. To explore the strengthening mechanisms, transmission electron microscopy was performed on the cross-section and plane-view samples of the pure Fe, Fe-Zr 2.5%, and Fe-Zr 8% films. The micrographs revealed that the grain size of Fe-Zr decreased with increasing Zr content. However, grain size reduction could not result in the substantial increase in hardness that was observed. Further analysis of the microstructure showed that high stacking faults near column boundaries could have led to the extra hardening in Fe-Zr films. Our findings could provide general implications on the design of high-strength Fe alloys.

Research Mentor: Dr. Xinghang Zhang, Materials Science and Engineering, College of Engineering; Ruizhe Su, Materials Science and Engineering, College of Engineering

Yifan Zhang, Materials Science and Engineering, College of Engineering

Poster Number: 59b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Patient Centered Physical Ergonomics, Improving Healthcare with Each Day

Author:

Megan Lyons

Abstract:

To ensure a more safe, comfortable environment for patients in the US healthcare system, researchers are directing their attention to better understanding the needs and improving safety for patients. By applying Human Factors methods in the US healthcare system, researchers are able to expand their knowledge on how human interactions play a role in the care of patients. Human factors and ergonomics in healthcare pertains to a human's ability to work with systems and techniques in the healthcare industry. Since these studies are in an early stage, there lacks a definition of this Patient Centered Physical Ergonomics. This poster presents findings of a Scoping Review of Patient Centered Physical Ergonomics (PCPE) in order to work towards creating a definition for PCPE. Defining this broad topic will help to develop techniques and designs to reduce burden on patients in the healthcare system. To develop this topic, a review of sources identified through Google scholar was conducted. Following this review, categories were created to determine common themes of PCPE. By consulting two experts, many topics were found to be outside the definition of PCPE. In this poster, there are a range of categories to cover all aspects of PCPE, examples include usability and wearable devices. Patient Centered Physical Ergonomics is a topic that does not have a clear definition. This poster and research conducted offers a beginning definition of this topic in order to create a better experience for patients.

Research Mentor: Name: Linsey Steege

Department: Industrial and Systems Engineering; School of Nursing

College: University of Wisconsin- Madison; Name: Denny Yu

Department: Industrial Engineering

College: Purdue University

Poster Number: 60b :: Mathematical/Computational Sciences

College of Engineering

Visualizing Relevant Information on Social Media

Author:

Kalyan Mada

Abstract:

Visualizing Relevant Information on Social Media

The Social Media Analytics and Reporting Toolkit is a visual analytics application that aggregates tweets and geographic data for situational awareness in crisis management. Using a machine learning algorithm that is trained to determine which tweets are relevant, all tweets are categorized based on their relevance within topics such as weather, safety, traffic, etc. This project aims to visualize relevant tweets in the context of all incoming tweets. Specifically we use heat maps that show the location and volume of relevant tweets. Identifying relevant geographic areas is important as the visualization can be used by first responder groups in order to locate specific areas that are in need, such as people trapped in wildfires or other natural disasters. Twitter gives affected populations a platform to express their needs and local first responder groups can provide assistance based on where the tweets originated from.

-Kalyan Mada

*Research Mentor: David S. Ebert, College of Engineering, School of Electrical and Computer Engineering;
Morteza Karimzadeh, College of Engineering, School of Electrical and Computer Engineering*

Poster Number: 61b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

The Automation of Sewer Pipe Inspection

Author:

Alexandra Gray

Cecelia Maginot

Kelsey Vought

Abstract:

With over 800,000 miles of wastewater pipes, the United States sewer system cannot afford failure, yet the current infrastructure rating is a D+. Closed Circuit Television (CCTV) inspections are used to prevent infiltration, sewer overflows, sinkholes and catastrophic failure. However, current CCTV sewer inspections involve a manual interpretation of videos, which is often slow, inconsistent, and erroneous. Automated inspections have the potential to improve the speed, consistency, and accuracy of sewer condition assessment. In this study, an automated system was developed to take entire videos of sewer networks and identify the frames that harbor anomalies. The automated system is based on a ResNet Convolutional Neural Network (CNN) that was trained on a dataset of 20,000 defect and defect free sewer pipe images. To evaluate the accuracy of the automated system, an additional 2,000 images unseen by the CNN were applied. On the test set, the prototype system achieved an accuracy of 87%. The prototype system was further tested on CCTV videos, which televised 300 feet of sewer pipe line, to demonstrate practical applicability of the system. Once sufficiently robust, this automation tool will assist field analysis of real-time sewer video footage and reduce inspection time and potential error.

Research Mentor: Dulcy Abraham, Civil Engineering, College of Engineering; Srinath Kumar, Civil Engineering, College of Engineering

Poster Number: 62b :: Mathematical/Computational Sciences

College of Engineering
Network Camera Discovery

Author:

Joshua Majors

Abstract:

In today's world, collecting data is more important than ever. With an increasing interest in deep learning, large data sets of images are especially valuable. On the internet there is an abundance of cameras that are broadcasting live feeds to many publicly available websites. These network cameras could be used to create a valuable resource if organized in an efficient manner. However, there are several problems with collecting network cameras from various websites that must be addressed in order to produce a readily accessible database. Because every website has a unique design and structure, a generalizable method must be developed for identifying web cameras on individual websites. This leads to a need to filter out content that is not from a network camera. This paper outlines approaches used to determine if an image is from a network camera. Methods looking at the data received from the webcam over an extended duration are proving to show potential for success. Other techniques that analyze content surrounding the image such as the URL are also currently being explored.

Research Mentor: Yung-Hsiang Lu, ECE, Purdue;

Poster Number: 63b :: Physical Sciences

College of Engineering

Synthesis and Characterization of ZSM-22 and ZSM-11 for Propene Oligomerization

Author:

Hannah McGinness

Abstract:

Brønsted acidic zeolite frameworks, composed of silicon and aluminum atoms tetrahedrally coordinated to oxygen, catalyze light alkene oligomerization reactions, relevant for upgrading light alkenes to higher molecular weight molecules useful for transportation fuels [1]. Stability, rate of oligomerization and selectivity towards higher molecular weight oligomerization products depend on active site proximity, crystallite size, and active site location in different pore sizes within the zeolite. MFI (ZSM-5) is an industrially relevant zeolite that contains three pore environments: straight channels, sinusoidal channels, and channel intersections. The structural complexity of MFI complicates investigation of the effects of Al proximity on oligomerization independent of other relevant parameters such as pore size and crystallite length. Herein we report our efforts to synthesize zeolite frameworks MEL (ZSM-11) and TON (ZSM-22) with different Al distribution and crystallite size. The structural simplicity of MEL, which has only straight channels and channel intersections, and TON, which has only unidirectional straight channels, assists in synthetically decoupling Al proximity and pore size. Al-TON (Si/Al 30-90) and Al-MEL (Si/Al 20-60) zeolites were synthesized by previously reported methods using different ratios of potassium and structure directing agent (SDA) to influence Al siting [2][3]. Two structure directing agents were tested for the synthesis of Al-TON: 1,6-diaminohexane (DAH) and 1,8-diaminooctane (DAO). Water content in the synthesis gel was varied in Al-MEL synthesis (H₂O/Si 6-25) , since crystallite size in Al-MEL can be influenced by water content in synthesis [4]. The percentage of Al in proximity was quantified by Co²⁺ exchange. We will discuss how crystallite size and Al proximity vary with water content and SDA across this suite of catalysts.

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Research Mentor: Dr. Rajamani Gounder, Davidson School of Chemical Engineering, College of Engineering; Elizabeth Bickel, Davidson School of Chemical Engineering, College of Engineering

Poster Number: 64b :: Physical Sciences

College of Engineering

Understanding Object Detection Failures on Sequential Image Data by Interpreting Intermediate Outputs of Neural Networks

Author:

Daniel Merrick

Karthik Maiya

Kirthi Sivamani

Rui Wang

Abstract:

Despite their recent success, deep convolutional object detection algorithms demonstrate poor detection stability on sequential image data. By looking at the detection results on neighboring frames in a video stream, it is easy to observe that these models inconsistently detect objects of interest. This problem is apparent despite there being little visual difference between the neighboring frames. This project is focused on gaining a deep understanding of why object detection algorithms fail to consistently detect objects of interest on sequential image data. The fact that neural networks are not robust to small changes that are nearly imperceptible to humans introduces pressing security concerns for organizations with systems using this technology. For example, any organization selling intelligent security cameras or autonomous vehicles must guarantee the consistency of their products. Our work is in its' early stages, however, small-scale experiments have shown that specific features learned by the network are hyper-sensitive to small input perturbations. These sensitive features seem to be correlated with poor detection stability. Our methods are unique such that we are examining the sensitivity of specific features learned by the network where as other work focuses on the sensitivity of the output of the entire network. Looking ahead, some goals we are focused on are (1) reproducing our results at large-scale, (2) gaining a deeper understanding of the types of features that tend to be more sensitive, and (3) investigating if this problem exists across many network architectures.

Research Mentor: Yung-Hsiang Lu, School of Electrical and Computer Engineering, Purdue University;

Poster Number: 65b :: Mathematical/Computational Sciences

College of Engineering
Capstone Course Team Formation Overview

Author:

Daniel Meulbroek

Abstract:

A key component of Capstone project success is how well each student functions within their team. Substantial research exists on the parameters contributing to successful or outstanding team performance and individual performance on a team. Two of the bigger contributors to outstanding team performance are the characteristics and skills of team members relative to what the project needs and the student's motivation for selecting a particular team project. How these factors are considered in the formation of Capstone teams is the key focus of this research. Capstone team formation generally occurs in three different methods: random assignment of students to teams, systematic instructor assignment of students to teams, and student selection of the projects they prefer to work on. Many studies have been published describing each of these three methods and citing overall team/Capstone project/program success. Each of these Capstone team formation approaches were analyzed in terms of the pros and cons of the method and then all three methods were compared to identify best practices in Capstone team formation. Finally, alternate approaches to Capstone team formation are discussed.

Research Mentor: Dan Ferguson, Engineering, Engineering Education;

Poster Number: 66b :: Mathematical/Computational Sciences

College of Engineering

Thermodynamics of Coherent Structures near Phase Transitions

Author:

Julia Meyer

Abstract:

Phase transitions within large-scale systems may be modeled by using partial differential equations, in which system dynamics are captured by appropriate polynomial potentials. The ability to simulate and predict phase transition behavior has many applications, from material behaviors (e.g., liquid crystal phase transformations, coherent movement of granular materials) to traffic congestion. Coherent structures in these systems evolve along a single spatial dimension randomly through time; thus, the statistical behavior of these fields is of greater interest than particular system results. Past research focused on deriving solutions to the system probability density function (PDF) and verifying solutions for fourth-order and other simple potentials. Until recently, the extent to which these solutions could be verified was limited by computing power. This work focused on verifying solutions for PDFs of sixth-order and tenth-order potentials, which describe more complex phase transition behaviors, and determining their respective correlation functions. Large-scale MATLAB simulations were used to model the evolution of fields at certain system “temperatures”, for which statistical PDFs and correlation functions were computed. Once fully validated, this approach will enable a better understanding of successive phase transitions in complex materials, and allow for accurate modeling of these system behaviors based on material properties. In the future it would be beneficial to evaluate the field dynamics of higher-order potentials at a smaller scale to gain further insight on the behavior of stochastic processes in large-scale systems.

Research Mentor: Prof. Ivan Christov, Mechanical Engineering, College of Engineering;

Poster Number: 67b :: Life Sciences

College of Engineering

Fluorescent Biosensor to Detect pH Changes During Endocytosis

Author:

Abhipri Mishra

Abstract:

There is much still to be discovered about ligand-induced endocytosis of membrane proteins in neurons. To combat this, we are creating an optical tool to detect and understand how the endosomal pH activity affects activity of engulfed receptors by measuring the ratiometric changes of a red fluorescent protein, mKeima. Using this red fluorescent protein is advantageous because it allows for opportunities to dual image with other biosensors and conduct in vivo imaging in the future. Endocytosis can be induced through binding between a chemical ligand and its receptor, which in our case is accomplished through the SpyTag/SpyCatcher system. The SpyTag and SpyCatcher pair has been proven capable of selectively labeling membrane-localized proteins in live cells through its covalent, irreversible bond. The fluorescent protein mTurquoise is on the C-terminus of the receptor, which allows us to localize the membrane protein at all times, tracking it in live cells, and eventually neurons. After added exogenously, the SpyCatcher-mKeima fusion bonds and successively tracks the receptor trafficking, activity, and degradation. Successful development of this biosensor could potentially allow for detecting and preventing neurodegeneration through many diseases.

Research Mentor: Mathew Tantama, Chemistry;

Poster Number: 68b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Wearable devices can measure your sweat output with electricity. Shocking, isn't it?

Author:

Laura Mudge

Fajar Ausri

Abstract:

Wearable sensors are a popular way to monitor health conditions and behavior. Although physiological measures like heart rate has been long collected using wearables, electrodermal activity which detects emotional arousal has only recently been integrated into wearables. Currently, researchers use gold standard devices, such as the Shimmer3 GSR+, to collect the data. However, the procedure is lengthy and incompatible with those who have a limited range of motion. Current wearable devices on the market struggle to deliver accurate results under various workloads and activities, especially with motion sensing. The Empatica E4 is a new wearable device designed to deliver accurate EDA measurements. The device is worn like a watch and markets itself as an unobtrusive monitoring solution with accurate and precise physiological data. The purpose of this project is to analyze the validity and reliability of the Empatica E4 by comparing the accuracy of its readings to those of the Shimmer3 GSR+. For this experiment, participants (n = 10) completed a cognitive task at two levels of intensity and researchers compared the EDA values recorded by the E4 to those recorded by the Polar. In addition to monitoring these metrics, researchers tracked motion data by asking the participants to tap along with a metronome while performing the trials. Upon the conclusion of each task, participants completed a usability quiz, rating the difficulty of the task and their experience using the wearable devices. Preliminary results show that there is a significant difference between the devices when looking at EDA peak counts ($p < 0.001$) while there is no significant difference when looking at median EDA.

Research Mentor: Dr. Denny Yu, School of Industrial Engineering, College of Engineering; Dr. A. J. Schwichtenberg, Human Development and Family Studies, College of Health and Human Sciences

Poster Number: 69b :: Life Sciences

College of Engineering

Lipidomic Exploration and Dietary Interventions for Glioblastoma Multiforme

Author:

James Muskat

Abstract:

Glioblastoma multiforme (GBM) is the most common and aggressive primary brain cancer. Only 5% of patients are expected to live longer than 5 years, and the median survival is approximately 15 months with treatment. Treatment options have not advanced much in the last two decades, making new GBM therapies an important area for exploration. In recent years, the use of a ketogenic diet and intermittent or prolonged fasting has gained attention as a potential therapeutic option for GBM patients. More research is required to further understand and refine these techniques before they may become part of the standard of care. While genomic data for GBM is more expansive, with many therapies targeting genes, lipidomics is a budding field that may prove useful in identifying potential targets of this disease. Lipidomic data may also help illustrate how the ketogenic diet and fasting techniques could be tailored to help correct abnormalities in GBM lipid profiles. Using laser capture microdissection (LCM) and multiple reaction monitoring (MRM), mass spectrometry data was gathered and analyzed from several grades of human GBM tissue samples. Significant differences from lipid profiles of the tumor and the brain around the tumor were determined. Future work may aim to target or correct some of these abnormalities in the lipidome, be it with the use of nutritional interventions like a ketogenic diet and fasting or drug therapies.

Research Mentor: Kari Clase, Agricultural & Biological Engineering, College of Engineering; Stephen Miloro, Agricultural & Biological Engineering, College of Engineering

Poster Number: 70b :: Physical Sciences

College of Engineering

Characterizing Spin-Orbit Interaction in Hybrid Semiconductor/Superconductor Systems

Author:

Molly Newquist

Charles Guinn

Abstract:

A major obstacle in the advancement of quantum computers is the susceptibility of quantum bits to decoherence. Topological quantum computing with Majorana zero modes has attracted intensive research interests because it is less vulnerable to noise and decoherence. Majorana zero modes can be engineered using materials with a strong spin-orbit interaction coupled to superconductors. InSb/AlInSb/GaAs semiconductor heterostructures with strong spin-orbit interaction are ideal candidates for engineering Majorana zero modes. Perpendicular field magnetotransport measurements show signatures of weak anti-localization and can be used to extract physical parameters related to the spin-orbit effect. We perform measurements on InSb/AlInSb/GaAs at 4K using a He4 dipping probe in magnetic fields from -50mT to 50mT. Measurement parameters such as sample rate and magnetic field sweep rate are optimized to yield reproducible results. We fit the resulting magnetotransport data with the Lordanskii, Lyanda-Geller, Pikus (ILP) Model for perpendicular field measurement to extract the strength of the spin-orbit coupling. The results are analyzed to determine the viability of the methodology to characterize the spin-orbit interaction in heterostructures from this lab.

Research Mentor: Michael Manfra, Department of Physics and Astronomy, School of Electrical and Computer Engineering, School of Materials Engineering, College of Science, College of Engineering; James Nakamura, Department of Physics and Astronomy, College of Science

Poster Number: 71b :: Life Sciences

College of Engineering

Autonomous Capturing of ORBCOMM Satellite Transmissions for Earth Remote Sensing

Author:

Andrew Nguyen

Abstract:

Autonomous Capturing of ORBCOMM Satellite Transmissions for Earth Remote Sensing

Team: Earth Remote Sensing with Signals of Opportunity

Purdue University: School of Electrical and Computer Engineering

The agricultural industry is constantly looking for novel methods of optimizing output. Our team is tasked with utilizing Signals of Opportunity to determine changes in the coefficient of reflection of the surface of the earth. This data can then be used to determine soil moisture content several meters below the surface, in the root-zone of the farmland we are surveying. Previous attempts have been made in the EHF band, but these signals only penetrate a few centimeters into the ground. By receiving signals in the VHF band, we are able to calculate soil moisture content several times further beneath the surface, leading to more long-term measurements of soil moisture.

Previously, performing remote sensing with Signals of Opportunity was limited to stationary towers or manned flights. Stationary towers have limited range, and manned flights are expensive. By utilizing a Software Defined Radio and a commercial UAV, remote sensing using these signals can be done autonomously.

A USRP E310 Software Defined Radio has been configured to collect VHF signals from ORBCOMM communication satellites. The radio and RX antennas are attached to a DJI Matrice 600 Pro UAV such that the receiver can collect data from different locations autonomously.

Our team expects to measure various coefficients of reflection dependent upon the moisture content of the medium that the signal reflects off of. In the case of more torrid soil conditions, we would expect a low relative coefficient, properly irrigated soil would have a coefficient between 0.6-0.9, and a body of water would produce a coefficient and a body of water would produce a coefficient ~ 1.0 .

Keywords: SDR (Software-Defined Radio), ORBCOMM, Earth Remote Sensing, Root-zone Soil Moisture, MatLab, Signals of Opportunity, Signal Processing, QPSK, Loop Antenna.

Research Mentor: James L. Garrison, College of Engineering, and Aerospace Engineering;

Poster Number: 72b :: Life Sciences

College of Engineering

Initial Genes of Cluster S Phage Predominantly Revealed No Known Function

Author:

Quynh Nguyen

Kiersten Troyer

Ivy Crank

Nikita Patil

Abstract:

Bacteriophages, or phages, are viruses that infect bacteria host cells, which provide a way for the reproduction of the virus. Phages play an important role in the universe. With the rise of antibiotic-resistant bacteria, other methods of combating bacteria are required, and use of bacteriophages is one such option. There is a population of approximately 1031 phages in the world, but fewer than 1500 have been completely characterized in GenBank as of August 2014. We are working with the SEA-PHAGES Program to collect, isolate, extract, purify, and annotate DNA from phage using both hands-on field work and computer programs such as DNA Master.

Mycobacteriophages are viruses that specifically infect Mycobacterium host cells. For this biotechnology project, the mycobacteriophage Corazon genes 4 through 20, were auto-annotated and analyzed for correct start site call and function prediction using DNA Master. We were also able to recognize gaps and overlaps between gene calls. Corazon was found in Easton, PA belonging to the S cluster and a Siphoviridae morphology. The resulting gene annotations were recognized to be very similar to gene sequences in Marvin, MosMoris, and LittleLaf, previously annotated genes. The functions were mainly unknown since this section is at the beginning of the genome. To continue expanding the phages database, the Corazon gene annotations will be added into the overall database system to share with the scientific community.

Research Mentor: Dr. Kari Clase, ABE, Purdue University;

Poster Number: 73b :: Life Sciences

College of Engineering

Discovery, Characterization, and Annotation of Two Novel Mycobacteriophages

Author:

Lauren Novak

Abstract:

Bacteriophages are viruses that infect bacteria and have the potential to replace current popular medical methods such as the use of antibiotics for bacterial infections. It is estimated that there are 10³¹ bacteriophages in the biosphere; however, only a small portion has been discovered and an even smaller portion have their genomes annotated. In the fall of 2017, the Mycobacteriophage GreenWhale was isolated from a soil sample near the Engineering Fountain on Purdue University's Campus in West Lafayette, IN. GreenWhale was further purified, amplified, and imaged. TEM imaging of GreenWhale showed that it has a long tail (approximately 265 nm), thus belonging to the morphotype Siphoviridae. Due to time limitations, GreenWhale was not sequenced because the titer was 1.2 x 10⁹ pfu/ml which is not high enough for genomic sequencing (> 5 x 10⁹ pfu/ml). However, potential future experiments that could be performed include testing to see if the phage infects more than one type of bacteria, characterizing the genome using restriction enzyme digest, and performing a lysogeny test.

In the spring semester of 2019, the Mycobacteriophage Kanye was adopted from Brown University for annotation of its genome (titer = 2.6 x 10¹⁰ pfu/ml). Kanye was discovered in 2014 in Providence, RI, belongs to phage cluster E and morphotype Siphoviridae, and has approximately 140 genes in its genome. DNA annotation software DNA Master, and other online genomic tools such as PECAAN, Starterator, and Phamerator were used to annotate the start sites and functions of the genes in Kanye's genome and compare it to other already annotated genomes. While there are some gene functions that are found in all phage genomes, Kanye's genome contains a variety of gene functions that are distinct to cluster E. The annotation of bacteriophage genomes is important because it further develops our understanding about protein diversity, deepens our knowledge about how evolution has differentiated different bacteriophage genomes, and allows us to explore how bacteriophage functions can be used in other areas of science.

Research Mentor: Dr. Kari Clase, Director of Biotechnology Innovation and Regulatory Science (BIRS) Center, Professor in Agricultural and Biological Engineering;

Poster Number: 74b :: Mathematical/Computational Sciences

College of Engineering

Tracking and Predicting Pedestrian Movement

Author:

Rohan Prabhu

Moiz Rasheed

Sumati Gupta

Ethan Glaser

Juanda He

Ian Haggerty

Paul Chang

Ashita Bawankule

Abstract:

Predicting traffic from both pedestrians and vehicles is a significant factor in the early stages of planning land development. Current traffic mapping of vehicles and pedestrians is limited to human observation, and the range and accuracy of this data is unreliable. A robust and accurate tracking method was developed for mapping object trajectories, involving a Regional Convolutional Neural Network (R-CNN) combined with a tracker. The objects identified by the detector (R-CNN) are passed to a tracker, GOTURN, which predicts their motion in the following frames. Additionally, parameters such as time, position, depth, and movement changes were extracted from the tracking data. As a result, we were able to map the movements of several people and characterize certain demographic information. The current tracker can be used to detect groups of people in each frame based on their relative speed and make use of this data for further developments in prediction of pathways.

Research Mentor: Yung-Hsiang Lu

Electrical and Computer Engineering; David Barbarash

Horticulture and Landscape Architecture

Poster Number: 75b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Immunity Tests of a Class-D Audio Amplifier.

Author:

Raghul Prakash

Siddharth Inani

Yuichiro Suzuki

Krister Ulvog

Fiyi Ogunkoya

Abstract:

Title: Immunity Tests of a Class-D Audio Amplifier.

By Siddharth Inani, Raghul Prakash, Yuichiro Suzuki, Krister Ulvog, Fiyi Ogunkoya

Abstract

This work tests the immunity of a Class-D Audio Amplifier which uses the Texas Instruments TPA3122D2 integrated circuit and its output signal performance and integrity when exposed to controlled electric field source was investigated. This study was conducted to determine the best PCB layout practices for digital switching circuits that operate at high frequencies which would lead to better EMC design practices. Two different testing solutions were adopted. First, a high intensity E-field near-field probe was designed and constructed and applied to different points on the printed circuit board of the amplifier. Next, the amplifier was exposed to other sources of relatively high intensity E-fields (cell-phones and Wi-Fi routers). Finally, E-Field intensities and output signal distortion were measured using calibrated near-field probes, a spectrum analyzer, and an oscilloscope. The result indicated that as the intensity of the E-field increased, the signal integrity of the integrated circuit of the Amplifier was affected and the signal output of the Amplifier was severely distorted. The cell phone and router caused no noticeable changes. The Class-D amplifier seemed to be immune to the cell phone and router's electromagnetic emission.

Research Mentor: Mr. Barret Robinson, ECE;

Poster Number: 76b :: Mathematical/Computational Sciences

College of Engineering

Redesigning Team-Work Peer-Rating Reporting System

Author:

Unnati Pulla

Trisha Zalani

Quang Nguyen

Binoy Shah

Abstract:

Purpose

CATME is a peer rating team-work reporting system currently used by about 7000 instructors and 200,000 students each month over 60 countries. In order to achieve this goal, we are redesigning the current display of reports to emphasize on each team's individual characteristics.

Methods

Implementation involves effective database querying and the use of web-development tools such as Perl, HTML and CSS.

Results

Usability testing at Purdue of the new design would further strengthen our objective to equip CATME users with a new tool to analyze student contribution within teams.

Implications

By providing information that is specific to a team, we will highlight each team's unique dynamics, and facilitate an easier grading and educational experience for instructors.

Research Mentor: Dr. Daniel M Ferguson, CATME(Engineering Education);

Poster Number: 77b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Purdue Autonomous Aerial Vehicle (AAV) Vertically Integrated Project Abstract

Author:

Yaodong Shen

Luke Thomae

Jongwon Min

Young Sun Kim

Hojung Ryoo

Brandon Skiles

Abstract:

Our goal in building this drone is to create a drone based on open source software and components, that has an ability to do various autonomous tasks. There is an increasing number of applications that drones are being used for. With facial recognition, drones can be used for security purposes and many other important applications. For our drone specifically, a Pixhawk controller is used for the flight control and stability. The Pixhawk controls the attitude, and also enables the drone to follow pre-mapped routes. A wireless telemetry system is used to get first person view video from the drone, and to display flight information. The drone is flown primarily using the remote control but can also be operated from the mission planner application on a PC. In order to do image processing and object recognition, a Raspberry Pi controller is attached to the drone and serves as a slave computer that communicates to the Pixhawk via MavProxy. The Raspberry Pi runs an algorithm that identifies an object through the camera and tracks this object by keeping the object within a specified pixel range. To keep the drone positioned over the object, the Raspberry Pi sends commands to the Pixhawk controller through a serial port. The Raspberry Pi will be running an openCV library in order to access the necessary software. This technology is becoming very prevalent in our society today in both the private and public sectors. Bringing autonomous abilities to this quadcopter opens up limitless possibilities for the interaction of human and machine and allows further exploration into this realm of technology.

Research Mentor: SAMUEL P Midkiff, Electrical and Computer Engineering;

Poster Number: 78b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Developing new training tools and training methods for the interactive Website: CATME

Author:

Elizabeth Shu

Abstract:

2019 Purdue Undergraduate Research Conference Abstract

Title: Developing new training tools and training methods for the interactive Website: CATME

The instructor and students who use the CATME system for improving their teamwork effectiveness must be able to first learn about what is available through CATME and how they can effectively utilize new and improved website and analytic functionality. The "CATME Training team" focuses on implementing training tools and validating them through usability testing and interface design analysis.

This new training approach methodology has greatly improved our customer relationships who are now more aware of what CATME has to offer and also report that they are able to utilize new functionality more effectively and quicker.

Research Mentor: Daniel Ferguson - Engineering Education; Matthew Ohland

Engineering Education

Poster Number: 79b :: Social Sciences/Humanities

College of Engineering

Undergraduate Academic Policy Trends Among Institutions Over the Last Thirty Years

Author:

Wil Stuckey

Nicholas Tomlin

Tom Cody

Hamza Tanzeem

Nate Eckhart

Dan Irby

Rochan Nachiketa Yakkundi

Shynggys Menglibay

Sayed Hashem Had Alaali

Abstract:

This study sought to compare engineering undergraduate academic policies among national universities in order to identify existing trends in the past 30 years. We conducted content analysis on institution catalogues using Nvivo and investigated on the core courses required in engineering first year curricula. In addition, we investigated the different probation policies and compared them across different institutions. We hypothesized that as time has progressed, colleges have better refined and specified their policies and catalogs, generally in such a way that has led to higher academic standards. We also expected to see an increase in the required math and science courses as the years went on. However, when we examined the data, there were more complex relationships than we had originally predicted. In conclusion, across multiple years, there is not much of a difference, but across colleges, more definitive trends can be observed. We used visualization methods to illustrate the differences among institutions and throughout the last thirty years.

Research Mentor: Hossein EbrahimiNejad, Engineering Education; Catherine E. Brawner, Engineering Education; Hassal Alyagoub , Engineering Education

Poster Number: 80b :: Innovative Technology/Entrepreneurship/Design

College of Engineering

Road Assessment

Author:

Brooke Walsh

Kevin Phelps

Peymon Dalirifar

Nazura Ramli

Abstract:

Road Assessment

By: Peymon Dalirifar, Kevin Phelps, Nazura Ramli, and Brooke Walsh

Many cities around the United States are having a constant battle with potholes on the roads. Cities in areas where the temperature often is below 32 degrees Fahrenheit have a significantly harder time with potholes. As water is trapped within cracks, it expands as it freezes and ultimately results in larger cracks and potholes on the roads. Current pothole detection methods are expensive and are not used enough to be effective. We are working on a small, cost effective system to attach to the backs of regular cars that can autonomously detect the locations and severity of potholes. Rather than have large, expensive vehicles that may only check a road once every three years, attaching a small and cheap device to regular cars can provide near continuous monitoring of roads. The current system in place requires the use of vehicles with advanced systems that can detect potholes and relay accurate location and depth information on potholes. Unfortunately, these vehicles can cost millions of dollars, and the extreme accuracy of their systems is not a necessity when it comes to pothole detections. Our system aims to reduce the price of a pothole detection system significantly by only utilizing technology necessary to simply detect the locations and severity of potholes rather than relay extremely accurate information about the pothole itself. Deep learning is used in analyzing the data provided by the depth sensor in deciding the severity of the potholes. Upon detecting a pothole, our system will report it to the city so that it may be fixed in a timely manner. Ultimately, this will result in a decrease in the severity of potholes and the amount of time they are on the road.

Research Mentor: Mohammad Reza Jahanshahi, College of Engineering, Civil Engineering;

Poster Number: 81b :: Mathematical/Computational Sciences

College of Engineering

CATME Accessibility

Author:

Jiixin Wang

Lalit Maharjan

Zhan Gao

Brian Cardon

Jia Cheoh

Koustav Samaddar

Zhibo Hou

Abstract:

Accessibility in web development refers to ensuring that a piece of software – usually an application or a software suite – is designed to be usable by all people agnostic of any disabilities or handicaps. This is crucial for web sites and web-based applications since the internet is designed to be usable by everyone regardless of their computer hardware, browser software, language and/or locale, or ability. Therefore, accessibility should be an important element of web design and development.

At CATME over the last year, we have started a major initiative to make our application more accessible than ever. The CATME web site is over a decade old and so the accessibility standards we used to adhere to have changed over the years. Currently, we are striving to meet WCAG 2.0.

Research Mentor: Daniel Ferguson, Engineering Education, College of Education;

Poster Number: 82b :: Mathematical/Computational Sciences

College of Engineering

Reinforcement Learning of Real Time Strategy Games

Author:

Yuanhao Wang

Yunlei Yan

Yuan Liu

Abstract:

The main idea of this is to use the idea of Reinforcement Learning to train an agent based on the Real Time Strategy Game(short for RTS) environment. This represents the capability of reinforcement learning and leads an introduction for the beginners of Reinforcement Learning. Given the complex environment of the RTS games, which contains multiple agents, large amount of selections and arrangement of groups of units and precise observation and acknowledgment of certain maps, the agent we trained has the goal of completing and winning the game. During the game, the agent may contain actions like selecting typical units to collect resources, developing technology and building defending architectures to defend its own base. The agent also needs to build troops and choose proper strategies to attack and destroy other agents' troops and base. In order to accomplish these goals, we programmed certain actions and limitations for the agent. The reward functions we programmed which will tell the agent the correct actions to take also give proper commands and constraints to the agent. We also trained with the "computer players", which is the agents controlled by the game itself to collect proper data set. Nevertheless, the agent we trained right now only has the limited ability which may not lead to the final goal. Thus, using Reinforcement Learning for Real Time Strategy Game offers a challenge for the programmer who studies the Reinforcement Learning and gives the programmer a brand new working experience which may be implemented during future working and learning circumstances.

Research Mentor: Guang Lin, Mechanical Engineering, College of Engineering;

Poster Number: 83b :: Life Sciences

College of Engineering

A Visual Analytics Approach to Detect Discontinuities of Movement

Author:

Feidi Xie

Abstract:

A wide range of applications use object movement analysis to improve decision making. This project focuses on the discontinuities of movement trends. Movement discontinuity is a common phenomenon in real world such as when obstacles (e.g., buildings, mountains) prevent objects from proceeding or when obstacles prevent monitoring devices from receiving movement signals. Identifying such discontinuity helps decision makers in planning for alternative strategies. For example, to improve public safety, supplementary surveillance devices are installed at areas where tracking signals are blocked. This project presents an approach to identify areas that cause potential discontinuity of object movement trends.

Movement discontinuities are more likely to occur at disjoint areas that have fewer or no data records but are spatially close to logged movement records. In addition, the movement trends in these disjoint regions are coherent, e.g., they follow similar directions. Therefore, the approach proposed in this project includes three parts. First, we outline spatial regions with dense movement records. We use one contour to visualize areas with dense records and a second contour to expand areas of the first contour to contain locations that have no or sparse data. Areas between the two contours have sparse data but are approximate to dense movement locations. Second, we use trajectory clustering methods to find representative trajectories that describe movement directions and locations in detail. Finally, we use visualization techniques to highlight areas not only outlined by two contours but also connected by representative trajectories. Thus, possible areas with movement discontinuities are presented to the end users for further verification.

Research Mentor: Guizhen Wang, ECE, College of Engineering,;

Poster Number: 84b :: Mathematical/Computational Sciences

College of Engineering
Earth History Visualization

Authors:

Yuxin Zhang, Karan Oberoi, Songlin Chen, Yidi Du, Charles Franchville

Abstract:

The visualization of Earth History is a very wide team that creates and manages a line of software and cloud solutions that aid scientists and geologists around the world in their research by providing them tools necessary for their research. Currently, the team is split into different subteams, one of which is working on improving the memory and data storage efficiency of our website. Another team is currently working on data mining, and another one working to add more functionality to the Time scale creator(name of our tools) web version.

For the team that is adding more functionality to the website, we are working on the function of creating a data package and share that package to the cloud. When a user uploads a graph including the information about geology over different time periods, the user can add timeline manually on that graph and our program will read the information of those time periods automatically, then creating a package including the data in the graph. After the user hit the button "send to cloud", this package will be uploaded to TSCloud, and the user can have this package for later usage.

The data mining subteam is working on creating new ways to visualize geologic data. For example, one new functionality being developed will allow a user to view the rates at which a certain data column is changing over an interval that the user inputs. Data taken from this operation will then be examined by an algorithm that looks for periodic cycles in this particular dataset, and analyzes other sets parallel to this main set to find correlations between different types of data. Then, once this data is processed, it will be sent to a plotting subroutine which will section the data off into individual points, and then plot them on the visual display. This has exciting possibilities for scientists and educators who wish to use this tool, as it will allow them to cross reference datasets such as levels of greenhouse gasses or tectonic activity with extinction events or population booms, and will also allow them to easily view and display periodic processes in the Earth's history.

For the team that is working on improving the memory and data storage efficiency of our website, the goals are monitoring the stability, and the cause of the crashes, sending notifications when system encounters a problem, and few other minor tasks. Currently the team is focusing on monitoring the stability, and the cause of the crashes. There are two major crashes. One is inside docker container, checking whether application/server is running, which is our priority, and the other one is simply checking if the docker is running or not. The method used to monitor crash is to create a new bash script inside docker container by using the terminal vim editor and somehow get it done so that it can check if the application (node app.js)/server.sh is running or not. It will also check whether disk and memory monitors are on or not. Then, in order to visualize it on website, a JavaScript program must be made to visualize what we have in bash script. In both cases, whenever the server/application is offline, the program will automatically turn them on. Also, as the program is run in the docker, we need to make a file outside the docker to make sure the docker is on. We will also use the same method as the server monitor. As the future improvement, we will add the email notification function into the system so that it could notify the developer who is in charge of the server that the system had some problem need to be fixed.

Research Mentor: Andy Khan;

Poster Number: 85b :: Life Sciences

College of Health and Human Sciences

The Status of Complement Cascade Activation in Human Epilepsy

Author:

Zoe Carlson-Stadler

Abstract:

Rationale: Individuals with refractory epilepsy have drug-resistant seizures. Currently, surgical resection of the seizure focal point remains the next treatment option for refractory epilepsy, but not all patients are candidates. Thus, our objective is to identify novel therapeutic targets focusing on neuroimmune interactions. Histopathological features of drug-resistant epilepsy include a decline in synaptodendritic elements and neurons, along with microgliosis. Through characterizations in brain samples from human refractory epilepsy we previously reported alterations in complement proteins C1q and C3. These proteins are associated with the regulation of inflammatory and phagocytic responses, and with microglial dendritic and synaptic pruning in neurodegenerative disorders. In this study we further investigated the status of immune complement activation (C1q, C3, and C5) in a larger pool of brain samples from patients with refractory epilepsy, and their correlation with the levels of the synaptic protein PSD95. Methods: Western Blot analysis was done on brain tissue resected from humans with Focal Cortical Dysplasia (FCD) (n=17) and human tissue from non-epileptic patients (n=5) with antibodies against complements C1q, C3, and C5, along with PSD95. Results: Results from the western blot showed a significant correlation between the protein levels of C3 and C5 ($p < 0.0001$), as well as between C3 and PSD95 ($p = 0.076$). However, there was no significant correlation between proteins C1q and C5 ($p = 0.1085$) and between C1q and C3 ($p = 0.5165$). Conclusion: Based on these results, we speculate that the significant increase in complement proteins C3 and C5 may play a role in the synaptic structural changes in epilepsy. Mechanistic studies are currently underway to determine the role of complement proteins in pathological synaptic remodeling in epilepsy.

Research Mentor: Amy Brewster, Psychology, College of Health and Human Sciences;

Poster Number: 86b :: Social Sciences/Humanities

College of Health and Human Sciences

Predicting of Treatment Response in Children with Autism Spectrum Disorder: The Role of Manual Object Exploration

Author:

Shelby Claflin

Abstract:

Autism spectrum disorder (ASD) is an extremely heterogeneous neurodevelopmental disability with recent prevalence estimates of 1 in 59 children. Although there are several evidence-based treatments for children with ASD, the variability in symptomatology across the spectrum entails that each child responds to therapeutic approaches differently. Therefore, it is unclear which treatment may be most effective for each child. A future approach to ASD intervention includes the implementation of precision medicine techniques, which will inform the types and intensities of interventions that may be most efficacious for individual children. The objective of this paper is to explore the behavioral characteristic of manual object exploration, defined as the use of the hands (e.g., grasping, banging, shaking, rotating) to manipulate toys or objects, as a potential predictor of treatment response in infants and toddlers with ASD. To investigate this topic, a literature review of research examining predictors of treatment response in ASD early intervention was conducted. Findings from an emerging body of research suggests that manual object exploration may be a valuable variable to include as a potential treatment predictor, and that targeting object exploration may be an important first step in improving outcomes of children with ASD. However, there is a lack of standardization across study designs and more research is needed to confirm the effectiveness of object exploration and other child variables as predictors of treatment response for young children with ASD. Such research will enable clinicians and families to select treatments more efficiently, leading to better outcomes for each child and more productive use of time, energy, and resources.

Research Mentor: Brandon Keehn, Speech, Language & Hearing Sciences, College of Health and Human Sciences;

Poster Number: 87b :: Social Sciences/Humanities

College of Health and Human Sciences

Relationships Between Free Speech and Prejudice

Author:

Jacob Cole

Abstract:

Prior research has shown that individuals who hold prejudiced attitudes toward Black people use free speech as a justification for the acceptability of racist rhetoric. Is such “free speech justification” unique to high-prejudice people? Or do people with low-prejudice attitudes also use the first amendment to justify inflammatory speech directed at racist people? Undergraduate research participants whose attitudes toward Blacks ranged from relatively low to high in prejudice viewed various social media posts and recorded impressions. After our critical post, which either included inflammatory racist rhetoric or inflammatory anti-racist rhetoric, participants rated the extent to which they endorsed free speech and the extent to which they personally agreed with the post (i.e., ideological symmetry). Results replicated past findings for justifying racist rhetoric with free speech among high-prejudiced participants when compared to low-prejudiced participants. This effect was not mediated by ideological symmetry. In addition, low-prejudiced participants invoked free speech to justify anti-racist but not racist rhetoric, and this effect was mediated by ideological symmetry. These findings contribute to understanding contemporary polarization based on ideological symmetry and justifications.

Research Mentor: Dr. Margo Monteith, Psychological Sciences, College of Health and Human Sciences; Laura Hildebrand, Psychological Sciences, College of Health and Human Sciences

Poster Number: 88b :: Life Sciences

College of Health and Human Sciences

Evaluating the Reliability and Validity of the Indiana Supplemental Nutrition Assistance Program - Education (SNAP-Ed) Evaluation Tool

Author:

McKenna Deckard

Abstract:

Objectives: Supplemental Nutrition Assistance Program-Education (SNAP-Ed) is a national program that delivers nutrition education to low-income households to improve nutrition-related behaviors. A pre-post survey, or Medium Term Survey (MTS), is used to determine participant behavior change as a result of the program. The objective of the present study was to determine the short-term (4-10 weeks) and long-term (1 year) reliability of the Indiana SNAP-Ed MTS.

Methods: Data for this secondary analysis was from an RCT evaluation of Indiana SNAP-Ed. SNAP-Ed-eligible adults (≥ 18 yrs) living in Indiana and interested in receiving nutrition education ($n=62$) were recruited from 2015-2016. Short-term and long-term test-retest reliability of the 17 pre- and post-test items on the Indiana SNAP-Ed MTS was determined using Spearman correlations. MTS pre-test results from the control group who did not receive SNAP-Ed were compared with post-test results collected 4-10 weeks (short-term) later and 1 year (long-term) later respectively. Analyses were completed using SAS 9.4.

Results: The Indiana SNAP-Ed MTS demonstrated poor test-retest reliability with correlation coefficients of 0.4 to 0.6 in 15 items over the short-term ($p < 0.05$) and correlation coefficients of 0.3 to 0.7 in 11 items over the long-term study period ($p < 0.05$) among Indiana SNAP-Ed-eligible adults who did not receive the SNAP-Ed intervention ($n=62$). Significance level was set at $p \leq 0.05$.

Conclusions: Among Indiana SNAP-Ed-eligible adults, the Indiana SNAP-Ed MTS is not a reliable survey instrument to assess nutrition-related behaviors over a short-term or long-term time period. Further research is needed to develop reliable survey items to conduct program evaluation.

Research Mentor: Dr. Heather Eicher-Miller, Associate Professor, Department of Nutrition Science, Health and Human Science;

Poster Number: 89b :: Social Sciences/Humanities

College of Health and Human Sciences

Visualization of Global Opioid Use Disorder Rates Based on Harm Reduction Availability

Author:

Soyol Enkh-Amgalan

Abstract:

For the past two decades, the United States has seen a dramatic increase in opioid overdose rates. The US government have taken a supply-reduction approach to tackle this public health crisis by increasing the restrictions to access opioid prescriptions and strengthening law enforcement against the illicit market. However, this one-sided punitive approach has indirectly turned dependent users to more harmful drugs such as fentanyl. This public health issue needs an integrative policy that includes prevention, treatment, and education. One alternative strategy has been spreading globally to reduce the harms associated with drug use. Harm reduction strategies are shown to decrease infectious diseases and overdose rates, but implementation and evaluation of these programs face many challenges. This project aims to develop a tool that will inform future research questions for researchers and provide insight for policymakers. The disorder prevalence and death rates from 1990 to 2017 based on the country's status of harm reduction implementation will be compared using data visualization tool Tableau. We anticipate the resulting interactive visualization will show changes in opioid use disorder and the availability of harm reduction strategies in a global context.

Research Mentor: Vetricia L. Byrd

Department of Computer Graphics Technology

Purdue Polytechnic Institute;

Poster Number: 90b :: Social Sciences/Humanities

College of Health and Human Sciences

Peer Deviance, Adolescent Substance Use and The Moderating Role of Parental Monitoring

Author:

Shuyu Gao

Emily Rolan

Nayantara Nair

Kristine Marceau

Abstract:

Low parental monitoring (Barnes et al., 2006; Kiesner et al., 2010) and associating with deviant peers (Bahr et al., 2005; Barnes et al., 2006) has been linked to adolescents' substance use. Studies examining parenting and peers together typically assess whether low monitoring has an effect on substance use through increasing youths' ability to engage with deviant peers (Dishion et al., 2004; Pires & Jenkins, 2007). Fewer studies have investigated how these two factors interact to influence adolescent substance use, but suggest that the effect of peer deviance is stronger for youth experiencing less monitoring (Kiesner et al., 2010). The current study extends this work by examining mothers and fathers and older and younger siblings separately. We hypothesized that peer deviance would be more strongly associated with adolescent substance use when parental monitoring is low. Utilizing data from 395 families (father, mother, older sibling and younger sibling) from the US-based Nonshared Environmental in Adolescent Development study (NEAD; Neiderhiser et al., 2007), we ran a series of hierarchical regressions testing interactions of parental monitoring and peer deviance predicting adolescent substance use. For younger siblings, the effect of peer deviance was strongest when maternal monitoring was low ($\beta = .07$, $p = .036$). However, contrary to our hypothesis, for older siblings, the effect of peer deviance was strongest when paternal monitoring was high ($\beta = -.13$, $p = .001$). Results indicate that for younger siblings with highly deviant peers, maternal monitoring plays a protective role, but for older siblings monitoring may be too restrictive and exacerbate risk associated with deviant peers.

Research Mentor: Dr. Kristine Marceau, Department of Human Development & Family Studies, College of Health and Human Sciences; Emily Rolan, Department of Human Development & Family Studies, College of Health and Human Sciences

Nayantara Nair, Department of Human Development & Family Studies, College of Health and Human Sciences

Poster Number: 91b :: Innovative Technology/Entrepreneurship/Design

College of Health and Human Sciences

Rebuilding Consumer Privacy and Trust in Service Industries in the Digital Economy

Author:

Yuankai Ge

Abstract:

The availability of big data has opened up new opportunities for industries, but meanwhile, it also posed great challenges to humanity. The aim of this research is to study how the blockchain technology will reshape the interaction between consumers and service providers and how it can help to rebuild consumer privacy, trust, and equality. Specifically, relying on economic theory, we study how blockchain technology can help to promote consumer orientation and empowerment, the growth of small businesses (e.g., family-run hotels, peer-to-peer accommodation) and efficient resource allocation for brand companies.

Research Mentor: Jiong Sun, Department of Consumer Science, College of Health & Human Sciences;

Poster Number: 92b :: Physical Sciences

College of Health and Human Sciences

Building a Statistical Index on Nuclear Security Culture Awareness at a University

Author:

Naomi German

Abstract:

Cultural assessments of nuclear power plants are well established, however in a general setting such as an academic institution little research has been accomplished. This is important due to the increasing cases of radiological threats and terrorism with nuclear material. To assess nuclear security culture levels at a university, a survey was deployed and completed by 3,336 students and personnel. The survey contained a total of 12 questions and was divided into three categories: General Awareness, University Specific Awareness, and Behavior Response Awareness. Members were classified using a variety of demographics such as age, gender, ethnicity, nationality, work category, and degree. Responses were evaluated using a variety of statistical methods that indicated which of the demographics affected a survey taker's response. The results of the survey evaluation using Chi-square showed that the demographic values chosen are dependent or related. The ANOVA Regression for General Awareness demonstrates that age, gender, nationality, and ethnicity have statistical significance in regards to the mean scores of survey responses. The School Specific Awareness ANOVA Regression indicates that work status, nationality, and gender showed significant differences in the mean score of responses. The ANOVA Regression for Behavior Response Awareness were only significant for age, degree, and gender in the mean score of responses. The results suggest that nuclear security cultural awareness across all areas is most affected by age and gender, meaning that these categories have the most significance in determining the overall awareness confidence of nuclear security culture.

Research Mentor: Dr. Jason Harris, Health Physics, College of Health and Human Sciences; Marcia Robinson, Health Physics, College of Health and Human Sciences

Poster Number: 93b :: Social Sciences/Humanities

College of Health and Human Sciences

Working memory and reasoning: Analyses of errors and strategies in number series performance

Author:

Katherine Goulden

Abstract:

In intellectual ability assessments, series completion tasks are used as a measure of inductive reasoning. Individual differences in working memory capacity and general fluid intelligence are positively correlated with success on these tests, but research on how and why test-takers make mistakes is limited. The current research explored item-level performance on a frequently used number series test, focusing on the incorrect choices subjects made if they selected an incorrect response option. We also analyzed self-report strategies that test-takers used, specifically constructive matching and response elimination. A large sample of young adults from three universities completed working memory tasks, number series, and a retrospective strategy questionnaire. Working memory was correlated with number series performance, as expected, but only weakly correlated with number series strategy use. Individuals self-reporting higher use of a constructive matching strategy got more items correct on number series, and those self-reporting higher use of response elimination got fewer items correct on number series. Number series items varied in success rates, and on specific items, individuals were likely to pick a specific incorrect item. The strategy and error results suggest that, similar to other reasoning tests, the relationship between working memory and number series is accounted for general control processes.

Research Mentor: Dr. Tom Redick, Ph.D;

Poster Number: 94b :: Life Sciences

College of Health and Human Sciences

TNBC and LABC Expression of CYP7B1 Enzyme in African American Women

Author:

Tiarra Harney

Abstract:

In previous research, it was found that Triple Negative breast cancer (TNBC) was higher in the African and African American women population than in the European American population. This aggressive type of breast cancer also has a high mortality rate for these women. It was observed that the enzyme CYP7B1 could be associated with the survival outcomes of TNBC. The more deficient the enzyme is the more aggressive the cancer. When comparing TNBC to Luminal-A breast cancer (LABC), a less aggressive type of breast cancer, LABC shows presence of this enzyme. Currently we are studying this comparison by perform western blots to find the prevalence on several breast cancer cell lines in African American women. For future research, we will observe the differences between rats with TNBC that have and do not have the CYP7B1 enzyme present. This enzyme could be a potential marker for predicting outcomes of aggressive breast cancer in African American women as well as developing pharmaceutical methods for assisting in depressing the cancer.

Research Mentor: Sulma Mohammed, Comparative Pathobiology, College of Veterinary Medicine;

Poster Number: 95b :: Life Sciences

College of Health and Human Sciences

Engineering a Receptor Labeling Strategy for Monitoring pH Changes during Endocytosis

Author:

Chace Henning

Abstract:

Understanding the pathology of neurodegeneration in many instances, has made very little headway, particularly due to the limited resources available to study it. Therefore, it is difficult to develop therapeutic treatments for various neurodegenerative diseases because there are currently not many tools available to track the damage of neurodegeneration. Our goal, is to develop a red fluorescent biosensor that monitors endosomal pH activity in live-cells that can be imaged by measuring the ratiometric change in fluorescence of our fluorescent protein "tag" through endocytosis. This will allow us to answer questions regarding receptor membrane activity, signaling of the receptor once it is engulfed into an endosome, and to what extent pH is a determining factor. In our experiment, we use two different FPs to track the membrane receptor-ligand, SpyTag-SpyCatcher, pathway post-endosomal integration. The benefits associated with using previously studied SpyTag-SpyCatcher is that it has been shown to be biologically compatible with membrane surface proteins post-translationally, and without the use of synthetic dyes. Furthermore, the use of the SpyTag would eliminate the need to add an FP to the N-terminus of the membrane receptor and risk disrupting its functionality. The interaction between SpyTag and SpyCatcher is non-covalent and non-reversible which is advantageous to tracking the cellular biological processes unconcerned about weak interactions being severed. Our biosensor is a protein, which makes it easy to produce and isolate, and is more easily recognizable when implemented in cells. The development of our sensor using a red FP opens the optical window for dual imaging with other sensors and will hopefully give us more insight, in vivo, into the biochemical changes that influence neurodegeneration.

Research Mentor: Mathew Tantama

Department of Chemistry

College of Science; Emily Haynes

Department of Chemistry

College of Science

Poster Number: 96b :: Social Sciences/Humanities

College of Health and Human Sciences

The Effects of Posttraumatic Stress Disorder and Depressive Symptomology on National Guard Service Member Commitment

Author:

Courtney Isgett

Abstract:

Military deployments can impact the psychological functioning of service members, sometimes resulting in comorbid diagnoses of posttraumatic stress disorder (PTSD) and depression, which could have ramifications for service members' commitment to the military. Additionally, the multitude of unique experiences facing National Guard members, such as social isolation and transitions within civilian employment, can have significant impacts on mental health. The goal of this study was to examine the effects of PTSD and depressive symptomology on commitment to military service. We addressed this goal using data from 129 National Guard service members three months (Time 1) and eight-months (Time 2) following deployment. We used three organizational commitment scales to measure service members' commitment to their military job: affective commitment (the "want" to continue), continuance commitment (the "need" to continue), and normative commitment (the "ought" to continue). Multiple regression analyses tested whether mental health symptomology significantly predicted different aspects of service members' commitment to the military. We found that Time 1 PTSD symptomology significantly predicted Time 2 continuance commitment ($\beta=.22, p<.05$), but dropped from significance when we controlled for Time 1 continuance commitment. We did not find a significant association between Time 1 PTSD symptomology and Time 2 affective commitment. The association between Time 1 PTSD symptomology and Time 2 normative commitment also was not significant. Furthermore, there was no significant association between Time 1 depressive symptoms and the three types of commitment at Time 2. Our results indicate that the "need" to continue service in the military when PTSD symptomology is present might demonstrate the influence of financial and medical benefits within the military.

Research Mentor: Dr. Shelley MacDermid Wadsworth, Human Development & Family Studies, College of Health and Human Sciences; Christine McCall, Human Development & Family Studies, College of Health and Human Sciences

Poster Number: 97b :: Social Sciences/Humanities

College of Health and Human Sciences

Translating policy to practice: Theory-based formative research to improve EC OTC access and messaging in Italy

Author:

Kathryn Jamieson

Emily Ball

Scotlyn Sunkel

Abstract:

Background: Italy's 2015 emergency contraception (EC) policy has increased access and reduced some barriers for women to obtain EC. EC is now available over-the-counter for individuals 18 years and older; however, women living in Italy continue to face knowledge and access barriers. Conscientious objection, where providers and pharmacists refuse to prescribe or dispense EC due to personal beliefs, further complicates access and dissemination.

Objective: The purpose of the current paper is to understand EC knowledge, attitudes, and behaviors among women living in Italy. Additionally, a secondary purpose is to explore the impact of the 2015 EC policy.

Methods: Thirty in-person interviews were conducted among women living in or around Florence, aged 18 to 50 years, and using the Italian healthcare system at the time of study enrollment. Researchers used an expanded grounded theory approach to understand women's experiences with EC with diffusion of innovations serving as a conceptual lens for data analysis. HyperRESEARCH, a data management system, assisted with open and axial coding and theme development.

Results: Women described low observability of the 2015 policy, expressing surprise regarding increased EC availability. Participants suggested increased messaging in strategic locations to overcome this barrier. Participants held both positive and negative attitudes toward EC. While some perceived the relative advantage of EC compared with unintended pregnancy, others expressed concerns about irresponsibility and EC safety. Finally, conscientious objection impacted healthcare access, despite participant desire for autonomous EC decision-making, suggesting support for increased EC access despite provider barriers.

Discussion: Findings offer practical recommendations to guide EC messaging in Italy to increase women's knowledge and to empower women's access. Additionally, opportunities for communication strategies and access campaigns to improve attitudes and increase knowledge and uptake of over-the-counter EC are discussed.

Research Mentor: Andrea L. DeMaria, PhD, MS, Consumer Science, College of Health and Human Sciences; Stephanie Meier, MA, Consumer Science, College of Health and Human Sciences

Poster Number: 98b :: Social Sciences/Humanities

College of Health and Human Sciences

Differential Effects of Majority vs. Minority Religious Denomination on Subjective Well-Being

Author:

Derek Kahng

Abstract:

Previous literature has shown disparities in the relationship between subjective well-being (SWB) and religion. Whereas some studies have found a positive association between religion and SWB (Emmons, Cheung, & Tehrani, 1998; e.g., Eryilmaz, 2015), other studies found that religiosity did not always benefit people's SWB (e.g., Barber, 2012; Snoep, 2008). Our study aims to find an explanation for this gap based on social norm theories. Social norm theories postulate that culturally normative behavior or thoughts increases SWB. We hypothesized that religiosity will be related to greater SWB only when religious individuals belong to the majority religious denomination (e.g. Christianity in the United States). We used data collected by the World Values Survey (WVS), which consists of nationally representative surveys measuring an individuals' attitudes and beliefs towards political, cultural, economic, civic beliefs, and other aspects of life. We composited three items in WVS, i.e., life satisfaction, happiness, and health, as the measure for SWB for a more comprehensive measure. SWB of the majority religious denomination and minority religious denomination (e.g., Islam in the United States) was analyzed and compared using regression models. Results supported our hypothesis that only identification with majority religious denomination was related with greater SWB. Our study contributes to a deeper understanding of how religious beliefs relate to an individual's SWB.

Research Mentor: Viola (Xiaofang) Zheng, Psychological Sciences, Health and Human Sciences; None

Poster Number: 99b :: Social Sciences/Humanities

College of Health and Human Sciences

Are they too young? Views about community and community change from young adolescents.

Author:

Jim Kanani

Abstract:

Background: Youth civic engagement has been found to promote youth development by enhancing awareness of personal potential and sense of community responsibility, and deterring health-diminishing behaviors such as substance use. Although, efforts have successfully engaged youth in community-level work, these tend to focus on older adolescents, consequently, limiting younger children's access to opportunities to showcase their potential as change agents. In this qualitative study we explore how young adolescents define community, their perspectives related to community issues and challenges faced by youth, their ideas to address these challenges, and their barriers to engaging in community change efforts.

Methods: Youth ages 11-13 (n = 39, Mage = 12.1, SD = 1.12, 51.2% male) from low-income families who attended a summer sports camp participated in semi-structured interviews (20-40 minutes) that were thematically analyzed.

Results: Youth-reported narratives defined community as a place where people bond and feel accepted and protected. Youth described poverty, crime, and substance use as pressing community issues and peer conflict and school pressures as issues youth in their community face. Youth offered ideas to address the challenges they identified including fundraising and bringing people together. They also spoke of barriers that prevented them from engaging in or believing in their ability to create change such as feeling devalued, dismissed by adults, and not having opportunities to engage in change efforts.

Conclusion: The findings suggest that young adolescents are aware of and interested in participating in community change efforts. Given the evidence that youth civic engagement can lead to both community and individual-level benefits, efforts should be made to develop activities and programs that enable younger children to gain the skills needed for civic engagement. These findings can inform development of evidence-based strategies focused on promoting younger children's involvement in civic engagement.

Research Mentor: Yumary Ruiz, Ph.D., MPH;

Poster Number: 100b :: Life Sciences

College of Health and Human Sciences

The effects of environmental copper exposure on developing zebrafish

Author:

Christina Kaucic

Abstract:

Copper is an essential metal that is key in many metabolic functions and is a vital cofactor in many enzymes. Copper homeostasis is dually important for optimal health. Excess copper has been associated with minor symptoms such as fatigue, weakness, and memory loss as well as with neurological disorders such as Wilson's disease, Alzheimer's disease and some cancers in humans. Similarly, excess copper has been shown to damage visceral organs and produce abnormal behaviors in multiple fish species including the zebrafish who has a high degree of genome sequence homology when compared to humans. For this reason, the zebrafish is an advantageous model for the study of copper toxicity. In this study, we assessed survival, behavioral alterations, and morphological changes in developing zebrafish. We hypothesized that zebrafish exposed to higher levels of copper during embryogenesis would show signs of increased physiological and behavioral stress. To test this hypothesis, zebrafish embryos were obtained through natural spawning and exposed to a control or one of three experimental groups: 13ppb, 130ppb or 1300ppb (current regulatory concentration in US drinking water) copper. Fish were exposed through 120 hours post fertilization (hpf). Survival was assessed every 24 h and behavioral analysis was performed at 120 hpf using the DanioVision chamber and EthoVision software. Copper caused mortality at 1300ppb and decreased time spent moving as well as decreased counterclockwise rotation frequency at 130ppb ($p < 0.05$). Developmental exposure to copper produces dysfunctional locomotor behavior and mortality at concentrations lower than regulatory concentration in US drinking water.

Research Mentor: Dr Jennifer Freeman, Health Sciences, College of Health and Human Sciences; Keturah Kiper, Health Sciences, Health and Human Sciences (graduate mentor)

Poster Number: 101b :: Social Sciences/Humanities

College of Health and Human Sciences

Challenges of Sustainable Supply Chain Management in Large Dining Facilities

Author:

Emma Kaye

Abstract:

Sustainability has come to the forefront of the hospitality industry's focus, specifically in foodservice. This exploratory study examines the challenges large dining facilities face in executing sustainable supply chain management. The research is a case study on Purdue Dining and Catering and the dining courts on Purdue University's campus. Purdue's procurement team, along with one direct supplier (Purdue Farms) and two intermediary suppliers (US Foods and Piazza Produce) were interviewed using semi-structured interviews. These discussions looked at the structure of the supply chain and each company's focus on sustainability, both individually and within the supply chain. The results of these interviews are organized by (a) defining sustainability (b) motivations for sustainability, (c) strategies for sustainability, and (d) challenges. Thematic analysis of the results showed four main areas of challenge: complexity, demand, cost, and culture.

Research Mentor: Jonathan Day, Hospitality and Tourism Management, Health and Human Sciences;

Poster Number: 102b :: Social Sciences/Humanities

College of Health and Human Sciences

Medication Patterns among Infants and Toddlers with Neurodevelopmental Syndromes

Author:

Kayla Kollmann

Joey Shin

Liberty-Ann Shelton

Patricia Aguilar

Abstract:

Children with Neurogenetic Syndromes (NGS) display a variety of symptoms that may be managed with medication use, including physical, cognitive, and developmental delays, as well as additional medical issues that originate from these delays. In the present study, we sought to understand the differences in medication use and how usage differs by age in three NGS populations: Angelman (AS), Williams (WS), and Prader-Willi (PWS) syndromes. We hypothesize that the number of medications utilized between the NGS groups will vary significantly, with PWS demonstrating the most use due to early intervention strategies that emphasize medication. We also hypothesize that there will be significantly more medication usage in older participants than younger due to developing or worsening symptomologies. Participants included 98 children (AS=35; WS=34; PWS=29), aged 6-58 months, with currently reported medication use. All participants of the sample are enrolled in the Purdue Early Phenotype Survey, a longitudinal study examining early development in NGS populations. Preliminary statistical analyses suggest that PWS and AS show significantly more medication use than WS. There is a significant correlation between age and medications specific for medical issues, both overall and within each NGS group. However, overall medication use by age was not significant between NGS group subjects. This study addresses the lack of literature surrounding medication patterns in NGS populations, providing comparisons of medication usage and trends related to age among these NGS groups. Future research includes examining effectiveness of medication type and necessary dosage regimens in NGS.

Research Mentor: Nicole Witthuhn, Lab Coordinator, Psychological Sciences, College of Health and Human Sciences; Dr. Bridgette Tonnsen, Psychological Sciences, College Of Health and Human Sciences

Poster Number: 103b :: Social Sciences/Humanities

College of Health and Human Sciences

The Color 'Blue' Lexicon in Classical Russian Poetry

Author:

Vera Kotelnikova

Abstract:

In comparison to the English language, there is a more distinct difference between the words representing the colors of “dark blue” and “light blue” in Russian. Instead of having a word that means simply “blue” and using “dark” and “light” for different shades of the color, the Russian language has two completely different words: “siniy” means dark blue and “goluboi” means light blue. These words are not used interchangeably by native Russian speakers and are used differently for imagery and symbolism in literature. The purpose of this study is to collect and analyze the usage of “siniy” and “goluboi” in Russian literature to see whether there is significance difference between how these two words are used by Russian classical authors and how this differs from using the word “blue” in English. Additionally, we will be looking at the usage of synonyms of these two words in Russian. The author chosen to specifically analyze is Pushkin, who is considered by many to be the greatest Russian poet in Russian literature. This research is currently in process, and we hope to have analyzed all of Pushkin’s poetry by the end of the project and analyzed all the different ways that the two different colors of “blue” are used.

Research Mentor: Olga Lyanda-Geller, Russian and Languages and Cultures, College of Liberal Arts;

Poster Number: 104b :: Social Sciences/Humanities

College of Health and Human Sciences

Effects of SES and Prenatal Maternal Stress on Infant Sleep Behaviors

Author:

Maya Kumar

Abstract:

Spring 2019 UG Research Abstract

Effects of SES and Prenatal Maternal Stress on Infant Sleep Behaviors

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Since poor sleep in infancy has been linked to behavioral problems later on in childhood (Gregory & O'Connor, 2002), it is important to assess the factors influencing infant sleep. Despite its theoretical importance, recent studies have found no evidence linking socioeconomic status (SES) to infant sleep (Tomalski et al., 2016; Tomalski et al., 2013). However, prenatal maternal anxiety has been found to predict sleep problems in infants (O'Connor et al., 2007). The purpose of the present study was to determine whether SES emerged as a predictor of infant sleep in the context of maternal prenatal stress. Specifically, we examined: whether (1) SES and maternal prenatal stress were independently associated with infant sleep, and (2) the effect of SES on infant sleep depended on levels of prenatal maternal stress. We hypothesized that higher maternal prenatal stress and lower SES would be associated with poorer infant sleep, and that for mothers who report higher levels of prenatal stress, the association between SES and infant sleep would be stronger. Using data drawn from a pilot study (N = 16), regression analyses revealed that higher SES was associated with a higher number of minutes spent awake ($d = .70$), and higher maternal prenatal stress was associated with more time spent awake ($d = .12$), but there was no interaction effect. Our results suggest that both SES and prenatal maternal stress are linked to infant sleep independently. These are preliminary findings based on exploratory analyses; future research should examine these associations in a larger sample.

Research Mentor: Kristine Marceau, Human Development and Family Studies, College of Health and Human Sciences; Emily Rolan, Human Development and Family Studies, College of Health and Human Sciences

Poster Number: 105b :: Social Sciences/Humanities

College of Health and Human Sciences

Effects of Consuming Crisco® with Caloric or Non-Caloric Sweeteners and Ketogenic Diet on Body Weight, Composition and Glucoregulation in Male Rats

Author:

Zhengliang Lan

Abstract:

Rates of obese and overweight individuals in the U.S. are reaching epidemic levels, affecting roughly 70% of adults. The ketogenic diet (KD), characterized by high fat and low carbohydrates, is a rising nutrition trend that many believe promotes fat loss and weight loss. Previous research has primarily focused on KD-induced ketosis and its effects on fat loss. However, the relationship between caloric intake during ketosis and effects on body composition is not well understood. Due to the high intensity, zero-calorie nature of non-nutritive sweeteners (NNS), NNS is commonly used in conjunction with KD because normal sugars are carbohydrates, and can compromise the ketogenic state. Therefore, we investigated the effect of administering the NNS sucralose or the caloric sweetener sucrose along with a KD on weight gain and caloric intake. Adult male Sprague-Dawley rats were given a KD paired with either plain, sucralose- (0.01mg/g), or sucrose- (15%) sweetened Crisco™ for 7 weeks. We measured body weight, beta-hydroxybutyrate levels, food intake, and body composition along with an oral glucose tolerance test. The results indicated that there were no differences in weight gain or body fat across groups. Beta-hydroxybutyrate levels were similarly elevated compared to baseline in all groups and oral glucose tolerance responses were similar across groups. Animals given sucrose- sweetened Crisco™ consumed more grams of Crisco compared to plain or sucralose-sweetened Crisco, but fewer grams of the KD; no difference in total caloric intake were observed across groups. These results suggest that addition sucralose or low quantities of sucrose to a KD does not significantly affect body weight, body composition or glucose tolerance in male rats.

Research Mentor: Susan E. Swithers, Department of Psychological Sciences, HHS;

Poster Number: 106b :: Life Sciences

College of Health and Human Sciences

Is There Greater Lactose Intolerance in Women?

Author:

Rebecca Lapides

Abstract:

Relevant literature has suggested that women perceive lactose intolerance (LI) and avoid lactose-containing products at a higher rate than males. Lactose-containing foods are ideal sources of essential nutrients such as fat-soluble vitamins and calcium, so individuals who avoid lactose do not reap these nutritional benefits. This emphasizes the importance of investigating whether women actually experience more LI symptoms than men. The primary study aim was to determine if women and men who are lactose maldigesters, perceive milk intolerance and avoid dairy foods experience different levels of symptoms when fed equivalent amounts of lactose in milk based on their body weights. This was a dose-controlled, single intervention study. Participants were asked to consume commercially available milk with a fat content of 2%. The milk was fed for breakfast following a 12-hour overnight fast. Each subject was fed milk containing 0.5g lactose per kg of body weight. This study utilized baseline data from an ongoing randomized control trial that compares lactose digestion and tolerance to milks containing different genetic variants of beta-casein. A Wilcoxon Signed Rank Test was performed to compare the peak and total symptom scores for each symptom between genders; as well as to compare the total symptom scores between genders. The results were that for each comparison measure, there was strong evidence to support that there is no difference in LI symptoms experienced between genders when body weight is accounted for by the dose.

Research Mentor: Dr. Dennis Savaiano, Department of Nutrition Science, College of Health and Human Sciences;

Poster Number: 107b :: Life Sciences

College of Health and Human Sciences

Fibroblast growth-factor receptor inhibitor modulates T cell activity

Author:

Zian Liu

Abstract:

Breast cancer is the most commonly diagnosed cancer for women in the United States. Unfortunately, patients who are diagnosed with metastatic disease in distant organs suffer worst progression-free survival. Previously, we have developed a covalent inhibitor of fibroblast growth factor receptor 1, FIIN4, that prolongs the survival of mice with metastatic breast cancer. Mechanistically, FIIN4 treatment leads to increased infiltration of cytolytic T lymphocytes (CTLs) which are expected to target and kill cancer cells in pulmonary metastatic tumors. However, the effects of FIIN4 on the antitumor function of CTLs remains unknown. Our preliminary data show that FIIN4 inhibits the function of CTLs both in vitro and in vivo. Here, we hypothesize that FIIN4 has off-target effects against the T-cell signaling pathway which subsequently affects CTL function. We have compared the levels of various adaptor proteins in drug-treated versus untreated Jurkat T cells following T cell receptor activation via immunoblot analyses. These experiments suggest that FIIN4 inhibits tyrosine-protein kinase Lck which plays a key role in T-cell signaling. In future experiments, we will evaluate whether FIIN4 treatment affects the expression of proinflammatory cytokines in Jurkat T cells via ELISA and flow cytometry. Our study may unveil the molecular mechanisms of the observed decrease in T cell function with FIIN4. This knowledge may facilitate the design of novel therapeutics to better treat metastatic breast cancer patients in the future.

Research Mentor: Michael K Wendt, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy; Saeed Salehin Akhand, Department of Medicinal Chemistry and Molecular Pharmacology, College of Pharmacy

Poster Number: 108b :: Social Sciences/Humanities

College of Health and Human Sciences

Do what I say, not what I do? Personal finance experiences of Purdue alumni and advice for current undergraduate students

Author:

Andi Long

Abstract:

Undergraduate students in the United States typically lack the necessary money management skills to keep up with their personal finances and meet their current and future financial goals (Lusardi and Mitchell 2014; Lusardi et al. 2010). This has long-term negative consequences on wealth, savings, retirement preparedness, and other important economic outcomes. I conducted a survey of 400 alumni of Purdue's College of Health and Human Sciences and found that alumni have learned from their experience as college students and have valuable insights for current students. Specifically, they recommend that current students acquire additional knowledge about personal finance than they themselves had when they were at Purdue. Purdue's core curriculum does not include any economics, finance, or personal finance classes (Office of the Provost at Purdue University, "Welcome to Purdue's Undergraduate Outcomes-based Core Curriculum", 2018) and as a result only 15% of respondents voluntarily took a course on personal finance that was not required in their plan of study. Yet, in my survey 94% recommend that all current students take additional personal finance courses (Figure 1). In addition, only 50% of alumni indicated they had a general knowledge of basic retirement savings vehicles upon graduation, but an overwhelming 95% advise current undergraduate students to be familiar in this area of personal finance. The evidence indicates that alumni have financial knowledge from which current students can benefit. In consequence, personal finance training of students could leverage the experiences of alumni to help students gain a more stable financial footing post-graduation.

Research Mentor: Jonathan Bauchet, Department of Consumer Science, Health and Human Resources;

Poster Number: 109b :: Life Sciences

College of Health and Human Sciences

Gut Microbiota Fermentation of Wheat Bran Particles: Does Size Matter?

Author:

Christine Medin

Abstract:

The purpose of this study is to analyze microbial preferences to wheat bran and its impact on metabolite production, which is dependent on food matrix size and accessibility. Prior results suggest that gut microbial species favoring smaller wheat bran particle sizes will elicit higher levels of propionic short chain fatty acid following fermentation, while species that favor larger particle sizes synthesize more butyric acid—a preferred energy substrate of colonocytes. In our lab, fecal samples from three individual donors were inoculated with buffer and exposed to 180-250 μm , 300-500 μm and 1000-1700 μm wheat bran particle sizes over the course of a seven day fermentation cycle. Samples from day one and day seven were subjected to 16S rRNA sequencing, while only day seven samples succumbed to Gas Chromatography-Mass Spectrometry for global metabolites analysis. Samples from all seven days were subjected to short chain fatty acid analysis using Gas Chromatography. Findings substantiated that depending on preference to small, medium and/or large wheat bran particle sizes, colonic microbial species will produce different levels of short chain fatty acids and other metabolites. Advanced agricultural milling processes have developed more consistent, finer sizes of grains, which has improved the palatability and texture functionality of wheat bran. However, future studies in animal models—and potentially humans—may determine the physiological ramifications of selecting certain wheat bran particle sizes in foods, specifically from the perspective of colonic bacterial species, their fermentation metabolites and their role in human nutrition.

Research Mentor: Dr. Stephen Lindemann, Department of Food Sciences, College of Agriculture; Riya D Thakkar, Department of Food Sciences, College of Agriculture

Poster Number: 110b :: Social Sciences/Humanities

College of Health and Human Sciences

Provider/Patient Shared Decision-Making and Opioid Prescribing

Author:

Leroy Medrano

Abstract:

In the U.S. there is an opioid crisis which has major repercussions on the healthcare system and can result in overdoses and death. Physicians and other healthcare providers are under pressure to moderate the use of opioids for managing patients with chronic pain. When physicians and patients make decisions together (shared decision making, SDM), patients are more likely to adhere to the recommendations which may include the reductions of opioids and the use of alternative strategies such as diet, exercise, and orthopedics. We hypothesize that higher levels of SDM will be associated with reduction in the use of opioids, increase in use of OTC medications, and alternative approaches. I coded a sample of 20 transcripts of patient-physician interaction concerning the management of opioids. I used an Excel coding template with indications of incremental, equivalent, and decremental amounts of opioids and OTC medications, as well as signs of other treatments such as non-opioid medicines, dietetics, surgery, or physical therapy. The preliminary results of the 19 cases found that 3 did not discuss about opioids, 5 lower or stopped the opioids, 7 where they gave in equal dosage, and 4 where they gave an increase.

Research Mentor: Dr. Cleveland Shields, Human Development & Family Studies, College of Health and Human Sciences;

Poster Number: 111b :: Social Sciences/Humanities

College of Health and Human Sciences

The Underlying Mechanism behind Pragmatic Deficits in Children with Autism: How Pragmatic Difficulties are Related to Social Visual Experience

Author:

Allison Menting

Abstract:

Children with Autism Spectrum Disorder (autism) typically have deficits in pragmatic language skills. Adolescence is a time of dynamic social experiences when children form their own social groups and lead independent social lives. This increase in social complexity compared to earlier stages of development makes it even more difficult for children with autism to fit in with their peers. Most of what we know about pragmatic language skills in adolescents with autism is based off standardized assessments and questionnaires. To improve interventions for pragmatic language, we first need to better understand communication processes within the contexts they occur. We examined the visual experience of children with autism in the first-person perspective and how this is related to their pragmatic skills. In this study we compare the interrelationship between pragmatic skills and visual experience in children with autism. Participants included 6 7-14 year-old children with a diagnosis of Autism Spectrum Disorder. Participants were separated into two-person groups engaging in a question-answer game focusing on initiating conversations while wearing a head mounted camera. We coded for the duration of the conversation partner's hands, body, face, and eyes in the participant's visual field. Examining this may help us find the underlying mechanism of pragmatic deficiencies, as it has not been specifically studied in existing literature.

Research Mentor: Dr. Carolyn McCormick, Human Development Family Studies, Health and Human Sciences;

Poster Number: 112b :: Social Sciences/Humanities

College of Health and Human Sciences

Detecting Obsessive Compulsive Personality: The Agreement between Self and Others

Author:

Srinithya Nagarajan

Abstract:

The Five Factor Obsessive Compulsive Inventory-Short Form (FFOCI) is a brief measure of maladaptive variants of the Five Factor Model (FFM) personality traits that are linked to obsessive compulsive personality disorder (OCPD), which includes problematic aspects such as perfectionism, workaholism, and rigidity. The present study provides further validation to FFOCI-SF by investigating the degree of overlap of self-report ratings of FFOCI-SF, as well as ratings from a close friend. A total of 302 undergraduates completed FFOCI-SF, general personality measures and the information of a close friend to serve as an informant rater. One hundred thirty-five informants responded to the invitation to participate in the study and completed ratings of their close friend on FFOCI-SF and measures of general personality. Results indicated moderate to strong convergence between these perspectives (mdn $r = .37$), as well as evidence that both perspectives correlated in expected ways with other related constructs.

Research Mentor: Dr. Douglas Samuel, Psychological Sciences, College of Health and Human Sciences;

Poster Number: 113b :: Life Sciences

College of Health and Human Sciences

Evaluation of Harmane as a Potential Toxicant to Dopaminergic Neurons in *Caenorhabditis elegans*

Author:

Claudia Nieves

Abstract:

Heterocyclic amines (HCAs) are chemicals that are formed from reactions between amino acids, sugars, and creatine, when meat, pork, beef, fish, and poultry, are cooked at high temperatures. Harmane is one such HCA and a potential neurotoxin. It is found in cooked meat, roasted coffee beans and tobacco. Harmane accumulates in brain tissue and has been linked to neurological conditions such as essential tremor and Parkinson's disease (PD). Here, we hypothesized that: harmane treatment would produce selective dopaminergic neurodegeneration. To test this hypothesis, we utilized *C. elegans* as a model organism. *C. elegans* is a unique and simple model in terms of transparent body, GFP reporter strain, relatively low number of neurons and short lifespan. We observed morphological changes, such as, swollen neurons, dendrite breaks. Some worms also exhibited complete loss of neurons. The observed effects were dose-dependent. Mitochondrial viability (evaluated using Mitotracker red) exhibited significant decline, alongside reduced dopamine levels (as evaluated using 1-nonanol repulsion assay). Overall results indicated significant symptomatic overlap with PD pathology in terms of afflicted mitochondria, dopamine neurons and behavior. Considering the fact that < 10% cases of PD are familial in nature and in light of the preliminary findings, harmane should be further evaluated as a PD-relevant neurotoxin.

Research Mentor: Jason Canon, School of Health Sciences, College of Health and Human Sciences; Shreesh Sammi, School of Health Sciences, College of Health and Human Sciences

Poster Number: 114b :: Life Sciences

College of Health and Human Sciences

3,3' Diindylomethane (DIM) offers radioprotection property in mice treated with ionizing radiation

Author:

Huong Pham

Abstract:

Radiation therapy is a treatment for localized forms of cancer. This form of treatment uses high doses of radiation to destroy cancer tissues and decrease tumor size, either given as an internal or external beam therapy. Accompanying the benefits of external radiation are side effects, including hair loss, fatigue, skin changes, shortness of breath, and other changes in the tissue structure of the organ targeted. The purpose of this study is to test the ability of 3,3'-Diindolylmethane (DIM) to protect against the skin side effects of chest irradiation while still allowing radiation beams to treat the cancer. For this research study, a X-RAD 320 Precision X-ray was used to irradiate a mouse model aiming at the thoracic area. Test subjects were divided into a treatment and a control group. The mice from the treatment group received an intraperitoneal injection of DIM 30 minutes prior to irradiation. The control group only received irradiation without prior administration of the drug. Over a period of six weeks, mice were graded on the level of damage from 0 to 5, with 0 being no hair loss, and 5 being there is presence of skin tissue necrosis. Damage grade and time were graphed and critically analyzed, and results show the mice that received DIM treatment prior to irradiation experience less skin effects than those in the control group. These mice also show sign of improvements such as hair growing back after having lost hair during the earlier weeks. These results are promising for using 3,3'-Diindolylmethane as a treatment for preventing severe radiation skin side effects in cancer patients.

Research Mentor: Carlos Perez-Torres, Health Science, College of Health and Human Sciences;

Poster Number: 115b :: Life Sciences

College of Health and Human Sciences

The Relation Between Fine Motor Skills and Executive Functions in 2-Year-Old Children

Author:

Alyssa Pierotti

Jacob Herr

Sarah Cook

Abstract:

The ability to coordinate thoughts and actions (Executive Function, EF) at 3-years predicts lower BMI, higher job satisfaction, and fewer criminal convictions at 30-years (Moffit et al., 2011). Given the importance of EF to our lifelong health and wellbeing, identifying mechanisms underlying the development of EF could lead to better interventions. One promising factor is motor skills. Fine motor skills and EF are positively correlated in 3- to 6-year-olds (e.g., Oberer et al., 2017; MacDonald et al., 2016); however, it is unknown if this relation exists earlier. Therefore, our project explored EF and fine motor skills in 37 2-year-olds ($m=30.91$ mo; 14 girls; range=25-35mo). Participants completed the Minnesota Executive Function Scale (MEFS) and the Fine Motor portion (FMQ) of the Peabody Developmental Motor Scale. The MEFS assesses EF (cognitive flexibility, inhibition, and working memory). The FMQ has two subtests: Grasping (whole-hand and finger grasping) and Visual Motor Integration (VMI; eye-hand coordination). To measure verbal IQ, parents identified the number of words children could produce (MacArthur-Bates Communicative Development Inventories). MEFS and FMQ were positively correlated ($r=0.62$, $p=0.00$) even when controlling for age (in mos) and verbal IQ ($r=0.57$, $p=0.01$). For the fine motor subtests, MEFS positively correlated with VMI ($r=0.52$, $p=0.00$) and Grasping ($r=0.40$, $p=0.03$). Only VMI remained positively correlated with MEFS when controlling for age and verbal IQ (VMI: $r=0.54$, $p=0.01$; Grasping: $r=0.25$, $p=0.26$). These findings demonstrate a link between EF and visual-motor integration in 2-year-olds. Future research should investigate how interventions focused on improving visual-motor integration impact EF development.

Research Mentor: Laura J. Claxton, Health and Kinesiology, HHS; Lucas J. Rooney, Health and Kinesiology, HHS

Poster Number: 116b :: Life Sciences

College of Health and Human Sciences

Tracking the Oral Side Effects of Brain Irradiation in Mice With Magnetic Resonance Imaging

Author:

Elizabeth Roach

Abstract:

Typically, the goal of radiation therapy is to deliver doses in a precise manner to the tumor in order to prevent damage of healthy surrounding tissue. While radiation is proven to be wildly successful in the destruction of tumors, the side effects and injury to adjacent tissue can lead to lifelong morbidity. When it comes to head and neck cancers, one tissue of concern is the jaw area. The aim of this study is to discover the root cause of the damage and develop techniques to prevent or lessen the side effects of radiation in the mandible area. Our first experiments included five BALB/cNHsd female mice aged seven to eight weeks radiated in a 5 x 5 millimeter area between the cerebellum and eye using an X-Rad 320. Amifostine, an approved radioprotectant drug, was injected intraperitoneally 30 minutes prior to irradiation, at doses of either 0, 100, or 200 mg/kg. The study was blind in order to prevent bias in knowing the concentration of the drug while viewing MRI results. After utilizing MRI, pathology was seen consistently within the alternate groups. More recently we have shifted towards a more clinically relevant topic, xerostomia, which is an underproduction of saliva due to damage of the salivary glands. Five BALB/cNHsd mice were split into groups and irradiated with 5 Gy, 10 Gy, or no dose. The irradiations alternated between left and ride sides in a 5 x 5 millimeter area. The mice were monitored and imaged ten days post-irradiation. Weight was used as a measurement of damage as well as dark spots within the salivary glands on MRI images. Results were inconclusive. Future directions include increasing the dosage as well as irradiation of the whole neck along with use of Amifostine.

Research Mentor: Dr. Carlos Perez Torres, School of Health Sciences, Radiological Health Sciences;

Poster Number: 117b :: Social Sciences/Humanities

College of Health and Human Sciences

The Broader Autism Phenotype in Early Childhood: Are gaze patterns a possible risk marker?

Author:

Carissa Serratos

Abstract:

With a current autism spectrum disorder (ASD) national prevalence of 1 in 59, research efforts are committed to identifying potential risk markers for later diagnosis. Previous research tracking younger siblings of children with ASD (high-risk infants) have identified social communication difficulties in children later diagnosed with ASD, as well as children exhibiting subclinical symptoms, such as the Broader Autism Phenotype (BAP). However, knowledge is limited about early social communication development in children exhibiting the BAP. Recognizing eye gaze is essential to social communication and is a key early risk marker for ASD, understanding gaze patterns in the BAP may inform our developmental understanding of risk markers in high-risk infants. The present study assessed gaze patterns between children with BAP and their typically developing peers (TYP), during a play interaction to test whether the BAP group (1) looks less towards their mothers' face, and (2) look more towards toys. As part of a prospective study, 66 children completed a mother-child play task at their 18- or 24-month laboratory visit. The interaction was coded for the frequency and duration of look face and look object. At each child's final laboratory visit, outcome classifications of either BAP (n=18) or TYP (n=48) were assigned. A series of ANCOVAs, with infant sex and maternal education as covariates, were conducted and revealed no significant group differences. Our results suggest gaze may not be a core social difficulty in children exhibiting the BAP. Future studies may build upon our study by assessing other core social behaviors that may differentiate risk.

Research Mentor: Dr. A.J. Schwichtenberg, Human Development and Family Studies, College of Health and Human Sciences; Ashleigh Kellerman, Human Development and Family Studies, College of Health and Human Sciences

Poster Number: 118b :: Social Sciences/Humanities

College of Health and Human Sciences

Attachment Contagion in Romantic Relationships: Do Partners Adopt Each Other's Comfort Versus Misgivings with Closeness?

Author:

Emily Stahly

Abstract:

Couples often are mismatched in their attachment orientations, their general level of comfort and trust toward relationship partners. These attachment orientations encapsulate one's past history with close others, and become expressed in a current relationship as expectations, beliefs, and strategies for managing moments of distress. Attachment tendencies are captured by two orientations: feelings of avoidance (distrust and discomfort with close emotional connections) and anxiety (feeling unlovable and fearing a partner leaving them). Some individuals feel relatively secure within partners, as they are comfortable being close to others and others being close to them (low on feelings of both avoidance and anxiety). The current project examined whether romantic partners become increasingly similar across time, adopting the other's attachment tendencies, or instead retain stable tendencies. The literature review evaluates three competing predictions: (1) romantic partners maintain their attachment tendencies over time (2) the more secure partner adopts the more insecure partner's attachment tendencies (becoming more insecure) (3) the more insecure partner adopts the secure partner's tendencies (becoming more secure). The current project examines the existing support for each prediction and finds support for each. This project informs how attachment orientations may change in new relationships with romantic partners.

Research Mentor: Dr. Ximena B. Arriaga

Psychological Sciences

College of Health and Human Sciences;

Poster Number: 119b :: Social Sciences/Humanities

College of Health and Human Sciences

Parent Suggestions for Improving Psychological Assessment for Children with Neurogenetic Syndromes

Author:

Amber Swint

Samantha Howell

Breanna Martin-O'Dell

Abstract:

Children with rare neurogenetic syndromes (NGS) frequently undergo psychological assessments for various purposes. Many caregivers anecdotally report dissatisfaction with these processes yet are not given the opportunity to report their concerns. We sought to investigate the concerns of caregivers in regard to their child's psychological assessments, and whether these concerns differ across NGS. 97 caregivers of children with NGS completed online questionnaires about their child's most recent psychological assessment. Open-ended survey responses were coded by two undergraduate research assistants with high agreement (87-96%). We examined the frequency of five themes: communication (A); environment (B); organization and preparations (C); resources, planning, and results (D); and testing (E). We hypothesized there would be more reported concerns with the A and E themes for the caregivers of children with other NGS (OTH) compared to caregivers of children with Down syndrome (DS). Due to small sample sizes within cells, we used Fisher's exact tests to examine proportional differences between DS and OTH for each of the five themes. Contrary to hypotheses, there were no significant differences between DS and OTH groups for each of the five themes; 22.7% OTH reported A concerns compared to 15.5% DS, $p=.498$; 9.3% OTH reported B concerns compared to 2.1% DS, $p=.116$; 11.3% OTH reported C concerns compared to 5.2% DS, $p=.338$; 6.2% OTH reported D concerns compared to 6.2%, $p=.303$; 24.7% OTH reported E concerns compared to 18.6%, $p=.330$. Further exploratory analyses will examine additional themes. Learning about caregivers' concerns will likely inform clinicians and researchers how to improve the assessment process for children with NGSs and their caregivers.

Research Mentor: Taylor Halligan, Department of Psychology, Health and Human Sciences; Dr. Bridgette Tonnsen, Department of Psychology, Health and Human Sciences

Poster Number: 120b :: Life Sciences

College of Health and Human Sciences

Defining the Developmental Toxicity of the Herbicide Dicamba Using the Zebrafish Model System

Author:

Lucas Turner

Abstract:

The use of the agrochemicals glyphosate and dicamba make up a majority of the pesticides used in the United States, especially in the farming states of the Midwest. Glyphosate is the most widely used herbicide in the US and world because of the genetically modified crops that have been developed to be resistant to glyphosate's herbicidal effects. Over the years, dicamba use has been modest throughout the United States; however, with Monsanto's introduction of Xtend crops including soybeans and cotton as a part of their Roundup Ready crop system in 2016, dicamba use is expected to increase in a similar manner as that of glyphosate. Glyphosate's maximum contaminant level (MCL) for drinking water has been set at 0.7 ppm (mg/L); however, an MCL still has not been set for dicamba. In the spring of 2017, the US EPA approved the mixture of dicamba and glyphosate in one tank for application purposes by farmers in order to reduce the number of application trips. Although this decision was good for the farmers, there has been little research looking into the mixture toxicity of the two herbicides. One possible effect, synergism, happens when the combination of two chemicals has a greater effect, in this case toxicity, than the sum effects each one has individually. To study this, zebrafish embryos were collected immediately after fertilization and exposed to different concentrations of dicamba alone, glyphosate alone, and mixtures of dicamba and glyphosate through 120 hours post fertilization (hpf). After this exposure a visual motor response test was used to assess behavioral changes at 120 hpf. It was found that zebrafish larvae were observed to be hypoactive at higher dicamba and glyphosate concentrations when tested individually and in mixture ($p < 0.05$).

Research Mentor: Dr. Jennifer L. Freeman, School of Health Sciences, College of Health and Human Sciences;

Poster Number: 121b :: Life Sciences

College of Health and Human Sciences

Accuracy of Portable L X-Ray Fluorescence (L-XRF) to Quantify Lead (Pb) in Condor Bones In Vivo

Author:

Emma Wallens

Abstract:

Our lab has been working on the development of a portable L-shell x-ray fluorescence (LXRF) device to quantify lead in human bone in vivo. The purpose of this project is to determine the accuracy of the portable LXRF machine in measuring the lead content of condor bones. While the existing K X-Ray Fluorescence (K XRF) system is the most accurate system to measure bone lead content in vivo because it has sufficient energy to overcome soft tissue attenuation, it is not very practical for use in a research lab with animals or for researchers covering a large migratory territory of condors (from California to Arizona). The portable L XRF machine is lightweight, does not require continuous maintenance, a radioisotope source, or nitrogen cooling, and provides immediate spectra for analysis.

I calibrated the system with Pb-doped bone-equivalent phantoms that were covered with 0.54 mm, 1 mm, and 1.5 mm Lucite to mimic the effects of soft tissue attenuation. The detection limit was calculated to be 0.6 ppm with 0.54 mm Lucite thickness. Seventeen condor cadaver bones were measured twice (for reproducibility) and the spectra were analyzed with our in-house spectral fitting program written with MatLab. Significant correlation was observed between the bone Pb concentrations measured by the portable XRF and ICP-MS ($R^2 = 0.68, 0.763, \text{ and } 0.74$ for 0.54, 1, and 1.54 mm tissue thicknesses, respectively) and the linear regression of the K XRF results versus the 0.54, 1, and 1.54 mm Lucite thickness measurements was $R^2 = 0.9, 0.81, \text{ and } 0.84$. Two measurements of the same set of bones (Lucite thickness at 0.54 mm) gave rise to a strong correlation with an R^2 of 0.95, which shows a great reproducibility of the results.

In conclusion, the L XRF machine has sufficiently proven to provide accurate measurements, with a few consistent outliers across the tissue thicknesses; we expect the correlation constant to move further away from 1 as the tissue thickness increases, but this trend is not visible in the linear regressions of the portable XRF versus the ICP-MS, while it can be observed in the trend of the K versus L XRF linear regressions.

Research Mentors: Dr. Linda Nie, School of Health Sciences, College of Health and Human Sciences; Xinxin Zhang, School of Health Sciences, College of Health and Human Sciences

Poster Number: 122b :: Social Sciences/Humanities

College of Health and Human Sciences

Use of Counterfactual Thinking Technique in Storytelling: Effect on Affect and Aesthetic Judgement of a Destination/an Attraction

Author:

Kexin Wang

Abstract:

The project addresses a significant literature gap in hospitality and tourism marketing with the use of counterfactual thinking strategy, a content strategy that forms an effective brand storytelling mechanism. Hospitality and tourism business offerings are complex with multi-components and a high degree of intangibility. Therefore, content marketing when well executed will play a critical role in tangibilizing our experience-based products and building brand equity. In this project, we aim to identify specific visual traits in brand storytelling that can optimally engage consumers. These identified traits will become useful parameters for hospitality business in their effort to create compelling brand stories. Additionally, given hospitality and tourism businesses tend to serve a wide population with various cultural backgrounds, we hope to identify culturally specific content traits that will assist companies to build emotional bonds with customers from various cultural backgrounds. An empirical study will be conducted on people's perception of images that are representative of various visual traits and data will be gathered through a survey. There will be also an analysis component where researchers will examine the effect of scenario-based visual storytelling in hospitality and tourism businesses. This second step in conjunction with the results of the experiment will allow researchers to provide suggestions in hospitality brand storytelling practices. This research shall provide evidence-based recommendations for the industry practitioners in better structuring their brand stories, and in better communicating their brand value to a global audience.

Research Mentor: Xintan Lehto, Hospitality and Tourism Management, Health and Human Science

Alei Fan, Hospitality and Tourism Management, Health and Human Science, Hospitality and Tourism Management, Health and Human Science; Lihan Huang, Hospitality and Tourism Management, Health and Human Science

Tianyi, Hospitality and Tourism Management, Health and Human Science

Poster Number: 123b :: Social Sciences/Humanities

College of Health and Human Sciences

Audience Element

Author:

Carlie Wilson

Introduction. Out-of-home placement (OOHP) is a traumatic event experienced by children with substantiated child abuse and neglect. OOHP has been associated with more depression (Anderson, 2011) and post-traumatic stress symptoms (Kolko, Hurlburt, Barth, Leslie, & Burns, 2010) as well as with externalizing problems, such as delinquency and aggression (Newton, Litrownik, & Landsverk, 2000; Perry & Price, 2017). Few studies examine how change over time in OOHPs can influence internalizing and externalizing problems during adolescence – a gap the current research addresses.

Methods. Data come from the National Survey of Child and Adolescent Wellbeing I, which includes a national sample of children in contact with Child Protective Services (CPS). Three waves of data (waves 1, 2, and 4) over a three-year period was used in the present research.

Latent transition analysis was conducted in Mplus 7.4 to evaluate patterns of change in OOHP over three years. OOHP patterns were used to assess outcomes among youth when they were between the ages of 13 and 17 using regression models.

Results. Results from the latent transition analysis indicate four patterns of change over time in children's OOHP: 1) no OOHP, 2) OOHP one time, 3) OOHP two times, 4) OOHP two times with change in placements, 5) OOHP three times, and 6) OOHP three times with change in placement..

Results demonstrate that greater instability in placement (i.e. more frequency and change in placement) was associated with more depressive and trauma symptoms as well as more delinquent and aggressive behaviors.

Conclusion. Greater instability of out of home placements can make children more vulnerable in terms of negative outcomes when they reach adolescence – a finding that is rooted in attachment theory. Specifically, greater instability can result in the lack of strong caregiver-child attachment which has been linked to poorer adjustment among children throughout their life (Hardt & Rutter, 2004). Findings highlight a need for prevention efforts aimed at improving outcomes among children with unstable placements following child abuse and neglect.

Research Mentor: Aura Ankita Mishra, Human Development and Family Studies, College of Health and Human Sciences; Dr. Sharon Christ, Human Development and Family Studies, College of Health and Human Sciences

Department of Statistics

Poster Number: 124b :: Life Sciences

College of Health and Human Sciences

Is Hair a Reliable Biomarker for Internal Manganese Exposure?

Author:

Frank Yanko

Chloe Rivers

Abstract:

Manganese (Mn) is an essential metal in the human body that has significant implications in maintaining normal brain and nerve function. Numerous accessible biological specimen Mn levels may serve as biomarkers of internal Mn exposure such as blood, urine, plasma, nail and hair samples. The absence of a proven biomarker to quantify internal exposure drives this study. We aim to determine if hair is a reliable biomarker for internal Mn exposure in the body. We used 12 week old male and female C57BL/6J mice. The animals were exposed in two blocks of 3 subcutaneous injections every 3 days starting day 0 and 20. There are three treatment groups in this study. The control group received saline (vehicle), second treatment group received two blocks of Mn (50 mg/kg $MnCl_2 \cdot 4H_2O$) and the third group received only one block of Mn injections. Methylmercury (MeHg) was used as a positive control (3mg/kg) as it is known to accumulate in hair upon internal exposure. The third treatment group received MeHg injections in the second block. Hair was collected on day 0 and day 60 from all three treatment groups. The animals were sacrificed on day 60 of the study, tissue from brain, liver and kidney were also collected. Mn concentrations in the hair samples were quantified by inductively coupled plasma mass spectrometry (ICP-MS). We have successfully established the methods for hair digestion and detection of Mn in mouse hair using ICP-MS. We will be using this protocol to analyze our samples. We will determine if a significant correlation between the internal doses of Mn and the levels of Mn found in the collected hair is found. Potentially, hair can be used as a reliable and non-invasive biomarker for internal Mn exposure in humans to lead to earlier detection of neurotoxicity.

Research Mentor: Aaron B. Bowman, Health Sciences, College of Health and Human Science; Rekha Balachandran, Health Sciences, College of Health and Human Sciences.

Poster Number: 125b :: Social Sciences/Humanities

College of Health and Human Sciences

Ostracism and Passive Receptivity

Author:

Yichuan Yin

Abstract:

Abstract

Ren et al (2016) found that ostracism induced a stronger desire to seek solitude among ostracized individuals, and the effect is especially strong among introverted individuals. The current study examined whether ostracized individuals would become more passive toward proactive taking actions to join the group, but, would be receptive to invitations from others (passive receptivity). We also investigated several individual differences that might moderate these effects. All participants were randomly assigned to be included or ostracized in Cyberball. After which, they entered Cyberchat, a simulated chatroom invitation site, where they were asked to decide whether they wanted a partner for subsequent tasks. If they did, they could send an invitation; if not, they needed to do nothing. Participants who did not proactively send an invitation received an invitation from another "user" 55-second later. We recorded the time span between when they entered Cyberchat and when they sent an invitation for those who proactively sent an invitation as well as the acceptance rate of invitation for those who were invited at 55th second. Ostracism threatened fundamental needs, however nearly everyone proactively invited a partner prior to the 55-second delay. Among ostracized participants, introverted individuals had a longer delay to invite than extroverted ones. I discuss potential improvements to Cyberchat that will better test my hypotheses.

Research Mentor: Kipling D. Williams, Department of Psychological Sciences, College of Health and Human Sciences;

Poster Number: 126b :: Social Sciences/Humanities

College of Liberal Arts

Educational Policy in the Indiana General Assembly

Author:

Manuel Arauz

Abstract:

The purpose of this research is to scrutinize the legislative activity of the of the two standing education committees in the House and Senate of the Indiana General Assembly. Data from the study include field notes taken during weekly committee meetings and general sessions (both live and archived video) and interviews with various stakeholders in education policy. Two important issues have been brought up numerous times in committee hearings and testimony, these are the central topic of this poster symposium: a civics literacy test for high school students and school safety. Legislators in the state's capitol have struggled over the years to enforce a mandatory one hundred question civics literacy test for high school students. This year momentum has built up as university's like Purdue and several other states are proposing similar bills as part of their curriculum. School safety has been a topic of contentious debate at the national and state level after incidents such as Parkland. With Hoosiers demanding solutions to avoid the loss of lives, a Republican-controlled congress has vowed to solve the problem through pro-gun legislation.

Research Mentor: Tara Johnson, English Department, College of Liberal Arts;

Poster Number: 128b :: Social Sciences/Humanities

College of Liberal Arts
P'urhepecha Classifier Morphemes

Author:

Matthew Ball

Abstract:

This project focuses on the syntactic properties of classifier morphemes found in P'urhépecha, a language isolate spoken in Michoacán, Mexico. P'urhépecha is an agglutinative language that relies heavily on concatenative morphology within words to create complex meaning. This project explores classifier morphemes found in locative verb constructions, as in example (1):

(1) Posti ana-nu-sti terunukwa-rhu

Post CLF-CLF-is patio -on

The post is laying on the patio

The verb contains several morphemes: ana- referring to the DP (posti 'post'); -nu- referring to the locative XP (terunukwa-rhu 'patio'); and -sti marking tense and person agreement of the initial DP. These morphemes carry information regarding specific properties attributable to the constituent they refer to. The question this project aims to answer involves the nature of the relation between the classifier morphemes and their corresponding arguments within the sentence unit and how to represent it in a syntactic structure.

Following Benedicto (2018), this project hypothesizes that these classifier morphemes can be parasitically merged with a functional head already existing in locative expressions. This can be represented in syntactic structures from which we can derive the observed distribution.

Research Mentor: Elena Benedicto;

Poster Number: 129b :: Social Sciences/Humanities

College of Liberal Arts

Intersectionality Dimensions of Inequality in the Labor Market: How Gender, Race, Class, Age, and Sexual Orientation Influence Hiring Decisions

Author:

Ellen Deemer

Abstract:

The focus of this project is to evaluate LinkedIn profiles from a sociological standpoint. This project consists of manipulating different social factors including age, sex, race, religion, and class on LinkedIn profiles to determine biases made against these characteristics in the hiring process. The purpose of this study is to understand stereotypes made against minorities and other social factors. Based off information from previous studies, this study aims to determine more in depth the discrimination made when looking at LinkedIn profiles rather than resumés or curriculum vitae. One goal is to determine which combinations of these social factors will influence someone's opinion positively or negatively on a LinkedIn profile.

Research Mentor: Trenton Mize, Sociology, College of Liberal Arts;

Poster Number: 130b :: Innovative Technology/Entrepreneurship/Design

College of Liberal Arts

The Menominee Project

Author:

Gabe Cassala

Abstract:

The purpose of this project is to create a feasible shooting script for a nature documentary titled "The Menominee Project." The purpose of this film is to raise awareness for the Menominee area and its struggle to keep away a sulfuric mining operation near the river. We took footage previously filmed in the town of Menominee by Professor Osman, and combined it with home video and archived footage of Michigan to create a documentary film propelled by nostalgia. We took this angle because we believed it would be the best way to get the most people involved and interested about a natural area that could be hundreds of miles away from them. This film is meant to play at numerous film festivals across the country. Afterward it would most likely be uploaded to Vimeo so to be seen by a world-wide audience. The conclusion is yet to be seen about how this project will turn out; as is common with pieces of creative film content.

Research Mentor: Doug Osman, Communication, Liberal Arts;

Poster Number: 131b :: Social Sciences/Humanities

College of Liberal Arts

Digitizing Victorian Era History in BRANCH and COVE—Innovative Tools for Scholars

Author:

Alicia Geoffray

Abstract:

This project involves pinning geospatial locations and allowing for easier visualization of their significance during the Victorian era on Central Online Victorian Educator (COVE); thus, digitizing and making the research process easier for Victorian scholars. The project is significant because it allows for easier visualization of integral cities, houses, and other significant locations and displays how these various locations connect and overlap. These locations are then hyperlinked within a multitude of scholarly articles published on British Representation and Nineteenth-Century History (BRANCH). Through deeper research into these locations, and in retrofitting the BRANCH articles with hyperlinks to the COVE map, this project cultivates a furthered understanding of the physical world during the Victorian Era and adds to the materials available digitally in this discipline. This project involves summarizing the main points of interest about these specific locations, researching their exact locations, and finding a suitable image. These map pins are then inserted as hyperlinks in every article within the published, peer-reviewed works of BRANCH so that Victorian scholars can better visualize the locations to which these articles refer and in turn cultivate a deeper understanding of the time period. This resource also allows for a more advanced visualization of the connection between these different locations as well as the vast number of significant events that shaped the development of these different cultures during the nineteenth-century.

Research Mentor: Dr. Dino Felluga, English department, College of Liberal Arts;

Poster Number: 132b :: Life Sciences

College of Liberal Arts

3D Scanning of Human Hunting and Butchery Evidence

Author:

Amanda Gozner

Corissa Meyer

Abstract:

The purpose of the research is to study the morphology of bone surface marks in order to isolate the differences between types of marks and provide statistical support. For this research three different types of marks are being studied: trampling, butchery, and crocodile marks. These marks are experimentally made, then 3D scanned and edited. Editing of the scans is completed through the use of the computer program Meshlab and solely limited to the extraction of the marks of interest from the 3D scans. The scans must be edited in-order to remove unnecessary variables from them such as generic bone surface or other insignificant marks. The isolated marks are then further processed through the use of R-programming to create a generic shape for each individually extracted mark. These mark shapes are then further compared using statistical analysis in R-programming in order to observe general trends of difference in each of the types of marks. The data can eventually be used to be compared to unidentifiable mark types, allowing for statistical analysis of the probability an unknown mark is one of the types.

Research Mentor: Erik Otarola-Castillo

Department of Anthropology

College of Liberal Arts;

Poster Number: 133b :: Social Sciences/Humanities

College of Liberal Arts

The Garden of Evil

Author:

Dalton Griffin

Abstract:

The purpose of this study is to write a documentary script for Doug Osman, clinical associate professor in the School of Communication. The documentary explores the various carnivorous plants that grow in the United States, the community of people who buy and sell them, and how we as humans are harming their delicate habitats. The end of the documentary calls the viewer to be more courteous and kind to wildlife and to advocate for conservation in the United States. The script will take on a horror/visceral tone throughout, which will harken back to the time of carnivorous plants used in horror films in the Golden Age of Hollywood. The goal is to get a high-profile celebrity, perhaps one with a stake in environmentalism/conservationism, to narrate the documentary.

Research Mentor: Doug Osman, Brian Lamb School of Communication;

Poster Number: 134b :: Social Sciences/Humanities

College of Liberal Arts

Media, Music and Language: How the cultural references in the soundtrack complete the films A City of Sadness and Platform

Author:

Dingdan Hou

Abstract:

Jia Zhangke has been seen as the representative auteur of “Sixth generation” of Chinese cinema, and Hou Hsiao-hsien is the leading figure in Taiwan’s New Wave cinema movement. Both directors’ films have received critical praise and have been internationally recognized, their films both have a sense of showing the real life of ordinary or marginalized people in a specific time of history. And Hou Hsiao-hsien was featured in one of Jia Zhangke’s documentary I Wish I Knew in 2010. As I noticed from watching Platform and A City of Sadness, two pieces have many cultural references and symbolized moments hide underneath the quiet and static long takes, Also there are some similar aesthetics of camera angles and shots between two directors. In this research paper, I want to analyze and compare two films from these two great directors based on the aesthetic use of long shots and long takes, the intentional use of dialects, use of cultural reference in different media, the choice of using main protagonists represent society, also their attitude as narrative and observative directors.

Research Mentor: Hongjian Wang, School of Languages and Cultures, College of Liberal Arts.;

Poster Number: 135b :: Life Sciences

College of Liberal Arts

Intersecting Dimensions of Inequality in the Labor Market

Author:

Navni Kharde

Ellen Deemer

Abstract:

Inequality in the Labor Force is very protruding subject which has been observed across the board. This study attempts to broaden the search parameters by identifying as many varied factors of both the employee for hire and the hiring employee and evaluate how gender, sex, race, sexuality and age of both employees influences the hiring process. This approach uses LinkedIn profiles to test the various characteristics from a sociological standpoint. Based off information from previous studies, this study aims to determine more in depth the discrimination made when looking at LinkedIn profiles rather than resumées or curriculum vitae. One goal is to determine which combinations of these social factors will influence someone's opinion positively or negatively on a LinkedIn profile. We will then develop a structure which would help explain how different combinations add to increase the marginalization or how they one another cancel out.

Research Mentor: Trenton Mize, Sociology, College of Liberal Arts;

Poster Number: 136b :: Social Sciences/Humanities

College of Liberal Arts

Emotional Labor- How We Work to Show Certain Emotions

Author:

Paige Kinder

Abstract:

Emotional labor is a concept that has been around since 1983, when sociologist Arlie Hochschild talked about certain careers that require you to manage your feelings and emotions in her book *The Managed Hearts*. Certain jobs require you to act nicer than you may be feeling, like a teacher or a nursing home aid who cannot show if they are frustrated or angry in the workplace. While others may force you to act more angry than you may usually be, like a bill collector, who cannot show sympathy towards their clients. These jobs often see you putting your actual feelings aside and acting in a way that you are expected to when interacting with clients and coworkers while in a professional setting.

There are three main ways that emotional labor is regulated: bodily, cognitive and expressive. Bodily Emotions include doing physical things in order to change the way that one feels, such as taking deep breathes to calm down or reduce anger. Cognitive strategies look at how workers change their thoughts and ideas so that they may change the way they feel towards things. A worker may place a picture of their family on their desk so they can look at that and feel happier. Expressive links ones gestures to inner feelings. Someone may smile even if they are not happy so that they can attempt to change how they are feeling.

Through this research, we hope to see how emotional labor has a toll on those in the workplace and who it is affecting the most.

Research Mentor: Elizabeth Hoffman, College of Liberal Arts, Sociology Department;

Poster Number: 137b :: Social Sciences/Humanities

College of Liberal Arts

The South Korean feminist movement and the effect of female representation in a Korean drama series on social norms and the self

Author:

Rachel King

Abstract:

This honors thesis project focuses on the South Korean feminist movement and the representation of women in South Korean media. Countless factors influence these areas, some of which include Confucian values, high beauty standards, feminist organizations, Western ideologies, and legislation on the feminist movement, which I analyze. Then, I evaluate the representation of women in a very popular South Korean television series called *Secret Garden*, a soap opera-style drama series. This form of media is very pervasive in South Korean popular culture, so it can have a profound impact on social norm and self-image constructions. This project aims to provide an example of how one such influential drama series serves as an intimate part of the reality and well-being of many people and reinforces deeply-rooted gender ideologies harmful to women.

*Research Mentor: Dr. Laura Zanotti, Anthropology, Liberal Arts; Dr. Elizabeth Wirtz, Anthropology, Liberal Arts
Dr. Sherylyn Briller, Anthropology, Liberal Arts*

Poster Number: 138b :: Social Sciences/Humanities

College of Liberal Arts
The Kayapó Cinema Project

Author:

Grace Long

Abstract:

The purpose of this project is to work with the indigenous Kayapó People in Brazil, developing activities that strengthen their filmmaking and media aptitude. This research attempts to tie both the value of media as film with the importance in promoting such films adequately through social media. Through the gathering of films and relating common themes, the value in promoting these themes through social media tools was seen. However, the need for expert knowledge of these social media tools created a need for a social media guide. The social media guide created highlights three major social media outlets and walks the individual through creating an account, managing who views their posts, deleting their account if needed, and more, while also identifying important areas to consider: sharing, privacy, and security. The aforementioned guide will be translated into Portuguese. Though this is an evolving project and its reception is currently unknown, this project supports the importance of indigenous media as a resource for cultural preservation and promoting indigenous lifestyles, ultimately serving as a vehicle for political change. From this understanding, the social media guide was created for the Kayapó peoples to add to and strengthen their voices in today's cultural climate.

Research Mentor: Dr. Laura Zanotti, Department of Anthropology, College of Liberal Arts;

Poster Number: 139b :: Social Sciences/Humanities

College of Liberal Arts

Documenting the Oral History of Linguists for Nicaragua

Author:

Joshua Martin

Abstract:

Following the end of the Nicaraguan Revolution in 1979, a group of Linguists from the United States traveled to provide aid to the indigenous population and document their languages that faced becoming extinct. Following this, Linguists for Nicaragua had been a presence in Nicaragua providing help to indigenous people throughout the 80s and 90s, with even my own research mentor for the project, Elena Benedicto having participated. Since many of the the original members have passed away, there has been an effort to capture the stories of the surviving members, wanting to preserve their stories and not allow their work to go unrecognized by others how may not be aware of their contributions. As such interviews were conducted with the remaining original members of the first endeavor of Linguists for Nicaragua, with recordings done in English, Spanish, and French. My research done with Professor Elena Benedicto involves taking the interviews of the remaining original participants of the Linguists for Nicaragua who arrived in the country all those years ago, transcribing them, and putting them in story format for a website chronicling their works. The audio, which came from english recordings of the participants' interviews, is transcribed with help of the software program Elan. Once transcriptions are written down, I put them into a more biographic/story-like format. Once the writings are all done, we put them onto a website that we created that will preserve and showcase the stories of these linguists for all to see, learn from, and appreciate.

Research Mentor: Elena Benedicto, Linguistics Department, College of Liberal Arts;

Poster Number: 140b :: Social Sciences/Humanities

College of Liberal Arts

Current Student's Opinions on the Professional Writing Program at Purdue University

Author:

Emily Mast

Brendan Robb

Ashlie Clark

Korbyn Torres

Abstract:

The goal of our research was two fold: (1) to understand the needs of the current students in Professional Writing (PW), and (2) to provide the program's facilitators with insights on the weaknesses of the program as described by students. A survey was distributed through Google Forms to current PW students during the Fall 2018 Semester, with five topics covering: demographics, extracurricular activities, education history, future goals, and suggestions for the PW program. Our survey contained a total of 23 questions distributed to students via the PW-Talk email list. Student identities were left anonymous and all long-answer questions were optional. The data collected gives an brief synopsis of the people that were in the PW major or minor during Fall 2018 semester. Many students are: involved in student organizations, value internships, don't feel ready for graduation, and interested in revision of the PW program. Some students included comments and suggestions on the program, which can be addressed by the program's facilitators. Many participants indicated a lack of advertising for the program by stating that they didn't know about the major/minor until later in their academic careers. We concluded that the PW department may want to consider more advertising to students both in and out of the college of Liberal Arts. The opinions and views discussed by students should be presented to those in charge of PW, who can decide to further research these needs. Those in charge of the program can use our data to conduct research on the needs of current students. Overall, our research gathered previously unknown knowledge about PW students that is useful to both students and administrators.

Research Mentor: Jennifer Bay, English, Liberal Arts;

Poster Number: 141b :: Social Sciences/Humanities

College of Liberal Arts

Progressing Data-Driven Research: Advancing Accessibility of Writing Center Usage Data through Usability Testing

Author:

Sarah Merryman

Abstract:

According to the Purdue Online Writing Lab (OWL) Usability Report, "Creating usable Web-based material is challenging because most Writing Labs do not employ designers, or usability experts" (Salvo et al. 5). This pilot study addresses the lack of usability scholarship in web-based writing lab materials by using talk aloud protocol to measure the usability of the Purdue Writing Lab Data Usage tables. Undergraduate tutors-in-training were asked to verbalize their thoughts while completing a series of tasks using the data tables. The tasks assessed if data trends were easily interpreted and if the level of accessibility for color blind or motor impaired users was adequate. Results indicate that students have difficulty distinguishing the purpose of the data tables based on their titles. Accessibility for motor impaired users was deemed satisfactory; however, accessibility for colorblind users was limited and screen reading features were nonexistent. This study indicates areas that warrant future usability testing and suggests changes that should be made, such as implementing an optional color coding feature and screen reading software. Continuation of this research will further enhance user experience by establishing a method of usability testing that can be applied and replicated in writing centers worldwide.

Research Mentors: Elizabeth Geib, English Department, College of Liberal Arts; Harry Denny, English Department, College of Liberal Arts

Poster Number: 142b :: Social Sciences/Humanities

College of Liberal Arts

Energy Consumption Behaviors: The Role of Knowledge and Motivation

Author:

Claire Meyer

Abstract:

This study seeks to understand the relationship between consumer knowledge and motivation, as well as numerical representations of energy uses and decision making ability in the development of a residential energy consumption plan. Knowledge regarding how decisions are made and in what formats information regarding energy consumption is best understood will be gained through studies, surveys, and literature. This knowledge will then be applied to a larger collaborative project working on manipulating AI systems such as Amazon's Alexa technology that are used in the residential setting not only to provide information regarding temperature and energy consumption, but also influence it.

Research Mentor: Dr. Torsten Reimer

College of Liberal Arts

Communications;

Poster Number: 143b :: Social Sciences/Humanities

College of Liberal Arts

Rare Books Registry: Giovanni Lami and "Novelle Letterarie", the Impact of Weekly Literary Magazines in 18th Century Italy

Author:

Brenae Newhard

Abstract:

The following research covers the translation and identification of Italian literary texts discovered in the Rare Books Registry project led by Professor Liz Mercier. Beginning in January 2019 Liz Mercier organized a team of undergraduate and graduate students to sort through upwards of 500 books that have come into her possession. These books based on their publication date range from the 16th century up through the 18th century. I am identifying a book written in Italian and researching its origins and background while creating a translation of parts of the text I have chosen. Along with the translation I will be researching the editor of the book and researching whether this book had any influence in the realm of Italian literature during the time of its publication. The book I will focus my research is titled *Novelle Letterarie* and contains critiques or comments of literary works including those of Machiavelli, Boccaccio, and Beccaria published in mid-18th century Italy. These works are especially intriguing to me because of my current course-work in Italian literature from this specific time period.

Research Mentor: Elizabeth Mercier, Classical Studies, School of Languages and Cultures;

Poster Number: 144b :: Social Sciences/Humanities

College of Liberal Arts

Facial Expressions in Sign Language Grammar: What does the 'flat chin' mean?

Author:

L. Nikolai

Abstract:

In American Sign Language (ASL), little is known about the linguistic function of the non-manual marker (NMM) “flat chin,” also known in the literature as Action Unit 17 (AU-17) (Ekman & Friesen, 1978). Previous research suggests AU-17 correlates cross-culturally with expressing disgust and anger (Ekman, Sorenson, & Friesen, 1969) and in ASL with negation (Benitez-Quiroz, Wilbur, & Martínez, 2016). Bross & Hole (2017) propose that in all sign languages the lower face (i.e., nose, mouth, chin, etc.) conveys linguistics information about scalarity and evaluation . Given Bross & Hole (2017)’s predictions, we hypothesize that AU-17’s functions can be extended into these domains.. We propose several functions of AU-17 based on analysis of a video corpus taken from the published video series Face of ASL as well as initial analysis of elicited data.

First, we note that lexical functions account for 3% of appearances of AU-17 in our corpus data (e.g., miss). Beyond this we identify three wider functions: speaker evaluation, uncertainty, and context narrowing. For speaker evaluation, AU-17 occurs where the signer is making a judgment about what they are stating (27% of the appearances of AU-17 in our corpus). Evaluation seems to be supported by our elicitation data thus far. For uncertainty, AU-17 occurs where the signer is uncertain about what they are saying or is offering a possibility for the future (13%). For context narrowing, AU-17 occurs over a phrase where the signer wants to focus on part of a larger topic (~33%). These functions account for approximately 76% of the appearances of AU-17 in our corpus, indicating that AU-17 does indeed have wider linguistic functions than previously noted. Moreover, our findings correlate with Bross & Hole (2017)’s predictions about the functionality of the lower face. Ultimately, our analysis of AU-17 will feed the development of automatic non-manual detection algorithms, improve education of both native and non-native ASL signers, and fill in a gap in our overall linguistic knowledge.

Research Mentor: Ronnie B. Wilbur, SLHS & SIS, College of Health and Human Sciences & College of Liberal Arts;

Poster Number: 145b :: Social Sciences/Humanities

College of Liberal Arts

Mortuary and Paleopathological Analysis of New Kingdom Burials at Tombos

Author:

Isabelle Ort

Abstract:

The town of Tombos, in present-day Sudan, has a record of occupation beginning as an Egyptian colony established in Nubia around 1400 B.C. This study examines burials excavated from a subterranean vault and shaft tomb, Unit 36, located in an elite area of the Tombos cemetery. Comingled remains and 13 separate burials have been evaluated for age, sex, and pathological conditions to generate biological profiles of the occupants of this tomb. Transition Analysis was used to determine an age of maximum likelihood (AML) and lower and upper 95% CI ages for each combination of skull and or pelvis. Sex, measurements, and differential diagnoses were obtained in accordance with standards set by Buikstra and Ubelaker following a full inventory of each set of remains. Unit 36 contained comingled material and 13 discrete burials, including 3 children under the age of 10, as well as 6 adult females and 4 adult males with calculated AML ranging from 15 – 60+ years. Pathological conditions observed include a case of significant lower body muscle atrophy in the body of an elderly female, as well as healed cribra orbitalia, porotic hyperostosis, and dental abscesses. Burial positions and grave goods represent a fusion of Nubian and Egyptian cultural practices, following a precedent set by other areas of the New Kingdom cemetery. Elite individuals experienced physiological stress but were able to survive with some conditions likely causing impairment.

Research Mentor: Dr. Michele R Buzon, Department of Anthropology, College of Liberal Arts;

Poster Number: 146b :: Social Sciences/Humanities

College of Liberal Arts

Assessing Corporate Sustainability and Social Entrepreneurship in Retail Communication

Author:

Alexandra Paoli

Abstract:

Researcher: Alie Paoli

Presentation Title: Assessing Corporate Sustainability and Social Entrepreneurship in Retail Communication

Research Focus: Communication Methodology Within Differing Audiences

School: Purdue University | College of Liberal Arts

Presentation Type: Poster Presentation

Abstract:

Assessing Corporate Sustainability and Social Entrepreneurship in Retail Communication

The purpose of this report was to assess the various modes of communication surrounding the Bangs shoe company. In particular, I focused on the variance in how they communicate with their different audiences as a 'social good start-up' company. This study involved in depth rhetorical analyses of Bangs shoes' communication artifacts including their website and blog, social media, brand ambassador documents, and information presented by their business partner: Kiva. Through a comparative analysis of Bangs shoes and other 'social good' shoe companies such as Toms, that the juvenile tone that Bangs shoes has elected to communicate to their audience with will ultimately inhibit their growth as a legitimate competitor for companies like Toms and Bobs shoes. The lack of representation of their philanthropic work in their social media and marketing materials greatly differs from the advertising tactics used by other companies and is a major oversight in their marketing plan, costing them a large potential consumer base. They are limiting their audience and potential investors by relating their entire communication model around millennials and young audiences, and in the future they will need to blend the way they communicate with their consumer base and the way they communicate with those who are interested in their philanthropy into one targeted audience.

Research Mentor: Allegra Smith, Professional Writing, College of Liberal Arts;

Poster Number: 148b :: Social Sciences/Humanities

College of Liberal Arts

World War One and Edith Wharton's Morocco

Author:

Scott Straight

Khalil Williams

Abstract:

The research is an examination of Edith Wharton, a popular and influential author throughout the 20th century, and whether she portrays an accurate cultural and historical representation of Morocco in her 1920 travelogue, "In Morocco." This research questions if her views on Imperialism, the Arabic world and Morocco are representative of the United States or unique to her. These objectives are addressed through the close analysis of "In Morocco" and relevant book reviews her work. Other forms of media such as newspaper articles and films from the year 1906 to 1925 are analyzed. Primary source documents such as government reports pertaining to the United States and Morocco, photographs and journals written by the researchers whilst traveling Morocco are consulted. The research is evolving, and a conclusion will be present at time of completion.

Research Mentor: Dr. Stacey Holden, History, College of Liberal Arts;

Poster Number: 149b :: Social Sciences/Humanities

College of Liberal Arts

Conservation vs Recycling: What Early Modern Print Can Tell US

Author:

Jay Tockstein

Abstract:

Through the ages, old technologies become redundant as faster, more efficient means are developed. But that doesn't mean that these technologies disappear; in fact, they are often reborn into a new phase of life. In this study, I seek to answer the question of where the value of a text ends and begins. From binder's waste torn from Medieval manuscripts to 17th century books used as Disney props, the cycle of the written word doesn't end with indefinite storage. Using an archive of early modern print books that show evidence of both recycling and being recycled, I analyze two opposing views: books as material that must be used to be valuable, and books as cultural artifacts that must be preserved ad nauseum. The line between print as material and print as artifact becomes less distinct as we look at texts that have survived both. I concluded that, though the modification or destruction of historic texts should not be deliberate, that destruction does not eliminate the value of the new product. The significance of historic texts comes from three aspects: craftsmanship, culture, and information. The resulting value of the new, modified text is not necessarily less than the significance that it had before, especially if the "new" text ages and eventually becomes an artifact in and of itself, or if recycling old material vastly decreases waste of raw material and human labor. Certain books, however, should never be destroyed, such as sacred texts and texts with priceless cultural significance. Ultimately the risks and rewards of harming a book can only be known in retrospect.

Research Mentor: Elizabeth E. Mercier, Classical Studies, College of Liberal Arts;

Poster Number: 150b :: Social Sciences/Humanities

College of Liberal Arts

Archival Studies

Author:

Nicole Williams

Abstract:

I don't have one yet.

Research Mentor: Jennifer Bay

English Department

College of Liberal Arts;

Poster Number: 152b :: Social Sciences/Humanities

College of Liberal Arts

Why do humans farm? Effects of Climate Change on the Transition to Farming

Author:

Isabella Zuffoletti

Abstract:

On a global scale, warming trends began at the end of the Last Glacial Maximum about 20,000 years ago. Since the beginning of this interglacial period, sporadic, but overall directional changes in climatic conditions occurred. Changing conditions led to changes in plant and animal ranges, temperature, and precipitation. It is presumed these climatic changes would have impacted the subsistence strategies of prehistoric populations and are related to the independent invention of agriculture at many locations across the world. However, the effect of climate change on subsistence transition has not been examined.

This project involves examining archaeological evidence of the transition from foraging to farming in response to climate change in the Interior Eastern Woodland region of North America during the Late Archaic and Early Woodland periods. This project combines research of paleoenvironmental and paleoecological data, botanical and faunal remains, and cultural materials. Information will be collected from existing publications and compiled into a database. This information will contribute to an existing database on climate change and the human diet. From this database, questions about how climate change in the early Holocene was related to the development of agriculture in the American Midwest can be answered. This research will also allow for future studies examining what we may learn from the Native American response to climate change, as our current food production strategies may need to be adaptive to ongoing climate change.

Research Mentor: Dr. Otarola-Castillo, Anthropology, College of Liberal Arts; Melissa Torquato, College of Liberal Arts, Anthropology

Poster Number: 153b :: Life Sciences

College of Pharmacy

Dose-Response Effect of Dried Blueberry Powder on Bone Turnover in Post-Menopausal Women Using ^{41}Ca Technology

Author:

Julia Czarnik

Abstract:

Osteoporosis is a medical condition that impacts the majority of post-menopausal women and causes brittle bones. Half of women over the age of 50 will suffer from a bone fracture during the rest of their lifetime. A diet rich in fruits and vegetables has been found to reduce oxidative stress and increase bone mineral density. Blueberries have one of the highest antioxidant properties among fruits due to the high concentration of polyphenolics. Animal studies in ovariectomized rat model of osteoporosis found that blueberries can protect bones due to their high content of polyphenolics. Our study aims to examine the effects of three different doses of dried blueberry powder added to a regular diet on net bone calcium retention and bone turnover in postmenopausal women. We hypothesize that an increased consumption of blueberry powder will improve the retention of calcium in bones. Using the ^{41}Ca labeling methodology, we tracked the excretion of ^{41}Ca in urine and used the changes in urinary ^{41}Ca excretion to estimate the effect of blueberry consumption on bone loss. In total, 18 healthy postmenopausal women were enrolled in the study and 14 have completed it. The results of this study are forthcoming and will be presented at the Undergraduate Research Conference on April 9, 2019. This study will increase our understanding of calcium metabolism in humans and provide insights about potential non-pharmacological treatment of osteoporosis.

Research Mentor: Joanna Hodges, Nutrition Science, College of Health and Human Sciences;

Poster Number: 154b :: Physical Sciences

College of Pharmacy

Synergistic Effect of Co-Spray Dried Colistin and Azithromycin for the Treatment of Lower Respiratory Infections

Author:

Athena He

Abstract:

An ongoing focus of pharmaceutical research is enhancing the efficacy of inhaled medications indicated to treat lower respiratory infections like pneumonia. To achieve this, an inhaled drug must exhibit a high aerosolisation performance, or the ability of fine drug particles to disperse and act at the target site of action in the lungs. Proper deposition of the aerosol drug particles at the target site is dependent upon chemical properties and the aerodynamic diameter of the particles. Preliminary data demonstrated that the aerosolisation performance of colistin, a hydroscopic antibiotic, notably decreased when stored at a relative humidity (RH) of 75% due to its moisture absorption. To prevent moisture absorption, my goal is to combine two antibiotics, colistin and azithromycin, into one formulation to improve the combination drug's delivery to the respiratory passageways and produce a synergistic effect. Both aims intend to reduce undesired side effects and minimize antibiotic resistance, respectively. Azithromycin, a broad-spectrum antibiotic, exhibits hydrophobic properties and is able to encapsulate colistin through spray-drying, a method used to generate a fine-particle powder. Additional methods include high-performance liquid chromatography and cascade impactor to assess the drug's efficacy. Ultimately, simultaneous local delivery of colistin and azithromycin can not only treat multi-drug resistant bacterial infections, but it can also reduce side effects of long-term drug delivery. A better understanding of colistin and azithromycin's properties is important in strengthening therapeutic methods to treat patients with lower respiratory infections.

Research Mentor: Dr. Qi (Tony) Zhou

Industrial and Physical Pharmacy

College of Pharmacy; Nivedita J. Shetty, Graduate Student

Industrial and Physical Pharmacy

College of Pharmacy

Poster Number: 155b :: Life Sciences

College of Pharmacy

Associations Between Gender and Childcare Language Environments

Author:

Megan Routh

Abstract:

In early childhood, language environments are considered a prominent influence on children's development of cognitive and language abilities. This study examines to what extent gender is associated with key two aspects of the language environment (i.e., the number of conversational turns and the number of adult words children hear) within childcare settings. The sample of preschool children (N = 44; 26 males and 18 females) were assessed during 2 preschool days at their respective childcare centers. The Language Environmental Analysis (LENA) device was used to assess language environments, which was placed in vests that the children wore throughout the school day (from approximately 9:30am until 3:30pm). Multi-level regression analyses (clustering at the child and center level) were conducted that predicted number of adult words heard and conversational turns based on child gender and controlling for child vocalizations, age, and day of recording (one versus two). An interaction term was also examined between gender and the number of child vocalizations predicting both outcomes. Gender was not associated with the number of adult words children heard throughout the preschool day, nor was the interaction statistically significant. However, for conversational turn taking, there was a statistically significant interaction between gender and child vocalizations. Specifically, for children who were highly vocal (one standard deviation above the mean), females had substantially more conversational turns than males. Children who were not very vocal (one standard deviation below the mean), conversational turns did not substantially differ between males and females. These findings suggest that the experiences of children in childcare potentially differ in meaningful ways between males and females.

Research Mentor: Robert Duncan; Yemimah King

Poster Number: 157b :: Life Sciences

College of Pharmacy

Development of Novel Linker for Ligand Targeted Drug Delivery

Author:

Shannon Zhou

Abstract:

Drug delivery using a targeting ligand that preferentially targets pathologic cells over healthy cells can improve safety and efficacy of current and novel therapeutic agents. For cancer, the folate receptor has been identified as a potential target as it is highly overexpressed on cancer cells. The folate receptor binds extracellular folates with high affinity and internalizes them through an endocytic process. This mechanism can be exploited for drug delivery. The focus of this project is to create a mechanism for development of a self-immolative linker between a targeting agent and the therapeutic cargo. The linker is then cleaved inside the cell due to glutathione (GSH) in the endocytic environment to cleanly release the drug without modifying chemical function. Target molecule was successfully created and found to be highly reactive, showing promise as a cleavable linker. The linker will then be attached to a drug and targeting agent. The finished product is planned to be tested in vitro, simulating cell conditions, for effectiveness. Though the resulting product is exciting, it is also important to understand the chemistry and process behind the molecule. The project is still in progress and results have not yet been published. Therefore, this poster will focus on the process and development of the project, summarizing its progress thus far and future steps.

Research Mentor: Madduri Srinivasarao, Department of Chemistry, College of Science;

Poster Number: 158b :: Life Sciences

College of Science

Differential Effects of Dietary Fat on Body Composition and Blood Ketone Levels

Author:

Brent Bachman

Anna Hallowell

Abstract:

Ketogenic diets (KDs) are effective treatment options for patients suffering from diseases such as epilepsy, diabetes, and cancer. Therapeutic effects of KD are often attributed to diet-induced elevation of circulating ketones such as beta-hydroxybutyrate (BHB), although recent research has challenged this idea and suggested that therapeutic effects may be due to increased circulating medium chain fatty acids (MCFAs) instead. MCFAs are the digested by-product of medium chain triglycerides (MCT) found in some foods and are more easily transported throughout the body's metabolic pathways than their counterparts, long chain triglycerides (LCT). To test the ketogenic potential of MCT-rich diets vs LCT-rich diets, 16 female Long Evans rats were assigned to one of four diet types: chow, LCT, MCT, or Coconut oil (composed of LCT and MCT). Rats were given ad libitum access to their assigned diets for 3 weeks. Food intake, bodyweight, body composition, and blood BHB levels were recorded before, during, and after the study. There were no differences in BHB between MCT and LCT groups, and females consuming the LCT diet gained more bodyweight and fat mass than the chow and MCT groups, but not the coconut oil group. These results suggest that there may be some differential effect caused by the type of fat intake when given *ad libitum*. To further elucidate these effects, we calorie-matched fat-enriched groups to a chow control group for three weeks and measured body weight, body composition, and ketone levels. Preliminary data suggests that effects of LCT on body composition persist, suggesting that dietary fats have differential effects on body composition that are not dependent on the elevation of BHB. Collectively, these data demonstrate that LCTs may promote fat storage that is not observed in MCT-consuming groups. More research is necessary to fully understand these differential effects, and further elucidate the therapeutic potential of MCTs.

Research Mentors: Dr. Kimberly P. Kinzig, Department of Psychological Sciences, College of Health and Human Sciences; Elizabeth Sahagun, Department of Psychological Sciences, College of Health and Human Sciences

Poster Number: 159b :: Physical Sciences

College of Science

Chemistry Laboratory Development: Solid Shampoo and the Molecular Interactions of Washing

Author:

Sidnie Bienz

Abstract:

We are presenting a general chemistry laboratory experiment that combines solid shampoo formulation and soap synthesis with the chemistry of new product development. The experiment was inspired by an article published in C&EN News 2018, 96, 18-21. The article describes solid shampoos as trendy new consumer products with the added value that they are not packaged in plastic bottles and thus produce less plastic waste. Green product development is highlighted while learning about the chemistry of shampoo and soap. The objectives of the chemistry laboratory experiment are as follows: i) Develop hands-on skills on how to formulate solid shampoo and synthesize soap. ii) Prepare emulsions using the new shampoo and soap. Observe, record and explain results in terms of surfactant molecules and the molecular interactions important to the washing process. iii) Observe and analyze the influence of ions on surfactant molecules in hard water. Record data, evaluate and generate evidence supported conclusions. The new laboratory experiment introduces students to hands-on synthesis and formulation of surfactants, solubility, and the molecular interactions washing. The prediction of molecular interactions is very important in soap synthesis and shampoo formulation because damage to hair must be avoided. For example, soaps work best at a basic pH, but shampoos are formulated for cleaning hair protein at an acidic to neutral pH. At this pH the molecular forces that hold the hair protein together are maintained. A second part of the experiment focuses on emulsions and the influence of ions on surfactant molecules in hard water. Students learn about the chemistry of surfactants, emulsions, and the molecular interactions that lead to micelles.

Research Mentor: Gudrun Schmidt, Department of Chemistry, College of Science;

Poster Number: 160b :: Physical Sciences

College of Science

Analysis of atmospheric aerosol concentrations in small towns in developed and underdeveloped countries

Author:

Antonio Bonifasi

Greg Michalski

Elizabeth Olson

Abstract:

Aerosols present in the atmosphere can have major environmental and biological effects. These are particles that are suspended in the atmosphere that have a wide range of different properties. Aerosols anions such as nitrate, sulfate, and chloride are major causes for acid rain and can result in multiple respiratory illnesses. This study compares the concentration of these harmful aerosols between a small town in California and a small town in Peru. Measurements were taken from multiple air filter samples throughout a calendar year. The filters collected suspended particulate matter for 24 hours and the total mass was then measured. Filters were extracted in deionized water and the ion measurements were made using ion chromatography to find out the concentration of nitrates, sulfates, and chloride anions and cations. It was determined that the California aerosols ranged from 0.16 ug/m³ to 6.54 ug/m³ for sulfate anions, 0 ug/m³ to 0.46 ug/m³ for chloride anions, and 0.05 ug/m³ to 1.01 ug/m³ for nitrate anions. For the Peru site, the concentration ranged from 3.2 ug/m³ to 6.7 ug/m³ for sulfate anions, and 0.6 ug/m³ to 2.4 ug/m³ for nitrate anions. These results give insight into how the government regulations affect the air quality in developing countries such as Peru, when compared to developed countries such as the United States.

Research Mentor: Greg Michalski, Department of Earth Atmospheric and Planetary Sciences, College of Science; Elizabeth Olson, Department of Earth Atmospheric and Planetary Sciences, College of Science

Poster Number: 161b :: Physical Sciences

College of Science

Development of a More Effective Approach to Analyze Nitrate Isotopes

Author:

Jacob Brejcha

Abstract:

Nitrate (NO_3^-) plays an important role in the environment, influencing air and water quality and providing nitrogen to soil. Stable isotopes of nitrate can help deepen our understanding of nitrogen sources and chemistry. For nitrate to be measured in an isotope ratio mass spectrometer (IRMS), it must be converted to the gas phase. Currently, the most popular method uses a bacterial species (*P. auerofaciens*) that lacks the nitrous oxide reductase enzyme, allowing the species to reduce NO_3^- to nitrous oxide (N_2O), and the N_2O is subsequently measured by IRMS. However, this method is complicated, as it is labor intensive, requires high expertise, and is susceptible to contamination. To simplify this process, we have developed a new inorganic approach using titanium (III) chloride (TiCl_3) to reduce NO_3^- to N_2O . Because this method involves controlled physical chemistry, factors that influence the reaction can be more readily constrained. Thus, our study aims to understand these factors and determine what conditions lead to the greatest N_2O production. Test variables consist of: 1) the concentration of TiCl_3 and 2) the composition of the atmosphere (aerobic vs anaerobic). Our results show that 0.06 to 0.12% TiCl_3 under an anaerobic condition provides NO_3^- conversion to N_2O at near a 100% yield with consistent results. This complete conversion provides excellent accuracy and precision for stable isotope analysis of nitrate. Compared to the traditional bacteria approach, this approach is more cost- and time-efficient, is more environmentally friendly, and has the potential for broad applications for nitrate analysis.

Research Mentors: Jianghanyang Li, Department of Earth, Atmospheric and Planetary Science, College of Science; Benjamin Wilkins, Department of Chemistry, College of Science; Greg Michalski, Department of Earth, Atmospheric and Planetary Science, College of Science;

Poster Number: 162b :: Life Sciences

College of Science

Imperfect Timing: Influence of Infection Maturity on Co-Infection Success with a Dominant Competitor

Author:

Sara Carpenter

Abstract:

Parasite infection is dependent on the ability of the parasite to avoid host defenses, exploit host resources, and outcompete other parasites. Using a freshwater snail host (*Biomphalaria glabrata*), we studied the ability of a highly competitive trematode, *Echinostoma caproni*, to establish and reproduce in a host previously infected with a less competitive trematode species, *Schistosoma mansoni*. Snails were exposed to *S. mansoni* and co-exposed to *E. caproni* either simultaneously or after 1 week, 4 weeks, or 6 weeks. Control treatments were established as unexposed, exposed to *E. caproni* only, or exposed to *S. mansoni* only. Co-exposure decreased the infection prevalence of *S. mansoni* for all treatment groups relative to the *S. mansoni* exposure control. Infection prevalence of *E. caproni* was lower for the 4 week exposure group than for all other treatment groups and the *E. caproni* control. *E. caproni* infections 4 and 6 weeks after *S. mansoni* exposure took longer to reach patency than infections in *E. caproni* control snails. Survivorship of co-exposed snails did not significantly differ from survivorship of *E. caproni* controls but was significantly lower than survival of *S. mansoni* controls. These results indicate that the timing of infection is important for parasite competition, affecting successful parasite establishment and developmental time.

Research Mentor: Dennis Minchella, Biological Sciences, College of Science; Jonathon T. Vannatta, Biological Sciences, College of Science

Stephanie Gutierrez, Biological Sciences, College of Science

Poster Number: 163b :: Life Sciences

College of Science

Quantification and Analysis of Blueberry Polyphenols

Author:

Kaitlyn Cooper

Abstract:

Purpose: Fruit and vegetable consumption is associated with a healthy diet and beneficial health outcomes. In addition to vitamins and minerals, fruits and vegetables provide health-promoting polyphenols. While not essential to the diet, regularly consuming polyphenols may aid in cardiovascular and neurocognitive health. These health benefits have spurred the consumption of herbal and botanical dietary supplements, providing consumers with concentrated extracts of purified polyphenols. Often times, however, the phenolic content of these extracts differs from the composition in the whole fruit. Thus, in the current project, we examine the differences in polyphenols between lyophilized wild blueberries and a concentrated blueberry extract.

Methods: Polyphenol were extracted with an acidified methanol-water solution, purified via solid phase extraction in order to remove vitamin C and carbohydrates, and phenolics quantified colorimetrically via the Folin-Ciocalteu method. Additionally, in support of an on-going animal study, starting materials and blueberry doses were monitored every 10d for changes in phenolic content.

Results: Total polyphenols in wild blueberries and the purified extract were 3.5% and 27% (w/w), respectively. Analysis of blueberry doses given throughout the study is ongoing and results will be presented at the Purdue Undergraduate Research Conference.

Conclusion: By monitoring the stability and consistency of blueberries and blueberry doses throughout the animal study, this analysis provides continual monitoring of the polyphenol content of doses to ensure animals are correctly dosed. This analysis is crucial to the success of the study and directly influences how the data for the animal study are interpreted.

Research Mentor: Dennis Cladis, Food Science, College of Agriculture, Purdue University;

Poster Number: 164b :: Life Sciences

College of Science

Investigating Inhibition of Apoptosis as a Novel Treatment for Retinitis Pigmentosa using a Transgenic Zebrafish Model.

Author:

Emre Coskun

Abstract:

Retinitis pigmentosa (RP) is the most common cause of night blindness, and it affects 1 in 3,500 people around the world. RP can be inherited through many mutations, including the Q344X mutation in the human rhodopsin gene. This mutation causes the truncation of the rhodopsin and causes rod degeneration. To discover an effective treatment for patients with RP, we use a transgenic zebrafish model expressing the Q344X mutation. The Q344X larvae show onset of rod degeneration at 5 days post fertilization (dpf) which progresses significantly by 7 dpf. The extent of diminished vision in the 7 dpf Q344X larvae can be assessed with a Visual-Motor Response (VMR) assay. The VMR assay acclimates the Q344X larvae to dim light within larval rod range preceding a dark flash, which does not induce a significant behavioral response. Therefore, the behavioral phenotype of Q344X is due to rod degeneration. Previous studies indicate that degenerating rods undergo apoptosis. Inhibition of apoptosis to decrease rod degeneration is investigated further with our model by screening the Selleckhem anti-apoptotic compound library with the VMR assay. The Q344X larvae are treated with these compounds between 5 – 7 dpf. Compounds that decrease rod degeneration by inhibiting apoptosis pathways would be expected to show an increased behavior in the VMR. 82 of the 142 compounds in the anti-apoptosis library have been screened and analyzed with the VMR assay, and 7 showed an increase in behavior. In the future, the extent of apoptosis in rods could be verified using TUNEL staining of retinal cryosections. Drugs that produce consistent results can be reimplemented toward an effective and operational treatment for RP.

Research Mentor: Yuk Fai Leung, Biological Sciences, College of Science; Logan Ganzen, Biological Sciences, College of Science

Poster Number: 165b :: Life Sciences

College of Science

Assessing Fic proteins from *H. pylori* as novel virulence factors involved in gastric cancer

Author:

Taryn Coyle

Abstract:

Gastric cancer, or stomach cancer, is the 5th most common cancer in the world, making up roughly 7% of all new cancer diagnoses. The primary risk factor associated with the development of gastric cancer is infection by *Helicobacter pylori*, a gram-negative bacterium that inhabits highly acidic environments, such as the human stomach. Specifically, the *cag* pathogenicity island, a collection of genes coding for various virulence factors produced by *H. pylori*, serves as a significant risk factor in the development of gastric cancer. This pathogenicity island is secreted using a type IV secretion system. *Helicobacter* also produces five Fic proteins, a family of proteins characterized as bacterial toxins. Fic proteins are unique for their ability to AMPylate, or add an AMP molecule to, their targets. This enables their function as a bacterial toxin, allowing them to destabilize phagocytic immune cells, effectively dodging the host's immune system. The purpose of this study is to enzymatically characterize and assess the secretion mechanisms and targets of these proteins, with the intention of investigating their relationship to *H. pylori* infection and virulence.

Research Mentor: Dr. Seema Mattoo

Department of Biological Sciences

College of Science;

Poster Number: 166b :: Life Sciences

College of Science

Characterizing a Zebrafish Model to Study Dendritic Spine Development

Author:

Elisabeth DeMarco

Abstract:

Synaptic connections facilitate neuronal communication. Excitatory synapses in the human brain are primarily formed at dendritic spines, specialized neuronal compartments which are often disrupted in various neurologic conditions. In Fragile X Syndrome, reduced amounts of Fragile X Mental Retardation Protein (FMRP) result in learning deficits, increased susceptibility to seizures, and changes to spine density and stability. To enable in vivo analysis of spine development, we have identified and developed a cell-type specific genetic labeling system in the larval zebrafish brain using an *id2b:gal4* transgene that selectively and consistently labels pyramidal neurons (PyrNs) of the zebrafish optic tectum, a class of cholinergic interneurons that forms dendritic spines. Confocal image volumes of single PyrNs labeled with a membrane-targeted EGFP were collected throughout early larval development to monitor spine morphology and maturation. Analysis of static images demonstrated a developmental transition from long, thin filopodia to short protrusions with enlarged heads. To examine the dynamics of spine stabilization during larval development, timelapse image series were collected and analyzed to quantify protrusion lifetime. Spine lifetime increased over this developmental period, suggesting changes in spine morphology may reflect the formation of stable synaptic connections. To determine if spine development in zebrafish is regulated by FMRP, we examined PyrN morphology in mutant larvae with reduced levels of FMRP. Preliminary data indicate that PyrNs in mutant larvae exhibit decreased spine density and reduced spine stability, confirming this genetic animal model as a viable system to study the disruption of spine development in Fragile X syndrome.

Research Mentor: Estuardo Robles, Dept. of Biological Sciences, College of Science;

Poster Number: 167b :: Mathematical/Computational Sciences

College of Science

Particle method with Landau Equation

Author:

Tong Ding

Abstract:

In plasma physics, the Landau equation (a.k.a. Fokker-Planck-Landau equation) is an integro-differential equation widely used to describe the collisional effects among particles. Yet, due to the high-dimensional, nonlinear, and nonlocal structure of the integral operator, direct simulation of the Landau equation is very challenging. In this project, we propose a novel particle method to solve the Landau equation. The method renders the original PDE into a system of ODEs that is easier to solve. Most importantly, it preserves the physical properties of the solution, such as positivity, conservation, and energy decay. We demonstrate the performance of the proposed method by implementing the code in MATLAB, with comparison to an exact solution. The research indicated this particle method can be used for Landau equation with other parameters which have significant applications in real life situations. Regarding to its low order of accuracy, the particle method has the advantage of easy implementation, comparing to other numerical methods like the spectral method.

Research Mentor: Jingwei Hu. Math department, college of science;

Poster Number: 168b :: Life Sciences

College of Science

Probing Subjective Contour Perception in Mice using a Touchscreen-Based Operant Conditioning Paradigm

Author:

Jeffrey Dorsch

Vincent Phillips

Claudia Li

Abstract:

Recent research has suggested that mice are able to perceive rather complicated figures, such as visual illusions, or subjective contours. We aim to replicate these findings in the hope of further elucidating the visual capabilities of mice in a research setting. A popular method of evaluating visual abilities in mice is by utilizing a touchscreen-based learning paradigm, similar to tests used with both humans and primate models. We have applied this paradigm in our laboratory to study mice's ability to perceive subjective contours. Mice were first taught to select a visual stimulus for a food reward, then trained to discriminate the presence or absence of an illusory square. Our results demonstrate that mice may be trained to discriminate subjective contours, although more work is needed to verify these results and improve our training paradigm. Future directions for this project hope to apply this subjective contour training paradigm to further study the neural pathways involved with visual information processing.

Research Mentor: Alexander Chubykin, Department of Biological Sciences, College of Science; Alexandr Pak, Department of Biological Sciences, College of Science

Poster Number: 169b :: Physical Sciences

College of Science

Acid Rain Analysis: Efficiency of Anion Trapping from Rainwater of Anion Columns

Author:

Jocelyn Elgin

Abstract:

Rainwater ion composition reflects the salts present as the water droplets form around the aerosols in the atmosphere. Therefore, anion composition of rainwater gives insight into biological system's aerosols, climate, and acid rain. These aerosols and acid rain cause damage to environmental systems as well as causing health concerns. This experiment's purpose was to develop a new, low cost method for collecting anions in remote locations. To do so, I determined how much rainwater can pass through columns filled with anion exchange resin before the resin no longer effectively traps the anions. To accomplish this, synthetic rainwater was made based on previously determined average concentrations of anions around the globe. 100 milliliters of the synthetic rainwater were run through the resin columns, and the eluted water was analyzed using ion chromatography to determine concentrations of eluted anions. The washes were repeated, analyzing ionic chromatography after each wash, until the eluant no longer contained common anions, and only eluting a high concentration of chloride anions that desorbed from the resin. The result of this experiment showed how long the resin columns were able to effectively trap anions and be left in the field. It also showed this method is effective at trapping anions until a certain point. This gives an inexpensive way to collect and analyze anions from rainwater in various remote locations. The rain collectors will be distributed around of Arequipa, Peru to measure rainwater anions.

Research Mentor: Dr. Greg Michalski, Earth Atmospheric and Planetary Science, College of Science; Elizabeth Olsen, Earth Atmospheric and Planetary Science, College of Science

Poster Number: 170b :: Life Sciences

College of Science

Mechanism of Regulation on "Protein A" by Aurora Kinase A (AURKA) in CRPC

Author:

Benjamin Flueckgier

Abstract:

In the US, 11.2% of men are likely to be diagnosed with prostate cancer during their lifetime. Earlier stage prostate cancer can be treated using surgical or medical castration, but most patients subsequently develop Castration Resistant Prostate Cancer (CRPC), which has no therapy. Aurora Kinase A (AURKA) is overexpressed in multiple cancers including CRPC. AURKA inhibition reverses tumorigenesis and metastasis in mice. However, AURKA is also essential for mitosis in all dividing cells. Thus, targeting cancer-specific substrates of AURKA is a more effective approach for developing safer therapies. To this end, we utilized a chemical genetic approach developed in our lab and identified "Protein X" as a direct oncogenic target of AURKA. Our goal is to uncover the molecular mechanisms by which AURKA regulates Protein X to promote cancer. Therefore, site-directed mutagenesis was used to determine AURKA-mediated phosphorylation sites on Protein X. Once both single mutants were generated using PCR, corresponding double mutant was generated. Each mutant was then ligated into an E. coli vector. Once the correct colonies were identified, the corresponding DNAs were transformed into BL21 cells to facilitate expression of each protein. All mutant proteins were expressed, purified and their expression was confirmed using western blotting. Subsequently, we performed a kinase assay using wild-type and mutant proteins using AURKA. This study revealed AURKA-mediated phosphorylation sites on Protein X. We are using this information to uncover the molecular mechanisms by which AURKA promotes CRPC by harnessing Protein X.

Research Mentor: Kavita Shah, Chemistry, College of Science; Hanan Haymour

Poster Number: 171b :: Life Sciences

College of Science

Validating an unmanned aerial vehicle (UAV) approach to survey colonial waterbirds

Author:

Emily Godollei

Abstract:

Waterbirds are typically difficult to survey from the ground because vegetation often obscures their numbers, and flocks tend to flush at the approach of surveyors. Using unmanned aerial vehicles (UAVs) as an inexpensive alternative to surveying waterbirds compared to other aerial methods and ground counts can alleviate the difficulties of surveying waterbird colonies, improve counting accuracy, and reduce bias. To validate this method for surveying waterbirds, we compared counts from images collected from a fixed-wing UAV to ground counts using a double-observer method or direct counts at three study sites: 1) decoys in a field representing three waterbird species, 2) Great Egrets (*Ardea alba*) roosting on platforms in a swamp, and 3) Brown Pelicans (*Pelecanus occidentalis*) nesting in a colony on an island. Direct counts from UAV images were similar or more accurate than ground counts for decoys, Great Egrets, and Brown Pelicans. UAV flights did not disturb either Great Egrets or Brown Pelicans. Among decoys, detection probability was lower and visibility bias was higher for blue decoys against a dark background, compared to white and Brown Pelican decoys. Direct counts from UAV images of juvenile Brown Pelicans were almost twice as high as ground counts. Ground surveys flushed adult pelicans from the survey area; however, UAV images permitted counting adults, as well as eggs in nests that could not be seen by ground surveyors. Our results indicate that UAVs can provide a cost-effective method to survey waterbirds with similar to increased accuracy and reduced bias compared to ground counts.

Research Mentor: Dr. Landon Jones, Department of Forestry and Natural Resources, College of Agriculture

Poster Number: 172b :: Life Sciences

College of Science

The Effects Of Chronic Mild Stress on Female Wistar and Kyoto Rats During Adolescence

Author:

Anna Hallowell

Brent Bachman

Abstract:

Mood disorders are common and symptomatically challenging illness to treat. Despite years of research to understand underlying mechanisms and develop more effective treatment approaches, numerous challenges still exist. There are many chronic stress models and genetic strains used to study mood disorders, however the majority have been developed with adult males. This is problematic considering that affective disorders are more common in women, and generally develop particularly during late adolescence. Additionally, studies have shown that there are fundamental behavioral and physiological differences between males and females in response to the same external stressors, furthering a need to develop sex-specific paradigms to accurately model the etiology of mood disorders in females. In this study, we tested stress susceptibility of Wistar (Ws) and Wistar-Kyoto (Ky) female rats by using a three-week chronic mild stress (CMS) paradigm during late adolescence (days 45-66). To test this, body weight, food intake, and corticosterone levels during restraint stress were measured during CMS to evaluate physiological effects of stress. Immediately following CMS, animals underwent behavioral assessments of helplessness, anxiety, anhedonia, to evaluate the development of mood disorder phenotypes. Ky rat demonstrated endogenous behavioral and hormonal abnormalities that many symptom-presenting patients with depression exhibit, making them an ideal model for testing promising therapeutic treatments. Ws rats demonstrated higher susceptibility to CMS-induced symptoms, suggesting that Ws are a better model for understanding the underlying mechanisms linking stress and mood disorders. These tests are repeated during late adulthood (~ day 90) to determine whether expected stress-induced behavioral deficits persist later in life. The validation and characterization of this sex-specific model of mood disorders allows for more studies on the underlying mechanisms driving these disorders and ultimately contribute to the development of novel therapeutic strategies.

Research Mentors: Dr. Kimberly Kinzig, Department of Psychological Sciences, College of Health and Human Sciences; Elizabeth Sahagun, Department of Psychological Sciences, College of Health and Human Sciences

Poster Number: 173b :: Physical Sciences

College of Science

**Investigating Buried Groundwater Signals in Retreating Alpine Glacier Catchments: A Case Study
Using the Aletsch Glacier, Switzerland**

Author:

James Haydock

Abstract:

As the effects of climate change are continually felt around the world, communities and ecosystems that depend on flow from alpine glaciated catchments are becoming increasingly threatened by changes in the timing of peak flow and baseflow from these catchments. Baseflow sustains streams through periods of low precipitation and is largely comprised of groundwater flowpaths. Groundwater flow in alpine glaciated systems is largely unexplored and remains poorly understood. However, the signal captured by stream gauges in alpine glaciated catchments provides a mechanism to investigate baseflow, and therefore contribution of groundwater, to that stream. Using the catchment of Aletsch Glacier in Switzerland as a model, we attempt to separate the groundwater component of baseflow over recent decades and decouple it from surface runoff (event flow or glacial melt). We hypothesize that baseflow in the gauged Massa River draining the Aletsch Glacier catchment is increasing due to increased recharge from glacial meltwater. By assessing the monthly and yearly minimum discharge data and combining these data with air temperature, precipitation records, and local geology, we investigate how changes in baseflow are related to the retreat of the Aletsch Glacier. Preliminarily, a relationship was found between the minimum discharge data and air temperature data indicating that the outlet flow from this glacier is dominated by surficial melt and that the relative groundwater contribution to baseflow is buried due to the rapid release of meltwater. Further research is needed to separate the glacial groundwater signal from recharge due to rain and snowpack.

Research Mentor: Jordyn Miller, Earth Atmospheric and Planetary Science, College of Science; Dr. Marty Frisbee, Earth Atmospheric and Planetary Science, College of Science

Poster Number: 174b :: Physical Sciences

College of Science

Evidence for a Pulsar Wind Nebula in the Type Ib-peculiar Supernova SN 2012au

Author:

Brody Conner

Abstract:

We present an optical spectrum of the energetic Type Ib supernova (SN) 2012au obtained at an unprecedented epoch of 6.2 years after explosion. Forbidden transition emission lines of oxygen and sulfur are detected with expansion velocities of $\approx 2300 \text{ km s}^{-1}$. The lack of narrow H Balmer lines suggests that interaction with circumstellar material is not a dominant source of the observed late-time emission. We also present a deep Chandra observation that reveals no X-ray emission down to a luminosity of $L_X < 2 \times 10^{38} \text{ erg s}^{-1}$ (0.5–10 keV). Our findings are consistent with the notion that SN 2012au is associated with a diverse subset of SNe, including long-duration gamma-ray burst SNe and superluminous SNe, harboring pulsar/magnetar wind nebulae that influence core-collapse explosion dynamics on a wide range of energy scales. We hypothesize that these systems may all evolve into a similar late-time phase dominated by forbidden oxygen transitions, and predict that emission line widths should remain constant or broaden a few per cent per year due to the acceleration of ejecta by the pulsar/magnetar bubble.

Research Mentor: Dan Milisavljevic, Department of Physics and Astronomy; John Banovetz, Department of Physics and Astronomy

Poster Number: 175b :: Physical Sciences

College of Science

Analyzing the Effect of Air Pollution Regulations on Aerosol Concentrations in Urban Areas

Author:

Bode Hoover

Abstract:

Aerosols, any solid or liquid suspended in air, have significant environmental and biological effects. Fine particulate matter can cause serious respiratory issues and aerosols in the atmosphere absorb and reflect radiation which can warm or cool the atmosphere, respectively. This study compares air quality at two urban areas, the city of Wilmington, CA in the United States and the city of Arequipa, Peru. Concentrations of emissions are under higher regulation standards in California than in Peru which is a developing country. Air filters that measured total suspended particles were collected every 24 hours on Marine Avenue in Wilmington, CA and Avenida Independencia in Arequipa, Peru. Anion concentrations were measured using ion chromatography after they were extracted from the filters by dissolving in water and filtered (0.45 μ m). For Wilmington, the sulfate concentration ranged from 0.74 to 7.48 μ g/m³, the nitrate concentration ranged from 0.24 to 5.23 μ g/m³, and the chloride concentration ranged from 0 to 6.18 μ g/m³. Nitrate and chloride concentrations tended to increase from January to December while sulfate concentrations tended to decrease from March to December. For Avenida Independencia the sulfate concentration ranged from 3.0 to 6.0 μ g/m³, the nitrate concentration ranged from 1.9 to 2.0 μ g/m³, and the chloride concentration ranged from 0.5 to 1.0 μ g/m³. There was no discernible trend in anion concentrations in Avenida Independencia. By comparing California to Peru, the data shows that having regulations on air pollution successfully decreases anion concentrations which can improve human health and reduce environmental damage.

Research Mentor: Dr. Michalski, Earth Atmospheric Planetary Sciences, College of Science; Dr. Elizabeth Olson, Earth Atmospheric Planetary Sciences, College of Science

Poster Number: 176b :: Physical Sciences

College of Science

A Search for the Most Destructive Tornado Outbreak in the Modern Record (1950-2018).

Author:

Charlotte Jaeger

Abstract:

This study has focused on the analysis and comparison of the two greatest outbreaks of tornado activity in the modern U.S. record (1950-2018). The most productive 24 hour period of tornado activity for each was selected: 3 April 1974 and 27 April 2011 from 12 am CST to 11:59 pm CST. The 3 April 1974 outbreak totaled 119 tornadoes ranging from (E)F1- (E)F5, 88 of which were significant. The 27 April 2011 outbreak totaled 137 tornadoes ranging from (E)F1- (E)F5, 59 of which were significant. These events far exceed the criteria for a tornado outbreak, defined as 6-10 tornadoes in a 24 hour period with intensity \geq (E)F1, and including at least one significant tornado (of intensity \geq (E)F2). The objective of this study was to determine appropriate physical quantities of severity for the two superoutbreaks in order to analyze and compare the extremeness of the events. These quantities consisted of path width, path length, maximum intensity, and the Total Destructive Index (TDI). Based on these results the 27 April 2011 outbreak is determined to be the most destructive tornado outbreak in the modern tornado record. The quantities calculated showed the 27 April 2011 had twice as much destructive power as the 3 April 1974 outbreak.

Research Mentor: Ernest Agee, Earth, Atmospheric, and Planetary Sciences, College of Science.; N/A

Poster Number: 177b :: Physical Sciences

College of Science

Synthesis of Biologically Active Molecules from D-Galactose

Author:

Seth Keeling

Abstract:

Simple sugars have been utilized to produce useful products in pharmaceuticals, fuels, and plastics. Due to their abundance and low costs sugars serve as ideal starting materials in the synthesis of a variety of useful compounds. D-Galactose is one such sugar. D-Galactose is a readily available monosaccharide found in dairy products, fruits, gums, and is synthesized in the human body. Its structure lends itself to being readily modified for various purposes. Our project seeks to synthesis a variety of biologically active molecules as well as produce various other products that can serve as the base for building other biologically relevant products. Thus far, our research has demonstrated that the synthesis of products from D-Galactose proceeds in high yields and is extremely cost efficient. The biologically active nature of these products has given rise to the potential of using D-Galactose derivatives as a building block for the making of compounds that could be used in the treatment of a variety of diseases, such as diabetes. One particularly intriguing molecule is currently being investigated, for which results will be disclosed once research is complete.

Research Mentor: Dr. Arun Ghosh, Chemistry, College of Science; Hannah Simpson, Chemistry, College of Science

Poster Number: 178b :: Life Sciences

College of Science

Association Between Ketogenic, Vegan, and Paleo Diets and Dental Biofilm Formation In Vitro

Author:

Kynneddy Kelly

Abstract:

The purpose of this study was to investigate the association between three lifestyle diets (ketogenic, vegan, and paleo) and dental biofilm formation in vitro. This study was set up in glass test tubes containing hydroxyapatite discs, an artificial saliva and 5 percent natural saliva combination, *Streptococcus mutans*, and *Lactobacillus acidophilus*. Food items from three meals (breakfast, lunch, and dinner) were selected for each diet, blended to form a consistent mixture, and added to 25 percent final volume in the test tubes. Biofilms were grown for 48, 60, and 72 hours. Biofilm density was measured quantitatively using a crystal violet assay. Cell number was determined using a vortexing-sonication-vortexing method to remove biofilm cells from the discs, followed by plating. Preliminary results show biofilm formation on the hydroxyapatite discs was significantly higher for both methods compared to a control, which contained saliva combination, Ketogenic diet mixture, and no organisms. For the zero-time control, where the discs were briefly immersed in a bacterial culture and then plated, there were no colonies present on the plates. When comparing biofilm formation on the walls of glass tubes to formation on the discs using a crystal violet assay, the discs had a higher absorbance, indicating a denser biofilm, and justifying use of the discs. These preliminary results suggest that hydroxyapatite discs are sufficient substrates for biofilm formation. The zero-time control demonstrates only biofilm cells, not planktonic cells, are being measured. It can also be concluded that the growth medium is suitable for growth of the biofilms.

Research Mentor: Dr. Thomas Walter

Department of Biological Sciences

College of Science;

Poster Number: 179b :: Life Sciences

College of Science

Molecular Characteristics of Blood-Brain Barrier Tight Junction Protein in Brain Metastases of Lung Cancer

Author:

Chinyere Kemet

Abstract:

Non-small cell lung cancer (NSCLC) comprises 85% of lung cancer cases; 50% of NSCLC patients present with distant metastases at primary diagnosis. One of the greatest barriers to treatment of NSCLC brain metastases is the shift of the blood-brain barrier (BBB), the tightest barrier in the body, to the blood-tumor barrier (BTB). The BTB stands as one of the greatest barriers to effective delivery of therapeutics, including chemotherapies and other targeted therapies, to brain metastases. There is a gap in our knowledge of the molecular and pathologic characteristics of the BTB in brain metastases of lung cancer. We have established a reliable experimental model of brain metastases of lung cancer using A549-Br cells and defined the characteristics of the BTB tight junctions using immunofluorescence microscopy. In this study, athymic nude mice, which are T-cell deficient and were used as xenograft models to facilitate the growth of human cancer cell lines. To form brain metastases, cells were injected via ultrasound guided-intracardiac injection. Qualitative and quantitative analysis of immunofluorescence microscopy samples revealed a 1.38-fold increase in capillary diameter in the BTB compared to the BBB after 4 and 6 weeks of A549-Br cellular colonization. More interestingly, after six weeks of cellular colonization, there was a 1.41-fold ($p < 0.001$) increase in expression of the tight junction protein, claudin-5, in the BTB compared to the BBB. These preliminary data provide a foundation for continued investigation into tight junction proteins in the BTB, as they may serve as therapeutic targets in brain metastases of lung cancer.

Research Mentor: Dr. Tiffany Lyle, Comparative Pathobiology, College of Veterinary Medicine;

Poster Number: 180b :: Life Sciences

College of Science

Examining the Effects of Pesticide Mixtures on Ranaviral Disease Risk

Author:

Amanda Komasinski

Abstract:

Indiana's large agriculture sector has made pesticide use ubiquitous throughout the state. These pesticide intensive practices, however, can be detrimental to aquatic ecosystems. Direct pesticide exposure through runoff or contaminated soil has lethal and sublethal effects on pond communities, especially amphibians. In addition to the threat of pesticide exposure, amphibians are susceptible to ranavirus, an infectious disease that has been linked to declines in amphibian populations. A recent study has shown that chronic exposure to a singular pesticide can influence ranaviral infection rates (Pochini & Hoverman, 2017); however, amphibians are likely to face a mixture of pesticides of different types while in their larval stage. In this study, we examined how chronic exposure to various pesticide and their mixtures influences ranaviral disease risk, specifically in larval gray tree frogs (*Hyla versicolor*). We chose three pesticides that are widely used in Indiana to constitute our pesticide mixtures: an herbicide (atrazine), an insecticide (clothianidin) and a fungicide (azoxystrobin). The tadpoles were chronically exposed to either one or a combination of two pesticides prior to ranavirus exposure. At the conclusion of the study, we analyzed how the pesticide mixtures influenced infection and mortality rates. Our results revealed no significant infection or mortality differences between treatments, and all treatments, including the virus-exposed controls, resulted in uncharacteristically low infection rates. Our future efforts will be directed toward understanding what caused the low infection rates.

Research Mentor: Jason Hoverman, Forestry and Natural Resources, College of Agriculture; Turner DeBlieux, Forestry and Natural Resources, College of Agriculture

Poster Number: 181b :: Mathematical/Computational Sciences

College of Science

CATME Security

Author:

Aditya Kotalwar

Abstract:

CATME is a web based software which allows instructors to make teams in their classes based on the different characteristics of students. This might include their gpa's, free times, previous experience in this class, technical skills etc. This software takes all of this into consideration while making the most well balanced teams in class. About 200,000 students have user this software in over 60 countries. For this reason, the safety and preservation of these student's data is of the highest most priority. My role in this research is handling a lot of security related issues that CATME might face or has. I make functional tests that make sure there are no bugs in the frontend code. These functional tests go through every page and click every single button and text box and try to type in values that might break the system. I have also created a disaster recovery document for CATME, a document which covers all the different unplanned accidents that CATME could go through, and a step by step procedure about how the current team should go about solving this issue.

Research Mentor: Daniel Ferguson, School of Engineering Education, College of Engineering;

Poster Number: 182b :: Life Sciences

College of Science

AlkynylNicotinaamide-Based Compounds as ABL1 Inhibitors with Potent Activities against Drug-Resistant CML Harboring ABL1(T315I) Mutant Kinase

Author:

Alyssa Lambrecht

Abstract:

Chronic Myeloid Leukemia makes up about 10% of all leukemia diagnoses. Although the 5-year survival rate has increased from 6% to 90% in the last 30 years from the introduction of imatinib, there are several mutated forms of the cancer that are resistant treatment. Treatments such as Ponatinib can be used to treat CML patients that harbor the T315I mutation, but they have toxic effects on the body. Safer treatments need to be discovered to inhibit the proliferation of these resistant lines by inhibiting the activity of proteins and mutated proteins. Through research done utilizing cell cultures of CML lines K562 and KCL22 and the resistant line KCL22-IR, several compounds have been found to be effective in inhibiting the proliferation of these cancer cell lines. This research suggests that isoquinoline- or naphthyridine- based compounds could be safer alternatives for treating drug resistant CML.

Research Mentors: Dr. Herman Sintim, Drug Development, College of Science; Elizabeth Larocque, Drug Development, Graduate Student

Poster Number: 183b :: Social Sciences/Humanities

College of Science

The Value of Mentors for Young Adults

Author:

Jayla Langford

Abstract:

The goal of this study is to understand the nature and impact that adult mentors have on adolescents and young adults in the U.S. population. Using the National Longitudinal Study of Adolescent to Adult Health (Add Health) I evaluate a sample of 11,434 young adults (ages 18–26 in 2001-2002) on their experiences with non-parental mentors during adolescence and young adulthood. Description of the characteristics of mentors and the type of mentorship provided are presented. The association of characteristics of mentors and type of mentorship with young adult well-being were estimated. Seventy-six percent of young adults indicated that they had a non-parent adult who made a positive difference in their life. For these young adults, 66% say these mentors are still important in their lives. These mentors were described as relatives (26%), teachers or counselors (15%), or friends (13%). These mentors were reported to primarily provide advice and guidance, emotional support, and role modeling. Preliminary analyses suggests that having an adult mentor in adolescence and young adulthood is generally associated with positive outcomes in several domains. The benefits of different types of mentorship will be described. Descriptive and inferential statistics were obtained using The STATA Programming Language version 15.

Research Mentor: Dr. Sharon Christ

Associate Professor

Department of Human Development and Family Studies

Department of Statistics;

Poster Number: 184b :: Life Sciences

College of Science

The non-conserved C-terminal tail of Cdc14 phosphatase contributes to catalysis

Author:

Gabrielle Lorenz

Abstract:

Cdc14 is a highly conserved member of the protein tyrosine phosphatase (PTP) family and is best known for regulation of mitotic events within the cell cycle of budding yeast. Cdc14 preferentially recognizes Cdk phosphorylation sites with the sequence pSer-Pro-X-Lys (X is ideally Lys or Arg). In most PTPs, a conserved catalytic core is sufficient for full activity. However, in Cdc14 enzymes, the non-conserved C-terminal tail appears to make a large contribution to activity. My project was to identify what part of the C-terminal region contributes to catalysis and to test if it is biologically important in yeast cells. Multiple-sequence alignments revealed a widely conserved amino acid sequence, Gln-Pro-Arg-Lys, in the C-terminal tail in all fungal species. We hypothesized that this motif mimics a substrate and contributes to activity by interacting with the active site. A truncated enzyme that included QPRK had similar catalytic activity as a full-length enzyme, whereas a truncated enzyme lacking QPRK was catalytically deficient. Point mutation of the QPRK sequence into QARA resulted in a catalytic defect similar to the truncation missing QPRK, confirming that this motif is the functionally important part of the C-terminal tail. Growth assays demonstrated that this motif is biologically important to yeast cells. Future directions include characterizing the mechanism by which the QPRK motif contributes to activity. Since Cdc14 is essential for fungal pathogenesis, detailed knowledge of its catalytic mechanism could guide the development of novel antifungal agents.

Research Mentor: Mark Hall, Department of Biochemistry, College of Agriculture;

Poster Number: 185b :: Life Sciences

College of Science

Exploring The Presence And Contribution Of Rare Genetic Copy Number Variants In Myasthenia Gravis

Author:

Melanie Martinez

Abstract:

Myasthenia Gravis (MG) is a heritable autoimmune disorder that affects the neuromuscular junction. Here, we set out to investigate rare genetic variation in patients with MG by analyzing copy number variants (CNVs). CNVs occur when the number of copies of a specific gene varies in the population. Our study represents the first attempt to examine this type of genetic variation in association to MG. We studied a dataset of 1,243 European MG cases and 2,569 ancestry-matched healthy controls. To increase sensitivity, we used two software tools, PennCNV and QuantiSNP, to call the CNVs and collect consensual calls. We performed a quality control to filter out low confidence variants and included only the rare ($\text{freq} < 0.01$) variants in the downstream analyses. We conducted several CNV burden tests to evaluate if there were differences between cases and controls and found an increased burden in duplications in cases. We performed association tests to detect variants that are associated with MG. We analyzed duplications and deletions both independently and jointly. We obtained 33 regions of interest from the joint, genome-wide analysis; upon analyzing CNVs in known genes, we found 47 genic regions associated with MG. Identified genes were found to be associated with conditions having similar pathologies. The implications of this study are vast, as this is the first CNV study for MG and its results can contribute to the exploration of the genetic architecture of MG.

Research Mentor: Dr. Peristera Paschou, Department of Biological Sciences, College of Science; Apostolia Topaloudi, Department of Biological Sciences, College of Science

Poster Number: 186b :: Life Sciences

College of Science

Prevalence and Infection Intensity of *Batrachochytrium Dendrobatidis* Across an Altitudinal Gradient in Costa Rica.

Author:

Kiersten Nelson

Abstract:

Amphibian populations are declining globally at a historically unprecedented rate. Numerous examples of these population declines have occurred in seemingly pristine environments, where human disturbance is minimal. One factor that may be responsible for many of these declines is the high susceptibility of amphibian species to chytridiomycosis, a potentially deadly skin disease caused by the fungal parasite *Batrachochytrium dendrobatidis* (Bd). In Central America, many of these declines have been observed at high elevation sites. We examined prevalence and infection intensity of Bd in amphibian assemblages across an elevational gradient in Costa Rica (from 0-2500 m elevation), in both versants (Caribbean and Pacific). We swabbed 265 frogs to detect Bd and quantified the pathogenic load through qPCR approaches in eight localities between 2015-2017. We hypothesized that all study locations would exhibit low to intermediate levels of Bd prevalence and intensity of infection suggesting enzootic dynamics. We also hypothesized that disease prevalence and intensity would increase with elevation, because midlands and highlands of Central America are suggested to exhibit optimal ranges of temperature and humidity similar to those where Bd grows best in lab conditions.

We found a very low prevalence of Bd (19%) and low infection intensity (0.1-94.5 genomic equivalents) in one of our lowland sites (Foothills of Talamanca Mountain Range, 300-600 m elevation) on the Caribbean side, which matches with our predictions. We also found six Bd-positive species at lowland sites (*Leptodactylus savage*, *Pristimantis cerasinus*, *P. ridens*, *Smilisca phaeota*, and *S. sordida*) This value coincides with similar studies that show mid to low Bd prevalence and low infection intensity in lowlands, indicating enzootic dynamics. These findings demonstrate that Bd can be present in multiple species at low elevations, even though most of the documented die-offs associated with Bd have occurred at higher elevations.

Research Mentor: Hector Zumbado-Ulate, Purdue University, Department of Biological Sciences; Catherine Searle, Purdue University, Department of Biological Sciences

Poster Number: 187b :: Life Sciences

College of Science
Genome Elucidation of Corazon

Author:

Paula Pandolfi

Mikaela Hand

Avantika Bhardwaj

Sharonluz Torres

Abstract:

A phage is a virus that has a specificity for killing a certain strain of bacteria. They have properties that make them appealing to different fields, such as medicine and agriculture, because they can be used to target and terminate undesired bacterial colonies. Sequencing and annotation of the genome encoded by different phages is of great importance due to the fact that the more knowledge we have about these viruses, the more we can use them for designing tools for the mentioned fields. The focus of this paper is on the discovery, sequencing and analysis of the genetic code of a unique phage. Corazon was isolated from a *Mycobacterium smegmatis* mc²155 host found in Easton, PA and is a siphoviridae phage. It belongs to the cluster "S" and has a lytic life cycle. We will be conducting our analysis through the electronic tool, DNA Master. During our examination, we will evaluate start/stop codons, coding potential, start choice source, gap, and longest ORF. Additionally, we will look at Starterator, Phamerator, Function Analysis, NCBI Blast, Local Nucleotide Blast, Phagesdb, and HHPred. Our analysis so far has proven that genes in the middle of Corazon genome have specific functions and were mostly auto-annotated. In conclusion, our goal is to discover and sequence new phages. This is crucial because phage DNA can be used to solve questions about gene structure, organization, regulation, and function that may provide the scientific community with new genes that may have therapeutic and diagnostic uses as mentioned before.

Research Mentor: Kari Lynn Clase, ABE department, Engineering;

Poster Number: 188b :: Life Sciences

College of Science

Highly Efficient Selection System For Directed Evolution of Novel Endonuclease

Author:

Paula Pandolfi

Abstract:

Genome editing optimizes traits of interest by introducing specific changes to the genome of organisms. A novel genome editing tool, ASGARD, was developed in our laboratory as a more flexible tool for editing genomes without a binding site requirement, in contrast to the currently popular CRISPR systems (clustered regularly interspaced short palindromic repeats). Despite ASGARD's attractive characteristics, it suffers from low efficiency and off-target activity. We aim to mutate ASGARD and design a screening system that selects for mutants that display highly efficient DNA cleavage activity with minimal off-target effects. As current methods fail to fulfill our needs, we created a new positive screening method based on a homing endonuclease, I-SceI. I-SceI, encoded on a plasmid, could create a deadly double stranded break in the E. coli genome unless our ASGARD mutants efficiently cut the I-SceI plasmid, rescuing the cell from I-SceI activity and preventing a double stranded break in the genome. Survived cells will then contain DNA encoding highly efficient ASGARs for the next round of directed evolution. Using the inducible I-SceI system, we have halted cell growth by over 50%, illustrating our system's potential as a selection screen. We now aim to rescue cell growth targeting ASGARD to the I-SceI plasmid. Using a high efficiency selection system for directed evolution could lead to a highly active programmable endonuclease which will efficiently cut dsDNA without the limitation of a binding sequence, expanding the toolkits for genome engineering

Research Mentor: Michael Mechikoff, Department of Agricultural and Biological Engineering, College of Engineering; Kok Zhi Lee, Department of Agricultural and Biological Engineering, College of Engineering

Poster Number: 189b :: Life Sciences

College of Science
AAV CRISPR Delivery

Author:

Alexa Parker

Abstract:

Since its discovery in 2015, CRISPR-Cas9 gene-editing technology has opened the door to exciting advances in immunotherapy development for treating cancer and infectious disease. The laboratory is interested in using CRISPR-Cas9 technology to knock-out two genes (NPC1 receptor, signal peptidase SPCS1) that are necessary for Ebola virus infection in brain and liver cells.

The first goal of the proposed research project is to generate adeno-associated viruses (AAV-DJ) as a potential delivery system of the CRISPR-Cas9 system to cells in vitro. So far we have transfected HEK 293 cells with a lenti-viral vector system the lab has used before in order to have a standard of comparison for the AAV-DJ system. We are currently working on obtaining the particular cell line which will be transfected with the AAV-DJ recombinant viral vectors for virus production. This AAV-DJ "transfer vector" is currently being modified by our lab to include the Cas9 endonuclease from *Staphylococcus aureus* (SaCas9) and guide RNAs designed to target either the NPC1 or SPCS1 gene for excision by the SaCas9 endonuclease.

The second goal is to test the efficiency of this delivery system for CRISPR-mediated gene deletions and then evaluate its potential as a preventative immunotherapy against Ebola infection. Upon purification of the virus generated by the AAV-DJ viral vector system, we will determine the transduction efficiency and tissue-type specificity of our recombinant virus using a variety of cultured cell lines each representing different human tissues. This CRISPR-based system will allow us to knock out the genes of interest in the HEK 293 cells and other human cell lines. The last step will be to analyze the transduction efficiency and tissue specificity data to evaluate this vector system's potential effectiveness in immunotherapy applications for preventing Ebola infection in vivo.

Research Mentor: Dr. David A. Sanders

Department of Biological Sciences

College of Science;

Poster Number: 190b :: Life Sciences

College of Science

Development of baculoviral expression system of yeast wildtype and mutant isoprenylcysteine carboxyl methyltransferase (Icmt) for better protein yield necessary for biophysical and biochemical assays in pancreatic cancer research

Author:

Alex Piroozi

Abstract:

Isoprenylcysteine carboxyl methyltransferase (ICMT) is an integral membrane protein located in the membrane of the endoplasmic reticulum of eukaryotic organisms. ICMT plays a major role in the correct function of K-Ras, a CaaX box protein. CaaX proteins require three post-translational modifications including isoprenylation of the cysteine residue, proteolysis of the -aaX motif, and methylation to be localized to the plasma membrane for proper function. ICMT carries out the final step of this process by methylating the carboxyl group of the C-terminus of K-Ras. This information is critical when K-Ras becomes mutated, causing an oncogenic signaling pathway. Mutated K-Ras is responsible for approximately 90% of pancreatic cancers and 30% of all cancers. The role of ICMT in K-Ras signaling makes it a viable target for chemotherapeutic drugs. Inhibition of ICMT can decrease the likelihood of K-Ras localization, effectively stopping K-Ras signaling.

In our research, we perform various biochemical techniques, including site-directed mutagenesis, subcloning, immunoblotting, and radioactive activity assays to determine how individual residues within the binding site of the ICMT cofactor, S-Adenosyl methionine (SAM). The conformational dynamics of co-factor (SAM) and substrate binding (including K-ras) is currently unknown. Currently, we are working to amplify the expression of the yeast ICMT, Ste14, and Ste14 mutants through a baculoviral expression system in Sf9 cells. Successful transformations will result in higher Ste14 yields that is necessary for activity assays and other biophysical assays. We plan to use this data to better understand the methylation mechanism of ICMT that can be used to help create novel therapeutics against cancers affected by the K-Ras oncogenic pathway

Research Mentor: Christine Hrycyna, Department of Chemistry, College of Science;

Poster Number: 191b :: Life Sciences

College of Science

Regional Analysis of Intraspecific Variation in *Phormia regina*

Author:

Alexis Pittman

Abstract:

The field of forensic entomology has utilized molecular analysis to examine the applications of genetic identification of specimens, however, molecular analysis of intraspecific variations of specimens has been minimal. Through this research, molecular analysis of intraspecific variation will be examined in further detail. The purpose of this experiment is to analyze mitochondrial DNA haplotype frequencies, using region 1751-3014 of the CO1 mitochondrial gene, to determine if *Phormia regina* interspecific variations exceed intraspecific variations present for this gene region. The analyzed haplotypes would come from 50 *Phormia regina* specimens from a population in Knoxville, Tennessee and 50 *Phormia regina* specimens from a population in Dover, Delaware. Analyzing two distinct populations will allow for comparison of the haplotype frequencies from each populations' analyzed CO1 sequence to reveal any significant intraspecific variances. These identifying factors in the mitochondrial genome could be used to confidently classify *Phormia regina* specimens by region using means of genetic analysis. This would be an important advancement in forensic entomology as it could provide a means for genetic identification of morphologically similar specimens.

Research Mentor: Dr. Trevor Stamper, Entomology, College of Agriculture;

Poster Number: 192b :: Life Sciences

College of Science

In-vivo studies on slowing the progression of Idiopathic Pulmonary Fibrosis

Author:

Sasmita Rout

Abstract:

Idiopathic Pulmonary Fibrosis(IPF) is a chronic lung disease characterized by scarring of the lungs. The pathogenesis of IPF is not completely understood which makes it difficult to find a cure for the disease. Nintedanib and Pirfenidone are two FDA approved drugs currently available for the treatment of IPF. These drugs show some positive effect on the treatment, but do not completely cure IPF.

Macrophages play an important role in fibrosis. It is commonly believed that the phenotype of profibrotic macrophages are like the M2 subtype, whereas the anti-fibrotic population are more like M1. Based on previously conducted in-vitro studies, the Toll like receptor-7 agonist was successful in reprogramming the M2 macrophages to the M1 subtype.

The in-vitro study results led to in-vivo studies being conducted using the TLR-7 agonist. This agonist targets the folate receptor beta + macrophage to slow down the progression of Pulmonary Fibrosis in a C576L6 mice model. Black male mice are injected intratracheally with a single dose of bleomycin, inducing lung fibrosis, and then treated with the TLR-7 agonist. The main end points include survival rate and progression of fibrosis. By comparing with the disease control and healthy control, our compound can increase the survival and decrease the progression of fibrosis determined by the hydroxyproline assay, H&E staining and trichrome staining. Ongoing in-vivo studies are experimenting on drug dosage and frequency, to receive the optimal regimen for the treatment of IPF. These further studies could lead to a potential treatment for IPF.

Research Mentor: Dr Philip Low

Department -Chemistry

College of Science; Dr Fenghua Zhang

Department-Chemistry

College of Science

Poster Number: 193b :: Life Sciences

College of Science

The Iron Lung: An Analysis

Author:

Emily Sanders

Abstract:

During the polio epidemic, most ill patients died when they reached the point of not being able to breathe on their own, due to the virus paralyzing the chest muscles (The Iron). In 1927, the answer to this problem was invented: the artificial respirator, otherwise coined as “the iron lung” (The Iron). This machine was the sole reason why many patients survived polio, due to Emerson refining the design to make it more affordable (The Iron). Instead of an iron lung costing the same price as a home, Emerson gave the device a makeover so the common American could afford this life saving device (The Iron). Without this device, the survival rate of Polio would be a fraction of what it was. The device worked by a motor hooked up to two vacuums – allowing for constriction and expansion of the patient’s chest (The Iron). In my mind, not only did this help increase the survival rate, but possibly influenced the age of biomedical engineering and the invention of artificial organs that we implicate today.

Research Mentor: Sharra L Vostral;

Poster Number: 194b :: Life Sciences

College of Science

Targeting Erythrocyte's Band 3 Tyrosine Phosphorylation for Treatment of Sickle Cell Disease

Author:

Ruhani Sansoya

Abstract:

Sickle cell disease (SCD) is a common inherited erythrocyte disorder characterized by a sickle shape in erythrocytes as a result of a single heritable point mutation in hemoglobin located in the β -globin gene. Current treatment includes clinical management, but no drugs are being used to manage the pathophysiology of the disease. Our lab has discovered that inducing phosphorylation on a membrane protein called band 3 results in erythrocyte fragmentation triggering a release of free hemoglobin and erythrocyte-derived microparticles into the bloodstream causing painful vaso-occlusion seen in patients. SYK inhibitors such as Imatinib prevent phosphorylation of band 3 and reduce the intensity of these events. Imatinib has already shown promising results through experimentation. Since Imatinib can inhibit multiple kinases, the purpose of our research is to test other SYK inhibitors to confirm that the success seen by Imatinib is truly the result of blocking the tyrosine phosphorylation. The SYK inhibitors to be tested include R406, PRT062607, and S701 which all inhibit SYK more specifically to prevent microparticle release. The effect of the drugs can be measured by quantifying the phosphorylation of band 3 using western blot, microparticle release through flow cytometry, and release of free hemoglobin from sickled erythrocytes. The ultimate decrease in hemolysis as a result of treatment may introduce new perspectives to using drug therapy in order to control the side effects of SCD.

Research Mentor: Panae Noomuna, Chemistry, College of Science;

Poster Number: 195b :: Physical Sciences

College of Science

An Investigation of the Spatial Redistribution of Tornado Activity Versus Precipitation Patterns

Author:

Abby Sebol

Abstract:

A spatial redistribution of maximum annual tornado activity has been observed in the U.S. resulting in a decrease in the traditional tornado alley located in Texas/Oklahoma to an increasingly recognized area known as 'Dixie Alley' centered in Alabama/Tennessee. This shift has occurred between two defined time spans: Period I (1954-1983) and Period II (1984-2013). The cause of this change is not yet known, however precipitation could be a factor. With more tornadoes, there exists more convective available potential energy (CAPE). More CAPE is accompanied with updrafts and clouds which would therefore lead to more rain. Precipitation reanalysis data obtained from the Climate Prediction Center are analyzed for the same periods and within the same domain to examine the pattern and search for any correlation between precipitation and tornadoes. Both tornado days and events for (E)F1- (E)F5 tornadoes are used as well as rain amounts and frequencies (days with rain greater than 1 mm). Based on these results, there appears to be no evidence of an annual increase (decrease) of precipitation where there is an increase (decrease) of tornadoes. In the Central Plains where there has been a reduction of tornadoes, there is a greater amount and frequency of precipitation. There is also a negative precipitation change in the Dixie Alley region of increased tornado activity. Seasonal changes were also investigated. Most of the annual tornado activity increase in Dixie Alley is found in the spring season (when there is the most decrease in precipitation). Also, most of the annual increase in precipitation for the Central Plains is found in the summer season (which is accompanied by decreasing tornado events). The analysis suggests that a shift of precipitation patterns is not related to the spatial redistribution of tornado activity. Research into these changes continues and may be associated with a climate change phenomenon known as the 'warming hole'.

Research Mentor: Ernest Agee, Earth Atmospheric and Planetary Sciences, College of Science;

Poster Number: 196b :: Life Sciences

College of Science

**Assessment of Thyroid Toxicity of Per- and Polyfluoroalkyl Substances on the Northern leopard frog,
Lithobates pipiens**

Author:

Hannah Smith

Abstract:

Per- and Polyfluoroalkyl Substances (PFAS) are synthetic chemicals present in everyday products (e.g., nonstick cookware, stain-resistant fabric, firefighting foam). PFAS are an emerging contaminant of concern due to potential effects on the health of humans and wildlife via endocrine-disrupting effects. We have previously demonstrated that PFAS can reduce growth and delay development of larval amphibians. The goal of this study is to establish a relationship between PFAS exposure in northern leopard frogs and thyroid toxicity. We exposed frogs to different concentrations of four different PFAS (PFOS, PFOA, PFHxS and 6:2 FTS) for 31 days and collected their thyroid glands for histopathological examination. We examined a total of 26 thyroid specimens and assessed changes in follicular size, cell height and colloidal content. This method will assist in linking endocrine disruption of thyroid hormones to sublethal effects of PFAS observed in our previous experiments.

*Research Mentors: Marisol Sepulveda, Department of Forestry and Natural Resources, College of Agriculture;
Michael Iacchetta, Department of Forestry and Natural Resources, College of Agriculture*

Poster Number: 197b :: Mathematical/Computational Sciences

College of Science

Data Analysis and Simulation for Service Systems

Author:

Xinyi Tan

Abstract:

This research project explores methodology for estimating the underlying arrival rates of patients arriving at a hospital. We use a combination of stochastic simulation and operational data analysis for estimating the arrival rate, assuming a nonhomogeneous Poisson process model of patient arrivals. We used a data-set containing the patient id (id), entry route (ED_Entry_Route), ambulance type (ED_Entry_Ambulance_Type), and exact arrival time (ED_Entry_Ambulance_Type). Using the arrival time feature, we estimate a piecewise constant and piecewise linear arrival rate function with varying interval aggregation. We compared the simulated queue length with the queue length generated from the actual dataset. Results show that aggregated data in intervals shorter than 60 minutes provide a consistent arrival rate function. However, the mean difference statistics favor data aggregated over longer intervals, but this risks losing resolution.

We also extended this analysis to spatio-temporal arrival models. These types of models can be used in a larger model intended for the performance analysis of urban mobility systems, such as the Bird Scooter network. To include space into the rate function, we perform Poisson Random Field simulation, supposing that $l(t, x, y)$ is a separable function, $l(t, x, y) = f(x, y) l(t)$. We used Gibb's sampling to sample from the spatial nonhomogeneous Poisson process. In our simulations, we assume a fixed number of bird scooters travel between two areas. Our research suggests further directions including adding travel time, more locations, and non-separable request rate functions.

This research was conducted in collaboration with Anna Tatara (B.S. I.E., 2016), graduate student in the School of Industrial Engineering, and under the guidance of Prof. Harsha Honnappa, Assistant Professor, School of Industrial Engineering.

Research Mentor: Dr. Harsha Honnappa, School of Industrial Engineering, College of Engineering; Anna Tatara, School of Industrial Engineering, College of Engineering

Poster Number: 198b :: Life Sciences

College of Science

Efficiency of Telemedicine Using SpeechVive

Author:

Deepthi Thadasina

Abstract:

Parkinson's disease (PD) is a neurodegenerative disease caused by the breakdown of neurons in the basal ganglia which in turn causes disruptions in body movements. However, patients with PD also have problems with their speech, particularly with vocal intensity, although the reasons for these impairments are not entirely clear. A new device treatment on the market, SpeechVive, has been shown to increase vocal intensity. Current speech treatment paradigms require the patient to come into a clinic for treatment. Due to limitations in mobility and increased fatigue, traveling to speech treatment sessions can be difficult for patients. The purpose of this study is to examine the potential of using telemedicine to provide treatment with the SpeechVive device. Ten participants with PD were enrolled. Participants chose which modality they preferred (5 chose face-to-face and 5 chose telemedicine). Speech was measured before and after three months of treatment. The primary outcome measure was vocal intensity. Secondary outcome measures included a patient-report outcome measure and speech rate. Results will be discussed with respect to effectiveness of telemedicine treatment delivery.

Research Mentor: Dr. Jessica Huber

Department of Speech, Language and Hearing Sciences

College of Health and Human Science;

Poster Number: 199b :: Life Sciences

College of Science

Protein Engineering to Produce a Red Chemiluminescent Protein for Use in Tissue Imaging

Author:

Sarah Varney

Abstract:

Protein engineering has produced a vast array of new luminescent proteins and biosensors for detecting reactive oxygen species, calcium, and other molecules. One drawback to many of these biosensors made with fluorescent proteins is that the light required to excite the protein is often harmful to live cells or does not efficiently penetrate thick biological tissues. Chemiluminescent luciferases offer an alternative to fluorescent proteins because they do not require excitation light. Currently, a blue chemiluminescent protein, NanoLuciferase, engineered from a deep-sea shrimp, has become the brightest chemiluminescent protein to date. However, its blue emission has such a short wavelength that the light is easily absorbed and scattered, making its detection through thick tissue samples inefficient. By combining NanoLuciferase with a long Stokes shift red fluorescent protein (RFP), GRvT, a new red luminescent protein is being developed which utilizes the phenomenon of bioluminescence resonance energy transfer (BRET). Molecular biology techniques were used to clone the DNA for the two proteins into a plasmid. Next, the expression of the protein was optimized by growth in different cell and media types. Finally, the protein was purified and characterized to determine its capabilities as a biosensor for tissue imaging. When the chemiluminescent protein reacts with its substrate, coelenterazine, it becomes excited and transfers its energy to the RFP, causing it to emit red light now detectable through thick tissue samples. By engineering a red light emitting chemiluminescent protein, harmful side effects of excitation light required for fluorescent biosensors such as cytotoxicity can be avoided.

Research Mentor: Mathew Tantama, Chemistry, Science;

Poster Number: 200b :: Physical Sciences

College of Science

High wind alerts for Purdue campus based on observations from the X-band Teaching and Research Radar (XTRRA)

Author:

Lauren Warner

Abstract:

On August 13, 2011, the Indiana State Fair stage collapsed, resulting in multiple fatalities and injuries. The event was caused by a high wind gust from an approaching severe thunderstorm. In light of this tragedy, Purdue established new wind speed limits of 30 mph (13 m s⁻¹) for tents at outdoor events. During these events, volunteers stand outside with handheld anemometers, measuring and reporting when the wind speeds exceed the limit. The recent installation of the XTRRA near Purdue campus may allow these alerts to be automated. The XTRRA, which runs continuously, scans the atmosphere at low elevations over campus every few minutes. Using the data collected during its first few months of operation, we developed an automated system that generates high wind alerts whenever observed winds at altitudes below 412 m (considered indicative of surface conditions) exceed the threshold of 13 m s⁻¹. A combination of median filtering, clutter filtering, and statistical outlier removal mitigated false alarms caused by noise and ground clutter. Further testing and modification of the alert parameters will minimize the overall occurrence of false alarms. The high wind alerts will then be distributed to interested parties such as campus event coordinators and safety officials. In the future, alerts will also be generated from the XTRRA data for other forms of severe weather, such as hail and mesocyclones (a precursor to tornadoes).

Research Mentor: Robin Tanamachi, EAPS, College of Science;

Poster Number: 201b :: Life Sciences

College of Science

Increase in Net Bone Calcium Retention Was Not (Yet) Observed with the Consumption of Blueberries in Healthy Postmenopausal Women

Author:

Darah Waskin

Abstract:

Blueberries are a rich source of polyphenolic compounds, such as anthocyanins and flavonoids, that can influence bone health. This study tested the effects of blueberries added to a regular diet on bone mineral retention in postmenopausal women. The isotope ^{41}Ca , a long-lived radio isotope of calcium, was used to label the skeleton and track bone resorption. A controlled randomized clinical trial was completed in 14 women at least 4 years past menopause. The treatment involved a 5-mo equilibration period followed by a 6-wk baseline and 3 alternating 6-wk treatment and washout phases, each corresponding to a different dose of blueberries (low, medium, and high). The participants recruited for this study were healthy, slightly overweight (average BMI: 26.2 kg/m²), and non-osteoporotic (average bone mineral density: 1.1 g/cm³, average t-score: -1.33). This study will provide information on potential alternative therapies for osteoporosis and a better understanding of the impact of blueberries on bone health in humans.

Research Mentor: Joanna K Hodges, Nutrition Science, College of Health and Human Science;

Poster Number: 202b :: Life Sciences

College of Science

Health and Safety of Blueberry Polyphenols Using a 90-Day Oral Toxicity Model in Rats

Author:

Samuel Westendorf

Abstract:

Purpose: Polyphenols are secondary plant metabolites present in all fruits and vegetables that are often touted for their health benefits. Given their health promoting properties, they are increasingly marketed as dietary supplements. As the popularity of herbal and botanical dietary supplements grows, consumers are being exposed to far higher doses of polyphenols than found in nature. Although the health benefits of these compounds are well documented from dietary sources, little is known about the safety of high doses found in dietary supplements. This study explores the safety of high doses of blueberry polyphenols by employing a 90-day sub-chronic toxicology model to determine these effects.

Methods: Following OECD standards for a 90-day sub-chronic toxicology model, 5-month-old, ovariectomized, Sprague-Dawley rats were randomized to treatment groups, with each given a different concentration of blueberry polyphenols (0, 50, 300, or 1000 mg/kg bw/d). To mimic dietary supplement consumption, animals are gavaged daily. Throughout the study, animals are monitored for changes in body weight and food consumption. Upon completion of the study, animals will be sacrificed and a complete necropsy performed to detect changes in tissue morphology. Major tissues will be excised and fixed in formalin, and blood collected for hematology and clinical biochemistry.

Results: This study is currently ongoing, though no changes in overall health status, food intake, or body weight have been observed to date. Further results will be presented at the Undergraduate Research Poster Symposium.

Conclusions: This study will provide insight into the effects of high doses of polyphenols, as may be found in dietary supplements. Results from this study will provide information about toxicity that will inform safety guidelines for polyphenols.

Research Mentor: Dennis P. Cladis, Food Science, College of Agriculture, Purdue University;

Poster Number: 203b :: Life Sciences

College of Science

Expression of Flavivirus Subviral Particles to Study Particle Budding

Author:

Hunter Wieczorek

Abstract:

Flaviviruses such as Zika virus (ZIKV), dengue virus (DENV), West Nile virus (WNV), and yellow fever virus (YFV) cause significant global health issues. Flaviviruses are enveloped icosahedral viruses with a single strand RNA genome. In the cell, the viral genome is translated into a single polyprotein, which is subsequently processed into three structural proteins and seven nonstructural proteins. At the ER interface, the structural proteins C, prM, and E form the viral particle through an in-budding event involving both viral and host proteins as assembly machinery. Interestingly, the structural proteins alone are capable of forming membranous particles with characteristics similar to virions. These structures, termed subviral particles (SVPs) consist of only prM and E, and offer appealing advantages in therapeutic and experimental areas. SVPs present the viral proteins in a lipid membrane context, but distinct structural differences between SVPs and virions have been observed. Further study of SVP structure could provide important insight on assembly dynamics, particle budding, and virion structural asymmetry. The efficient expression and secretion of SVPs is essential to accomplish this goal, but available procedures for the production of SVPs vary greatly. SVP constructs containing the structural proteins from various flaviviruses were designed and then produced using PCR. Plasmid constructs were then transfected into mammalian cell lines. The relative expression levels of viral structural proteins were characterized using SDS-PAGE followed by western blotting. After sufficient SVP production is achieved, structural analysis can be accomplished.

Research Mentor: Dr. Richard Kuhn, Biological Sciences, College of Science;

Poster Number: 204b :: Physical Sciences

College of Science

Analysis and Measurement of the Anisotropic Thermal Conductivity of Composite Materials

Author:

Andrew Wildridge

Andrew Spring

Eshwar Puvvada

Karl Hauser

Ramon Felipe Guerrero Suarez

Ryan Baker

Tristan Schefke

Abstract:

The Large Hadron Collider (LHC) at CERN is the preeminent place in the world for research in particle physics. The next major upgrade of the LHC, scheduled for 2023, will generate a higher particle flux than ever before. The goal of our research is to design, build and test a configuration of supporting structures for the CMS detector that can withstand the additional energy caused by the higher particle flux. In order to achieve this goal, we developed apparatuses that can measure the thermal conductivity of materials that will be a part of the detector. These measured thermal conductivity values then go into thermal simulations of the detector design. Ultimately, we will determine what materials possess better thermal conductivity properties to meet the heat dissipation needs of the High-Luminosity (HL) LHC upgrade.

Research Mentor: Dr. Andreas Jung, Department of Physics, College of Science; Dr. Souvik Das, Department of Physics, College of Science; Abraham Koshy, Department of Physics, College of Science

Poster Number: 205b :: Physical Sciences

College of Science

Magnetic Variations Controlled by Compositional Complexity

Author:

Justin Shing Him Wong

Abstract:

Ternary Laves phases with the general formula, RTX (R = Rare earth metals; T = Transition metals; X = p-block elements), can adopt one of the following structure types: cubic MgCu₂ (Fd-3m), hexagonal MgZn₂ (P63/mmc) and hexagonal MgNi₂ (P-62m). This family of compounds displays rich structural and compositional complexity which leads to a wide variety of magnetic properties such as large magnetocaloric, magnetoresistance, superconductivity, etc. In particular, the GdTAI (T = Cu, Ni, Co, Mn) phases are amongst the most studied. Notably, GdMnAl has been found to display a high magnetic transition temperature (275 K) among the series, which is attributed to the decrease of the number of d-electrons at the Fermi level compared to the other compounds (Co-Cu). Thus, we have substituted other transition metals (Ti, Cr, Fe) for Mn in GdMnAl with the goal of improving its magnetic properties. The structural and physical properties of these new compounds will be highlighted.

Research Mentor: George Agbaworvi; Corey M. Thompson

Poster Number: 206b :: Life Sciences

College of Science

Chemistry Laboratory Development: Mussel Mimetic Adhesives from Corn

Authors:

Jessyca T. Woods

Lawrence XB. Fung

Jonathan J. Wilker

Abstract:

We are presenting a new general chemistry laboratory experiment based on a research paper published in *Advanced Sustainable Systems*, 2018, 2 (3), 1700159. The research paper is about making and evaluating mussel mimetic glue. Marine mussels are known for sticking to rocks but mussel glue is very expensive. The authors are using corn protein instead of mussel protein and tannic acid for cross-linking. Tensile testing instruments and lap shear experiments are used to determine adhesive strength. The results are compared to commercial Elmer's Glue and Super Glue. The objectives of the chemistry laboratory experiment are as follows: i) Develop hands-on skills on how to formulate a mussel-mimetic polymer glue from corn protein, ethanol and tannic acid. ii) Measure and record data in simplified lap-shear testing experiments. iii) Analyze data, calculate adhesion strength and generate evidence supported conclusions. For the new laboratory experiment a simplified tensile testing device (= hanging scale) is used and cotton ribbons for specimen. The cotton substrates with the applied adhesives are overlapped, pressed together, and then dried/cured. When the adhesive is cured, the hanging scale is used to pull the substrates in opposite directions until they separate. The adhesion strength is measured and divided by the surface area. The results are compared to literature values. Students learn about polymers, cross-linking, molecular interactions, and adhesion testing.

Research Mentor: Gudrun Schmidt, Department of Chemistry, College of Science;

Poster Number: 207b :: Physical Sciences

College of Science

Analyzing Silicon Detectors for the High-Luminosity Upgrade of the Large Hadron Collider

Author:

Jiexiong Xu

Zixin Xiong

Andrew Wildridge

Ethan Zweig

Abstract:

The Large Hadron Collider (LHC) at CERN is the preeminent place in the world for research in particle physics, most recently made famous by confirming the existence of the Higgs Boson in 2012. The next major upgrade of the LHC, scheduled for 2023, will generate a higher particle flux than ever before. The goal of our research is to design, build, and test a configuration of lightweight silicon detector models that can withstand the additional energy caused by the higher particle flux. In order to achieve this goal, we are taking a two-fold approach: developing a thermal model of heat dissipation of possible low-mass detector designs in various CAD simulation software and building physical prototypes for thermal and dynamic testing to compare to the simulations. Ultimately, we will determine an optimal shape and material composition to meet the needs of the high luminosity (HL) LHC upgrade.

Research Mentor: Professor Andreas Jung, Department of Physics and Astronomy, College of Science;

Poster Number: 208b :: Mathematical/Computational Sciences

College of Science

Best Strategy for Each Team in The Regular Season to Win Champion in The Knockout Tournament

Author:

Zijie Zhou

Abstract:

In 'J. Schwenk.(2018)What is the Correct Way to Seed a Knockout Tournament? Retrieved from The American Mathematical Monthly' , Schwenk identified a surprising weakness in the standard method of seeding a single elimination (or knockout) tournament. In particular, he showed that for a certain probability model for the outcomes of games it can be the case that the top seeded team would be less likely to win the tournament than the second seeded team.

This raises the possibility that in certain situations it might be advantageous for a team to intentionally lose a game in an attempt to get a more optimal (though possibly lower) seed in the tournament.

We examine this question in the context of a four or eight team league which consists of a round robin "regular season" followed by a single elimination tournament with seedings determined by the results from the regular season. Using the same probability model as Schwenk we show that there are situations where it is indeed optimal for a team to intentionally lose. Moreover, we show how a team can make the decision as to whether or not it should intentionally lose. We did two detailed analysis. One is for the situation where other teams always try to win every game. The other is for the situation where other teams are smart enough, namely they can also lose some games intentionally if necessary. The analysis involves computations in both probability and (multi-player) game theory.

Research Mentor: Jonathon Peterson, Professor of Department of Mathematics, College of Science;

Poster Number: 209b :: Life Sciences

College of Veterinary Medicine
Equine Asthma Therapy

Author:

Colin Harris

Abstract:

Equine asthma is a common respiratory disease in horses. The inflammation or obstruction is caused by environmental allergens such as dust, mold spores and mites. Sensible management practices do not allow for the practical avoidance of these allergens, the possible reduction of allergen exposure can improve clinical scores but clinical intervention and drug therapy is required for the horses to become asymptomatic. Historically, intravenous corticosteroids like dexamethasone and prednisolone have been used because they are cheap and effective. However, overuse of intravenous corticosteroids has proven to have drastic negative side effects which can be potentially life-threatening. Inhaled corticosteroids decrease the systemic absorption and side effects but are more costly than intravenous corticosteroids. Bronchodilators have also been used to treat equine asthma by means of allowing more air to flow through to the bronchioles. This study uses the results from past research that shows that nebulized dexamethasone is safe and effective in horses. The use of a bronchodilator immediately before the administration of the nebulized corticosteroid allows for better delivery of the drug into the bronchioles. The purpose of this study is to determine both the safety and efficacy of the combination of nebulized albuterol as well as nebulized dexamethasone. We are hypothesizing that the nebulized dexamethasone along with the nebulized albuterol will increase pulmonary function (as measured by amount of pressure difference required to move a volume of air) without the systemic absorption caused by intravenous administration.

Research Mentor: Dr. Laurent Couetil, Equine Sports Medicine, College of Veterinary Medicine;

Poster Number: 210b :: Social Sciences/Humanities

Exploratory Studies

Performance Assessment of Blackboard® Technology Among Freshman Undergraduate Students at Purdue University

Author:

Rod Van Pelt

Tyler Lim

Abstract:

At Purdue, almost every student uses electronic devices to access content and perform academic activities through the Blackboard platform. This study was aimed at understanding undergraduate freshmen' feedback on existing classroom technologies and how this information can inform improvement of platforms' design and effectiveness. Fourteen students completed a 12-question online survey. Blackboard technology was well accepted (92%) and rated user-friendly (62%). However, approximately 30% of students reported concerns over the convenience of use (23%) or reliability of the program (8%). This study confirmed that use of technology for academic learning and tasks performance is well accepted and didn't identify major areas of concern among students. However, methodologically, the survey failed at collecting students' feedback to identify areas for technologies' improvement.

Research Mentor: Libby Chernouski

Dept. of English | College of Liberal Arts

Purdue University

ICaP Instructor

Office: HEAV 311E;

Poster Number: 211b :: Social Sciences/Humanities

Exploratory Studies

Post-Traumatic Stress Disorder in Veterans Returning from Combat: Impact on Social Reintegration

Author:

Rod Van Pelt

Abstract:

Post-traumatic stress disorder (PTSD) is a mental health condition frequently observed in soldiers and veterans. The reintegration of veterans returning from combat is a challenge that state and federal administrations, as well as civilian structures and workplaces, face routinely. Despite PTSD being a public health issue with a socioeconomic impact, non-scholarly debate is the primary source of information on the non-medical burden of PTSD.

The majority of scholarly evidence focuses on PTSD primarily as a medical condition, including when addressing the problem from a socioeconomic standpoint. In fact, most of the recent scholarly evidence points to specific areas of PTSD, such as the psychiatric symptoms and their effect on behavior and interpersonal interactions, but fail to provide a comprehensive review of the condition and its overall impact in the life of the returning veterans.

This research leverages references from a wider time range to present an overview of PTSD from doctors and researchers on how to best address this problem. Most of the authors agree that medical intervention is the most important approach to help veterans with PTSD regaining their role in society. There is ongoing debate on whether the medical treatment has to be paired to other social-based interventions.

Research Mentor: Libby Chernouski

PhD Student in English Language & Linguistics | MA in English

GradSEA President

PLLS 2018 Promotions & Proceedings Co-Chair

Dept. of English | Purdue University

HEAV 311E;

Poster Number: 212b :: Innovative Technology/Entrepreneurship/Design

Krannert School of Management

What Role can the Insurance Industry Play in Fighting Climate Change?

Author:

Matthew Campbell

Abstract:

While the insurance industry may not be able to solve the issue of climate change, as one of America's largest industries, using risk management methodologies and providing financial backing, the impact the industry can have may be surprising. Being uniquely positioned between both ends of the climate change spectrum, the causes and the impacts, the industry has a pivotal role in using their methods and technologies to help create change. In this paper we will explore some of the current strategies the industry has in place, as well as some recommendations for future change. As technology evolves, firms are facing sets of data of unseen size and complexity. By using innovative solutions such as machine learning, data analytics, and statistics; data analysts are finding new ways to tap into this data to find faster and more optimal solutions for firms to implement. New companies focusing on cloud computing and machine learning are forming that allow managers to predict and manage the risk caused by severe weather and climate change. By being one of the largest institutional investors, we are also seeing insurance firms investing more capital into green investments. Offering premium discounts will incentivize homeowners to install durable improvements like hurricane-resistant doors and fire blocks, and these measures will help reduce the risk of filing a claim and prevent future property loss. Insurers could also offer a discount for installing ecofriendly products such as solar panels and power producing windmills. Some insurance firms are already offering discounts like these, and as more firms adopt new policies we can expect to see much greater popularity. After examining the nature of climate change and taking a broad look at the insurance industries operations we can see that there is quite a role that the industry can play in fighting climate change.

Research Mentor: Cliff Fisher, Business Law Dept, Krannert School of Management;

Poster Number: 213b :: Social Sciences/Humanities

Krannert School of Management

Protecting Consumer Data Privacy in the United States

Author:

Kelsey Hoke

Abstract:

Increases in the use of technology in the daily life of a United States citizen has brought upon many changes to how companies and consumers interact. Each party now has access to more information about the other than ever before; consequentially, changing the way companies market to their consumer base. The influx of data created by advancing technology has overwhelmed the corporate world leaving companies with more information than they know what to do with. This data has been used to better services and experiences for customers and create new and innovative products, but it has also been used in ways that take advantage of a person's private and personal information.

This paper will assess how companies use online consumer data and how the use of this data is essential to the online experience consumers have become accustomed to. These practices will also be looked at through an ethical and legal lens to evaluate whether or not consumer data should be permitted to be used in such fashion, especially in regards to the rights consumers have to data privacy. Although the United States does not currently have legislation in place regulating the use of online consumer data, there is similar legislation throughout the world that will be used to propose how the United States should address the issue of data privacy.

Research Mentor: Cara Putman, Krannert School of Management;

Poster Number: 214b :: Social Sciences/Humanities

Krannert School of Management

SAFMEDS as an Instructional Tool and Assessment

Author:

Lindsey Prommer

Abstract:

Say-all-fast-minute-each-day-shuffled (SAFMEDS) is a precision teaching method utilized in both instruction and assessment. Existing literature illustrates support for the retrieval hypothesis and the testing effect due to repetition and active learning, thus making SAFMEDS an effective studying strategy. Differing from traditional flashcards, SAFMEDS are based on the concept of saying the vocabulary word aloud with an emphasis on speed. This study's purpose is to analyze how the repetitive use of SAFMEDS affect test scores. Examining SAFMEDS as instructional devices and assessment tools will give insight into the effects of fluency-based techniques on retention and accuracy. I predicted a positive relationship between SAFMEDS quiz scores and exam scores. There were 173 undergraduates from an Introduction to Cognitive Psychology class at a large midwestern public research university that participated in this study and the participants came from a variety of academic programs. During in-class SAFMEDS timings, students studied for 3-5 minutes and were timed for one minute, attempting to achieve as many correct responses as possible. A partner held up the definition side of the SAFMEDS and the participants said aloud the vocabulary word. Cards were split up between correct, incorrect, and skip. For quizzes, participants were given five minutes to type the 40 vocabulary words next to the definition shown. These repeated SAFMEDS quizzes show the testing effect to varying degrees. As a retrieval practice and instructional tool, SAFMEDS are shown to be an effective study method. They lead to improved performance as compared to flashcards due to their emphasis on fluency rather than accuracy. In the future, I'd like to conduct more research into the impact of SAFMEDS on length of retention.

Research Mentor: Dr. Melissa Swisher, Department of Psychological Sciences, College of Health and Human Sciences;

Poster Number: 215b :: Life Sciences

Polytechnic Institute

Lyme Disease and Urbanization in the United States

Author:

Daphne Fauber

Abstract:

Over 30,000 cases of Lyme Disease are reported annually in the United States; however, according to the Center for Disease Control and Prevention (CDC) these reports are an underestimate of actual cases as between 300,000 and 400,000 Americans are likely infected annually. Since the 1990s, documented and estimated cases of Lyme Disease have been on the rise globally along with other diseases spread by human-animal contact. It has been well documented that urbanization—“[the] rapid intensification of agriculture, socioeconomic change, and ecological fragmentation”—is associated with an increase in zoonotic disease rates (Hassell, Begon, Ward, & Fèvre, 2017). Thus, the focus of the study was to break down urbanization in order to specifically examine the expansion of city boundaries and its relation to rates of Lyme Disease in the United States. The expected outcome was for the areas on the edge of expanding city boundaries to have increased risk of Lyme Disease due to the clash of a pre-existing natural ecosystem with the urban ecosystem moving in. Data from the CDC and US Census bureau were merged including population density, the classification of county (urban, peri-urban, and rural), and rates of Lyme Disease. A generalized linear regression was used to examine the relation between rates of Lyme Disease, and the classification of each county controlling for population. Results indicated that there were greater instances per person of Lyme Disease in counties that were classified as urban.

Research Mentor: Dr. Hsin-Yi Weng; Associate Professor of Clinical/Analytical Epidemiology, Department of Comparative Pathobiology, College of Veterinary Medicine;

Poster Number: 216b :: Physical Sciences

Polytechnic Institute

Genome Characterization and Annotation of a Cluster S Bacteriophage

Author:

Anna-Nikol Georgiev

Kathryn Myers

Kierra Jammer

Morgan Callin

Taylor Sorrel

Abstract:

Bacteriophages (phages) are viruses that infect their host and cannot reproduce independently outside of them. The application of bacteriophages in the biotechnology and medical sectors has recently increased, including uses as a potential antibacterial agent and CRISPR technology. In this project, the 48,667 to 58,636 base pair region (genes 87-98) of the Corazon phage genome was annotated by five student researchers at Purdue University.

Corazon, a cluster S phage was isolated at Lafayette College in Easton, PA. Corazon belongs to the Siphoviridae morphotype and its genome consists of 109 genes. In this study, gene locations were called using evidence consisting of alignment results, coding potential, and comparison to other phage genomes using DNAMaster, NCBI Blast, Phamerator, HHPred, Starterator. The annotation of a genome consists of confidently assigning start sites and functions to genes based on evidence obtained from auto-annotation of the genome and additional evidence collected based on the genome cluster and similar calls in other phages.

Notable functions include minor tail proteins, which are found in the tail fiber or sheath of the phage, and HNH endonuclease, which is a component of the phage packaging machinery. Many of the genes annotated have no known function based on the collected evidence but additional research may yield alternative results and additional uses. Further research of bacteriophage genetics allows deeper investigation and heightened understanding of their possible uses.

Research Mentor: Kari Clase, Agricultural and Biological Engineering, Engineering;

Poster Number: 217b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Analysis of Propaganda Modern Chinese Newspapers in the Context of Historical Methods

Author:

Qingyuan Hu

Alexander Mullenix

Christine Wang

Abstract:

This project seeks to analyze current and historical content and methods that can be used in psychological warfare in order to create a model for automated propaganda detection. A historical perspective is established through a literature review aimed at understanding trends in propaganda methods and their outcomes in particular political and cultural environments. A collection of written news articles, in both Chinese and English, was collected from online Chinese state-sponsored media sources. The selected texts often reflected the particular agenda of the controlling party, the Chinese Communist Party. The perspective of the media varied between positive, neutral or negative, containing explicit messages and more sophisticated methods of implication and manipulation. Throughout the process of data collection and annotation, textual differences and similarities were recorded with their given technique and implied intent. The recorded results were compared with historical perspective with the goal of recognizing anomalies in the data. The texts are then processed by machine learning algorithms and results are analyzed. While the analysis is focused on Chinese media reports, the findings are expected to be applicable to a wider range of information materials and countries.

Research Mentor: Julia Rayz, Computer and Information Technology, Purdue Polytechnic Institute;

Poster Number: 218b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Applications of Mobile Robots in Construction Education

Author:

William Hubbard

Abstract:

Robots have been a new focus lately in the construction industry. While many projects have been successfully completed using stationary robots or even semi-stationary robots, this research project is focused on what mobile robots can achieve. Specifically, the attention for this project is given to a GoPiGo unit that utilizes a RaspberryPi for comprehending coded instruction and direction. The objective to be achieved with this robot is to have it follow given directions to a specific location on a jobsite, where it will take a picture and record simple measurements such as temperature and humidity and promptly return to its original location.

To begin the project, I contributed to the assembly of the GoPiGo unit alongside two other researchers and manually tested its maneuverability and speed. Then, time was taken to understand its environment recording capabilities, such as its distance and height sensor. After these were evaluated, I began to construct simple tasks for the robot to do, such as travel a distance down a hallway and return. These simple tasks were made more complex and had more tasks added to them, such as changes in direction and temperature readings. After its capabilities were fully understood, I made a final test that stayed well within the limits of the robot but also achieved a practical task on a jobsite.

In practice, this task could be used for simple jobsite inspections that might otherwise be unsafe for human construction workers to conduct due to environmental hazards. The impact I hope this research has is to allow future unsafe tasks to be undertaken by robots and keep construction workers out of harms way.

Research Mentor: Kereshma Afsari, Construction Management, Polytechnic;

Poster Number: 219b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Drones on the Rise: Societal Misperceptions of Small Unmanned Aircraft Systems (sUAS)

Author:

Renee Keilman

Abstract:

Throughout the past decade, Small Unmanned Aircraft Systems (sUAS) have been on the rise in both the civilian and military sectors. It is forecasted that in the near future they will create thousands of jobs and billions in tax revenue due to their ability to execute difficult and hazardous tasks safely, efficiently, and cost effectively. However, one current issue with the proliferation of the technology is a shortage of skilled employees due to a lack of education and common negative public misperceptions associated with them.

To investigate this, responses from a mixed methods survey will be analyzed. Within the survey, questions such as the participants age, education level, current knowledge of sUAS, and their interest in learning more about the technology were asked.

The new knowledge we hope to create is a clearer understanding about the challenges and barriers regarding public perceptions on sUAS. The examination of data may reveal how stakeholders can better communicate to the public in hopes of building a skilled and educated work force.

One approach to changing misperceptions about drones is through formal and informal educational initiatives, which can engage the public. The research will propose opportunities for higher education to play a role in educating the public through (1) aviation focused after-school programs, (2) transdisciplinary/interdisciplinary courses and programs incorporating aviation, (3) the establishment of aviation minors and aviation university-level electives, (4) the development of informal aviation programs working with museums, and (5) facilitating summer aviation camps for high school students, to name a few.

Research Mentor: Lisa Bosman, Technology Leadership and Innovation, Purdue Polytechnic Institute; Julius Keller, School of Aviation and Transportation Technology, Purdue Polytechnic Institute

Poster Number: 220b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Applications for Robotics in Construction

Author:

Christopher Lacny

Abstract:

Over the past fifty years, the construction industry has lagged behind other non-farming industries in its adoption of robotics and other automation technologies. Given the present workforce shortage in the construction industry, technical solutions that increase construction labor productivity could bring significant value. This project attempts to identify the unique needs of the construction industry by comparing it to the manufacturing sector and outlines a novel design for a general-purpose robotic system developed to automate several labor-intensive tasks related to the framing of residential homes. The task of framing homes was chosen for this research because no robotic systems presently exist to automate this particular task, and it provides an effective test bed to develop solutions that could be applied to a broader range of construction operations. The system is designed to operate alongside human workers to enable increases in productivity and improvements in worker safety, leveraging computer vision and advanced control algorithms to respond to the dynamic environment of a construction site. A small-scale prototype of the device was constructed, and data was collected on its performance. This data will be used in future research to advise the development and testing of a full-scale device.

Research Mentor: Jiansong Zhang, Ph.D.

Assistant Professor

School of Construction Management Technology

Polytechnic Institute;

Poster Number: 221b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Making Data Visualization Design Worksheets Accessible

Author:

Edith Mauro

Abstract:

Accessibility of a document means that the material can be read by a visually impaired person just as well as a person without a visual impairment would. Accessibility is an essential factor of consideration because it allows students with visual impairments and other disabilities to be smoothly integrated into courses. Purdue is making efforts to mandate accessibility within all departments, but there is still a significant gap that needs to be filled. One method of combating a limited document layout, and normalizing accessibility, is to format electronic course documents to be fully compatible with a screen reader. The focus of this research is answering the question, "how can data visualization activity worksheets be designed and made accessible for the visually impaired?" In this study, we will examine scholarly works that provide data visualization worksheets designed to guide novices through the visualization design process. We anticipate design decisions, in previously published works, were made with a focus on the content, not accessibility. In this work, we are developing data visualization activity worksheets to introduce the data visualization process with a focus on accessibility and understanding the intricate stages of the process. The activity worksheets, for this study, are being designed and formatted according to Purdue's public manual, Accessibility for Instructional Design. Outcomes from this work will support and enable access for all communities and empower all persons to actively engage in the data visualization design process while meeting the requirements for accessibility of electronic information, communication, and technology.

Research Mentor: Dr. Vetricia Byrd, Computer Graphics Technology, Polytechnic Institute;

Poster Number: 222b :: Mathematical/Computational Sciences

Polytechnic Institute

Dynamic Visualization in Game Theory

Author:

Natalie McGuckin

Abstract:

I am conducting research to design a visualization in the area of game theory. This research team includes faculty and colleagues from five universities. We are working with data that rendered 72 petabytes of data. The goal is to understand the underlying structure of the mathematics for a large game theory problem. We want to be able to pick any three points in the parameters space of the problem and have our visualization show us the structure of the game in that region. It should be able to tell us what kind of data is stored at those points. If we look at the visualization as a whole we want to be able to hover or mouse over any area of the visualization and have a pop up come up to tell us what type of data it is. I am working on a refined visualization system of the data. We are planning to use D3.js, a javascript library, to visualize the data. This is a foundational game theory problem that has been open since the 1960s. By solving this problem we will further the understanding of a foundational problem in this area. The research team is supported by the National Science Foundation Grants #0939370, #1246818, #1620073. The authors include B. Benesh, J. Carter, D. Coleman, D. Crabill, J. Good, K. Lacy, N. McGuckin*, M. Smith, J. Travis, and M. Ward

Research Mentor: Dr. Mark Daniel Ward, Statistics, College of Science;

Poster Number: 223b :: Life Sciences

Polytechnic Institute

Visualizing Multivariate Clinical Adolescent Lupus Data from a Longitudinal Study

Author:

Elizabeth McGuckin

Abstract:

We are visualizing secondary data from a longitudinal study of adolescents with a multisystem autoimmune disease called, systemic lupus erythematosus (SLE). The research question which we are addressing in this project is: Do therapies differ between male and female adolescents with early onset SLE? There are many symptoms of SLE and it manifests in many ways. SLE does not discriminate by gender, both males and females are susceptible to SLE; however, the disease is more common in women during their childbearing years. Research suggests adolescents who suffer from SLE have higher morbidity and mortality compared to adults. The data was provided by collaborators at Riley Hospital for Children at Indiana University Health. The data was collected from 69 children with early onset SLE from 14 different centers. This prospective observational study assessed subjects every 3 months, with average individual participation of 2-3 years. Males were 9-14 years old and females were 8-13 years old at enrollment. All participants were enrolled near the onset of puberty and many remained in the study until puberty was complete. Some participants enrolled in the study shortly before the conclusion of the study and therefore registered only 3-4 visits. The data is extensive and inherently heterogeneous, therefore applying data visualization tools should make it easier to understand. We plan to utilize Cytoscape to create ring graphs of this data. Our expected outcome is to visualize the data so that it provides insight as to what the data represents in the relationships that exist between the variables in the data set.

Research Mentor: Dr. Vetricia L. Byrd, Computer Graphics Technology, Purdue Polytechnic Institute;

Poster Number: 224b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Submicro Thin Bioelectronics: Thin Film Transistors

Author:

Mohammad Javad Mirshojaeian Hosseini

shih hung

Abstract:

As technology advances in the past decade, we have been trying to make machines more animal-like, leading to the bloom of fields like Artificial intelligence, and Bio-technology. But as our integration of technology moves forward, we begin to face issues. One of these issues is the limit of materials that we can use, and the devices that is needed with new characteristics. One of the major issues is flexibility. In this Research, we are attempting to fabricate organic transistors that could be potentially used in thin flexible sensors, thin flexible neuromorphic networks, etc. The current research focus is to be able to stably fabricate Organic Field Effect Transistors, and to apply them to simple circuits. The device is fabricated through the processes of spin coating polymers on a clean glass as an adhesive layer. Then with metal evaporation, the gate electrodes are evaporated onto the adhesive layer of PVP. Followed by the process of another layer of spin coating, the base electrode is separated from the contact of air. The second layer of polymer also serves as a dielectric layer in the transistor. On top of that, a layer of semiconductor will be applied, followed by another layer of metal evaporation for the source and drain electrodes. After the device is fabricated, it is tested for characteristics such as impedance, current leakage, conductivity etc. Upon success, the research moves on to stabilizing the characteristics of the OFETs that were fabricated and also implementing them into simple circuits.

Research Mentor: Dr. Robert Nawrocki, School of Engineering Technology, Polytechnic Institute;

Poster Number: 225b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Charge Amplifier Circuits for PVDF

Author:

Saw Yan Naung

Abstract:

This project is an essential part of a larger project called "Piezoelectric eSkin". To elaborate on the role and the purpose of this project we first need to understand the larger project. "eSkin" is the intended artificial skin for prosthetics created from organic transistors and polyvinylidene fluoride (PVDF) which possesses piezoelectric property. However, the conversion of mechanical signals to electric signals through piezoelectric materials like PVDF is unique and cannot be done with a normal amplifying circuit. Since the voltage across the gold-plated PVDF sheet depends on the charge, which is proportional to the force it experiences, on each side of the sheet, a special amplifying circuit called charge amplifier is required. In addition to the charge amplifier, low pass filter will be required to produce clean detectable electric signals. Thus, characterization of PVDF sheet with and without the charge amplifier is carried out to understand the sheet properties. The results are output signals against time which are crucial in the process of creating charge amplifier designs. Since the project is not yet completed, the conclusion of the poster is limited to a few unrefined charge amplifier designs without filters.

Research Mentor: Robert Nawrocki, ECET, Polytechnic;

Poster Number: 226b :: Mathematical/Computational Sciences

Polytechnic Institute

Understanding Existing Bias in the Unsaid: Lessons Learned from Word Embeddings

Author:

John Phan

Abstract:

Recent research in natural language processing has shown that bias can be accidentally captured within some fundamental models used within the field. This work takes a closer look at biases that may be present in word embedding technology, a set of popular techniques used to capture the meaning of words based on distributional hypothesis idea (Harris 1954, Firth 1957). In this project, we study the gender bias implicitly present within three forms of popular pretrained word embeddings -- word2vec (Mikolov et al 2013), GloVE (Pennington et al 2014), and FastText (Bojanowski et al 2017). We attempt to approximate the amount of bias present within each model. We use a support vector machine classifier (SVM) trained on 300 dimensional vectors of strictly gendered nouns (e.g., man, woman, girl, boy), with each dimension being a feature within the classification algorithm. SVM is used to determine the two most salient features from the vector space for each set of pretrained word embeddings. The algorithm is then tasked to classify potential gender of neutral words -- e.g., homemaker, boss, programmer. Results of our methods are consistent with previous work in identifying gender bias within word embeddings using other means (i.e., Bolukbasi et al 2016), and shows bias in word representation. All three models are shown to perform differently, which likely to be due to differences in datasets used to train the models of these popular embeddings. It is possible that the models themselves contribute to slight differences, which is left for future work.

Research Mentors: Dr. Julia Taylor Rayz, Department of Computer and Information Technology, Polytechnic Institute; Kanishka Misra, Polytechnic Institute

Poster Number: 227b :: Social Sciences/Humanities

Polytechnic Institute

Combining Data Visualization with Engineering Design Problems to Foster Data-Driven Design Decision Making

Author:

William Rowe

Abstract:

When students enter their field for the first time, or even when entering their college classes, they realize they may be woefully unprepared for the situations they are put in. In fact, a survey conducted by ManpowerGroup heard back from engineering firms that stated 82% of hiring firms are having trouble filling vacancies and that 20% of those were not optimistic that they will have potential employees that have all the skills that are required for the position. In a study completed in the Spring of 2019 that introduced new pedagogy utilizing interdisciplinary programs to mimic the engineering field will have high school engineering technology students working with data-visualization techniques to produce more meaningful work. By combining data-visualization techniques, a field that works to literally visualize data, within engineering technology classrooms at the high school and middle school level we will prepare students for when they are entering the field and their college classrooms. Currently in secondary education facilities students embark on guess and check techniques that end up wasting time and other resources as they must change their project a multitude of times. With data-visualization techniques we can determine the most efficient methods and designs before the production steps to be more like the industry.

Research Mentor: Scott R Bartholomew, Technology Leadership & Innovation, Purdue Polytechnic Institute;

Poster Number: 228b :: Social Sciences/Humanities

Polytechnic Institute

Influencing Student Perceptions of STEM and STEM Careers Through Children's Literature

Author:

Vanessa Santana

Abstract:

Encouraging individuals towards STEM career fields is of national and international importance. Research shows that many young students don't envision themselves working in STEM fields (Leak, 2017). There is no consensus as to what approaches might best fill this gap and encourage students to identify with and pursue STEM-related careers. In light of continued efforts related to improving STEM education and increasing the number of individuals entering the STEM workforce, we chose to study the students at a local rural elementary school and an inner-city elementary school, to explore their attitudes towards and perceptions of STEM-related careers.

The aims of this study are to discover if young children are already influenced by common stereotypes that exist in relation to many STEM careers, and if, through the intervention of reading STEM-related literature, these perceptions can be changed towards a more inclusive vision of STEM. Specifically, we sought to understand how primary-aged children viewed their own, and their peers' abilities, opportunities, and aspirations towards STEM fields and careers. We also sought to better understand the influence that exposure to NSTA Top STEM children's literature could have on these perceptions. Our present report details our efforts to understand the effect of an 8-week reading intervention on four elementary school classes.

Research Mentor: Dr. Scott R. Bartholomew

Department of Technology Leadership and Innovation

Polytechnic Institute;

Poster Number: 229b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Unstable Underground

Author:

Michael Staats

Maxwell Williams

Abstract:

This poster depicts the process for the design, production, and marketing of an original board game. This began in our ENGL 419 class as a group of four and is currently being continued during our free time as a group of two outside of the course. To begin, we researched multiple scholarly and industry articles to gain insights into modern hobbyist board game (HBG) design practices as well as playtesting a variety of HBGs to get a grasp on various styles and mechanics. We also studied crowdfunding trends and design; this research consisted of articles on practices when crowdfunding, as well as learning from successful and unsuccessful Kickstarter projects.

We began the design process by designing the core mechanics of our HBG, and then building off of those core mechanics. Once we had an initial gameplay loop designed, we began conducting playtests internally to help balance mechanics, as well as externally to receive user feedback on the current state of the game. Using this feedback, we made several new iterations of our HBG in an iterative design process.

After multiple weeks, we created a full paper prototype to test our HBG. This prototype included full card art and a written rulebook for players. Upon completion of this paper prototype, we created the first draft of our Kickstarter page which included a promotional video, images, game description, cost estimates, and a final goal. We also developed a social media plan for marketing purposes. After much playtesting, we decided to take our findings and redesign the game, altering several core mechanics into a new version that we are currently working on. Once we finish the second version, we will redesign the Kickstarter page to reflect our new ideas.

Research Mentor: Anthony Bushner, English, College of Liberal Arts;

Poster Number: 230b :: Social Sciences/Humanities

Polytechnic Institute

Fatigue and Aviation: Fatigue Among Collegiate Aviation Students

Author:

Aaron Teo

Abstract:

Abstract

Airplanes are very complex machineries and likewise, flying an airplane is a very complex operation — from having to manage the three-dimensional inflight controls, aircraft configurations, maintaining situational awareness to handling communications with air traffic control. These activities involve complex cognitive processes that require pilots to be at his or her most alert mental state. Pilots not only need to have adequate amounts of rest but also quality sleep. Just as important, pilots need to manage task-related fatigue. This is especially challenging for collegiate aviation pilots as this may be their first time away from home in a new environment. Additionally, collegiate aviation pilots face long days, part-time jobs, student organizations, social activities, and academic matters. Furthermore, college students are in the midst of learning how to manage stress, time, social and their finances. The examination of fatigue in aviation is more predominant in airlines and military operations. The purpose of the current study was to investigate the causes and effects of fatigue among collegiate aviation pilots at a Midwestern University. The data indicated the top three causes of fatigue were: not enough sleep, working a long day, and poor quality of sleep. Interestingly, respondents who had more flight experience the higher frequency in accepting their fatigued state and continuing the flight. However, respondents also indicated a desire to reduce their workload, schedule breaks properly, and increase the hours of sleep overall.

Research Mentor: Professor Julius Keller, School of Aviation and Transportation Technology, Purdue Polytechnic Institute; Flavio Mendonca

Poster Number: 231b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Crypto vs Paper

Author:

Zach Vallow

Abstract:

The purpose of me researching this topic was to compare the overall growth of crypto currency in these pasts few years to trends of actual paper currency backed by governments. By analyzing the data between the two different currency's I can draw out if crypto is here to stay or just a recent fad that took off. The research question this work will address is compared to paper currency does crypto currency have a chance in becoming a widely used currency.

Research Mentor: Vetrica L. Byrd, College of CGT teaches Data Visualization;

Poster Number: 232b :: Innovative Technology/Entrepreneurship/Design

Polytechnic Institute

Evaluation of Virtual Internships Integrated Into College Engineering Coursework

Author:

Daniel Young

Abstract:

Many engineering underclassmen in higher education struggle to find an internship before their junior or senior year. A common concern among potential employers is that the underclassmen do not possess enough real-world project experience to consider those students for an internship. This is problematic because without internships there is very few options for students to gain real experience to be eligible for many internships. This study seeks to evaluate the effectiveness of employing virtual internships through the Virtual Student Federal Service (VSFS) in a group setting in order to provide students with experience solving real life engineering challenges. It also will provide insight into the potential implementation of these internships into standard curriculum in universities. A group of six undergraduate students volunteered to participate in a VSFS internship project over the length of 15 weeks. The anticipated results from this research will find that the students enjoyed the VSFS project overall and gained valuable real-life project experience during the period that the internship was conducted. The implementation of a virtual internship through VSFS into common curriculum would provide a way for undergraduate students to gain valuable project experience early in their careers that goes beyond the standard classroom coursework, and would allow for those students to be more attractive to potential employers seeking students for internships.

Research Mentor: Lisa Bosman, Department of Technology Leadership and Innovation, Polytechnic Institute;

Poster Number: 233b :: Life Sciences

Polytechnic Institute

A interactive Approach to visualizing Diseases, their related symptoms, and medications prescribed for treatments

Author:

Qiuhan Zhang

Abstract:

The propose of this research is to develop a web-based visualization to assist with Lupus diagnoses and treatments. The research question being addressed is, “Can a visual mapping of commonly reported symptoms shared by multiple diseases (including lupus) and medications used to treat those diseases, help to minimize the number of misdiagnosed cases of Lupus?” The objectives of this research are to identify diseases that are commonly misdiagnosed as Lupus and identify what medications are often prescribed in misdiagnoses. The goal of this research is to create a visualization tool that will enable users of the tool to select clusters of symptoms and display the diseases commonly associated with those symptoms and visually identify diseases that have been misdiagnosed as lupus. I will begin by identifying two diseases (for example HIV/AIDS and diabetes), commonly reported symptoms and the medications used to treat them. An initial visualization will be created to assess the functionality of the proposed tool. In the visualization, there will be three categories of data that will be linked together – symptoms, medication, and Diseases. The visualization will be designed to allow users to select multiple symptoms at once. Based on the user’s selection, the visualization will adjust to automatically connect medications commonly used to treat the symptoms. This process will help users to observe patterns from medical journals and medical databases in order to eliminate misdiagnosis of Lupus. In the future, this system can be used for analysis of other diseases. The visualization diagram will be created in CytoScape, an open source visualization software for analyzing medical and social network data. The interactive framework will be created with CytoScape.js, a JavaScript library for enhancing any interactive abilities for a CytoScape visualization. Upon completion, the visualization tool will be examined for scalability. Additional diseases, more complex symptoms, and medications will be added to the model. This visualization approach will develop an interactive solution to the research question. Results from this task will inform the next task of extending an existing JavaScript framework to visually show connections between diseases, symptoms and medications.

Research Mentor: Dr. Vetricia L. Byrd

Department of Computer Graphics Technology

Purdue Polytechnic Institute;

THEMATIC CATEGORIES' TOP ABSTRACT

Life Sciences

Directed Evolution of ASGARD, a Guide-Dependent Targeting Endonuclease
by Kevin Fitzgerald (Poster #9b)

Social Sciences/Humanities

Proximate Bodies and Social Landscapes: A Looking into the Immediate Connection of Social Media through Dance
by Frankie Tao and Bri Meyer (Poster #153a)

Physical Sciences

Development of a More Effective Approach to Analyze Nitrate Isotopes
by Jacob Brejcha (Poster #161b)

Mathematics/Computational Sciences

Cost-Effective Active Transfer Learning
by Jacob Harmon, Li Yon Tan, Jack Hyslop, and Isha Ghodgaonkar (Poster #54a)

Innovative Technology/Entrepreneurship/Design

Development of Pond Cleaning Unmanned Surface Vehicle (USV)
by Yuta Hoashi (Poster #55a)

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