

**2020**

**PURDUE  
UNDERGRADUATE  
RESEARCH  
CONFERENCE**

**APRIL 14-21, 2020**

West Lafayette, Indiana

# THEMATIC CATEGORIES' TOP ABSTRACTS

## Life Sciences

*Heterologous Expression of the Anaerobic Fungal Mevalonate Pathway*

by Elizabeth Frazier (Poster #67)

*Differences in Lipid Metabolism Gene Expression Between Non-Metastatic and Metastatic Breast Cancer Cells* by Josie Asher (Poster #134)

## Social Sciences/Humanities

*Big Sister, Big Brother: A Mixed Methods Study on Older Siblings' Role in Infant and Young Child Feeding and Care in Rural Tanzania* by Morgan Boncyk (Poster #136)

## Physical Sciences

*Chemistry Laboratory Experiment: Molecular Interactions in Liquid Crystals*

by Carissa Gettelfinger and Kylie Smith (Poster #243)

## Mathematics/Computational Sciences

*Using Information Visualization Techniques to Uncover Patterns in Pubescent Lupus Data* by Nathan Kanter (Poster #281)

## Innovative Technology/Entrepreneurship/Design

*The Impact of Virtual Simulation-based Training on Speech-Language Pathology*

*Students in the Graduate Dysphagia Course: A Pilot Study* by Jennine Bryan (Poster #137)

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**SPECIAL APPRECIATION TO THE CONFERENCE  
PLANNING COMMITTEE'S UNIT DELEGATES FOR  
ORGANIZING THIS EVENT**

**Oral Presentation Abstract Number: 1 :: Life Sciences**

**College of Agriculture**

**Effects of Aging on Genes involved in Photoreceptor Survival**

Author:

Kimaya Bakhle, College of Agriculture

Abstract:

Abstract Redacted

*Research Mentor:*

*Dr. Vikki Weake, Biochemistry*

*Juan Jauregui, Biochemistry*

**Oral Presentation Abstract Number: 2 :: Life Sciences**

**College of Agriculture**  
**Grinding behavior in mice**

Author:

Haley Davis, Agriculture

Abstract:

Food grinding is an abnormal behavior where mice grind their food into a fine dust called orts, indicating poor welfare. Supplementing sunflower seeds can lower ort production possibly due to the seed's nutritional content or manipulating the seed as enrichment. Orts have also been found to have less energetic content than the starting diet. We hypothesized that ort production and content would differ based on nutritional treatment. Twenty-four cages of mice (Crl;CD1; 12 male: 12 female, 4 mice/cage), were randomly allocated to a treatment: control, sunflower seeds (50g), or pelleted seed diet (25g). Baseline orts were determined over 3 weeks (baseline) then treatments were provided for 3 weeks (during). Treatments were removed (after) and cages monitored for another 3 weeks. Orts were weighed each week. The difference from baseline was calculated during and after treatment provision. Bomb calorimetry determined ort cal/g. Data were analyzed as a GLM. Ort production increased in cages supplemented with the pelleted seed diet compared to controls ( $F_{2,21}=3.72$ ;  $P=0.04$ ). Ort production increased in seed-like diets after treatments were removed. Sex did not influence ort weight ( $P>0.05$ ). Ort cal/g was the same across all treatments ( $F_{2,18}=0.36$ ;  $P=0.70$ ). In this study, mice ground more when supplemented with pellets similar in nutrition to sunflower seeds, but the orts energy content did not differ between treatments. The mice may be grinding regular diet to gain access to the seed-like pellets. Future research could provide diets in different feeders to determine if grinding occurs when given free access to supplemental feed.

*Research Mentor:*

*Dr. Brianna Gaskill, Animal Science*

*Lindsey Robbins, Animal Science*

**Oral Presentation Abstract Number: 3 :: Mathematical/Computation Sciences**

**College of Agriculture**

**Digital phenotyping**

Author:

Zhengsen Fu, Engineering

Yiming Li, Engineering

Xinlue Liu, Engineering

Miguel Rodriguez, Engineering

Abstract:

As machine learning algorithms advancing rapidly throughout the decades, it becomes applicable in many fields. One such utilization is to process image data, which was previously manually processed. The aim of this study was to explore the possibility of implementing such technology to support agricultural researches. With images from Purdue University Controlled Environment Phenotyping Facility, masked RCNN models to detect spikes were trained. The training data were obtained in a standard controlled environment with identical target center position and photo angle to yield similar area of interest for every picture. As the result, the models have good performances recognizing plants from images obtained in the same facility, yielding a mAP (mean average precision) of 85.51% at peak, which later becomes a convenient tool for researchers to analyze the image data. However, for other spike images from the internet or from the field, the performance would be unsatisfying. Large number of objects cannot be detected or recognized as expected. The mAP was less than ten per cent. The main reason leading to this result is that the classifier was fully trained over the lab images. Despite the poor performance on internet images, for our current purposes of only implementing masked RCNN within the facility, it would be enough. The team is considering expanding the training data sets by including more images from the field, so that the functionality of the model would not be limited to only the facility

*Research Mentor:*

*Augusto Cesar Magalhaes de Souza, Digital phenotyping*

*Yang Yang,*

**Oral Presentation Abstract Number: 4 :: Life Sciences**

**College of Agriculture**

**The Role of a Putative Amino Acid Transporter in Nitrogen Response in *Arabidopsis thaliana***

Author:

Wenyi Ran, Agriculture

Abstract:

Abstract Redacted

*Research Mentor:*

*Ying Li, Horticulture & Landscape Architecture*

*Russell Julian, Horticulture & Landscape Architecture*

**Oral Presentation Abstract Number: 5 :: Social Sciences/Humanities**

**College of Agriculture**

**Measuring Interest and Engagement in Extension Programming**

Author:

Ashley Rosenkrans, College of Agriculture

Danielle Marks, College of Agriculture

Abstract:

In extension programming, it is crucial to use evidence-based methods to optimize participant learning. However, there is limited implementable strategies to review and quantify programming impact on participants. The objective of our study was to evaluate and describe participant interest and engagement in the inaugural offering of the Shell Egg Academy. We randomly selected eight sessions (25-40 participants/session) across 16 total offerings and evaluated participant engagement, interest, and motivation. Instructor (n = 8) teaching type was recorded during each of the sessions and each instructor taught only one session. A questionnaire was administered immediately following each session and contained Likert-style questions to evaluate interest, motivation, and self-reported engagement. Sessions were recorded and reviewed using the Behavioral Engagement Related to Instruction protocol. Overall, instructors selected lecture as the primary instructional tool, providing little variation in teaching strategies. Participant situational interest, including exploration intention, instant enjoyment, and attention demand was moderate to high during each session. Intrinsic motivation and identified regulation were also moderate to high during the sessions, indicating that participants felt a personal importance and natural enjoyment in participation. Participant engagement did not differ between sessions. This study is one of the first to describe participant interest and motivation on engagement in extension programming. Additional work is needed to better understand the impact of adopting different instructional strategies to programming in order to maximize participant experience and build evidence-based program evaluation practices.

*Research Mentor:*

*Elizabeth Karcher, Animal Sciences*

*Darrin Karcher, Animal Sciences*

**Oral Presentation Abstract Number: 6 :: Life Sciences**

**College of Agriculture**

**Coupling Metabolic Source Isotopic Pair Labeling and Genome Wide Association for Metabolite and Gene Annotation in Plants**

Author:

Abigail Sipes, Agriculture

Abstract:

To deepen our understanding of the plant gene function, it is important that we advance our knowledge of plant genomes and metabolic activity. It is important to have a solid understanding of the genes that are responsible for the synthesis of certain metabolites. With this information in hand, we will have the capability to unlock higher plant productivity, develop new strategies to protect plants from stressors, and develop new plant-based products. This project applies isotopic labeling and mutant strategies to identify amino acid-derived metabolites in Arabidopsis and then apply Genome-Wide Association (GWA) to characterize the genes responsible for their synthesis. We will isotopically identify amino acid-derived specialized metabolites in Arabidopsis by feeding wild type Arabidopsis tissues with  $^{13}\text{C}$  and  $^{12}\text{C}$  labeled amino acids. A computational pipeline will then be used to identify metabolic features that are derived from the labeled amino acids. This project aims to classify metabolites based on the precursor-of-origin to provide the function of annotated genes that are associated with plant metabolism.

*Research Mentor:*

*Clint Chapple, Biochemistry*

**Oral Presentation Abstract Number: 7 :: Life Sciences**

**College of Agriculture**

**Effect of Dry Aging on Pork Quality Attributes**

Author:

Anna Wagner, Agriculture

Abstract:

There has been a lot of research on the benefits of dry-aging for beef quality, but little has been known on the effect for quality attributes of pork loins. The objective of this study was to evaluate the effects of dry-aging on pork loin quality characteristics. Pork loins from one side of 10 pork carcasses were collected, split into three equal portions and aged for 21 days using three different aging methods (Wet-aging (WA), Dry-aging (DA), and UV-light Dry-aging (UDA)). After aging, the loins were trimmed, cut into multiple chops and assigned into different quality measurements such as shear force, water holding capacity, color and oxidative stability, and consumer sensory analysis (n=120). Both DA and UDA resulted in lower yield as compared to WA ( $P<0.05$ ). However, increase in water-holding capacity was observed in dry-aged treatment compared to WA ( $P<0.05$ ). Shear force was found to be no difference between all treatments ( $P>0.05$ ). Color was not different initially, until D5 of display ( $P>0.05$ ), where both DA and UDA had a significant increase in hue angle and decrease in redness, yellowness, and chroma ( $P<0.05$ ). Lipid oxidation increased during display, but no difference among the treatments was found ( $P>0.05$ ). Consumer panel results indicate that there were no significant difference among flavor, tenderness, juiciness, and overall liking between the treatments. Overall, aging in general improved pork quality, indicated by high rating from consumers. While dry-aging improves pork loin objective quality attributes, the consumers might not be accustomed to dry-aged pork palatability.

*Research Mentor:*

*Dr. Brad (Yuan H) Kim, Animal Sciences*

**Oral Presentation Abstract Number: 8 :: Life Sciences**

**College of Agriculture**

**Signatures of Selection for Docility in Cattle**

Author:

Kate Watkins, Agriculture

Abstract:

Temperament has been recently identified as a primary concern for cattle producers in the United States. This is because temperamental cattle diminish product quality, animal performance, and animal welfare as well as pose a greater risk to handlers. Currently, temperament in cattle is assessed based on numerous quantitative and scoring measures. However, these methods are usually subjective and are not a good representation of the biology of the trait due to low or moderate heritability estimates. Our main objective in this study was to better understand the genetic and genomic background of temperament in cattle, with the goal of improving the accuracy and efficiency of temperament selection in breeding programs. This study compared the genomic make-up of 146 worldwide cattle breeds on the basis of single nucleotide polymorphisms, or SNPs, provided by the W.I.D.D.E. database. Individuals in the data set, which represent a myriad of cattle subspecies and wild Bovidae, were sorted based on their known temperament. They were then compared based on a signatures of selection analysis under multiple grouping strategies, such as docile vs anxious, anxious vs aggressive, and wild vs domesticated. This aimed to identify selection signatures due to long-term selection for divergent behavioral traits. After identifying the genomic regions, we searched for candidate genes, which contributed to a better understanding of the biological mechanisms underlying temperament in cattle and indicated phenotypes associated with those genes that could be used as novel traits for genetic selection.

*Research Mentor:*

*Dr. Luiz Brito, PhD, Animal Sciences*

**Oral Presentation Abstract Number: 9 :: Life Sciences**

**College of Agriculture**

**Comparative study of bacteriophage protein structure and amino acid sequence**

Author:

Ian Welsh, Engineering

Victoria Granat, Engineering

Andres Dextre, Engineering

William Schmitt, Engineering

Dylan Pruitt, Science

Abstract:

This project aimed to determine if the conservation of secondary structure among proteins within a cluster of bacteriophages correlates to its similarity in amino acid sequences. Bacteriophages are viruses that infect and hijack the reproductive system of bacteria. Given the extensive bacteriophage diversity, classification of these organisms into smaller groups or “clusters” facilitates phage identification. However, current methods for cluster classification rely on whole genome comparative analysis which is time consuming and inefficient. Evolutionary relationships between phages have been established based on structural comparisons of phage proteins. Therefore, comparison of protein structure conservation could provide a more efficient alternative for cluster classification. First, a group of genes with known crystalized structure and functional similarity as predicted by Phamerator were selected. Using crystal structure images, the number of alpha helices and beta sheets in the selected proteins secondary structure was determined and assigned an identity value to the gene. This process was repeated with other genes in the cluster and the correlation between identity values and amino acid sequences was compared. The study revealed a specific relationship between secondary structure patterns and amino acid sequence. This newly found relationship will be used as a new defining trait for that cluster. Further analysis of multiple clusters would help establish cluster specific relationships between secondary structure and amino acid sequence to use as a novel approach for bacteriophage classification and potentially aid in protein function identification.

*Research Mentor:*

*Kari Clase, Agricultural and Biological Engineering*

*Ikenna Okekeogbu, Agricultural and Biological Engineering*

*Gillian Smith, Agricultural and Biological Engineering*

*Janice Chan, Agricultural and Biological Engineering*

**Oral Presentation Abstract Number: 10 :: Social Sciences/Humanities**

**College of Education**

**Spurring Grassroots Environmental Action in a High School English Class**

Author:

Quinn Cataldi, Liberal Arts

Abstract:

The drastic effects of climate change and environmental degradation are increasingly entering public consciousness, and schools, it seems, are inadequately preparing students to deal with these impending (and, in some cases, existing) problems. This action research project looks to gauge student responses to a New Historicist approach to English education that maintains a focus on environmental issues. Surveys, small order papers, and a culminating research project will be used to track a class of Junior-year high school students' attitudes and understandings of climate change, with particular attention paid to the identification and implementation of local-level solutions. Ultimately, this project hopes to provide a framework for approaching climate change in the English classroom (and the school at large), presenting existing problems in a solution-oriented manner. All of this builds upon the emerging research done on teaching environmental issues in the English classroom as well as general pedagogy that has provided a framework for constructively approaching climate change in classroom discussion. Looking ahead, this project will inform my future pedagogy as I try to develop a curriculum suitable for those living in a twenty-first century rife with change. More broadly, the goal is to add to the burgeoning field of research that looks to bring these issues into the classroom, where personal connection might be made with seemingly insurmountable problems.

*Research Mentor:*

*Tara Star Johnson, English Education*

**Oral Presentation Abstract Number: 11 :: Social Sciences/Humanities**

**College of Education**

**Promoting Diversity In STEM: Creating a more inclusive campus for underrepresented minorities in STEM spaces at Purdue University**

Author:

Alia Kabba, Purdue Polytechnic Institute

Abstract:

Diversity in Science, Technology, Engineering, and Math fields is a continued challenge in terms of how to recruit and retain underrepresented minorities (URM) students in STEM. This paper examines high-impact programs and their role in enhancing recruitment and retention of diverse populations in STEM fields at Purdue University. At Purdue, various initiatives from scholarship programs to recruitment days are in place to attract underrepresented minorities not only to STEM fields, but to Purdue as a whole. While these programs have helped incredibly, there is still more to the puzzle. Purdue currently has 9,413 students enrolled in the College of Engineering where of those, less than 700 are underrepresented minorities – equating to about 7%. Those numbers vary by college and major, but overall this shows the need Purdue has to create a more diverse STEM learning environment. Through analyzing past research in this area and examining the results of various studies and looking at the initiatives Purdue has implemented, a focus on recruitment and retention continues to be number one in creating success in this area. While it is nothing new to Purdue, a new take on these ideals is imperative to seeing the growth necessary. By adding onto existing programs such as learning communities, seminar courses, on campus organizations while creating new resources for first generation, minority, and/or low-income students, Purdue can be a trailblazer in fueling a more diverse STEM workforce.

*Research Mentor:*

*Priya Sirohi, Department of English*

**Oral Presentation Abstract Number: 12 :: Social Sciences/Humanities**

**College of Education**

**The True Colors of Assessment**

Author:

Edward Zawatski, Liberal Arts

Abstract:

In the field of education, the course material that is covered within a classroom environment is often created to enrich student growth within a specific subject area that expands their development as scholars as well as evolving their skills for the “real world” setting outside of the parameters of an institutional facility. State mandated standards are formalized for public school entities in order to properly evaluate effective and efficient classroom procedures in order to appropriately educate students. However, the most routine evaluation, in order to see if students are successfully obtaining, processing, and delivering information regarding content, is exercised through the method of assessment. This term “assessment” can encompass a broad spectrum of how to adequately score an individual’s comprehension, but generally the easiest approach educators tend to utilize is having a student complete a quiz or test in some sort of fashion. The problem that arises in this case is that students are all uniquely different and possess skills that go beyond the scope of a standardized evaluation like a quiz or test.

This Action Research demonstrates the utilization of autonomy as well as the multifaceted concept of the True Color personality indicator to see what type of assessment are beneficial to secondary English students based on their individual personality for success. The goal of this research is to see what types of personalities gravitate to the categories of quiz versus presentation based on students True Color results in order to offer multi-modal approaches when organizing a class.

*Research Mentor:*

*Tara Johnson, English*

*Brandon Schuler, English*

**Oral Presentation Abstract Number: 13 :: Mathematical/Computation Sciences**

**College of Engineering**

**DeepFake Video Detection In Microscale**

Author:

Bekbolat Abdikanov, College of Engineering

Austin Chen, College of Engineering

Abstract:

There are serious threats to the trustworthy distribution of information today. There are no distinct laws that pertain to the distribution of “Fake News”. The team hopes to tackle the proliferation of tampered videos online by experimenting with potential solutions for detecting “DeepFake” videos, multimedia that presents danger to the way we perceive and believe in information from popular news sources. Synthetic videos are applied in many areas such as politics, as a campaign weapon to fabricate false ideas into the real video, as well as adversaries from Internet trolls to damage famous figure’s reputation.

This paper proposes a system that implements I-frame extraction technique and various image analysis methods. The I-frame extraction technique pulls several key-frame images out of the video, therefore reducing the data size and processing time. The team is currently experimenting with various image analysis methods, including Discrete Cosine Transform based compression artifact detection, Partial Differential Equations based ringing effect detection to select the best approach, or the combination of the above-stated approaches with machine learning classifiers, that would yield an optimum result.

The expectation is to detect visual anomaly based on intrinsic video metadata that contains hard to remove data, utilizing datasets given by Facebook DeepFake Detection Challenge. The team aims to contribute to the ongoing high tech research arms race with our results.

Related works developed in the media forensics community include the detection based on correlating the emotions with facial positions, assessing blinking eyes, identifying shadows and light concentration, and color bleeding.

*Research Mentor:*

*Edward J. Delp, School of Electrical and Computer Engineering*

*Carla Zoltowski, School of Electrical and Computer Engineering*

**Oral Presentation Abstract Number: 14 :: Physical Sciences**

**College of Engineering**

**Development of Transcritical Carbon Dioxide Cycle for Experimental Comparisons of Expansion Work Recovery Technologies**

Author:

Paige Beck, Engineering

Riley Barta, Engineering

Abstract:

As the effects of global warming become more apparent, the demand for environmentally sustainable technology continues to increase. Specifically, within the Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC&R) community, there has been a push for development of refrigerants with lower Global Warming Potential (GWP) than the Hydrofluorocarbon (HFC) fluids commonly used today. One such refrigerant is Carbon Dioxide (CO<sub>2</sub>), which has a negligible GWP but a high critical pressure and low critical temperature. These attributes often require transcritical operation, which draws a large amount of compressor input power and results in a lower Coefficient of Performance (COP) relative to HFC systems. As such, more complex cycle architectures are necessary to even the gap in performance. The research presented is the development of a multi-stage transcritical CO<sub>2</sub> refrigeration cycle, which utilizes economization and expansion work recovery in eight cycle architectures to assess the relative COP benefits of the cycle architectures. In order to validate these results, an energy balance is required across the evaporators to confirm the cooling capacity through both the primary and secondary fluids. To accurately model the energy transfer to the secondary fluid, Ethylene Glycol, its density and specific heat must be characterized as a function of temperature, which will predict its heat transfer and mass flow rates. An experiment to find the specific heat of the substance was performed by observing temperature changes occurring at precise heat inputs. Future work is to close the energy balance and validate the performance costs and benefits of the cycle architectures.

*Research Mentor:*

*Eckhard Groll, Mechanical Engineering*

*Davide Ziviani, Mechanical Engineering*

**Oral Presentation Abstract Number: 15 :: Innovative Technology/Entrepreneurship/Design**

**College of Engineering**

**VIP-Image to Text Application**

Author:

David Bustamante, Engineering

Zack Dolsen, Engineering

Dan Peerapatanapokin, Engineering

Abstract:

With this project, we aim to develop a mobile application that can read an image and convert the text in the image into a Word Document. In order to achieve this, we had to use a tool called Tesseract. Tesseract is an open source OCR library developed by Google that can recognize and read the text in an image. The problem with Tesseract is it has a low accuracy rate. One downfall with this is the quality of the image greatly affects the reliability with which Tesseract can translate a certain page of text. In order to improve Tesseract's accuracy, our team focused its efforts on image preprocessing. Through several image preprocessing methods, such as Otsu's method, Gaussian Filtering and Sobel's Operator, we hope to achieve an improved character recognition rate of 85%, meaning the application can accurately read 85% of the characters it reads. In conclusion, we hope to achieve a reliable image-to-text application that meets the basic needs any user might have. Some things that could be added to our application include a formatting option, where you can choose some sort of template that text can be formatted into. Another possible addition to the project could be the ability to read handwritten text and convert it into a word document. Having to translate a printed document by typing out every word in a computer is a struggle everyone has to go through, and our application is meant to fix this problem by providing an easy, accurate solution.

*Research Mentor:*

*Edward Delp, ECE*

*Carla Zoltowski, ECE*

**Oral Presentation Abstract Number: 16 :: Physical Sciences**

**College of Engineering**

**Efficacy of Activated Carbon Pitcher Filters in Elevated Benzene Removal**

Author:

Ethan Edwards, Engineering, Honors College

Abstract:

The Tubbs Fire (2017) and Camp Fire (2018) in California instigated a new type of drinking water disaster. Benzene was detected at levels of 40,000 ppb and 2,217 ppb in the distribution network following the fires, exceeding the USEPA and California benzene maximum concentration levels of 5 ppb and 1 ppb, respectively. Following the Camp Fire, residents installed in-home water filters, but the county health department warned residents not to rely on these filters. Nine months later, state guidance claimed activated carbon would effectively remove benzene and other organic contaminants from the water. While activated carbon water treatment devices can be certified with NSF Standard 53 at benzene levels of 15 ppb to achieve reduction requirements, they are not certified against heavily contaminated water. For the present study, the performance of three popular in-home activated carbon filters is being evaluated when challenged with elevated levels of volatile organic compounds (i.e., benzene 15 – 1,000 ppb). A Headspace Solid Phase Microextraction-Gas Chromatography method is being utilized to quantify contaminant removal efficiency. Study results will provide a basis for future responses and better understanding of whether in-home drinking water filters should be relied upon to protect the population from heavily contaminated drinking water.

*Research Mentor:*

*Andrew Whelton, Civil Engineering, Environmental and Ecological Engineering*

**College of Engineering**

**SoOp-AD (SIGNALS OS OPPORTUNITY-AIRBORNE) In Earth Remote Sensing**

Author:

Renaissa Ghosh, Electrical And Computer Engineering

Abstract:

The project is about the earth (satellite) remote sensing, harnessing it to work and improvise in the field of agriculture and Coastal Altimetry. With data for the 5-point moving average filter and the transfer function provided, I worked on 1-D digital filters using MATLAB, each measuring the number of samples on a 5-day interval. The moving average filter is a simple low-pass FIR (Finite Impulse

Response) filter commonly used for smoothing an array of sampled data/signals. It takes L samples of input at a time and takes the average of those and produces a single output point. Overall, the -5 point moving average filter multiplies the input data by the coefficients of the transfer function to produce the output data. The 2-D filter is phase-shifted compared to the 1-D filter.

I worked on the signal reading and spectrum code that was provided to me. According to the MATLAB code given, first, we defined the variables. We read the data from the file (lines 48-83 of the code). We set every other part of the data to the real and complex parts of the signal (lines 60 & 62 of the code).

We used  $[pxx,f] = pwelch(x, window, overlap, f, fs)$  function to plot the power spectral density (lines 61 & 63 of the code). According to the two-channelled sample data that has been displayed by the

MATLAB code, the two plots are the power spectral density. A horizontal line along the time axis at some frequency (channel frequencies in ORBCOMM) is expected. If the line is seen at the channel frequency, it implies the signal from the ORBCOMM satellites. A longer recording time implies a shift in the Doppler effect. If more than one satellite is visible, then there may be more than one signal.

*Research Mentor:*

*Dr. James Garrison, Aeronautics and Astronautics*

*Dr. Carla Zoltowski, Electrical and Computer Engineering*

**Oral Presentation Abstract Number: 18 :: Mathematical/Computation Sciences**

**College of Engineering**

**Organic-Inorganic Hybrid Halide Perovskites**

Author:

Alex Hale, Engineering

Abstract:

Organic-inorganic hybrid halide perovskites are promising semiconductor materials due to their optoelectronic properties, charge transport properties, and ease of synthesis. The perovskite chemical structure,  $ABX_3$ , is composed of a divalent cationic metal (A), an organic cationic ligand (B), and a halide anion (X). Although 3-dimensional (3D) perovskite materials are the most common, 2D perovskites are interesting due to the reduced spatial constraints of the organic cation. These perovskites can accept large  $\pi$ -conjugated organic semiconductors as the ligands to tailor the functionality of the material or to enhance its mechanical properties, such as preventing water permeation and dissolution of the material. However, as the design space for these ligands is large, the major challenge is identifying ligands that both result in a stable perovskite structure and impart specific functionalities. To overcome this challenge, we have developed a methodology to rapidly screen ligands in a high throughput manner to identify promising candidates. Our methodology allows us to probe fundamental design questions, and we show that ligands almost twice the width of the perovskite base can geometrically fit. When investigating the alkyl linkers used to connect the perovskite layer with the ligand, we discovered that different lengths and rigidity abet the possible conformations of the ligand layer. Our results aid in rationally designing ligands for enhanced perovskite environmental stability and performance.

*Research Mentor:*

*Dr. Stephen Shiring, Chemical Engineering*

*Brett Savoie, Chemical Engineering*

**Oral Presentation Abstract Number: 19 :: Innovative Technology/Entrepreneurship/Design**

**College of Engineering**

**Active learning and High Dimensional Model Representation**

Author:

Ibrahim Imran, Engineering

Abstract:

The purpose of this research project is to get a grasp of Active learning and High Dimensional Model Representation and how they can be used with regards to metamaterials. This project was done through firstly getting to know what each of the two areas are and what they can be used for. Secondly, going over other research papers that describe scenarios and real-world examples in which they can be used and how to implement them. It resulted in learning how different queries and scenarios can be created for different tasks regarding active learning. The project also produced the multiple situations in which High Dimensional Data can be used depending on the inputs and outputs that are specified for the task. The implications of the project are to shed some light on how active learning can assist in and speed up tasks and High Dimensional Data can be used to assist in areas where there is an abundance of inputs and outputs to be used to figure out the probability of failure or success.

*Research Mentor:*

*Rih-Teng Wu, Civil Engineering*

**Oral Presentation Abstract Number:** 20 :: Mathematical/Computation Sciences

**College of Engineering**

**AI Powered Video Querying Over Cameras**

Author:

Bryan Jimenez, Purdue University

Wen-Hsiang Shih, Purdue University

Anthony Yu Hou, Purdue University

Abstract:

HYPER CAM is a systematic approach to perform video querying on zero streaming cameras. This system works by deploying lightweight neural network operators onto the camera which assigns confidence scores on each video frame and then sends only the frames with high confidence scores to the cloud. The cloud then performs a more expensive and accurate computer vision algorithm to detect the desired object which then gets outputted to the user. HYPER CAM offers the ability to use low-cost cameras while at the same time improving the performance of the system. However, even though HYPER CAM has many advantages due to its ability to outperform competitive alternative designs, the current system is missing some vital sub systems which hinders the overall system. In this project, we will be focusing on improving the overall functionality by implementing these subsystems into HYPER CAM's design as well as adding layers onto the object detection to allow users to detect a wide range of objects and allow users to filter results based on their specifications. As a result, this platform will allow remote users to easily query videos stored on zero streaming cameras in a fast, accurate and privacy preserving manner.

*Research Mentor:*

*Felix Lin, Electrical and Computer Engineering*

**Oral Presentation Abstract Number: 21 :: Life Sciences**

**College of Engineering**

**Impact of Braid Design on Pediatric Arterial Grafts**

Author:

Katherine Kerr, Engineering

Alycia Berman, Engineering

Abstract:

Current materials for vascular grafts face shortcomings in pediatric patients, such as the inability of the graft to adapt and “grow” with growing patients. To address this issue, tissue engineering has become an exciting avenue to allow for implantation of a vessel that has the ability to change over a period of time. However, the influence of specific design parameters—including density of braid, braid pattern, and filament diameter—remain elusive. In order to study differences in these design parameters in vivo, six types of tissue-engineered vascular grafts (TEVGs) with different braid and/or coating characteristics were implanted and tracked over time in a murine model (n=2-4 per graft type). To track growth, ultrasound imaging was performed at baseline and at weeks 1, 2, 4, 6, 8, 10, and 12 post-implantation. Preliminary results show dilation of the graft, beginning 4 to 6 weeks after implantation. In addition, the degree of dilation appears dependent on the braiding pattern, with the less-dense braided grafts having a higher early mortality. In contrast, the grafts with a higher braided density resulted in reduced mortality but still featured bulbous and dilated grafts at the time of explant. Lastly, while braiding did affect results, the coating appeared to have a limited effect on graft development. In summary, braiding parameter have a significant role in TEVG outcomes. As such, future work will involve optimizing the braiding parameters based on current results to improve TEVG outcomes in pediatric patients.

*Research Mentor:*

*Craig Goergen, PhD, Biomedical Engineering*

**Oral Presentation Abstract Number:** 22 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Suborbital Testing of a Small Satellite Propulsion System**

**Author:**

Benjamin Lumpp, Engineering

**Abstract:**

The increasing popularity of small satellites necessitates the development of small-scale propulsion and attitude control technologies. The Film-evaporated MEMS Tunable Array (FEMTA) offers a lower volume, lower mass and lower power requirement than many other chemical and electrical micropropulsion systems. The performance characteristics of the FEMTA are  $\approx 150\mu\text{N}$  of thrust with a specific impulse of  $\approx 70\text{s}$ . This thrust is generated by inducing film-boiling of ultra-pure deionized water in a micron-scale capillary. An opportunity to test the FEMTA technology has been secured on a suborbital flight of the Blue Origin New Shepard rocket, scheduled for the fourth quarter of 2021. A student team at Purdue University, through the Vertically Integrated Projects program, has developed two unique experiments to test the FEMTA and the supporting technologies. The first experiment is a novel propellant management system that provides propellant at a back-pressure ideal for the FEMTA thruster. This experiment utilizes a hydrofluoroether which provides pressure to expand two flexible diaphragms. This provides a force to push propellant out of the tank while not requiring any additional power or pressurization system. The second experiment tests the thrust generation of the FEMTA itself by utilizing plasma spectroscopy. After the FEMTA ejects water vapor, an ultraviolet plasma will be created at the outlet, which will be measured by a spectrometer. The thrust generated by the FEMTA will be quantified by the ultraviolet emissions measured by the spectrometer. These experiments have been developed to verify operation of the FEMTA and propellant management system in spaceflight conditions.

*Research Mentor:*

*Alina Alexeenko, AAE*

**College of Engineering**

**Low-Cost Occupancy Sensing in Offices with a Seat-Based Temperature Sensor Array**

Author:

Aayush Mathur, Engineering

Abstract:

Humans are an active emission source of carbon dioxide, volatile organic compounds, and bioaerosols. Human-associated emissions can alter the composition of air inside enclosed spaces. Thus, a real-time means of detecting occupancy can be used to determine the quality of air in these spaces, and the corresponding ventilation required to maintain conditions at a safe and comfortable level. Current occupancy detection methods are both inaccurate and wholly unable to determine spatial distributions of occupants. As such, this study aims to develop and evaluate a new means of real-time detection of spatiotemporal seated occupancy patterns in an open-plan office using low-cost Arduino-based temperature sensors.

Arduino microcontrollers were coupled with nRF24I01 radio transmitters and K-type thermocouples to develop a low-cost temperature sensor array that transmits data in real-time. These sensors were mounted to chairs, with each chair's surface temperature being transmitted to a receiver microcontroller. Using this data, a spatial distribution of occupancy at each seat was then generated, which constantly updated in real time.

Previously in this study, chair-appended thermocouples were found to be a viable means of detecting occupancy, being most accurate for spaces in which occupants remain seated for most of the time. This study next aims to expand the sensor array, and to integrate it in the Living Laboratories at Purdue University's Herrick Laboratories. The occupancy data from this sensor array can be combined with the building controls system of the Living Laboratories to provide a real-time input for adjusting environmental conditions such as ventilation, heating, and cooling.

*Research Mentor:*

*Dr. Brandon E. Boor, Civil Engineering*

*Danielle N. Wagner, Civil Engineering*

**Oral Presentation Abstract Number:** 24 :: Physical Sciences

**College of Engineering**

**Characterization of Anisotropy and Modulus of Cellulose Nanocrystal Thin Films**

Author:

Nolan A. Miller, College of Engineering

Abstract:

Abstract Redacted

*Research Mentor:*

*Chelsea Davis, Materials Engineering*

**Oral Presentation Abstract Number: 25 :: Innovative Technology/Entrepreneurship/Design**

**College of Engineering**

**Utilizing Mobile Technology to Overcome Nonverbal Autism Disorder**

Author:

Amita Pandey, College of Engineering

Hrushika Jagana, College of Engineering

Abstract:

According to the CDC, one in 59 children is diagnosed with Autism Spectrum Disorder. Of those children, nearly one-third of the group has nonverbal autism. The purpose of this research project was to develop a messaging application for individuals struggling with nonverbal autism in order to facilitate efficient communication. This application can also be utilized by individuals with communicative and cognitive physical difficulties that impair their ability to communicate. The idea behind this project is derived from the original process used to help individuals with autism begin to learn to communicate: Picture Exchange Communication System (PECS). This iOS chat application incorporates a unique keyboard that consists of graphics to convey the needs of the user. Users can customize the application by changing the images based on their preferences. Currently we are building the keyboard interface and secure login ID, and hope to be able to test the application soon. This application enables coherent communication between those with autism and their caretakers or anyone with an iOS device. Users will be able to not only learn to communicate in person but also to adapt to communication in the modern era, through technology, as many others do on a daily basis. Many studies show that children with autism who do not develop verbal communication skills by the age of 4 or 5 will never be able to speak. However, technology like this application opens a new door for these individuals to develop speaking skills or bypass current obstacles and change their life.

*Research Mentor:*

*Carla Zoltowski, Engineering Education*

*Edward J. Delp, Computer Engineering*

**Oral Presentation Abstract Number: 26 :: Physical Sciences**

**College of Engineering**

**Developing Characterization Tools to Evaluate Soft Solid Surface Tension**

Author:

Riley Plotner, College of Engineering

Abstract:

In soft substrates, solid surface tension (SST) can play a critical role in the interaction of varying materials. Traditional mechanical models such as the Johnson-Kendall-Roberts (JKR) theory can measure the surface energy of elastomers and characterize the mechanics of two bodies in adhesive contact. However, JKR theory relies on the assumption that bulk mechanical properties of the contacting materials resist deformation (quantified through Young's modulus). In very soft materials and at relatively small length scales, SST becomes important when considering the contact between two deforming. Interestingly, the SST of a soft elastomer may be strain-dependent, known as the Shuttleworth effect. Throughout literature, the Shuttleworth effect has been contested for soft silicone substrates. In this study, we address the discrepancy in literature by investigating the SST of a soft elastomer (polydimethylsiloxane (PDMS)). Here, dynamic water contact angle goniometry is used to characterize the surface energy of PDMS. The stiffness and free oligomer content is varied as the elastomers are subjected to increasing uniaxial strains to investigate the surface energy dependence with strain. Through advancing and receding contact angle data, our results show that surface energy is largely independent of strain for unextracted elastomers (substrates swollen with mobile free oligomer). However, upon removal of these free chains from the PDMS, the Shuttleworth effect is more readily observed.

*Research Mentor:*

*Chelsea Davis, School of Materials Engineering*

*Naomi Deneke, School of Materials Engineering*

**Oral Presentation Abstract Number: 27 :: Physical Sciences**

**College of Engineering**

**Impact of Surfactant Concentration and Type on Oil in Water Emulsion Stability During Static and Dynamic Ageing**

Author:

Rina Sabatello, Engineering

Cole Davis, Engineering

Abstract:

Oil-in-water emulsions (O/W) present in the bilge of ocean vessels are inefficiently filtered, causing oil to be discharged to sea and increasing oil pollution. The separation of the oily wastewater is difficult due to the presence of surfactants that stabilize the oil droplets. Bilge water is found to have two types of surfactants: anionic and nonionic, with concentrations ranging from 10 to 2500 ppm. The behavior and stability of emulsions drastically change over these surfactant concentrations. This study investigates model bilge mineral oil in water emulsions by examining their volume mean diameter as a function of surfactant concentration while ageing in static and dynamic conditions to mimic ship rocking. Nonionic (Triton X-100) and anionic sodium lauryl ether sulfate (SLES) were used as model surfactants at concentrations ranging from 10 to 2500 ppm. The average oil drop diameter decreases with increasing surfactant concentration during both static and dynamic ageing. The minimum surfactant concentration required for stable emulsions varies based on ageing conditions. Emulsions that are statically aged showed creaming and flocculation, leading to coalescence. These instabilities were amplified for low concentrations of surfactant. Emulsions were aged on a Benchmark 3D Rocker at low and high speeds to mimic shipboard movement. Emulsions aged at low rpm caused coalescence more quickly than statically aged emulsions and increased the minimum surfactant concentration required for a stable emulsion. Ageing at high rpm formed 1-10µm oil droplets within 3 days. The behavior of oil drops in these different conditions are explained in relation to the environment.

*Research Mentor:*

*Carlos Martinez, Materials Science Engineering*

*John Howarter, Materials Science Engineering*

*Kendra Erk, Materials Science Engineering*

**Oral Presentation Abstract Number: 28 :: Innovative Technology/Entrepreneurship/Design**

**College of Engineering**

**Mechanical Force as a Suppressor of Metastatic Breast Cancer: Development of a Biomimetic Cell Stretching Platform**

Author:

Doug Satoski, Engineering

Abstract:

Breast cancer is the most frequently diagnosed cancer among women with over 1.6 million cases per year worldwide. Localized breast cancer has an exceptionally high survival rate, but only 2-5% of patients with metastatic breast cancer survive more than 10 years. The mechanical forces at the most common metastatic sites, such as the lungs, likely significantly impact breast cancer cell behavior. In the lungs, cyclic stresses are present which induce changes in the gene and protein expression of cells. Our objective is to understand the underlying response of breast cancer cells to mechanical strain, specifically the dormancy and latent reactivation of disseminated breast cancer cells. To test these cellular responses, we developed a magnetically actuated platform that mimics the in-situ mechanical strain in 3D. We seeded four cell lines ranging in metastatic behavior on suspended fibronectin within the 3D platform. The seeded fibronectin was actuated at both a high and low strain rate for 7 days while control devices remained static. Fibronectin integrity and metabolic activity studies were then performed. The metastatic cancer cell lines displayed fibronectin degradation after induced low strain but displayed fibronectin integrity after induced high strain. Further, fluorescent metabolic studies indicated that actuated metastatic cells experienced decreased metabolic activity, while static metabolic cells maintained metabolic activity. These results indicate that the high strain environment may induce dormancy for moderate to aggressively metastatic cells. There is a cellular response to mechanical strain that may encourage further investigation into the mechanical cues influencing metastatic breast cancer.

*Research Mentor:*

*Hugh Lee, Biomedical Engineering*

*Angel Enriquez, Biomedical Engineering*

**Oral Presentation Abstract Number:** 29 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Optical Character recognition on encoded video data for embedded systems**

Author:

Li Yon Tan, Engineering

Fischer Bordwell, Engineering

Abstract:

Great strides have been made in advancing the field of computer vision. However, utilizing this knowledge on low-power embedded devices is challenging due to the high performance costs of deep learning convolutional neural networks. Optimizing modern machine learning algorithms for embedded devices will improve the capabilities of devices that rely on visual data, such as autonomous vehicles and video cameras. The benefits of decreased power requirements must be weighed against the need for acceptable accuracy. Our team seeks to find an efficient solution for performing optical character recognition on encoded video streams to discern contextual information on a Raspberry Pi 3B+. Our method minimizes the amount of computation that is spent on nonessential tasks by only performing inferencing on frames that we determine to have a high chance of yielding meaningful data. In addition, we integrate state-of-the-art methods of detection and recognition to achieve high accuracy alongside fast performance.

*Research Mentor:*

*Yung-Hsiang Lu, Electrical and Computer Engineering*

**Oral Presentation Abstract Number: 30 :: Social Sciences/Humanities**

**College of Health and Human Sciences**

**An employment needs assessment for parents returning to work after welcoming a child into their home**

Author:

Tessa Bauman, Health and Human Sciences

Maddy Wierenga, Health and Human Sciences

Anna Bohning, Health and Human Sciences

Abstract:

**Background:** Although women comprise approximately half of the US labor force, mothers with young children are less likely to be employed outside the home. The decision to return to work and characteristics of the work environment influence a range of maternal and infant health outcomes, including breastfeeding initiation and maintenance, and maternal mental wellness. New programs, such as those allowing employees to bring their infants to work until age 6 months, may support a positive work/life balance and allow employees to maintain overall health and wellbeing.

**Purpose:** This study aims to identify the ecological (i.e., policy, environment, intra- and interpersonal) factors affecting work/life balance.

**Methods:** We completed a three-phase, mixed-methods study among faculty, staff, and trainees at a large Midwestern university: Phase 1) focus group discussions among employees who recently welcomed a child into the home; Phase 2) interviews with campus administrators; and Phase 3) a campus-wide web-based survey. Techniques from expanded grounded theory will be used, allowing for a constant comparative approach to data contextualization and theme identification.

**Results:** Employees returning to work after welcoming a child into the home have a range of experiences. Onsite daycares, flexible work from home schedules, and childcare allowances were some of the programs/policies desired by employees. However, there are a range of barriers to implementing these types of programs, including cost and structure of the work environment.

**Conclusions:** Findings from this study offer practical recommendations and strategies to improve work/life balance among employees, specifically employed in an academic environment.

Research Mentors:

Andrea L. DeMaria, Public Health

Laura Schwab-Reese, Public Health

**Oral Presentation Abstract Number: 31 :: Life Sciences**

**College of Health and Human Sciences**

**PCE Exposure in Martinsville, Indiana**

Author:

Sankalp Katta, Health and Human Sciences

Arteen Rasti, Health and Human Sciences

Eileen Yan, Health and Human Sciences

Abstract:

Groundwater in Martinsville, Indiana has been contaminated with volatile organic compounds (VOCs), mainly tetrachloroethylene (PCE) and trichloroethylene (TCE), for almost two decades. One of the contaminated plumes was designated as an EPA Superfund site in 2013. The objective was to investigate the extent, level, and pathways of exposure to VOCs in Martinsville. Samples of indoor air (24-hrs), tap water and exhaled breath were collected from 10 homes (located along the EPA plume) and 39 individuals living in (n=36) and outside (n=3) plume areas. Samples were analyzed for 11 VOCs including PCE and TCE. PCE was detected in 67% of indoor air samples and ranged upto 70 µg/m<sup>3</sup>, exceeding a Cancer Risk Evaluation Guide of 3.8 µg/m<sup>3</sup> (2 homes) and the EPA removal action level of 42 µg/m<sup>3</sup> (one home). PCE was detected in 100% of tap water samples (0.39 - 0.92 µg/L) and exhaled breath samples (2.2 - 44 µg/m<sup>3</sup>). Mean PCE concentrations in the exhaled breath was higher among individuals living in than those living outside the plume areas (6.78 vs. 3.9 µg/m<sup>3</sup>). Elevated PCE breath levels were observed in both the EPA Superfund site and other plume areas. Breath sample was correlated with indoor air sample (r=0.77). TCE was not detected in any samples. Some community members are exposed to PCE at levels much higher than others. Besides the indoor air, PCE in tap water is also of concern. Further investigation is warranted to identify exposure mitigation strategies.

*Research Mentor:*

*Sa Liu, School of Health Sciences*

**Oral Presentation Abstract Number: 32 :: Social Sciences/Humanities**

**College of Health and Human Sciences**

**Understanding Visitor Harassment in China**

Author:

Jianlan Song, College of Health & Human Sciences

Shweta Singh, Health & Human Sciences

Abstract:

Visitor harassment (or Tourist Harassment) is recognized as a global issue. Previous studies have presented evidence of prevalence of Visitor harassment (VH) in China. Yet, it remains unexplored in academic research. The purpose of the study is to address existing gap in the Tourist Harassment (TH) research and offer insights into the issue in china context. Archival search was conducted on major tourist regions in China. Journal articles, project reports, speeches and press releases, news reports and newspaper articles, magazine and newsletter articles, blog postings as well as the survey results of a previous study were analyzed. Archives were thematically and contextually analyzed to identify: 1] Perpetrators of TH behavior in China; 2] Types of TH behaviors; 3] The drivers of TH behaviors among micro-traders; 4] Visitors response to these TH behaviors; and 5] Mitigation strategies employed by the destinations to address the problem. Secondly, the study mapped the phenomenon across China. Lastly, study recognized possible predictors of TH in socio-economic, environmental, cultural, and historical context of China.

The unique social-cultural fabric, political structure and historical context of China brings novel insights into the existing understanding of Visitor Harassment. Findings of this study provide information that scholars can use in future to further visitor harassment (VH) research. Contextual analysis offers basis to assess difference and similarities between VH in China and in other countries. Study presented a list of the mitigation strategies being used in China that can be adapted by other destinations struggling with the similar issue.

*Research Mentor:*

*Shweta Singh, Hospitality and Tourism Management*

*Mark Meng, Hospitality and Tourism Management, Indiana University Kokomo*

*Dan Zhu, Family and Consumer Sciences, Ohio State University*

*Annmari Nicely, Hospitality and Tourism Management*

**Oral Presentation Abstract Number: 33 :: Social Sciences/Humanities**

**College of Health and Human Sciences**

**Age of First Arrest is associated with Motivation to Succeed Among Juvenile Offenders, Beyond Socioeconomic Status**

Author:

Meesam Zaheer, Health and Human Sciences

Abstract:

Being arrested at an early age can lead to adopting socially deviant behavior. For example, students arrested in 9th or 10th grade were 6-8 times more likely to drop out of school than their peers (Hirschfield, 2009). Although studies have shown the consequences of early criminal activity, differences among age groups haven't been examined. The current study was designed to address this gap and examine whether the age at which an individual was arrested for the first time influences his or her motivation to persist in socially-approved pursuits while controlling for SES. Data was used from the Pathways to Desistance Study (2003). Age of arrest was collected from self-reported responses ( $M = 13.84$ ,  $SD = 1.95$ ). Motivation to succeed ( $M = 3.25$ ,  $SD = 0.65$ ) was assessed on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). SES score was computed based on parental information ( $N = 1346$ ,  $M = 25.59$ ,  $SD = 12.30$ ). We found that through a correlational analysis, the age of the first arrest was positively correlated with motivation to succeed ( $r(1,197) = .12$ ,  $p < .01$ ). Using hierarchical multiple regression analysis, SES did explain significant variability in responses, as expected ( $R^2 = .04$ ). However, even accounting for SES, the age of the first arrest still influenced motivation to succeed ( $R^2 = .06$ ). As the difference in correlation came from ethnicity and not SES, further research needs to be done to examine other variables that might influence an individual's motivation to succeed.

*Research Mentor:*

*David Rollock, Psychological Sciences*

**Oral Presentation Abstract Number: 34 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Hot and Cold: Quantifying Variance of Sentiment in Supreme Court Confirmation Hearings**

Author:

Noah Alderton, College of Science

Abstract:

Since the appointment of John M. Harlan II in 1955, every Supreme Court nominee has testified in a Senate Judiciary Committee hearing. These hearings provide a fertile ground for Senator ideologies, partisanship, and political forces to be in full display. However, little research has systematically analyzed confirmation hearings for Supreme Court nominees. In this paper, I conduct quantitative sentiment analysis on the transcripts of Supreme Court confirmation hearings between 1969 and 2018. By leveraging sentiment analysis, the attitudes of each of the Senators during the hearings can be measured. Investigating the correlative impact that variables at the Senator, institution, and nomination levels have on sentiment creates a better understanding of the factors that may influence a Senator's attitude during the hearings.

A positive correlative effect on sentiment was found with an increase in the percentage of the vote that the nominating president received during his most recent election in the Senator's home state. A positive correlation was also found when the nominating president and a Senator were members of the same political party. Additionally, a statistically significant negative correlation was measured when the departing justice was a swing voter and when the hearing was aired on television. My research points to new avenues for using textual data to study partisanship and ideological polarization. It is my hope that this project paves the way for additional sentiment analysis research to better understand political systems.

*Research Mentor:*

*Eric Waltenburg, Department of Political Science*

*Mintao Nie, Department of Political Science*

**Oral Presentation Abstract Number: 35 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Through the Lens of Tolerance: Group Affect and Attitudes Towards Civil Liberties**

Author:

Warisha Aslam, Liberal Arts

Abstract:

Tolerance and support for civil liberties are the pillars of liberal democracy. Nonetheless, the existing literature on the relationship between tolerance and civil liberties attitudes is unclear, since prior studies use different definitions of tolerance, making the literature on civil liberties and tolerance confusing and encumbered with disagreements. In response, we develop a theory on the relationship between civil liberties attitudes and tolerance, which we test through a series of survey experiments. Our findings also shed light on threats to tolerance and conditions under which tolerance for the civil liberties of target groups rise.

Furthermore, the interactions between attitudes towards civil liberties and tolerance have notable implications for our socio-political environment, because public attitudes and tolerance towards the civil liberties of social groups can impact policy development. Thus, this study is consequential because it serves to understand how variance in attitudes towards social groups, with respect to their identity, interacts with tolerance for their civil liberties by investigating the relationship between civil liberties attitudes and tolerance.

*Research Mentor:*

*Dr. Logan Strother, Political Science*

**Oral Presentation Abstract Number:** 36 :: Social Sciences/Humanities

**College of Liberal Arts**

**Five Decades of Persistence: The Struggle to Prohibit Discrimination on the Basis of Sexual Orientation at Purdue University**

Author:

Chris Buntin, College of Science and College of Liberal Arts

Abstract:

From the Stonewall riots in 1969, Harvey Milk's inauguration as San Francisco's Supervisor and assassination in 1978, Reagan's dismissal of the first visible manifestation of GRID (AIDS) in 1981, to the Clinton administration's ratification of DADT in 1993-94 and DOMA in 1996, and the defense of marriage equality, the queer liberation movement has persisted for fundamental human rights. Purdue is one of over 1,055 universities that have non-discriminatory policies that include sexual orientation, yet the struggle to include it in the Bill of Rights has spanned five decades, with the original bill written in 1969. In October 1976, the combined efforts of the Student Advocate-Student Affairs Committee, comprised of students, faculty, and staff, worked to revise and modernize the original bill. The amendment is declined in the summer of 1978, resurfacing towards the end of 1983 from combined student endeavors, to be rejected again. Finally, it was proposed in February 1989, where it would be rewritten by the Student Affairs Committee to not allow room for interpretation, only to remain on the floor of the University Senate for over three years. At the expense of numerous sexually nonconforming students facing discrimination, it was included in President Beering's Antiharassment Policy of 1993, but with disregard for these students as no sanctions were enacted on those engaging in said discrimination. With President Hansen's removal of sexual orientation from the University's Equal Opportunity and Affirmative Action Policy for the 2000-01 school year, Purdue's Gay Liberation Front pursued justice until he re-implemented it in August 2001. Given the significance, more research is needed to explore the gaps within the context of Purdue, the local area, national historical events, and within the BIG 10 and higher education.

*Research Mentor:*

*Aiden Powell, LGBTQ Center Assistant Director*

**Oral Presentation Abstract Number: 37 :: Social Sciences/Humanities**

**College of Liberal Arts**

**How Paper Marbling May be Used to Determine the Location and Time Period a Book was Published**

Author:

Johanna Carroll, Science

Abstract:

The purpose of this research is to understand how different countries, at various points in history, utilized different designs for the paper marbling found in the flyleaves of books. Using the work of the foremost authority on book marbling, I have amassed a collection of images of typical marble patterns as well as the country and time period that these designs were used. With the help of this catalogue, it is possible to confirm, or at least estimate, where and when a book was bound. Using books from our collection that have both marbling and clear publication information, a preliminary test proved that matching marbling patterns to the existing scholarly research could be very accurate, although there are some cases where it might not work well. Instances when it does not completely work, however, cannot be fully discounted, because it could simply mean that the book was reprinted or rebound in a different time/place and thus the marbling may not accurately represent the original publication. The collection includes many detached covers, so the intended outcome of this research is to be able to make educated guesses as to the region and time period in which these torn covers were created, and to potentially match the detached covers to books where they are missing and that fit the frame of reference. I hope that with my help, we can start the categorization process and future students can continue the work with the foundation that we have laid for them.

*Research Mentor:*

*Elizabeth Mercier, School of Languages and Cultures*

**Oral Presentation Abstract Number: 38 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Parchment to Paper: The Transition of Medieval Latin from Paleography to Print**

Author:

Desiree Clark, Liberal Arts

Abstract:

With the invention of the Gutenberg press, printed books supplanted medieval manuscripts. Subsequently, the Latin of the Middle Ages transitioned from parchment to paper, and this affected how Latin was represented on the page. The legacy of the Latin manuscript tradition can be readily observed in the earliest printed books as printers strived to create books that mimicked the beauty and sophistication of the medieval manuscript. This research addresses the representation and consequences of Medieval Latin's manuscript conventions in Europe from the 14th-15th century manuscripts to the printed books of the 15th-16th centuries. Under the direction of my Medieval Latin Paleography Professor, Elizabeth Mercier, I conducted two case studies for comparison and contrast of how ecclesiastical Latin is represented in manuscript form versus its printed counterpart. The first analysis focuses on Latin's complement to liturgical musical notation in a 15th century Antiphonary manuscript leaf and a 16th century Pontifical. The second analysis focuses on Latin's representation in Ecclesiastes from a 14th century manuscript leaf and two 15th century incunable Bibles. Examination of the hands, typescripts, abbreviations and sigla usage reveals the vitality of the manuscript conventions as they survived in the early era of printing.

*Research Mentor:*

*Elizabeth Mercier, School of Languages and Cultures*

**Oral Presentation Abstract Number: 39 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Fyrthyar: An Invented Language**

Author:

Leah Criss, CLA

Abstract:

As the primary mode of human communication, language contains information about a group's culture and history. Inventing a language allows for a deep examination of culture and history as manifested in vocabulary, grammar, and texts. The invention process also leads to a greater understanding of the nature of human language. To create a new language, learning the rules of existing, natural languages becomes necessary to make the language realistic. This language invention project, which I started working on last year for a class on Inventing Languages, seeks to explore what elements comprise a language and how language influences and is influenced by the culture around it.

Fyrthyar is a language created for the Kingdom of Fyrthen set in the world of Erdiae. The language is based on the trees, designed to hold the weight of ages within the words. Because the people of Fyrthen love craftsmanship, Fyrthyar's orthography, which resembles the Futhark, is designed to make carving wood or engraving metal easier. Fyrthyar is heavily influenced by Germanic languages, particularly German and English. Fyrthyar has no grammatical genders and only five verb conjugations, three of which are related to tense and two to aspect. Fyrthyar vocabulary, such as the word "Erd," also bears Germanic influence. The lexicon contains words specific to the culture of Fyrthen, particularly in the war and forest categories. The final product is an invented language that displays the major linguistic elements – phonology, vocabulary, grammar, writing system, and sample texts – and reflects the culture of Fyrthen.

*Research Mentor:*

*Elaine Francis, Department of Linguistics*

*Aparajita Sagar, Department of English*

**Oral Presentation Abstract Number: 40 :: Social Sciences/Humanities**

**College of Liberal Arts**

**The Purpose of Myth**

Author:

Taylor Davis, Liberal Arts

Abstract:

Mythology serves two major purposes: to answer questions about the world and to teach lessons about life. Neil Gaiman's "Norse Mythology" successfully does both, keeping true to the spirit of myth. The story of creation enlightens the reader on why the world exists and the purpose of life is. The three creators give humans abilities as they create them. Ve molds their physical features to give them the five senses: sight, touch, smell, hearing, and taste. Vili gives them intelligence and desires so that they may have goals to strive toward. Odin gives them life: the awareness of existence itself. Mythology gives a warning to not misuse one's life because there are dire consequences if one does so.. Loki, a character in "Norse Mythology," is utilized in teaching many lessons to the reader. His cleverness in word choice instills an understanding in the reader to be mindful of what one says. In his role as the antagonist, he reveals to the reader to be wary of people's motives and to never underestimate people. Loki creates problems for himself and others and while he often uses lies and trickery to avoid the repercussions, ultimately, in the end, Loki cannot lie his way out of the punishment for his crimes against others. This paper explores these and other aspects of Norse mythology to reveal that the narratives there are not just interesting stories, but also grounded in profound philosophical speculations.

*Research Mentor:*

*Shaun F D. Hughes, Department of English*

**Oral Presentation Abstract Number: 41 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Applying Cross-Curricular Skills to Transculturation Research**

Author:

Ryan Day, College of Engineering

Abstract:

This presentation discusses the author's experience as a STEM major working as part of a writing research team that welcomed collaboration between liberal arts and engineering. The often qualitative research of liberal arts offers tremendous value to the analytical approach typical to engineering, and vice-versa.

First, this presentation will describe the research project itself. Transculturation in First Year Composition explores the links between cultural and language outcomes in first year composition classes for domestic and international students. This involved the qualitative coding of students' reflective writings. To prepare a coding schema for data analysis, the research team first revised a draft schema on a trial dataset. The author developed more specific definitions of the codes, delineating differences in codes by their context to the student. This process is discussed in depth.

Second, this presentation will cover the author's experience in applying his engineering experience to language research. By developing a greater sense of qualitative thinking, the author has become better equipped to recognize the individual level characteristics of individual data samples. Applying an analytical perspective to the writing research coding schema led the author to recognize how different types of sentences were being coded the same due to an imprecise coding definition. In the future, applying qualitative research skills to engineering will give the author a better understanding of user perspectives and produce more complete development of datasets that help address a broader scope of stakeholder needs.

*Research Mentor:*

*Bradley Dilger, English*

**Oral Presentation Abstract Number: 42 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Historical analysis of social effects of Orientalis and applications to the Coronavirus**

Author:

Hetvi Desai, HHS

Abstract:

When epidemics strike, they cause significant fear and panic in the hearts of the general public. Such anxiety has many devastating social and cultural consequences. The third bubonic plague epidemic, for example, began in 1855 and caused people to flee their homes due to unreasonable fears. Most people did not have an understanding of how the plague actually spread; thus, they succumbed to it. The so-called Orientalis resulted in large scale discrimination against the people of Chinatown in San Francisco, California, because its residents did not realize that the lack of hygiene in the community contributed to the fast-paced spreading of the disease. The people outside of Chinatown began to harbor feelings of resentment towards this community, essentially blaming them for purposefully spreading the plague. With the recent spread of the coronavirus, we see similar xenophobic patterns emerging in modern society. It has been almost 120 years since the Orientalis outbreak and a lot has changed, unfortunately, our behavior in times of crisis have yet to improve. By comparing the outbreak of xenophobic behavior during the bubonic plague and now, during the coronavirus, we can break the cycle of discrimination, empowering us to take action to protect ourselves instead of hurting others.

*Research Mentor:*

*Wendy Kline, History*

*Caitlin Fendley, History*

**Oral Presentation Abstract Number: 43 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Finding Nemo: Dispelling the Perception of Disability as Inherently Inferior**

Author:

Alicia Geoffray, Liberal Arts

Abstract:

Finding Nemo dives quite deeply into disability studies and the impact that society plays in constructing a disability through use of the social model. Approaching this topic differently than many texts and media representations of disabilities, which rely heavily on the binaries of good versus evil and normal versus abnormal, Finding Nemo calls into question these distinctions and asks the viewer whether isolating and coddling those with disabilities is truly the correct way for society to handle disabilities. In accordance with raising this question, and through the method of bringing a sort of lived-experience of disability to the foreground, Finding Nemo fulfills the concept of narrative prosthesis in a new and refreshing manner in which the disabled character is not merely forgotten or magically healed, but instead able to integrate more fully into society because the perceptions surrounding disability have been drastically, positively changed. By focusing more on displaying the faulty logic of outside society, specifically Marlin, in which isolation and protective smothering is believed to be beneficial to those with disabilities, Finding Nemo manages to escape the traditional, and even harmful nature of narrative prosthesis, thus creating a new and more positive way to conclude narratives containing characters with disabilities.

*Research Mentor:*

*Dr. Dino Felluga, English*

**Oral Presentation Abstract Number: 44 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Hegelian Agency and Communication in William Gaddis' "JR"**

Author:

Ryan Andrew Paragas Hacek, Liberal Arts

Abstract:

This paper analyzes the relation between linguistic and extra-linguistic agency (as conceptualized by GWF Hegel) in the capitalist systems of postmodern literature. The subject of the paper is William Gaddis' "JR" and how it uses disjointed communication (from telephone conversations to clashing dialogue snippets) to express the chaos of late-stage capitalism. This paper argues that one can use Gaddis' narrative to analyze the significance of Hegel's account of agency for our own contemporary world, because Gaddis depicts individuals in capitalism having different forms of agency within different echelons and through different projects. This corresponds to Hegel's agency system of self-appropriation, self-determination, and self-governance.

Hegel admits the possibility of one kind of agency overcrowding the others. Gaddis' picture of capitalism shows this possibility in action by having self-governance crowd out other kinds of agency, in particular in (1) commodified education through television; (2) the decline from established status to individualized contract work; and (3) the focus on materialism for its own sake. The protagonist JR Vansant, a child of capitalism who views the accumulation of capital as his only want, further demonstrates this overcrowding by replacing the agency of others with his agency. He diminishes others' linguistic agency by talking through the phone or intermediaries, and their extra-linguistic agency by assigning them to projects they would normally reject. The conclusion is that the Hegelian account of agency is thoroughly examined through Gaddis' postmodern lens, with JR's behavior and capitalism as the main focal points.

*Research Mentor:*

*Christopher Yeomans, Philosophy*

**Oral Presentation Abstract Number: 45 :: Social Sciences/Humanities**

**College of Liberal Arts**

**The Tone of the Press: Differences of Coverage Between the Ethnic Press and the Mainstream Media.**

Author:

Phillip Harter, Liberal Arts

Abstract:

News media serve as an important means of transmission for disseminating and interpreting Court decisions. Prior literature on media coverage of Supreme Court decisions has mainly focused on mainstream media. The few studies on media framing of the Court's decisions by alternative sources have examined only affirmative action cases. In this study, I remedy these gaps by comparing both mainstream and ethnic news media's coverage across a range of Supreme Court decisions. Additionally, I conduct a quantitative sentiment analysis of how the tone of news reporting varies by media type. The sample of cases in my analysis consists of articles from the New York Times and 22 ethnic media outlets covering 423 Supreme Court decisions between 2011 and 2015. I attribute the differences in coverage and sentiment to the demographic nature as well as the ideological composition of the targeted markets of the media outlets and the resources they have available for their news reporting.

*Research Mentor:*

*Dr. Eric Waltenburg, Political Science*

**Oral Presentation Abstract Number: 46 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Empowerment of Marginalized Voices on YouTube**

Author:

Yihan Jia, College of Liberal Arts

Abstract:

This project explores how online participatory culture practices empower marginalized musicians who make videos on YouTube. By conducting three case studies on minority musicians with focuses on race, gender, and sexuality, the project aims to explore how they develop the music, technology, and media skills and literacies they needed to perform their identities and find empowerment through creating music videos on YouTube. Examining the approaches of these YouTube video creators will help us identify the practices, trends, and learning strategies that they used to produce and share their stories with virtual audiences and develop counter narratives that lead them to more fulfilling and successful lives. The research process requires me to: (a) identify potential participants, (b) review literature, (c) observe marginalized YouTube creators, (d) analyze data through qualitative coding, and (e) develop a preliminary cross-case analysis. In addition, I will also oversee other undergraduate researchers from the group and offer recommendations. The findings of this project can then be used to make suggestions to educators addressing how they might provide not just safe learning environments that are conducive to learning, but also spaces for marginalized students to explore their identities, develop their voices, and acquire empowerment. Students could then be able to challenge dominant narratives and hegemonic practices through video creation and performance with music, media, and technology.

*Research Mentor:*

*Christopher Cayari, Patti and Rusty Rueff School of Visual and Performing Arts/ Music Education*

**Oral Presentation Abstract Number: 47 :: Social Sciences/Humanities**

**College of Liberal Arts**

**A Systematic Review of Language Proficiency and Code-switching Assessments in Bilingualism Research**

Author:

Jacob King, Liberal Arts

Ellen Deemer, College of Liberal Arts

Hallie Stallings, College of Liberal Arts

Abstract:

This study provides a systematic review of how language proficiency and code switching practices are assessed in current linguistic research in bilingualism. These represent crucial variables, as language proficiency has been shown to impact a wide variety of bilingual behavior (e.g., Thordardottir et al., 2006, among many). Moreover, there is emergent evidence that a speaker's individual code-switching practices impact behavioral outcomes across a range of linguistic tasks.

A two-step process was used to determine study eligibility for this systematic review. First, the aims of the 100 journals with the highest impact factor in language and linguistics (SCI Mago, 2018) were examined for any of several keywords: bilingualism, multilingualism, etc (n = 19). Second, every article published in these journals in 2018 was assessed to determine if the study included bilingual participants (e.g., bilinguals, language learners, etc.). Finally, all eligible studies (N = 109) were coded for several key variables (i.e., subfield, methodological approach, language pairing), as well as use of any measure of language proficiency and/or code-switching practices.

Preliminary results show that approximately 76% of studies reference language proficiency (n = 83) of one or more languages. Broadly, proficiency is addressed via self-reported proficiency, standardized testing (e.g., TOEFL), institutional frameworks (e.g., Common European Framework), and holistic assessments (e.g., teacher assessment). In contrast, only 5% of studies reported a participant's code-switching practices (n = 6). We argue that a comprehensive account of participants' language proficiency, including code-switching practices, are fundamental for linguistic research on bilinguals.

*Research Mentor:*

*Daniel Olson, Languages and Cultures*

**Oral Presentation Abstract Number: 48 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Detrimental Development: a Study of the Consequences of Failed Humanitarian Efforts**

Author:

Claire LeMonnier, Liberal Arts

Abstract:

The purpose of my research on the ethics of international humanitarian work is to understand modern development work's relationship with imperialism and power disparity. Using the Peace Corps as a case study, I questioned whether their development efforts have alleviated the weight of past wrongs, or if they have furthered unnecessary dependency on Western aid while enforcing cultural homogenization and mostly benefiting the global North. My research involved interviewing current and return Peace Corps volunteers and comparing their experiences with information from readings on development theories. Interviews with volunteers showed a widely held belief that their work differs from that of other development organizations in that their service terms are longer in length, that there is training on cultural competency, and because Peace Corps aims to only aid the community in ways that the community desires. Despite intentions, many development programs remain actively destructive to cultural diversity, and have failed to create long lasting progress. Failed development projects are often uninformed on local cultures, are unsustainable, and are profit driven instead of being focused on the well-being of community members – all resulting in loss of autonomy and valuable indigenous knowledge. In an increasingly globalized world, the Peace Corps and other organizations must increase awareness of their actions' results and address the ways that poorly executed aid endeavors uphold historic power imbalances between the global North and South.

*Research Mentor:*

*Elizabeth Wirtz, Anthropology*

*TJ Boisseau, Women, Gender, and Sexuality Studies*

*Alfred Lopez, Interdisciplinary Studies*

**Oral Presentation Abstract Number: 49 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Thomas Gage and Poqomchi': A Glimpse of Linguistics in Early Atlantic Travel**

Author:

Joshua Martin, Liberal Arts

Abstract:

My research revolves around how contemporary approaches to indigenous languages are reflected in the work of Thomas Gage, a 17th century Dominican friar. Specifically I will be studying the penultimate section of Thomas Gage's autobiography, "The English American", that gives lexical information on the Mayan language known as Poqomchi', a language spoken by an indigenous population in the Alta Verapaz region of Guatemala. The reason for analyzing this is to see how Gage, despite trying to craft an objective, informative lexicon of the Poqomchi' language, still allows his colonial biases to shape his perspective on this language. There was a need to learn the Mayan languages so that the indigenous people of the Americas could more easily be converted to Christianity, and thus become more civilized in the eyes of Europeans. As a result of this desire to convert natives to Christianity, much of how linguistic study was conducted in the colonial period revolved around the idea of spreading Christianity and introducing natives to European tongues. Despite his biases, however, Gage's lexical entry remains one of the few English sources on the poqomchi' language to this day, and both linguists and historians can still derive much valuable information on Poqomchi' and the colonial period from this section of "The English American".

*Research Mentor:*

*Kristina Bross, English*

**Oral Presentation Abstract Number: 50 :: Social Sciences/Humanities**

**College of Liberal Arts**

**The Effects of Human Predation and Climate Change on the Niche Space of North American Proboscideans**

Author:

Alejandra Lynn May, Liberal Arts

Abstract:

Approximately 13,000 years ago, 37 genera of North American megafauna went extinct. Proboscideans, mammoths and mastodons were among the megafauna affected. Today, researchers continue to debate between three hypotheses to explain these North American Pleistocene mass extinctions: (1) human over-hunting, (2) climate change leading to a reduced niche, or (3) a combination of both. Our previous research suggests that the effects of the warming, drying, and more seasonal climate at the end of the Pleistocene likely caused a competitive environment between mammoth and mastodon seen in a drastic shift in the niche spaces of both species. While ecological theory predicts that competition can drive species to extinction, our original sample was not complete. Here, we expand on our previous work by increasing our sample, including archaeological and paleontological location data and radiocarbon dates, and completing paleoenvironmental reconstructions of key environmental variables. Our objective is to model the effects of climate change and human hunting on the niche space of North American proboscideans within Bayesian hierarchical and Structural Equation causal inference frameworks. This study will enhance our understanding of the changing environments in which these megafauna lived, which may have implications for the study of modern extinction rates.

*Research Mentor:*

*Erik Otárola-Castillo, Anthropology*

**Oral Presentation Abstract Number: 51 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Externalities and Policy Change**

Author:

Andrew Occhipinti, Krannert

Abstract:

After Union forces seized the Confederate city of Nashville in 1862, military officials implemented martial law. Soldiers quickly found Nashville's brothels leading Army surgeons to alert commanders to an emerging venereal disease epidemic among soldiers. After trying numerous ways to deal with the problem failed, Major General William Rosecerans decided to legalize and regulate prostitution in the city. Army clerks kept detailed records of licenses and fees.. These ledgers offer an unique data set for us to explore. The aim of my research will be to empirically analyze the data and show how externalities imposed by black markets can impact policy change. Externalities are costs of some form of production (in this case, sex work), that are not implicitly part of the costs of productions. The main externality imposed by the prostitution black market was the cost of medical care required for the soldiers. From this data we can get estimates of the size and value of the whole market. This should give us an equilibrium point in which it is more profitable factoring in these externalities to legalize and regulate the prostitution. Drawing direct lines from these conclusions to modern day equivalents can give us insight into why certain drugs and activities are still illegal.

*Research Mentor:*

*Yvonne Pitts, History*

**Oral Presentation Abstract Number: 52 :: Social Sciences/Humanities**

**College of Liberal Arts**

**A Software Tool to Aid Transcribing Medieval Latin**

Author:

Daniel Ostrowski, Science

Abstract:

The purpose of this project was to develop a software tool to facilitate the task of transcribing medieval Latin documents. This task of determining the Latin words that are written on the page is a prerequisite to the work of translation. Factors such as heavy usage of non-standard abbreviations by the scribe or physical deterioration of the ink sometimes allow only a subset of the letters in a word to be recognized with confidence. A freely available Latin word list was used which enumerates every Latin word in every grammatical form. The software tool accepts information that the user knows about the word, including specific known letters, which known letters have unknown letters between them, and various information a user may know that reduces the possibilities of which letters any unrecognized letters may be. The tool then filters the word list based on the information from the user and presents the filtered list to the user. The tool provides some other features, including providing definitions for words and automatically trying certain common spelling substitutions. Students of Professor Mercier's Latin paleography course in the fall of 2019 used the tool and provided feedback for its improvement. A publicly-accessible instance of the software and the source code for it will be hosted online to encourage its use.

*Research Mentor:*

*Elizabeth Mercier, School of Languages and Cultures*

**Oral Presentation Abstract Number: 53 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Charting the Course for Vehicle Repossession Research**

Author:

Nicholas Tucker Reyes, College of Liberal Arts

Abstract:

Research surrounding title loans has raised awareness by studying disadvantaged groups in society and their access to sufficient credit opportunity. Studies have indicated that debt, credit, and access to financial information, is not equally experienced across social groups. High-interest, over secured borrowing such as title loans remain prevalent in urban areas despite the exploitative nature of these credit programs. Many consumers become deeply indebted which causes a circuit of renewing loans or repossession of their vehicle; which for some borrowers is their highest valued asset. Future research on this subject will provide a more comprehensive understanding of the process of vehicle repossession and the effects it has on working-class and low-income groups in society. Much of the current data on repossession discusses title lending in regard to interest rates and banking regulations, with little detail on the social ramifications if loans are in default. Consequently, there is not much analysis or fieldwork surrounding families and individuals who have experienced repossession, and the complications it can provide. Our assertion is that credit instruments such as title lending, pose undesirable risks for borrowers who may lack the information or opportunity for adequate financial solutions. Therefore, in studying the current research, my intention of this presentation is to provide a thorough understanding of the laws, policies, and regulations surrounding the various fringe banking methods including title lending. In the process, my findings will provide the legal and analytical foundation for future ethnographic and interview research on vehicle repossession.

*Research Mentor:*

*Dr. Spencer Headworth, Sociology*

**Oral Presentation Abstract Number: 54 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Research in Early Modern Bookbinding**

Author:

Elizabeth Taylor, Liberal Arts

Abstract:

While book binding has existed for centuries, we have lost contact with the typical book binding methods from long ago. Once we used sewing and gilded vellum, now we use paper and glue. This research project seeks to understand how bookbinding was in the Early Modern Era, this being around the time when the Gutenberg Printing Press was first invented. This project studies the materials used, the methods of Early Modern bookbinding, and the design strategies for turning each book into a piece of art. Though many binders varied in their techniques and quirks, there was a strong common pattern across the board, allowing for a clear method to be deduced.

*Research Mentor:*

*Elizabeth Mercier, Languages and Cultures*

**Oral Presentation Abstract Number: 55 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Visualizing Religion in East Asia: The Online Spiritual Atlas of the Global East**

Author:

Tzu Ray Wang, Liberal Arts

Yutong Fan, Liberal Arts

Yifan Lei, Liberal Arts

Abstract:

Visualizing Religion in East Asia: The Online Spiritual Atlas of the Global East

This project involves collecting data on religious sites in different regions of the Global East and plotting these on a map. The primary purpose of our project is to provide data on religious sites for scholarly use and allow people who are interested in East Asian religions to visualize the distribution of sites. The project started with a focus on China, has recently expanded into Korea, and will develop further into the Global East framework. For now, we have collected a large amount of data on religious sites in China and created a mapping website using ArcGIS Online that shows religious distribution in China. In addition to mapping individual religious sites, this project also includes a Story Map function which provides additional information about particular religious sites by including pictures, videos and text submitted by users. This is a more interactive way to portray religious sites. The roles of student assistants include database construction (gathering and cleaning data), story map collection, and map design.

*Research Mentor:*

*Fenggang Yang, Sociology*

*Christopher M White, Sociology*

**Oral Presentation Abstract Number: 56 :: Life Sciences**

**College of Pharmacy**

**Subcellular GPCR Signaling in Neuropsychiatric Disorders**

Author:

Angel Lin, College of Health and Human Sciences

Abstract:

G-protein-coupled receptors (GPCRs) play diverse roles in the pathophysiology of human psychiatric disorders. Upon activation of GPCRs via extracellular stimuli, GPCRs transduce downstream pathways through two distinct pathways: canonical G-protein and non-canonical  $\beta$ -arrestin pathways. ERK1/2 phosphorylation is downstream of both GPCR signaling pathways and contributes to cell proliferation, survival, and gene expression. Despite evidence supporting that ERK1/2 is activated by G-protein or  $\beta$ -arrestin pathways, there is limited information regarding differences between  $\beta$ -arrestin isoforms in the spatial (cytosol vs. nuclear) and temporal profile of ERK1/2 activity in cells. Therefore, we proposed to investigate whether activation of  $\beta$ -arrestin-1 produces distinct patterns of ERK1/2 phosphorylation compared to  $\beta$ -arrestin-2. Ultimately, the purpose is to develop therapeutics for psychiatric disorders with precise mechanisms of action.

We applied interdisciplinary approaches, using G-protein-biased (TAN67) and  $\beta$ -arrestin-biased (SNC80)  $\delta$ -opioid GPCRs ( $\delta$ OR) selective agonists that display opposing effects on emotional behaviors. Following administration of these drugs, cells were collected at different time points and separated into cytosolic and nuclear fractions. ERK1/2 activation was then measured by Western blot analysis.

Our results indicated a trend of a transient cytosolic ERK1/2 activation by SNC80 and TAN67 in  $\beta$ -arrestin-2 and  $\delta$ OR-expressing Chinese Hamster Ovarian cells, whereas a trend of a weak and persistent cytosolic ERK1/2 activation by SNC80 and TAN67 were observed in  $\beta$ -arrestin-1 and  $\delta$ OR-expressing Osteosarcoma Epithelial cells. However, the patterns of ERK1/2 phosphorylation in the nucleus were difficult to identify. Our finding suggests that two  $\beta$ -arrestin-1 and -2 isoforms may differentially impact the spatiotemporal profile of cellular ERK1/2 signaling.

*Research Mentor:*

*Richard van Rijn, Department of Medicinal Chemistry and Molecular*

*Mee Jung Ko, Department of Medicinal Chemistry and Molecular*

**Oral Presentation Abstract Number: 57 :: Life Sciences**

**College of Pharmacy**

**Nanoparticle-mediated intracellular protection of natural killer cells for cancer immunotherapy**

Author:

Michaela Todd, Pharmacy

Abstract:

Immunotherapy with genetically-engineered natural killer (NK) cells enables the effective targeting and killing of difficult-to-treat tumors. Our lab is investigating the use of such genetically engineered cells to attack and kill solid tumors where traditional approaches have failed. Part of the treatment regimen involves freezing engineered NK cells prior to adoptive transfer into patients. This is typically done with dimethylsulfoxide (DMSO) which is, however, toxic and has been associated with post-infusion complications. The purpose of our research is to develop a new cryopreservation approach to freeze NK cells without using damaging cryoprotectants like DMSO. We use trehalose—a safe, natural sugar with cryoprotective properties. In order for cells to take up trehalose, we have developed a nanoparticle system to shuttle it across the membrane, based on crosslinked chitosan-tripolyphosphate, since trehalose cannot cross the cell membrane alone. We were able to functionally characterize the nanocarrier system with confocal microscopy to confirm nanoparticle uptake into NK cells. NK cells showed significantly higher viability and recovery when cryopreserved with our nanoparticle-based system compared to using DMSO alone. We also determined anti-tumor function of cryopreserved NK cells and show that these cells can mediate powerful effector functions against cancer targets, including killing ability, degranulation and IFN- $\gamma$  production. This system is a promising platform for the development of significantly safer NK cell infusions for use in cancer immunotherapy. The promising results from our studies allow us to advance the investigation into the anti-tumor immunity of these cryopreserved, engineered NK cells in adoptive transfer experiments in vivo toward clinical studies in humans.

*Research Mentor:*

*Sandro Matosevic, Industrial and Physical Pharmacy*

**Oral Presentation Abstract Number: 58 :: Physical Sciences**

**College of Science**

**Catalytic [2 + 2 + 1] Cycloaddition Reactions of Vinylidenes and Aldehydes**

Author:

Megan Bosso, Science

Annah Kalb, Science

Abstract:

4-methylene-1,3-dioxolanes, and their derivatives, serve as important compounds in organic synthesis. These motifs function as significant complexes in industrial polymerization, pharmaceuticals, and protection of functional groups. Dioxolane motifs also have applications in the synthesis of natural products, using the Patesis Ferrier rearrangement conditions, but the current methods are limited. An under-utilized application of 4-methylene-1,3-dioxolanes is their ability to form alpha-hydroxy ketones which are present in antibiotics and biologically active compounds. Thus, the investigation into the deprotection of 4-methylene-1,3-dioxolane to form alpha-hydroxy ketones provides a useful application for these valuable synthetic targets. Herein we report a one-pot dinuclear nickel-catalyzed [2+2+1] cycloaddition reaction using vinylidenes, aldehydes, and Zn as a stoichiometric reductant to form 4-methylene-1,3-dioxolane derivatives. The subsequent deprotection of the cycloaddition products through the addition of TFA generates alpha-hydroxy ketones in modest yields.

*Research Mentor:*

*Christopher Uyeda, Chemistry*

**Oral Presentation Abstract Number: 59 :: Life Sciences**

**College of Science**

**Inhibiting Apoptosis as a Novel Treatment for Retinitis Pigmentosa using a Transgenic Zebrafish Model.**

Author:

Emre Coskun, College of Science

Abstract:

Retinitis pigmentosa (RP) is the most common cause of night blindness, it affects 1 in 4,000 people worldwide, and it has no cure. RP is a heterogeneous disease that can be inherited through many mutations in the human rhodopsin gene, including the Q344X mutation. This mutation is associated with autosomal dominant RP in humans. The goal of this project is to use a transgenic zebrafish model expressing the Q344X mutation to discover an effective treatment for RP. The Q344X rhodopsin is truncated, which leads to its mislocalization and results in rod photoreceptor cell degeneration. At 7 days post fertilization (dpf), the Q344X larvae experience a diminished behavioral response to dim light preceding a light offset as analyzed by the Visual-Motor Response (VMR) assay. This suggests that the behavioral phenotype of Q344X is due to rod degeneration. Previous research proposed that rods degenerate through apoptosis. Therefore, the Selleckchem Apoptosis Compound Library was selected to identify compounds that can inhibit apoptosis. Compounds that inhibit apoptosis would decrease rod degeneration and enhance VMR in the Q344X mutant. The Q344X larvae are treated with these compounds between 5-7 dpf because it is a period of significant rod degeneration. So far, 6 compounds have enhanced VMR in the Q344X mutant. A TUNEL assay and immunostaining on retinal cryosections will determine the extent of apoptosis in the rods of Q344X larvae treated with identified compounds. Identified compounds will provide insight into specific target molecules involved in rod apoptosis and can be further developed as RP treatments.

*Research Mentor:*

*Yuk Fai Leung, Development and Disease*

*Logan Ganzen, Integrative Neuroscience*

**Oral Presentation Abstract Number: 60 :: Life Sciences**

**College of Science**

**Repurposing anti-inflammatory drugs to treat multi-drug resistant *Neisseria gonorrhoeae***

Author:

Amr Kais, College of Science

Abstract:

*Neisseria gonorrhoeae* infects 106 million people worldwide each year and the wide-spread of multidrug-resistant strains of *N. gonorrhoeae* has sparked an urgent demand for new drugs. However, the current process of drug-discovery is resource-intensive and time-consuming, requiring at the minimum 10 – 15 years of preclinical evaluation and clinical trials prior to receiving approval. To address this urgency, we utilized a drug repurposing strategy, screened 4,000 FDA-approved drugs, and identified seven clinically approved anti-inflammatory drugs including fenamic acids (tolfenamic, flufenamic, and meclofenamic acids) with potent anti-gonococcal activity.. Fenamic acids reduced a high inoculum of *N. gonorrhoeae* below the limit of detection within 12 hours and exhibited a low frequency of resistance.. Interestingly, the fenamic acids did not disrupt *Lactobacillus* spp., one of the major inhabitants of the healthy female genital microbiota. Furthermore, tolfenamic and flufenamic acid were far superior to the drug of choice, ceftriaxone, in reducing the burden of intracellular *N. gonorrhoeae* with a 99% reduction. Finally, fenamic acids significantly reduced the expression of the proinflammatory cytokines by infected endocervical cells. In conclusion, this study has revealed fenamic acids as a potential new addition to the limited treatment options available for gonococcal infections and warrants further investigation.

*Research Mentor:*

*Mohamed Seleem, Department of Comparative Pathobiology*

**Oral Presentation Abstract Number: 61 :: Life Sciences**

**College of Science**

**Pathology of the Blood-Tumor Barrier Breakdown Over Time**

Author:

Chinyere Maat Kemet, Science

Abstract:

Introduction: Brain metastases of lung cancer, particularly non-small cell lung cancer (NSCLC), are increasing. The restrictive blood-brain barrier (BBB), shifts to the blood-tumor barrier (BTB) in brain metastases, impeding therapeutic delivery. We aim to identify changes in structural components of the BTB in NSCLC brain metastases over time, which may serve as therapeutic targets. Experimental Design: A preclinical model of NSCLC brain metastases was created using intracardiac injection (ICI) in Foxn1nu mice and brains were collected at 1-6 weeks post-ICI (n=3 or 5). Each component was evaluated qualitatively and quantitatively with immunofluorescence microscopy. Methods: To evaluate changes in brain tumors (BTB) and the surrounding brain (BAT) compared to controls (BBB) 5 regions from each group were obtained and quantified (Zen, Zeiss) as percent area normalized to endothelial cells (CD31). Results: Endothelial cells (CD31) were increased within tumors (BAT) compared to controls (BBB) at 3-5 weeks ( $p<0.001$ ,  $p<0.001$ ,  $p<0.05$ , respectively). Basement membrane (collagen IV) components were decreased at the 5 week ( $p<0.001$ ) and 6 week ( $p<0.001$ ) time points. Pericytes (PDGFR $\beta$ ) were decreased in metastatic lesions at 4 ( $p<0.05$ ), 5 ( $p<0.001$ ), and 6 weeks ( $p<0.001$ ). Reactive astrocytes (GFAP) were increased at the 5-6 week time points ( $p<0.001$ ) and astrocytic water channels (AQP4) were markedly significantly diminished from the 3-6 week time points ( $p<0.001$ ). Conclusions: Our results demonstrate diminished pericytes, basement membranes, and astrocytic endfeet were present in the BTB compared to BBB controls. Impact: Identified BTB alterations may serve as therapeutic targets for treatment of NSCLC brain metastases to improve patient survival.

*Research Mentor:*

*Tiffany Lyle, Comparative Pathobiology*

**Oral Presentation Abstract Number: 62 :: Life Sciences**

**College of Science**

**Differential effect of OCRL1 patient mutations on Lowe syndrome cellular phenotypes**

Author:

Lisette Skiba, College of Science

Abstract:

Lowe Syndrome (LS) is caused by mutations in the OCRL1 gene, which encodes the lipid phosphatase Ocr1. This disorder is characterized by mental retardation, congenital cataracts and kidney malfunction (with renal failure mainly causing the premature death of affected children). The LS underlying mechanism remains obscure and there is no cure, this project will change such scenario.

We previously established that cells lacking Ocr1 fail at processes critical for embryo development and kidney function (e.g., primary cilia assembly). However, with 200+ OCRL1 mutations described, most patients express Ocr1 mutants rather than no protein. However, the mutation's impact on cell physiology is unclear. Our results indicate that different patient mutations have different impacts on cellular functions. Further we identified some conformationally-affected Ocr1 mutants that lack phosphatase activity and triggered phenotypes reverted with an FDA-approved drug.

This is the first LS study establishing a genotype-phenotype correlation and the existence of a LS conformational/protein misfolding component, while providing basis for LS-specific therapeutics.

*Research Mentor:*

*R. Claudio Aguilar, Biological Sciences*

*Swetha Ramadesikan, Biological Sciences*

**Oral Presentation Abstract Number: 63 :: Life Sciences**

**College of Science**

**Importance of controlling genome organization in regenerative medicine**

Author:

Rachel Stucky, Science

Abstract:

Over the past decade, the hopes of regenerative medicine through stem cell implementation have caught the attention of both researchers and clinicians. Although future goals include repairing spinal cords, forming new heart tissue, and reconstructing debilitated bodies like never before, the reality is that the ability to obtain and culture stem cells currently yields poor results. Additionally, the likelihood of cancer formation after stem cell implantation poses a major health risk that must be addressed before stem cells can be used in clinical settings. Our goal is to increase the reprogramming efficacy for the production of induced pluripotent stem cells (iPSCs) through improved cell culture technique under appropriate microenvironmental settings, as well as explore the effects of the Nuclear Mitotic Apparatus (NuMA) protein on the ability to produce iPSCs. Previously, NuMA has been found to be a major player in the formation and stability of the mitotic spindle. We have also demonstrated that NuMA is an essential organizer of higher order chromatin necessary for proper cell fate determination and is sensitive to the microenvironment. Because chromosomal abnormalities resulting in cancerous phenotypes have been known to occur during the division of stem cells, and directing genome organization is essential for the homeostasis of these cells, our hypothesis is that NuMA is a major player in improving the efficacy of production and maintenance of stem cells. Our preliminary analysis of chromatin-immunoprecipitation with NuMA from differentiated epithelial cells reveals binding to DNA regions corresponding to five (OCT4, SOX2, KLF4, C-MYC, LIN28) out of seven genes associated with the dedifferentiation necessary for the production of iPSCs. Encouraged by these results, we aim to reprogram fibroblasts to iPSCs to assess the necessity of NuMA in this conversion. Although this is a newly developing project, we believe that the implications will draw the future of regenerative medicine closer to the present.

*Research Mentor:*

*Sophie Lelièvre, Basic Medical Sciences*

**Oral Presentation Abstract Number:** 64 :: Social Sciences/Humanities

**Honors College**

**Letters to the Body: Letterpress Printing and Anatomical Representation**

**Author:**

Nina Hsu, Health and Human Sciences

**Abstract:**

Contemporary popular culture is dominated by life-affirming or body-positive statements, insisting that 'you are enough' or 'beauty comes in all shapes and sizes.' While it is important to expand the notion of physical beauty, these statements remain committed to seeing beauty as a matter of appearance. When these messages do conceptualize beauty not simply skin deep, it is often through recourse to the discourse on personality and moral character. But what if there were messages that sought to have the same positive impact but did so through raising awareness about the actual functions of the body, the fascinating intricacies of the human organism. In taking up this project, I argue that when viewers encounter more specific information about human biology they will have more reason to be grateful. My aim is to contribute to body-positivity through spreading deeper knowledge about the body to people who may not have backgrounds or foundations in biology or physiology. The goal is to present this information on beautifully finished, fine art posters, designed for vintage letterpress processes. The series of posters will follow the theme of "Thanking the Body" in which each poster conveys a message of gratitude to a specific part of the body, making explicit its function.

*Research Mentor:*

*Dr. J. Peter Moore, Honors College*

**Oral Presentation Abstract Number:** 65 :: Mathematical/Computation Sciences

**Krannert School of Management**

**Predicting Postoperative Delirium Post-Intracranial Surgery**

**Author:**

Juliet Aygun, College of Science

Alaina Bartfeld, Krannert School of Management

Sahana Rayan, College of Science

**Abstract:**

**OBJECTIVES/RELEVANCE:** Delirium has a high morbidity rate and is common in the hospital; around 10% of older, hospitalized patients have delirium, and 15-50% of patients experience delirium during hospitalization. If delirium could be predicted, many patients would experience a shorter hospital stay, less complications, and greater life expectancy, making finding an accurate predictive model prominent. Upon reading literature on postoperative delirium (POD), most focus on POD in the Intensive Care Unit (ICU), however none are specialized towards post-intracranial surgery. Our research specifically examines POD in the ICU after brain surgery, making our work unique. Our purpose is to employ machine learning methods to predict whether a post-intracranial surgery patient will get delirium in the ICU, and determine the variables that heavily influence POD.

**METHODS:** We used a Chinese dataset with 800 patients and 80 variables with information about brain surgery patients. We conducted variable data analysis to see how each relates to delirium. Then, based on a dendrogram, performed factor analysis to decrease variable count. This created our cleaned dataset. We then employed net elastic classification to select important variables and employed decision tree and neural networking methods. To evaluate model accuracy, we implemented confusion matrices and significance tests. This provided us with a model that accurately predicts POD in the ICU following intracranial surgery, and indicated variables that correlate to the onset of delirium.

**CONCLUSIONS:** By the accurate models employed, we conclude the main factors correlated with postoperative delirium following intracranial surgery are delirium at ICU admission, inadequate emergency, catheter presence, lesions, and length of stay in the hospital.

*Research Mentor:*

*Zhan Pang, Supply Chain and Operations Management*

**Oral Presentation Abstract Number:** 66 :: Mathematical/Computation Sciences

**Krannert School of Management**

**Data Analytics to Improve Hospital Patient Flow Management**

Author:

Asa Cutler, College of Engineering

Peter Xu, College of Science

Sabriya Alam, College of Engineering

Abstract:

At the intersection of public health and engineering technology lies the potential for innovative smart health solutions. As healthcare spending increases in the United States, it has become paramount to improve the efficiency of healthcare delivery while reducing costs. Opportunities to create impactful change in hospital operation administration include making improvements to patient flow management and mitigating patient readmission risks. This project seeks to design data-driven personalized decision support frameworks to predict a patient's risk of hospital readmission and use this decision to proactively propose optimal solutions for methods of treatment and care. It also aims to use similar analytical approaches to optimize hospital resource allocation and improve patient flow management, such that patients are routed within hospitals in a timely and efficient manner. By designing and practically applying statistical tools and machine learning predictive models on hospital datasets and patient readmittance histories on both a system level and an individual scale, the goal of this project is to decrease patient readmittance rates and ensure that patient flow within hospitals is made increasingly efficient. From this analysis, cost estimation models are designed to infer optimized resource allocation to ultimately create an integrated system that will reduce hospital congestion and improve patient care.

*Research Mentor:*

*Pengyi Shi, Management*

**Oral Presentation Abstract Number: 67 :: Social Sciences/Humanities**

**Krannert School of Management**

**Rising Student Debt and its effects on Consumer Activities in the Economy**

Author:

Andrew Ephlin, Krannert School of Management

Abstract:

Abstract Redacted

*Research Mentor:*

*Prof. Joseph Mazur, Economics*

**Oral Presentation Abstract Number:** 68 :: Social Sciences/Humanities

**Krannert School of Management**

**The Impact of Active Learning and Class Attendance on Student Outcomes**

**Author:**

Colin Harmeyer, Purdue University- West Lafayette

**Abstract:**

The purpose of this study was to observe how attendance and involvement in a large, core curriculum class affect a student's test performance. Students' attendance was measured by correct responses to in-class questions, asked via an online polling website. Students were given a chance to correct their wrong answer on the polling website, so answering correctly reflected the fact that a student was in class. The online questions asked in class also closely mirrored questions that would appear in exams, giving students in attendance insight into how exam questions would be asked. Correlation between student's online poll performance and exam performance was both positive and statistically significant. The impact of other demographic variables on test performance was also analyzed.

A second resource available to the students was online access to recorded lectures. Results from merging this online lecture access data with course performance and in-class polling data indicate that students accessed recorded lectures both as a review of class material and as a replacement for class attendance. However, as the semester progressed, students were more prone to use the online lectures as a replacement for class attendance.

*Research Mentor:*

*Kelly Blanchard, Economics*

**Oral Presentation Abstract Number:** 69 :: Social Sciences/Humanities

**Krannert School of Management**

**Predicting Movie Profitability**

**Author:**

Ryan Myers, Krannert School of Management

**Abstract:**

This project strives to find a quantitative way to predict the financial outcome of a movie in the box office. I am looking to assign values to all the variables that can affect the outcome of a movie's success during its theatrical release and derive an equation that can be used for any potential project. Predicting this value is difficult due to the intangible nature of some variables that affect movie's ticket sales. It is difficult to quantify these numbers in an equation and leads to large ranges of errors when trying to forecast a film's success. I plan to use financials from past films to derive the values for the variables that I find hold the most weight in determining a box office outcome. These variables are: IMDB score, Rotten Tomatoes score, A-List actors, Date of Release, Movie Genre, Subject's previous material, Budget, MPAA rating, and Type of Production. I plan to discover how past films have gotten to their box office numbers using their financials. I will find values for each aspect of a film and use them to build an equation to predict revenue. I then plan to use R Studio to quickly and easily test that equation on many films. This testing will refine the values to find an accurate formula that could be applied to any movie. In order to capture a film's unique characteristics, I will find equations to weight those characteristics differently to reflect their importance. This comprehensive formula will allow studios to accurately understand the potential outcome of a project.

*Research Mentor:*

*Arthur Alexander, Quantitative Methods*

**Oral Presentation Abstract Number: 70 :: Social Sciences/Humanities**

**Purdue Polytechnic Institute**

**A Study of the Human Factors Analysis and Classification System (HFACS) as Applied to Asiana Airlines Flight 214**

Author:

Alex Small, Purdue Polytechnic Institute

Abstract:

The Human Factors Analysis and Classification System (HFACS) is a safety tool that helps the identification and analyses of organizational factors contributing to aircraft accidents. By using the HFACS model, safety investigators can better understand and eventually develop safety programs to prevent the organizational conditions that could lead to aircraft accidents. In this study, the HFACS framework was utilized to isolate the human factors that contributed to the Asiana 214 accident on July 6, 2013. The results of this study indicate that a deviance from standard operating procedures (SOPs), inadequate usage of technology, and over-reliance on automation largely contributed to this accident. These findings emphasize the various organizational levels that serve a role in aviation accidents, ranging from industry-wide upper-level management to one specific company's front-line crew. This study also highlights the importance of practicing a proactive approach to safety and mitigating hazards within an organization before they lead to disaster.

*Research Mentor:*

*Dr. Flavio A. C. Mendonca, Aviation Technology*

**Oral Presentation Abstract Number: 71 :: Innovative Technology/Entrepreneurship/Design**

**Purdue Polytechnic Institute**

**If They Build It, Will They Come?: Disconnected Resources at the Northend Community Center**

Author:

Abigail Westbrook, Polytechnic Institute

Abstract:

Community centers have historically been built as convening places or a 'third place,' as was the case for the Northend Community Center in Lafayette, Indiana. Places like the NCC have been studied in order to understand the impact the space has on the people who use it and its surrounding community. However, through qualitative research including ethnographic engagement, interviews, and workshops, I have found there is a disconnect between the expectations of the people who facilitate these centers and the engagement of the people they are designed for. There needs to be a better understanding between the NCC facilitators and the Northend community residents for which this center was built (including those who participate in the space and those who do not). The research lends itself to the creation of an user research toolkit so that facilitators at the NCC may begin to better understand their audience.

*Research Mentor:*

*Austin Toombs, Computer Graphic Technology*

**Oral Presentation Abstract Number: 72 :: Social Sciences/Humanities**

**College of Liberal Arts**

**The Incomparable Mastery of Wes Anderson**

Author:

Margo Ahearn, College of Agriculture

Abstract:

Living in its own niche, in the wide world of film, is the work of Wes Anderson. The American filmmaker has worked on 14 films since 1996, working as a writer, director, producer, and/or actor. More than this, he is a storyteller; an auteur who weaves the fabric of the story in a way no filmmaker has before. There's a unique approach to film correlated with his name, featuring a pattern of consistencies. Among these consistencies are crash zooms, seen frequently in Tarantino films. Anderson also likes to push the envelope with the way he films scenes of taboo subject matter. He twists what could be controversial as artistic interpretation, abstracting the reality of the situation. Wes Anderson is the artist, the auteur of the offbeat mise-en-scène. His obsession with symmetry, the spritely Alexandre Desplat scores, the absolute commitment to one color scheme for the whole film, the delivery of lines, all of it creates a framed, crafted impression of reality, no matter how realistic or fantastical the script is. It makes you feel as much; it moves, it's funny, it's sometimes sad, but it's always just a little weird. It has the power to stimulate thought and interest in dissecting the way the frame is set up just as much as the plot itself. Wes Anderson has mastered a unique way to tell a story, to push the envelope, and to weave it through different plots and cultures. And the way he tells these stories is simply incomparable.

*Research Mentor:*

*Shaun Hughes, 1356 English*

**Oral Presentation Abstract Number: 73 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Through the Looking Glass: Reflections on Identity in The Bell Jar by Sylvia Plath and Alejandra Pizarnik's Poetry**

Author:

Amelia Amrhein, CLA

Abstract:

The concept of a mirror has a variety of symbols and interpretations from vanity, when someone looks at themselves too frequently, to bad luck if one were to be broken; however, it also reveals a degree of separation from one's inner self and the outward reflection seen by society at large. This division between one's internal identity and their outward identity is explored through the works of American author and poet Sylvia Plath (1932-1963) and Argentine writer Alejandra Pizarnik (1936-1972), who both struggled with the desires of their hidden identity which conflicted with the outward, more socially accepted appearances and behaviors. Plath and Pizarnik led lives that ran parallel to each other; they are considered near contemporary authors, they struggled with their mental health and individual spirals into madness, and ultimately took their lives at young ages. While these authors lived in a similar time period and shared many characteristics, they had differing life situations. Their distinct circumstances make the commonalities of their identity crises in their works notable. My paper will show, comparatively and contrastively, how these authors' reflections, as seen through mirrors and other polished surfaces, create a method of viewing the mismatch between their inward understandings of self and their external, unrecognizable images that had been influenced in part by peer expectations. By studying these two authors together, I hope to contribute to studies about the connections between writers who dedicated their lives to literature and how those works tie into their personal struggles with mental illness.

*Research Mentor:*

*Marcia Stephenson, Spanish—School of Languages and Cultures*

**Oral Presentation Abstract Number: 74 :: Social Sciences/Humanities**

**College of Liberal Arts**

**What Makes a Hero for Vikings?**

Author:

William Kuang, Health and Human Sciences

Abstract:

Throughout Viking mythology, there are many characters such as Sinfjotli, Sigurd, and Ragnar who were very influential in ancient Viking society. However, it is controversial about whether or not these characters should be considered heroes. One of the most notable features about the lives of these figures would be that they all die prematurely. Due to this, they can be considered failures, especially if they are discussed using the Hero's Journey model. However, it is not a good idea to judge these characters using modern American standards. Instead, it is necessary to judge them using characteristics that the Vikings considered were admirable in a hero. One important quality would be the willingness to face death head on rather than trying to avoid it. When using this definition of a hero, it is easier to understand why Sinfjotli, Sigurd, and Ragnar were not considered failures to the Vikings. However, even if these characters can be considered as heroes to the Vikings, can they also be considered ideal role models. There is no doubt that these characters made many mistakes throughout their lives. Even though this is the case, it does not mean that the Vikings cannot improve themselves by analyzing these mistakes. By integrating these characters' strengths into their own lives and learning from the mistakes, the Vikings could still use these characters as role models despite the shortcomings. Through this, it can be concluded that the Vikings did consider these characters as heroes and, to a certain degree, role models.

*Research Mentor:*

*Shaun F D Hughes, English*

**Oral Presentation Abstract Number: 75 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Laptop Sticker Poems: Creating Personas in Poetry**

Author:

Sydney Luk, Liberal Arts

Abstract:

This creative project explores the outward expression of individuals through the laptop stickers they choose to display. Laptop stickers are a small yet instrumental method through which individuals can form judgements or establish first impressions of others. These stickers may also reveal an individual's political or religious views, among other personal ideologies. This project began by thinking about how poetry can be a medium that examines, explores, and interprets the personality of others based on these laptop stickers. This project has resulted in the creation of six unique persona poems that are inspired by different individuals' laptop stickers. This work is interested in creating an entirely unique persona, that is, the character an author takes on in written work, and a concept by Carl Jung that describes the facade that an individual projects outward. The creation of this persona through persona poems explores the extrapolation of a single laptop sticker and the persona that results from one sticker and thus a single impression of an individual. In order to create these persona poems, pictures of laptop lids around Purdue's campus were collected and the process of forming a voice and telling the story of that voice behind the laptop stickers ensues in the poems.

*Research Mentor:*

*Dr. Derek Pacheco, English*

*Dr. Don Platt, English*

**Oral Presentation Abstract Number: 76 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Law Letter Collection**

Author:

Isaac Pickett, Liberal Arts

Abstract:

This project involves evaluation of a collection of legal correspondence sent from a Leek law office in the very early 1900s, found while conducting research on the Rare Books Project. This analysis will focus on establishing an historical and social context for the samples. Analyzation of these letters will help to shed light on the modern advancement of early 20th century England and the effectiveness of ephemeral documents in historical study. Analysis of these letters provides traceable lines for both technology and legislation, providing insight into questions both historical and social: What types of legal problems arose for citizens in early 20th century England? What technologies were emerging? How did the citizenry react to these technologies? Using these letters, this project attempts to piece together narratives, painting a broader picture of the legal and political landscape of England in the early 1900s.

*Research Mentor:*

*Elizabeth Mercier, School of Language and Cultures*

**Oral Presentation Abstract Number: 77 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Gudrun Osvifursdottir- Killer Queen**

Author:

Daniel Raftery, College of Science

Abstract:

Gudrun Osvifursdottir is an interesting case study of a woman behaving as a traditional hero in the Viking age. She is unique throughout the ancient sagas in that her character has more agency than any other female, save Valkyries. She is well spoken in all cases, always level headed and capable of earning and keeping the respect of others. She is shown to have stunning intellect and strong control over her emotions in crucial situations; Gudrun uses these skills to raise her level of influence on the people around her. Her tools include cleverness, patience for opportunities, and manipulation through speaking less and more frankly to those whom she is controlling. To this end, Gudrun's will and her actions produce extraordinary outcomes. Gudrun's character changes throughout the saga to become more cold and conceited as she gains more influence and loses more people in her life. However, like all heroes, she is flawed and makes mistakes. And like most tragic heroes, she finds a way to get what she wants, but she never really obtains her deepest desire- a marriage to Kjartan.

*Research Mentor:*

*Shaun Hughes, Medieval Studies*

**Oral Presentation Abstract Number: 78 :: Social Sciences/Humanities**

**College of Liberal Arts**

**“By Reason of My Education”: Thomas Gage, 17th Century Catholic Education, and Anti-Catholicism**

Author:

Madisen Toth, Liberal Arts

Abstract:

In *The English American*, Thomas Gage writes about his travels through New Spain as a Dominican friar, but diverts from this main theme to greet the English politician Thomas Fairfax. Gage explains to Fairfax that he was exiled from England “partly by reason of my education in the Romish Religion.” Gage grew up in a devout Catholic family and was sent out of the country to two Catholic colleges: the English Jesuit College at St. Omer in France and the English College of Valladolid in Spain. Even though he eventually returns to England as a Protestant, Gage can’t help but still mention his early education. Both colleges were known to produce notable Catholic figures, but they also somehow turned Gage and other converts into anti-Catholics. Thomas Gage’s turn from Catholicism seems to be based on his adult experiences, but a closer look at the ways he and other converts describe their Catholic education from St. Omer and the English College in Valladolid suggests that early Catholic education had a major role in their conversion to Protestantism.

*Research Mentor:*

*Kristina Bross, English*

**Oral Presentation Abstract Number: 79 :: Social Sciences/Humanities**

**College of Liberal Arts**

**Papermaking and Paper Quality in Early Modern Europe**

Author:

Carissa Yonan, Liberal Arts

Abstract:

This project aims to analyze the evolution of papermaking from the 16th to the 19th centuries. Research will include looking at materials used to make paper such as linen, hemp, and flax as well as the methods used to create paper and how these materials and methods evolved throughout Europe. A recent tour of Twinrocker Handmade Paper Company has provided an in-depth look at every stage of the papermaking process. Additionally, the rare book collection provides a variety of samples to aid in analyzing watermarks and localizing the paper, as well as comparing paper quality and durability during the Early Modern Period.

*Research Mentor:*

*Elizabeth Mercier, School of Languages and Cultures*

**Oral Presentation Abstract Number:** 80 :: Social Sciences/Humanities

**College of Liberal Arts**

**Thomas Gage, the Invisible Man: Translating Early Modern Scholarship to Wikipedia**

Author:

Kelsey Hoskins, Liberal Arts

Abstract:

In Spanish Wikipedia there are approximately 1.6 million articles and more are continuously added. Thomas Gage: the Dominican friar, explorer, and author of *The English American* was not one of the entries. He has been written about in Spanish scholarly works, yet finding that information requires digging deep into scholarly archives. I believe this is due to his representation within Spanish scholarship, in which he is often called a heretic and reprimanded for his actions. Despite his villainous portrayal within the Spanish gaze Gage deserves to be recognized for his accomplishments. I have decided on creating a non-bias Spanish Wikipedia page on Thomas Gage so that the public can be provided with information that they might not otherwise have access to, either due to his stigma or just the general lack of information circulating about him. In order to create an informational page I have worked to combine both Spanish and English scholarship; to create a fuller, less-bias portrayal. This required sifting through information in Spanish-language scholarship that was older, harder to access and sometimes led to only a single-word mention of Gage. I believe it is critical to give the Spanish Wiki a page on Thomas Gage so that he is no longer an invisible figure of the Spanish history.

*Research Mentor:*

*Kristina Bross, English*

**Oral Presentation Abstract Number: 81 :: Social Sciences/Humanities**

**College of Health and Human Sciences**

**Conveying Speech Disorders in Film**

Author:

Jordan Potter, Health and Human Sciences

Abstract:

The purpose of the research was to analyze how movies portray communication disorders and any common links between the purpose of the movies and their inaccuracies. Movies can affect how the public sees people with these disorders. Inaccurate information could change how someone is seen by the world. Three different films with two different communication disorders were analyzed for accuracy, as well as anything that could affect how people with irregular speech are seen by the general public. The purpose of the films was also analyzed to look for common links between the purpose of the movie and their portrayal of disorders. The research showed that the purpose of the movie greatly affected how the speech disorder was shown in the film. Still Alice was a more informative film. The people involved in the film did a lot of research, so the movie was a good representation of Alzheimer's. Rocket Science was a comedic film, so it was riddled with inaccuracies about speech disorders because the purpose of the film was entertainment. The King's Speech was based on a true story, so it was mostly accurate but still had some inaccuracies to carry the storyline. It was found that the purpose of the film decides whether the portrayal of speech disorders is accurate. The inaccurate films could change a person's view on speech disorders for the worst, while the accurate films could help a person in their interactions with someone with a speech disorder.

*Research Mentor:*

*Shaun Hughes, English*

Poster Number: 1 ::

Withdrawn

**Poster Number:** 2 :: Life Sciences

**College of Agriculture**

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

**Author:**

Andrew Ahlersmeyer, Agriculture

**Abstract:**

Corn cropping systems in the United States have generally involved rotations with soybeans. However, there have been times historically that farmers have switched to a corn after corn system. Although a corn/soybean rotation dominates the Eastern Corn Belt, there are still a number of farmers throughout the Midwest that grow corn after corn. There are many variables that affect the decision to execute a corn after 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 crop rotation decisions. 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 solves for net income under each crop budget. This takes into account not only the profit from growing corn after 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 corn after corn, which will assist them in making economically sound decisions on their farm in terms of choosing their cropping system.

*Research Mentor:*

*Dr. Tim Baker, Agricultural Economics*

*Dr. Bruce Erickson, Agronomy*

**Poster Number:** 3 :: Life Sciences

**College of Agriculture**  
**Gary Parks: Maintaining places for play**

**Author:**

David Armbruster, Agriculture

**Abstract:**

With the long-term goal of creating a pedestrian trail from Gary to the Indiana Dunes National Park, my project re-envision the urban park system for modern Gary with new designs for north border parcels, Ambridge-Mann, Jackson, and Gateway parks, which will catalyze broader regional greenway connections. The legacy of industrial use along the Lake Michigan shoreline has deprived Gary of access to natural resources. Disproportionate heat stress and brownfield density plague the city, resulting in depopulation and depleted natural resources. At the northernmost edge of residential Gary between industry and rail lines, parks lie in complete disrepair and trails have failed without parks to link. The city of Gary lacks financial resources to maintain neighborhood parks established during peak population, discouraging subsequent links to the national park system. Environmental justice hinges on vibrant park spaces and research was needed to show if current population can support a vibrant park and trail community. To show where interventions may be most effective, population density and road activity were mapped, while park serve analysis and tree cover shows where park need exists. Schools were weighted by student population based on their potential to supply community programming and outdoor learning. Park serve boundaries (10-minute walking distance) are overlaid with tree canopy estimated in 50ft. block groups. While population and parks seem balanced, park vacancy highlights the need for felt safety and increased park programming. The project's design phase will propose urban green infrastructure, sustainable for a declining population.

*Research Mentor:*

*Aaron Thompson, Horticulture and Landscape Architecture*

**Poster Number:** 4 :: Life Sciences

**College of Agriculture**

**Evaluation of Cooling Pad Flush Rates on Gilts**

**Author:**

Kristen Cleaver, College of Agriculture

Larissa Shirley, College of Agriculture

Tyler Field, College of Agriculture

Brooklyn Bitting, College of Agriculture

Kouassi Kpodo, College of Agriculture

**Abstract:**

The objective of this study was to evaluate the use of cooling pads on measures of physiological responses in heat-stressed gilts. Twelve gilts were randomly assigned into one of three treatment groups (Control (CN), flush 2.0 L cool water over 30 seconds every 4 minutes (F4), or flush 2.0 L over 30 seconds every 8 minutes (F8)) in a Latin Square design and replicated twelve times. Gilts were fed 1.2 kg at 0700 h and 1300 h each day. The room was gradually heated from 18°C to 32°C or 35°C starting at 0730 h or 1330 h. Two baseline measurements were taken for respiration rates (RR), skin temperature through thermal imaging (IRTemp) and vaginal temperature (VTemp). RR, IRTemp, and VTemp were recorded every twenty minutes after pads were turned on. Once the desired temperature was achieved, the cooling pads were turned on and the room temperature maintained for 2.5 hours. Measurements at the end of heat stress (PostH) and the change in values during the heat stress period (DIFF) were evaluated using PROC mixed of SAS. DIFF in RR during was greater in CN when compared to F4 and F8 ((8, -.67, -.5; 32°C) and (14.2, 1.6, .75; 35°C)). DIFF in Vtemp and IRTemp were not different among treatments. PostH and DIFF for VTemp were significant at 35°C. PostH for RR was significant at 35 °C and 32 °C ( $P=.0074$  and  $0.0472$ ) with CN being greater. Cooling pads, regardless of flush rate, had positive impacts on physiological indicators of heat stress.

*Research Mentor:*

*Allan Schinckel, Animal Sciences*

*Robert Stwalley, Agricultural & Biological Engineering*

*Jay Johnson, Animal Sciences, USDA*

**Poster Number:** 5 :: Life Sciences

**College of Agriculture**

**Effects of cross-fostering and farrowing crate hygiene on litter performance and scours prevalence**

**Author:**

Alexis Falaney, Agriculture

**Abstract:**

Cross-fostering practices can be stressful for sows and piglets, and may impact litter performance. Feces may be pathogenic for piglets and reducing the environmental contamination would increase pig performance. Not performing cross fostering and scraping crates to reduce environmental contamination may improve litter performance and decrease scour incidence. 156 sows were enrolled to the study in a randomized blocked design based on parity (P0-2, P3+) with a 2x2 factorial design. The factors evaluated in this study were effect of cross-fostering pigs post-farrow and effect higher hygiene in farrowing crates. For no cross-fostering, pigs could be removed from the litter to meet teat count. For cross-fostering, it was allowed between litters of the same hygiene group. High hygiene included scraping sow feces 1 time/day from farrowing to weaning, no stepping inside crates, and sanitary mats were placed in aisles to disinfect the boots for High hygiene groups. Standard hygiene included scraping sow feces for 2 days after farrowing, then once a week. Data was analyzed as a 2 by 2 factorial design using the PROC MIXED and GENMOD procedure of SAS with sow as the experimental unit. No significance was found to suggest that higher hygiene in farrowing rooms improves litter performance or decrease scours incidence. Litters that performed cross-fostering had a higher incidence of pigs scouring during the first three days, but this higher incidence didn't affect litter performance. Performing cross-fostering on day 1 and standard hygiene levels showed to have no significant impact on litter performance and pig survivability.

*Research Mentor:*

*Allan Schinckel, Animal Science*

**Poster Number:** 6 :: Life Sciences

**College of Agriculture**

**Reducing Antibiotic Use in Pakistan Poultry Production with Bacteriophages**

**Author:**

Doria L. Gilberg, Agriculture

**Abstract:**

Poultry products account for one-third of all meat consumed in Pakistan and represent a key source of high-quality protein for protein-deficient communities. There is, however, growing concern in Pakistan over the use of antibiotics in poultry production. While the drugs are necessary in many cases to treat and control bacterial infections, the development of antibiotic resistance that coincides with the overuse and misuse of antibiotics poses a clear human health risk. Phage therapy offers an alternative to antibiotics to treat bacterial infections, but without the risk of antibiotic resistance. Here, we describe the development of phage-based treatments to prevent or treat *Salmonella enterica* Var *Gallinarum* infections in chickens in Pakistan. Phages lytic against *Salmonella Gallinarum* (isolated from diseased chickens in Pakistan) were isolated from wastewater collected from seven different locations in Indiana. The lytic spectrum of the isolated phages ( $n = 7$ ) was measured against a library of *Salmonella Gallinarum* strains ( $n = 12$ ). Phages with the greatest lytic spectrum across the largest numbers of *Salmonella Gallinarum* strains were identified for further lytic capacity measurements. Treating *Salmonella Gallinarum* cultures grown to log-phase in liquid medium with individual phages reduced *Salmonella Gallinarum* concentrations an average of 48.6%, 66.7%, 73.0%, and 68.0% at 1, 2, 3, and 4hrs post-treatment, respectively. Future experiments aim to measure lytic capacity of the different phages in more complex environments, such as chicken ingesta. These results will then allow us to identify those phages with greatest potential to reduce infection in the target species (poultry).

*Research Mentor:*

*Paul D. Ebner, Animal Sciences*

**Poster Number: 7 :: Life Sciences**

**College of Agriculture**

**Evaluation of a Hybrid Food Safety Curriculum for Minority Families with Young Children**

Author:

Leah Klinestiver, College of Health and Human Sciences

Lia Rosa, College of Agriculture

Tressie Barrett, College of Agriculture

Han Chen, College of Agriculture

Abstract:

Introduction

The CDC estimates that 9.4 million episodes of domestically acquired foodborne illnesses occur each year in the United States. This is in part due to improper food handling practices in home kitchens influenced by various factors including environment, cultural practices and level of purchase power.

Purpose

The purpose of our study is to evaluate the effectiveness of a culturally-tailored food safety curriculum for Hispanics and African Americans, and to measure behavior change using the Theory of Planned Behavior.

Methods

Each group consisted of thirty people. The subjects received the sessions in their native language, Spanish or English, separately. Topics covered in the education sessions included cleaning, sanitizing, cross-contamination, cooking and chilling. After every session, take-home task data were collected, which covered cleaning, sanitizing, cross-contamination, cooking and chilling and checking the temperature of food and refrigerators in the participants' home kitchens. The pre- and post-surveys contained questions designed to measure the Theory of Planned Behavior constructs of attitude, subjunctive norms, behavioral intention, perceived behavioral control and perceived power.

Results

We are currently collecting and analyzing data. We anticipate participants from both groups will report improved attitude and self-efficacy scores and increase behavior intentions towards applying food safety handling practices within their home kitchens, after the exposure to the curriculum. The study will contribute to the existing literature on food safety education for low-income minority groups in order to reduce the incidence of domestically-acquired food borne illness in the U.S.

*Research Mentor:*

*Yaohua Feng, Department of Food Science*

**Poster Number: 8 ::**

**Withdrawn**

**Poster Number:** 9 :: Life Sciences

**College of Agriculture**

**Using a Split-Root System to Identify Genes Involved in Shoot-to-Root Signaling of Arabidopsis**

**Author:**

Emily Kuhn, Agriculture

**Abstract:**

Increasing nitrogen use efficiency of plants, through approaches such as increasing the capacity of roots to forage for nitrogen, can reduce the need for artificial fertilizers and lead to a cleaner environment. It is known that root-to-shoot long-distance signaling plays an important role in root foraging in Arabidopsis, but the identity of these signals is still unclear. The purpose of this experiment was to determine if certain genes were involved in directing root foraging in Arabidopsis. A unique “split-root” system was developed to study root foraging. For the procedure, Arabidopsis seedlings had their primary roots cut until two lateral roots remained. These two lateral roots were separated using a split plate and exposed to different nitrogen conditions (nitrogen-supplied or nitrogen-deprived). After four days, the roots were scanned and the images were analyzed to compare root growth between the nitrogen-supplied side and the nitrogen-deprived side, as a measurement of the root foraging capacity of the plant. Multiple mutant lines and wild type plants were compared to identify genes that are important in shoot-to-root signaling thus influencing root foraging in Arabidopsis. After these genes are identified, this knowledge can then be applied to suggest new targets for conventional breeding or genetic engineering to help increase nitrogen uptake efficiency and reduce synthetic nitrogen fertilizer use.

*Research Mentor:*

*Ying Li, Horticulture & Landscape Architecture*

*Ryan Patrick, Horticulture & Landscape Architecture*

**Poster Number:** 10 :: Life Sciences

**College of Agriculture**

**Odor discrimination does not vary in the rTg4510 mouse model of Alzheimer's disease**

**Author:**

Katherine Leeson, Science

Leslie Tibbets, Agriculture

Amanda Barbaras, Agriculture

Lindsey Robbins, Agriculture

**Abstract:**

Many tests used to assess mouse models of Alzheimer's disease (AD) are not based on measures used in humans, which can affect the likelihood of translating data from mice to men. A recently discovered human AD measure uses the loss of olfaction as an early warning sign of AD. Olfactory tests reflect normal mouse behaviors such as their tendency to investigate novel smells and can be run in the mouse's home cage. This study hypothesized that smell discrimination in mutant mice would be altered as AD progresses. Specifically, mutant mice will investigate novel smells less than controls. Two transgenes were inserted into mutant mice (Car:Car), which increases tau accumulation in the brain and mimics AD, and measures were compared to controls (WT:WT, Car:WT, WT:Car). In total, 32 mice (rTg4510) were observed at three points: 8, 12, and 16 weeks of age. Mice were balanced across sex, 4 genotypes, and diet. Half of the mice were fed a doxycycline diet, which suppresses the transgene in mutant mice, reducing the progress of AD. To test olfactory abilities, mice were randomly assigned a scent that was placed in their home cage six separate times, for a minute each. On the seventh trial, a new scent was introduced. Latency to approach the scent and total time sniffing each odor was measured. No significant differences were found based on genotype or diet with respect to either olfactory measure ( $p$ 's > 0.05). Our results did not support the hypothesis that olfaction is affected in this mouse AD model.

*Research Mentor:*

*Brianna Gaskill, Animal science*

**Poster Number: 11 :: Life Sciences**

**College of Agriculture**

**Genetic transformation of narrowleaf plantain (*Plantago lanceolata*)**

Author:

Hannah Levengood, Agriculture

Abstract:

The genus *Plantago*, which includes 256 species in its genus, has been used as a research species in several hundred laboratories throughout the world. The genus is especially unique in its features that have led to discoveries including the phenomenon of male sterility, the transport of sugar and the evolution of vascular culture in response to mineral deficiency. Advancements in the last few decades have produced transcriptomic, proteomic, metabolomics and biochemical studies that have helped to identify thousands of genes that participate in the diverse biological process of this genome. However, studies that include a more in-depth analysis of the relationship between genome and phenotype are often limited by the lack of an effective genetic transformation approach in *Plantago*. This project has aimed to overcome the bottleneck that limits further study through creating an efficient transformation protocol in two *Plantago* species; broadleaf (*P. major*) and narrowleaf (*P. lanceolata*). We were able to create a successful protocol in one of the species, narrowleaf, where it was found that *Agrobacterium* infected roots of the species prove to have a high rate of transformation (30%). Future studies are expected to focus on developing a more effective protocol for other species in the *Plantago* genus, while further plant vascular studies on narrowleaf plantain are expected to be conducted using the improved protocol.

*Research Mentor:*

*Cankui Zhang, Agronomy*

**Poster Number:** 12 :: Life Sciences

**College of Agriculture**

**IgG, IgM, protein, and lactose content in sow milk across the course of lactation**

**Author:**

Lea Logan, College of Agriculture

Sarah Luecke, College of Agriculture

**Abstract:**

Piglets are born immunologically immature, so they rely on the transfer of passive immunity in the form of immunoglobulins (Ig) in colostrum and milk from their mother. Evolutionarily, the composition of milk reflects the needs of the neonate across development, so we hypothesized that protein, lactose, IgG, and IgM would vary across time points. This study was conducted to characterize the changes in protein, lactose, IgG, and IgM content in sow milk across the course of lactation. At the time of farrowing (day 0), colostrum samples were collected from multiparous sows (n=9) within an hr of birth of the first piglet. On days 3, 7, and 14 post-farrowing, piglets were removed from the sow for 1 hr, 1 mL of oxytocin was injected into the sow's vulva to facilitate milk letdown, and milk samples were collected. Samples were aliquoted and stored at -80°C until analysis. Bradford assays were utilized to determine percent protein. Lactose, IgG, and IgM concentrations were measured using liquid-chromatography tandem mass spectrometry (LC-MS/MS). Two-way ANOVA analysis, followed by Tukey post-hoc analysis, indicated percent protein was higher ( $p < 0.05$ ) on day 0 ( $10.74 \pm 2.11$  mg/mL) versus days 3 ( $5.00 \pm 0.74$ ), 7 ( $4.16 \pm 0.25$ ), and 14 ( $4.00 \pm 0.24$ ). Lactose concentration was lower ( $p < 0.05$ ) on the day 0 ( $1.52 \pm 0.30$  mg/mL) versus days 3 ( $3.78 \pm 0.27$ ), 7 ( $3.82 \pm 0.35$ ), and 14 ( $3.64 \pm 0.45$ ). Expression and concentration of specific proteins, including IgG and IgM, differed significantly between colostrum and milk.

*Research Mentor:*

*Theresa Casey, Animal Sciences*

*Aridany Suarez-Trujillo, Animal Sciences*

*Karen Plaut, Animal Sciences*

**Poster Number:** 13 :: Life Sciences

**College of Agriculture**

**Determining the Relationship Between Fat Percentage and Lipid Species in Colostrum**

**Author:**

Sarah Luecke, College of Agriculture

Lea Logan, College of Agriculture

**Abstract:**

Colostrum is the first milk available to neonates. Fat content of colostrum is crucial to neonatal survival, as it is utilized for thermogenesis and nutrition. Preliminary studies showed a great amount of variation in percent fat in colostrum. Little is known regarding colostrum synthesis, other than it is synthesized during pregnancy prior to the initiation of fatty acid synthesis in the gland. We hypothesize that all fats in colostrum are from maternal circulation, and the variation in fat content is due to availability and mammary uptake. The purpose of this study was to determine if there was a relationship between colostrum fat percent and lipid species in colostrum. Milk was collected from 9 multiparous sows on days 0, 3, 7, and 14 relative to birth. Percent fat was determined by creatocrit and found to be different ( $p < 0.05$ ) between day 0 ( $12.36 \pm 5.90\%$ ) and day 3 ( $16.22 \pm 3.65\%$ ) but not between day 7 ( $13.13 \pm 2.19\%$ ) and day 14 ( $12.13 \pm 2.45\%$ ). Fat was extracted from milk using the Bligh-Dyer method and profiled using multiple reaction monitoring. Amounts of lipid species were calculated relative to standards and data analysis was performed using Metaboanalyst 4.0. Principle component analysis revealed lactation day had a significant effect on distribution of fats. Correlation analysis of percent fat with lipid concentration indicated strong relationships ( $p < 0.05$ ;  $|r| > 0.80$ ) with eight lipids including five phosphatidylcholines. Identifying lipids that correlate with percent fat enables future research aimed at understanding colostrum synthesized and factors that affect quality.

*Research Mentor:*

*Aridany Suarez-Trujillo, Animal Sciences Department*

*Karen Plaut, Animal Sciences Department*

*Theresa Casey, Animal Sciences Department*

**Poster Number:** 14 :: Life Sciences

**College of Agriculture**  
**Evaluation of Cooling Pads on Gilts**

**Author:**

Paul McDonald, Agriculture

**Abstract:**

**Evaluation of Cooling Pads on Gilts**

P.W. McDonald<sup>1</sup>, L.K. Shirley<sup>1</sup>, T. Field<sup>2</sup>, B. Bitting, K. Kpodo, A.P. Schinckel<sup>1</sup>, J.S. Johnson and R.M. Stwalley<sup>2</sup>

<sup>1</sup>Department of Animal Sciences, Purdue University, West Lafayette, IN, <sup>2</sup>Department of Agricultural and Biological Engineering, Purdue University, West Lafayette, IN

Cooling pads have been developed to remove excess heat from animals during times of heat stress. The study was designed to evaluate the effectiveness of different cooling water flush set temperatures on physiological measures of gilts subjected to heat stress. Twelve gilts were randomly assigned to three treatments (Control (CN), flush 2 L cool water over 30 sec when sensors read 28.0°C (F28), or 29.5°C (F29.5) in a Latin square design. Sows were fed 1.2 kg of feed at 0700 h. Room temperature was gradually increased from 19 °C to either 32 or 35 °C by 0810. This temperature was maintained until 1050 when the room was cooled. The pads were set and turned on when the desired room temp was achieved. Vaginal temperature (VTemp), and cooling pad temperature were measured continuously. Respiration rate (RR) and thermal images (IRTemp) were taken every 20 minutes. The same schedule was followed in the afternoon replicates with feeding at 1300 h. Pre-heat measurements (PreH) and Post-heat measurements (PostH) and differences (PostH - PreH) were evaluated using PROC mixed of SAS. Differences for RR were greater for CN than F28 and F29.5 ((10.17, 7.33, 8.5; 32°C) and (10.33, 14.33, 10.72; 35°C)). Differences in VTemp were slightly higher for CN than F28 and F29.5 ((.19, .15, .14; 32°C) and (.33, .33, .21 35°C)). Differences for IRTemp means for CN, F28 and F29.5 were not significantly different between treatment. Limit fed gilts accumulate excess heat more slowly and require different cooling pad management than lactating sows.

Funded by a Purdue Agseed Grant

*Research Mentor:*

*Dr. Allan Schinckel, Animal Sciences*

**Poster Number:** 15 :: Life Sciences

**College of Agriculture**

**Effect of Day of Induction on Sow and Piglet Performance**

**Author:**

Miranda McGuire, Agriculture

**Abstract:**

Induction of farrowing is a useful herd management tool. However, inducing too early can impact critical biological processes. Inducing at 115d of gestation is widely accepted for commercial sows, though the natural gestation length of purebred lines can exceed 115d. The objective of this trial was to estimate the effect of: 1.) induction at 115d; 2.) induction at 117d; 3.) farrowing naturally  $\leq$  115d or; 4.) farrowing naturally between 116 - 117d of gestation on sow performance and piglet performance. Multiparous, purebred females from a commercial multiplier were assigned an induction date of 115 or 117d of gestation. In total, 2,050 piglets were produced from 601 litters, 185 litters of which farrowed before the assigned induction date. Sow traits analyzed included: percent stillborn, sow mortality, and removal rate prior to weaning. Piglet traits analyzed included: weaning weight, lactation ADG, and pre-weaning mortality. Each trait was analyzed using a generalized linear model, except mortality and removal rate, which were analyzed using a LOGIT model. Results show that piglets from non-induced litters had significantly greater weaning weights ( $P = 0.02$ ) and lactation ADG ( $P = 0.004$ ) than piglets from induced litters. No significant effect of treatment group was detected for analysis of piglet pre-weaning mortality ( $P = 0.19$ ), sow mortality ( $P = 0.12$ ), sow removal rate ( $P = 0.48$ ), or percent stillborn ( $P = 0.35$ ). In conclusion, allowing purebred sows to farrow naturally resulted in significantly better piglet performance from farrowing-to-weaning, than induction at 115 or 117 days of gestation.

*Research Mentor:*

*Allan Schinckel, Animal Science*

*Jenelle Dunkelberger, N/A*

**Poster Number:** 16 :: Life Sciences

**College of Agriculture**  
**Fungal Pathogen Resistance in Arabidopsis thaliana**

**Author:**

Iris Moore, Agriculture

**Abstract:**

This study took a reverse genetics approach to identify genes required for plant resistance to the fungal pathogens *Botrytis cinerea* and *Alternaria brassicicola*. These pathogens kill cells of their host plants, grow and reproduce on nutrients acquired from these dead and dying cells. To identify genes required for resistance to these pathogens, T-DNA insertion mutants of the model organism *Arabidopsis thaliana* were screened for their responses to fungal infection. These mutants were in the Columbia ecotype wild type genetic background. Polymerase chain reaction with gene and T-DNA specific primers were used to screen and identify homozygous mutant lines in different genes. Pathogen assays identified at least one gene required for resistance to *B. cinerea* and *A. brassicicola*. The T-DNA insertion plants displayed increased susceptibility to the two fungal pathogens compared to the wild-type plants. This data was further substantiated by isolating additional but independent mutations in the same gene which also showed the similar disease response phenotypes. Our data paved the way for future investigation of the identified mutant plants and the corresponding gene for their molecular and biochemical functions in disease resistance.

*Research Mentor:*

*Tesfaye Mengiste, Botany and Plant Pathology*

*Chao-Jan Liao, Botany and Plant Pathology*

**Poster Number: 17 :: Life Sciences**

**College of Agriculture**

**Comparing Sampling Methods for Freshwater Mussels in the White River (Muncie, IN)**

Author:

Emily Musenbrock, Agriculture

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 using Adaptive Cluster Sampling. This sampling method begins with surveying the stream substrate surface of an initial quadrat for mussels and excavating up to 15cm of substrate to survey for additional mussels. If a baseline density of mussels is found in the initial quadrat, adjacent areas of the streambed are sampled, both on the surface and excavated in the substrate. During these surveys, biologists record abundance, species, and whether mussels were found on the substrate surface or by excavation. With these data, we hope to better understand the effects of these sampling methods (surface vs. excavated, initial quadrats vs. Adaptive Cluster Sampling) on mussel densities and communities. We are using statistical analyses such as Analysis of Variance (ANOVA) to assess potential differences in data obtained from these survey methods. Ultimately, we hope our analyses will allow biologists to more effectively allocate sampling time and more accurately measure mussel population densities and species richness.

*Research Mentor:*

*Tomas Hook, Forestry and Natural Resources*

*Suse Lagory, Forestry and Natural Resources*

*Laura Bowley, Bureau of Water Quality*

**Poster Number:** 18 :: Life Sciences

**College of Agriculture**

**How gut microbiota shape behavior via the microbiota brain-gut axis**

Author:

Madeleine Nunn, Agriculture

Abstract:

Abstract Redacted

*Research Mentor:*

*Dr. Heng-wei Cheng, USDA LBRU*

*Dr. Jiaying Hu, USDA LBRU*

**Poster Number:** 19 :: Life Sciences

**College of Agriculture**

**Effects of Novel Stimuli on Fear and Distress Behaviors of Commercial Breeding Dogs**

**Author:**

Margaret Pritchett, Agriculture

**Abstract:**

Understanding the behavioral welfare of dogs in commercial breeding kennels is important for improving management practices of licensed breeders. This new area of research can help facilitate dogs' abilities to transition to new homes after retiring from breeding. In the current study, breeding dogs from commercial kennels were exposed to novel stimuli to evaluate their behavioral responses, with emphasis on indicators of fear and distress. Subjects were presented with an orange traffic cone, a realistic dog statue, and an observer performing a standard stranger approach test. Sixty dogs were exposed to the stimuli and behavioral responses were scored using an ethogram developed for the study. Subjects reacted significantly differently to all stimuli for latency to contact to stimulus, locomotor behavior, investigating the environment, sniffing the stimulus, body posture, and position in the pen ( $p < 0.01$  for all comparisons). Post-hoc pair comparisons indicated dogs spent significantly more time in locomotor behavior, investigating the environment, and position at the back of pen—away from the stimulus—when presented with the cone compared to the dog statue and stranger approach. Findings suggest the cone stimulus elicited more stress and fear behavior as compared to the dog statue and stranger approach stimuli. Given these results, commercial breeders should be encouraged to continue socializing their dogs to unfamiliar people and other dogs within their kennels as well as increase exposure of their dogs to more diverse novel stimuli to reduce neophobia, smooth the rehoming transition, and improve the welfare of rehomed dogs.

*Research Mentor:*

*Dr. Candace Croney, Comparative Pathobiology*

*Dr. Shanis Barnard, Comparative Pathobiology*

**Poster Number:** 20 :: Life Sciences

**College of Agriculture**

**Evolution of Embolism Resistance in the Radiated Genus *Silphium***

**Author:**

Joshua Randall, Agriculture

**Abstract:**

The Genus *Silphium* is composed of two subgenera, *Silphium* and *Composita*, which are distinguished by growth habit: as either tall sunflower-like or geophytic herbs, respectively. Both groups have scleromorphic leaves as well as high densities of trichomes. Species in *Composita* are found in drier habitats, and the biofuel species *Silphium perfoliatum* is a member. The radiation of *Silphium* into wetter habitats with increased biomass did not come at the expense of leaf toughness, but selection for more vulnerable hydraulic traits could have potentially occurred. The anatomy of both taxa revealed that the number of vascular bundles, their size, and carbon chain accumulation differed between the two and followed the hypothesis of increased hydraulic machinery and decreased lignification in species from the subgenus *Silphium*. In order to determine if differences are present between the xylem vulnerability to embolism, the optical vulnerability method was performed. Results from this experiment supported the hypothesis that mesic species from the subgenus *Silphium* have traded embolism resistance for increased growth. Further integration of other species in the genus and carbon accumulation study will be performed to increase strength for the hypothesis that this change defines the *Composita* and *Silphium* split. Identifying apomorphies between *S. perfoliatum* and its closest relatives could reveal traits useful for further utilization as a biofuel or conservation species.

*Research Mentor:*

*Scott McAdam, Botany and Plant Pathology*

**Poster Number:** 21 :: Life Sciences

**College of Agriculture**

**Cumulative Risk Assessment of Organophosphate Pesticide Exposure based on Vegetable Consumption in Thailand**

**Author:**

Ishani Roychowdhury, Agriculture

**Abstract:**

Pesticide poisoning is a major public health problem in Thailand. As a result of large amounts of pesticide use by farmers, consumers of Thai produce are likely to ingest more than one type of pesticide from a single crop.

The goal for this study was to evaluate the cumulative dietary pesticide exposure for vegetables produced and consumed in Thailand, with Organophosphates being the primary means of assessment of exposure.

Organophosphate pesticides (OPs) are organic compounds that are known to inhibit the function of the nervous system.

The following methodology was used to analyze pesticide exposure: Pesticide residue data for the period 2013-2016 were extracted from a study performed by Wanwimolruk et al., and food consumption data about people in Thailand were obtained from a dietary survey conducted by Mahidol University. Using disulfoton as the Index Compound (IC), the relative potency factor (RPF) approach was used to assess pesticide exposure.

To gain comprehensive insight into the extent of exposure, the RPF was calculated using Benchmark Dose at 10% (BMD10). After analysis, it was found that the maximum exposure noted was in children aged 3-6 years. Additionally, OP exposure calculated using the BMD10 approach was found to be 4 times greater than the reference dose of the index compound. The pivotal relevance of this research is that it provides policymakers with quantitative information to help support policy changes to address the issue, as well as save the lives of children being affected by this poison.

*Research Mentor:*

*Dr. Yaohua Feng, Food Science*

**Poster Number: 22 :: Life Sciences**

**College of Agriculture**

**Evolution of stomatal development in response to drought stress**

Author:

Kristin Sauder, Agriculture

Abstract:

As climate change presents plants with increasingly frequent and intense droughts, it has become imperative to understand the mechanisms that plants use to adapt to, acclimate to, or tolerate water-stress. Stomata are extremely important for modulating plant water loss, both through stomatal closure and the reduction in stomatal pore index (the percentage of leaf surface that is made up of stomata) in leaves developed after experiencing water stress. There seems to be a great deal of research on the short-term effects of drought on stomata (e.g., stomatal closure in response to abscisic acid) but the literature lacks clarity on the more long-term effects on stomatal development. The goal of this project is to understand the evolution of stomatal development as a method of conserving water. To this end, we exposed plants to varying levels of water stress in a controlled experiment. Once leaves developed under treatment, we assessed the response of the plant by comparing the anatomy and physiology of leaves developed before the stress with leaves developed after the treatment was initiated. To understand the evolution of this trait, we selected three prehistoric plant species for this experiment, two ferns and one ancestral angiosperm to better understand when this trait evolved.

*Research Mentor:*

*Michael Mickelbart, Botany & Plant Pathology*

*Scott McAdam, Botany and Plant Pathology*

**Poster Number: 23 ::**

**Withdrawn**

**Poster Number:** 24 :: Life Sciences

**College of Agriculture**

**Risk Factors Associated with Histiocytic Sarcoma in Bernese Mountain Dogs**

Author:

Morgan Uebelhor, Agriculture

Abstract:

Abstract Redacted

*Research Mentor:*

*Audrey Ruple, Public Health*

**Poster Number:** 25 :: Life Sciences

**College of Agriculture**

**Genetic similarities in phage cocktails targeting Staphylococcus and E. Coli**

Author:

Amanda Ventura, Purdue

Antonia Dyvik, Purdue

Rebecca Slaughter, Purdue

Ben Burns, Purdue

Abstract:

In the past thirty years, phage therapy has blossomed as a promising new treatment for bacterial infections. Phage therapy is a medical treatment that utilizes bacteriophages rather than antibiotics to kill bacteria. Bacteriophages are viruses that infect and kill bacteria. Due to the narrow specificity of phage-bacteria interactions, it has become popular to use multiple phages in phage therapy treatments. These mixtures of multiple phages are known as phage cocktails. Phage cocktail treatments are more successful in killing host bacteria than singular phage counterparts due to the versatility of multi-phage treatments.

This research explored genetic similarities in phages from cocktails targeting the bacteria Staphylococcus Aureus and Avian E. Coli using the bioinformatics tool DNA Master and the NCBI GenBank Database. After genomic analysis of the phage cocktails individually and overall, it was found that phage cocktails have a wide variation in the genetic makeup of the phages used. However, the phages used tend to have higher similarity with phages from other cocktails targeting the same host. Further analysis of these findings would be necessary to make any conclusive results, but this information is a good start to making a protocol for a successful phage cocktail.

*Research Mentor:*

*Dr. Kari Clase, agricultural and biological engineering*

*Ikenna Okekeogbu, Agricultural and biological engineering*

*Gillian Smith, agricultural and biological engineering*

*Emma Lietzke, agricultural and biological engineering*

**Poster Number: 26 ::**

**Withdrawn**

**Poster Number:** 27 :: Mathematical/Computation Sciences

**College of Agriculture**  
**Latent Heat Estimation From UAS**

**Author:**

Maiqi Zhang, Agriculture

**Abstract:**

Latent heat flux is an important indicator of water use and critical for irrigation management. An algorithm was developed to estimate latent heat flux from thermal imagery at the pixel level. The objective of the project is to estimate latent heat flux on the plant and field segment level. The algorithm was developed based on sorghum, we need to revise the algorithm to adapt to more types of crop, such as soybean and corn. One way to improve the algorithm and achieve segment level estimation is to evaluate the proportion of the plant latent heat flux from the sunlit upper layer leaves versus the more shaded lower leaves. These contributions must be measured, which were calculated from measurements taken in 2019 summer using a handheld leaf porometer. Then the corresponding thermal images must be separated out into pixels representing upper and lower canopy areas. Several separation methods have been tested, such as classifying pixel brightness in higher-resolution RGB images or using the digital surface model (DSM) produced when georectifying the thermal and RGB imagery. DSM is a file represents the earth's surface and includes all objects on it. Using DSM examining pixel elevations could assist the soil-plant differentiation, which may increase the accuracy of layer separation. Once we can distinguish these two layers of the plant from RGB images, thermal and visual images could be co-registered to determine these two layers from thermal images, by which the latent heat contribution of these two layers of the plant would be assessed.

*Research Mentor:*

*Keith Cherkauer, Agriculture and Biological Engineering*

*Yan Zhu, Agriculture and Biological Engineering*

**Poster Number:** 28 :: Social Sciences/Humanities

**College of Education**

**Examining the Race of Characters in Picture Books Portraying People with Autism**

**Author:**

Maya Cameron, Education

**Abstract:**

The rate of incidence of those with Autism Spectrum Disorder has been increasing over time. "Students need to see themselves in what they read. They need to know that they are worthy of appearing in literature and that their struggles are not only real, but others also experience them," (Effertz, M.E. 2017). All students, including those with ASD need to see themselves in literature, especially at a young age. In databases such as "TeachingBooks", there are lists of books that portray people of categories of diversity like race, gender, or disability. However, within the broad category of disability, there are levels of diversity within that. Children of every race are diagnosed with ASD and need to see themselves in literature. Twenty-three children's books were examined for the ratio of people of color to white characters portrayed in each picture book. These books came from the Innovative Resources for Instructional Success (IRIS) Center's list of children's books with Portrayals of People with Disabilities. The IRIS Center is an online resource supported by the US Department of Education and Vanderbilt University.

*Research Mentor:*

*Jasmine Begeske, Educational Studies*

**Poster Number:** 29 :: Social Sciences/Humanities

**College of Education**

**Promoting Cultural Capitals and Self-Determination Through Reflective Journaling in First-Year Biology Labs**

**Author:**

Victoria Coats, Krannert School of Management, College of Science

**Abstract:**

First-year biology students have preconceived notions of what it's like studying biology. However, these dominant narratives can hinder students' success and their pathway into the STEM field. Here we had students use reflective journaling as a form of counter-narrative, informed by the Alma Project that aims to increase students' persistence and sense of belonging in STEM. In the intervention, students enrolled in a first-year biology laboratory were asked to do journaling for five minutes four times during the semester, to reflect on their personal experiences. Then, students spent another five minutes "sharing their stories" with their lab group and peers. Analysis of reflective essays, informed by the Community Cultural Wealth framework, identified 11 cultural capitals utilized by first-year biology students: aspirational, attainment, community consciousness, familial, filial, first-generation, navigational, perseverance, resistant, social, and spiritual. Moreover, preliminary data suggest that reflective journaling may also allow expression of students' self-determination. With these implementations, biology students engaged in meaningful reflections that identified their cultural wealth which may help them stay focused on their path to a STEM degree.

*Research Mentor:*

*Nancy Pelaez, Department of Biological Sciences*

*Khanh Tran, Department of Biological Sciences*

**Poster Number:** 30 :: Social Sciences/Humanities

**College of Education**  
**Chicago Public Schools Classroom Behavior**

**Author:**

Lia Dees, Liberal Arts

**Abstract:**

This project examines the effects of implementing a positive behavior reinforcement program into

Chicago classrooms. This was done by remodeling the pre-existing behavior/discipline system which was largely punitive and rarely encouraged or rewarded students. Taking a more positive approach to classroom discipline changes the school environment for both students and teachers alike.

*Research Mentor:*

*Tara Star Johnson, English Education*

**Poster Number:** 31 :: Social Sciences/Humanities

**College of Education**

**A Critical Data Studies Analysis of Smart Campus Recruitment Technology**

**Author:**

Nikita Gerard, Science, Honors

Antonio Dominguez Palomar, Krannert

**Abstract:**

The purpose of this study is to analyze the history of existing student data regulations in order to observe their relevance and applicability to current data collection technologies and predictive analytics models used by universities to recruit prospective students. Drawing from the discipline of critical data studies, we utilize frameworks involving critical platform studies, data colonialism, and surveillance studies to understand how universities' definition of "successful" targeting and recruitment using predictive modeling can limit equitable opportunities for students, particularly those belonging to marginalized groups. We employ a discourse analysis on present policies regulating student data privacy, as well as industry and academic literature describing the predictive analytics used for universities' recruitment strategies, in order to investigate how private corporations and higher education institutions frame the utility of these technologies. Additionally, we study cases of student data protection initiatives from universities in the U.S. and U.K. to critically analyze their impacts on students and institutions. Based on this interdisciplinary analysis, we make recommendations for how student data regulations can be more responsive to recruitment technologies, placing emphasis on algorithmic transparency as a means of facilitating the identification and mitigation of systematic bias within such technologies.

*Research Mentor:*

*Lindsay Weinberg, Innovative Studies*

**Poster Number:** 32 :: Social Sciences/Humanities

**College of Education**

**Retrospective Bibliometric Analysis of Freeman, et.al (2014) active-learning meta-analysis**

**Author:**

Helen Park, College of Education

**Abstract:**

The purpose of my study is to analyze articles that reference “Active learning increases student performance in science, engineering, and mathematics” by Freeman, et al. (2014) (hereafter referred to as “Freeman”).

This study is a retrospective bibliometric analysis. Bibliometrics provide statistics drawn from the metadata of articles, including author(s) information, title, source, abstract, indexing or keywords, etc. I will be using the database Web of Science Core Collection, (WOSCC) a prominent database that indexes the literature of many disciplines. Within this database, Freeman is marked as a “Highly Cited Paper,” and has been cited over 900 more times than other scholarly articles addressing active learning strategies. Through these bibliometric analyses, this project will identify various characteristics of these citing articles by answering the above questions.

As of February 12th, 2020, this article has been cited 1474 articles in WOSCC by articles indexed in WOSCC. 70.01 % of these works came from journals categorized as “ Education Educational Research.” A majority ( 64.84%) of the citing articles came from the United States. Most of the citing articles (74.42%) are journal articles, and nearly 15% of the citing articles are proceedings papers. The publication year with the largest number of works citing Freeman (382, 25.92%) was 2018, with the full year 2017 and partial year 2019 almost tied with 21.10% and 25.71 % respectively. Lastly, the predominant language of the citing articles was English (97.69%).

This retrospective bibliometric analysis provides a visual representation of a widespread in Freeman, et.al (2014) active-learning meta-analysis.

*Research Mentor:*

*Nancy E. Marchand-Martella, college of education administration*

*Jane Yacilla, Libraries*

*Amedee Martella, psychological sciences*

**Poster Number:** 33 :: Physical Sciences

**College of Education**

**Efficacy and Visibility of Misconception-Based YouTube Videos on Introductory Physics Concepts**

**Author:**

Andrew Santos, Science

**Abstract:**

As online videos become a popular resource for learning science, it is crucial to understand what methodologies best convey specific subjects to students and how widespread such methodologies are in the broad array of videos available on platforms like YouTube. Previous studies indicate that it is more effective to teach introductory physics concepts through addressing common misconceptions. Building off this, we look at this teaching style on YouTube. Here, we investigate the efficacy and visibility of Misconception-Based videos compared to their Non-Misconception-Based counterparts among YouTube videos covering the topic of "heat and temperature" in introductory physics. Specifically, we study the number of views on Misconception-Based videos compared to Non-Misconception-Based videos and the reaction from YouTube viewers through comment sections and "comment likes" on these videos.

*Research Mentor:*

*Andrew Hirsch, Physics and Astronomy*

**Poster Number:** 34 :: Mathematical/Computation Sciences

**College of Engineering**

**Destruction Report Analysis via Natural Language Processing**

**Author:**

Aidan Abbott, College of Engineering

Nikkhil Sankar, College of Engineering

**Abstract:**

Every year devastating events such as natural disasters happen that leave city infrastructure in ruins. When devastating events occur surveyors are sent out to record the damage to building infrastructure. Frequently, these surveyors record their findings by writing things down relating to the damage, for example, "Damage Level" is often written down with a specified level. It takes a very long time to analyze the data recorded as it is not recorded in a central computer database but instead on paper forms. Additionally, the data recorded can vary greatly from person to person making it difficult for a computer to interpret. Our team's solution to this problem is to modify an existing end-to-end Natural Language Processing (NLP) architecture which will be able to both locate the recorded information on an image of the destruction reports as well as recognize the text meaning. This solution will decrease the time required to review recorded information in the destruction reports because a computer will be able to do it automatically and output the results in a readable format. Currently, our implemented solution is able to clean the image files provided and locate as well as recognize the words seen in an image by using MATLAB's Object Character Recognition (ocr) software. Our implementation performs best with computer text and we are currently training the ocr model for handwritten information. With our team's solution the analysis of destruction reports will become much faster and help will be delivered to the struggling areas much quicker.

*Research Mentor:*

*Taratal Mondal, Civil Engineering*

*Mohammad Jahanshahi, Civil Engineering*

**Poster Number:** 35 :: Life Sciences

**College of Engineering**

**Hypothetical Model for the Determination of Bacteriophage in Medical Applications**

**Author:**

Sofia Alfieri, Engineering

Jessica Nieters, Engineering

Sarah Heffner, Engineering

Jieun Lee, Engineering

Nicole Branca, Science

**Abstract:**

The purpose of our research is to plan out a hypothetical math model that would rank phages, which are viruses that infect bacteria, using different databases to determine which phage would be best for a specific medicinal use. Phages have become a new form of delivery of medicine to the targeted cells in patients. The technique is new, but has potential for wide application and research. By developing a hypothetical math model, in the future, other researchers would be able to develop it into a real software program to follow and phage therapy could gain attention within the research community. The idea for our model was created by selecting phages derived from literature on phages selected for treatment. The selected phages were analyzed for similar properties among their cohort and compared to phages as a whole. The programs Phagesdb, Phamerator, PECAAN, Pymol, and Itasser were used to analyze the phages. These programs allow for the review of the phages genomes, amino acid and protein sequence, protein structure, and phage gene functions. The noted similarities were used to decide what features would work best in the model and based off of that we could generate an algorithm.

*Research Mentor:*

*Emily Kerstiens, Agricultural and Biological Engineering*

*Joseph Krampen, Agricultural and Biological Engineering*

**Poster Number:** 36 :: Physical Sciences

**College of Engineering**

**Numerical Analysis of Stick Bombs and Model Validation**

**Author:**

Lucas Allegrette, Purdue University

**Abstract:**

Stick bombs are popular toys made solely from bent popsicle sticks that are held together by stored elastic energy. The removal of a critical stick triggers a chain reaction where the strain energy is converted to kinetic energy. While previous studies have worked to create an analytical model, the present study presents a numerical analysis of the stick bomb problem in the context of a finite element model. This allows for the observation of properties that would be difficult to obtain experimentally. Prior work has demonstrated the viability of such simulations, but the accuracy has not been investigated. Several stick bomb configurations were created using ABAQUS finite element software, with the sequential use of a static analysis for prestress and a subsequent explicit analysis for disintegration. A visual representation of the reaction, as well as results for the residual stress and release of energy were observed throughout the simulations. The detonation of an A-frame bomb was simulated, and the results were verified by observing the strain state and energy release of the simulation. While stick bombs are a popular toy, we demonstrate that some of their physical properties relate very well to other engineering problems. For example, the construction of these stick bombs may give us insight to how many bird's nests remain intact even after several years of being exposed to the elements. This may be useful in developing processes to build longer lasting yet more cost-effective structures.

*Research Mentor:*

*Dr. Thomas Siegmund, Mechanical Engineering*

**Poster Number:** 37 :: Mathematical/Computation Sciences

**College of Engineering**  
**CAM2 Crowdsourcing Research Group**

**Author:**

Phillip Archuleta, Engineering

Esteban Gorostiaga, Engineering

Gore Kao, Engineering

Yukyung Lee, Science

Kaiwen Yu, Engineering

Ashley Kim, Engineering

Fischer Bordwell; Xiao Hu; Haobo Wang; Anirudh Vegesana;, Engineering; Science; Science; Engineering;

**Abstract:**

Despite many exciting innovations in computer vision, recent studies reveal a number of risks in existing computer vision systems. This suggests the results of such systems may be inaccurate and untrustworthy, stemming from dataset bias. Many of these risks can be partly attributed to the use of a training image dataset that exhibits sampling biases and thus does not accurately reflect the real visual world. Being able to detect potential sampling biases in the visual dataset prior to model development is thus essential for mitigating the fairness and trustworthy concerns in computer vision. We are developing a three-step crowdsourcing workflow to get humans into the loop for facilitating bias discovery in image datasets. By doing data pre-processing, images from distinct datasets will be clustered by different features they present, such as colors and shapes. Following this procedure, crowd workers will be given these images and tasked with generating concise questions and answers describing any patterns. Additional crowd workers will use the previously created questions and provide answers meant to verify the initial data. A third set of crowd workers will analyze all the data collected and determine whether the results are logical or not. Employing this workflow, we aim to refine the efficiency and robustness of our previous model, which was used to better identify sampling biases in real-world image datasets that are widely used in computer vision research and system development.

*Research Mentor:*

*Yung-Hsiang Lu, Electrical & Computer Engineering*

*Ming Yin, Computer Science*

**Poster Number:** 38 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**CAM2: Embedded Vision 1**

**Author:**

Vasstav Arora, Colledge of Science

Siddharth Srinivasan, College of electrical and computer engineering

Seyram Mortorti, College of electrical and computer engineering

Xin Wang, College of electrical and computer engineering

**Abstract:**

Our research aims to train a computer vision based machine learning model to detect and intercept incidents of unsafe behaviour that lead to accidents at indoor factory settings such as the Bechtel Innovation Design Center (BIDC) at Purdue. As machine learning models require large amounts of data to be trained, generating the required data would involve placing people in danger, committing unsafe behavior around dangerous machinery and possibly being victims of accidents. Therefore, in such situations, researchers are using virtual images to overcome these challenges. We take a similar approach by attempting to create virtual datasets of unsafe behaviour in the BIDC workspace. We use photogrammetry and 3D laser scanning to recreate the indoor BIDC workspace in a 3D virtual computerized environment. We use designing and simulation softwares such as Blender 2.8, a free and open-source 3D computer graphics software tool-set, to simulate and generate synthetic images. This method allows the creation of physically accurate images that are indistinguishable from real images to the machine learning models. Further, we validate our model by comparing the accuracy of our virtual images with real images obtained from the available dataset. The results indicate that our virtual images consistently deliver features and details comparable to real data of indoor unsafe behaviour and accidents.

*Research Mentor:*

*Yung-Hsiang Lu, Computer Engineering*

**Poster Number:** 39 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**  
**Synthetic Dataset Generation**

**Author:**

Vaastav Arora, College of Science

Siddharth Srinivasan,

**Abstract:**

Our research aims to train a computer vision based machine learning model to detect and intercept incidents of unsafe behaviour that lead to accidents at indoor factory settings such as the Bechtel Innovation Design Center (BIDC) at Purdue. As machine learning models require large amounts of data to be trained, generating the required data would involve placing people in danger, committing unsafe behavior around dangerous machinery and possibly being victims of accidents. Therefore, in such situations, researchers are using virtual images to overcome these challenges. We take a similar approach by attempting to create virtual datasets of unsafe behaviour in the BIDC workspace. We use photogrammetry and 3D laser scanning to recreate the indoor BIDC workspace in a 3D virtual computerized environment. We use designing and simulation softwares such as Blender 2.8, a free and open-source 3D computer graphics software tool-set, to simulate and generate synthetic images. This method allows the creation of physically accurate images that are indistinguishable from real images to the machine learning models. We plan to validate our model by comparing the accuracy of our virtual images with real images obtained from the available dataset, hoping for results that indicate our virtual images consistently deliver features and details comparable to real data of indoor unsafe behaviour and accidents.

*Research Mentor:*

*Yung-Hsiang Lu, Electrical and Computer Engineering*

**Poster Number:** 40 :: Mathematical/Computation Sciences

**College of Engineering**

**Mobile License Plate Detection iOS Application**

Author:

Tremael Arrington, Purdue University

Yuqing Fan, Purdue University

Patool Kutmah, Purdue University

Abstract:

Abstract Redacted

*Research Mentor:*

*Edward Delp, Electrical and Computer engineering*

**Poster Number:** 41 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Alternative Energy Grid Integration and Systems**

**Author:**

Davis Ashbrook, Engineering

Sachi Rajadnya, Engineering

Nadeem Siddique, Engineering

Favour Agbara, Engineering

**Abstract:**

In the effort to electrify the transportation industry, with the goal of reducing greenhouse emissions associated with fossil fuel use, a revolutionary system, Dynamic Wireless Power Transfer (DWPT), has been developed within the past several years. DWPT is a system capable of wirelessly charging electric vehicles (EVs) through electromagnetic induction while they are driving on the road. DWPT will be a valuable contributor to electrifying the transportation industry as it will make EVs more attractive via a decrease in required battery storage, reducing the EV cost, as well as providing unlimited driving range for extreme convenience and reliability. In order for a DWPT system to be feasible to build, an efficient method of connecting the EV drivers to the operators of the DWPT infrastructure must be established. In this study we present a cross platform mobile application, enabling EV drivers to conveniently plan and pay for their use of the DWPT service. This mobile application has a simple procedure for EV drivers to plan a trip, then instantly view, and be billed, the cost for the DWPT charging on said trip. This project will specifically analyze the mobile app's potential for heavy duty EV drivers, as they are almost constantly on the road and have the most to gain from the DWPT system. An effective interface of this sort encourages the feasibility of a DWPT system, which has the potential to push the world towards a complete adoption of EVs.

*Research Mentor:*

*Dionysios Aliprantis, Electrical and Computer Engineering*

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

**College of Engineering**

**Effect of Mutation Frameshifts in Mycobacteriophage Organisms**

Author:

Kasia Ashwill, Engineering

Ji Won Choi, Engineering

Andrea Pegg, Engineering

Nicole Geer, Engineering

Rachel Thomas,

Abstract:

Mycobacteriophages are viruses that infect mycobacterial hosts with high specificity. Frameshift mutations can occur in a phage gene that lengthen or shorten the amino acid sequences to aid development and function. In humans and other mammals, these frameshifts create abnormal proteins which can potentially lead to fatal diseases. The purpose of this project was to determine the impacts of frameshifts caused by mutation in genomes and the implications this has to disease in organisms other than bacteriophages. In order to do this, analysis of frameshifts in different bacteriophage clusters, hosts, and documentation of frameshifts in bacterial organisms were conducted. Researching simplified cases such as bacteriophage was conducted, first in an analysis and comparison within literature sources. Then specific non-draft phage genomes with known frameshifts were analyzed using DNAMaster. The mechanisms of the frameshifts occurring in phages were analyzed using the protein sequences, and the causes and consequences, even if beneficial, were analyzed. Additionally, a comparison was conducted to determine the causes and consequences of mutation frameshifts that occur in human beings, and a brief analysis of resulting diseases was discussed. The differences and similarities between frameshifts and their function between the bacteriophage and other models were discussed. Creating a frameshift function in a model organism will provide information to extrapolate to human models.

*Research Mentor:*

*Dr. Kari Clase, Agricultural and Biological*

*Ikenna Okekeogbu, Agricultural and Biological*

*Gillian, Agricultural and Biological*

*Lauren Oparah, Biological Engineering*

**Poster Number:** 43 :: Life Sciences

**College of Engineering**  
**Phage Protein Phylogeny**

**Author:**

Maansi Asthana, College of Engineering

Sean Renwick, College of Engineering

Anita Gopalrathnam, College of Engineering

Julia Mollenhauer, College of Engineering

Alyssa Easton, College of Engineering

**Abstract:**

A large part of genomics is the understanding of how genes traverse generations. Because bacteriophages replicate and mutate so quickly, they can provide incredible amounts of information on how genes are shared and change. A method of visualizing this evolution is called a phylogenetic tree. The evolutionary history of phages has largely remained uncovered due to their relatively recent discovery. While phylogenetic trees traditionally have been used to relate different organisms, it is possible to show the evolutionary paths of bacteriophages.

The analysis of one type of protein present in multiple phage clusters and phages could serve as a guide to mapping the phages' evolutionary relationship. For this research project, the protein Lysin A was selected. The genomic sequence and structure of Lysin A was analyzed in each phage selected from different clusters to predict the evolutionary path of the selected bacteriophages. Two phylogenetic trees were constructed, one based upon the structural comparison and the other upon the amino acid sequence comparison. These trees were then compared to see if the analysis methods yielded similar results.

It was found that structural alignment and amino acid sequence alignment methods for generating phylogenetic trees do not yield similar results. No conclusions could be drawn about the evolutionary paths of the phages of interest based upon an analysis of Lysin A. Further investigation may determine which method of analysis draws a more accurate predictive phylogenetic tree.

*Research Mentor:*

*Kari Clase, Agricultural and Biological Engineering*

*Gillian Smith, Agricultural and Biological Engineering*

*Ikenna Okekeogbu, Agricultural and Biological Engineering*

*Shruthi Garimella, Agricultural and Biological Engineering*

**Poster Number:** 44 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Radiated Emissions of a Cell Phone to Bluetooth Speaker System**

**Author:**

Rony Johny Augustine, College of Engineering

Maanus Singh Gulia, College of Engineering

**Abstract:**

The objective of the project was to test a smartphone-bluetooth speaker system to observe the radiated emissions of the system operating in it's normal modes in preparation for FCC pre-compliance.

Three different operating modes were defined for the system under test. The first one was when the speaker was receiving bluetooth signals from the smartphone. The second mode of operation was when the speaker was charging. The third state consisted of the speaker charging and receiving bluetooth messages simultaneously.

In each of these modes of operation, a spectrum analyzer was used with appropriate sensing probes to identify the in-band and out of band RF frequency components transmitted by the smartphone and unintended components produced by the speaker.

All radio frequency emissions indicated compliance with FCC regulations for unintentional and intentional radiators.

*Research Mentor:*

*Barrett F. Robinson, Electrical and Computer Engineering (ECE)*

**Poster Number:** 45 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Effectiveness of exoskeletons to minimize musculoskeletal pain of surgical teams**

**Author:**

Dongwei Bai, Engineering

**Abstract:**

Over half of surgeons in the U.S experience musculoskeletal disorders due to overuse of muscle and awkward postures in surgeries. Exoskeletons can be a potential solution to minimize these pains caused by non-ergonomic postures during surgeries. This study aimed to evaluate the effectiveness of exoskeletons by comparing differences in biomechanical angles of surgical team members with and without the exoskeleton. Inertial measurement units were placed on the participants' chest, left and right bicep, low back, and forehead during laparoscopic procedures, and upper body biomechanical angles were calculated. Results from the study will add to the understanding solutions to minimize pain and fatigue of surgical team members during surgery to eventually improve their performance and extend career longevity.

*Research Mentor:*

*Cha S. Jackie, Industrial Engineering*

**Poster Number:** 46 :: Physical Sciences

**College of Engineering**

**Effects of Zeolite Framework Topology on Cu Ion Exchange and Diffusion During NO<sub>x</sub> Selective Catalytic Reduction with Ammonia**

**Author:**

Lucas A Baston, College of Engineering

**Abstract:**

Copper exchanged zeolites are well-known as catalysts for the selective catalytic reduction (SCR) of NO<sub>x</sub> into environmentally benign products. Previous studies have shown that the reaction requires the diffusion of two copper cations into the same zeolite void. The most prevalent copper zeolite used in SCR is the chabazite framework topology, which has three-dimensional small pores. Here, we aim to understand how the internal void structure of zeolite frameworks affects the ability of copper cations to exchange with the protons and mobilize during reaction conditions. Structures of interest for this study were ones that had one-dimensional channels, different cage dimensions, and varying pore sizes. These materials were prepared following literature reports or purchased from chemical suppliers. Zeolite cations were ion-exchanged with copper nitrate at varying concentrations to obtain various Cu weight contents. Following Cu<sup>2+</sup> exchange, samples were analyzed using inductively coupled plasma and atomic absorption spectroscopy to determine the molar Cu weight percent of the samples. Exchange conditions were manipulated to study how they affected the ability to exchange Cu<sup>2+</sup> cations within different structures. With kinetic tests, these materials will give insight to the effect of restricting the copper ions to one-dimensional channels or changing size and shape of internal voids. It is hypothesized that restricting the copper ion mobility to 1-D diffusion will reduce the number of reactive Cu cations, providing better understanding to the role of Cu diffusion on the catalytic cycle. We compare SCR kinetic data on a subset of the samples to chabazite as preliminary results.

*Research Mentor:*

*Rajamani Gounder, Chemical Engineering*

*Claire T Nimlos, Chemical Engineering*

*Casey B Jones, Chemical Engineering*

**Poster Number:** 47 :: Mathematical/Computation Sciences

**College of Engineering**

**DeepFreight**

**Author:**

Caio Teixeira Bastone, Engineering

**Abstract:**

Abstract

In 2019 at Purdue University, the starships robots were introduced to campus. The starships serves as a new way to delivery food throughout campus. The problem we are trying to solve is to better the delivery system of the starship robot by optimizing its routes with other starships robots.

To better its system, I analyzed the places that customers can order food from and the places that it can delivery. The first conclusion was that most restaurants that are using the starship services are the restaurants at Purdue Memorial Union, Crave Food Hall and Lawson. Additionally, they delivery to most dorms on the west side of campus.

First, I added all the restaurants that are nearby campus at W. State St and Northwestern Avenue. Then, I started by mapping out the demand that arises, along with the peak order timings. The next step would be to crawl the data out of a map, using an API from Google Maps. After which, I will decipher the estimated time of arrival between all delivering locations, and save both the map and ETA as a "pickle file". Next will be to create a code that creates order between 2 locations.

In conclusion, the peak hours for these robots would be night time for the dorms on campus and lunch hours for all campus buildings. Lastly, the most common route of delivery seen was between PMU and the dorms at night and to campus buildings during lunch time.

*Research Mentor:*

*Vaneet Aggarwal, Industrial Engineering*

*Caleb Tung,*

*Abhishek Kumar Umrawal,*

**Poster Number:** 48 :: Mathematical/Computation Sciences

**College of Engineering**

**Power Systems Optimization using a Physics-Informed Neural Network with Deep Reinforcement Learning**

**Author:**

Elijah Berscheid, Engineering

Viranch Bateriwala, Engineering

Ranjan Behl, Engineering

**Abstract:**

Power outages are highly disruptive to all and can be catastrophic for critical consumers, and corrective maintenance is extremely costly. As power grids increase in complexity, human operators are becoming ineffective to monitor and manage real-time issues. Our research pursues methods of automating power system management using physics-informed deep reinforcement learning. We seek to analyze the impact of physics-informed methods on neural networks and compare our solution with the top entries from the CodaLab power systems competition. We develop a deep Q-learning agent to predict the operations that will minimize the frequency and severity of line failures, which defines performance. Operations, which modify the system architecture, are executed on a power systems simulator within the CodaLab environment. To create a physics-informed neural network, our agent enforces certain rules, such as the balance of energy production and consumption, to enhance its efficiency, allowing it to learn faster and more accurately. We measure performance by the cumulative simulator reward over a defined set of training iterations. Our initial deep Q-learning agent showed an improvement of 12.5% over the baseline performance of the no-action policy. With further development of the physics-informed model, we aim for an improvement of at least 50%. So far, our results show great potential for success. The methods and algorithms developed in this research may be applied to real-world power systems for a substantial reduction in costs, maintenance downtime, and consumer disruptions.

*Research Mentor:*

*Guang Lin, Mathematics*

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

**College of Engineering**  
**Community Based Agriculture**

**Author:**

Oliver Bhamani, Engineering

Joyce Bernardino, Engineering

Chicoyah Hunt, Engineering

**Abstract:**

Gary, Indiana is adversely affected by a food desert. Its community members have limited access to fresh produce, and as a result, consume more processed foods, a diet choice that causes numerous health problems such as heart disease, diabetes, and obesity.

We are Soul CBA (community based agriculture), a sub-team of EPICS UF, and we are developing a meal-kit service with fresh produce to distribute to the community. The meal-kit package will include produce grown at our project partner's farm, Peace Garden and Farms, which is located in Gary, Indiana. It will also contain a card with nutritional information and a culturally relevant recipe from our recipe base, which consists of healthy versions of familiar soul foods. We choose recipes for our meal-kits based on the availability of produce at the farm to optimize their use.

We want this service to be provided to community members free of charge, to help eliminate the barriers they have to healthy diet options. We are currently exploring distribution options such as working with local food pantries to distribute the meal kits. We will be working with a food pantry and eight families in Gary to perform our first test run of the system.

This meal-kit service will decrease the impact of the food desert in Gary by bringing fresh produce straight to the table. By providing people with produce and a means to use it through cooking, we hope to improve the quality of life of the community through healthier eating habits.

*Research Mentor:*

*Tamara Benjamin, Horticulture and Landscape Architecture*

*Sanoar Rahman, ABE*

**Poster Number:** 50 :: Life Sciences

**College of Engineering**

**Phage Therapy: Analysis of Bacteriophage Genomes for Potential Tuberculosis Treatments**

**Author:**

Allison Biddinger, College of Engineering

Sonya Dervishian, College of Engineering

Sara Mavity, College of Engineering

Mari Leland, College of Engineering

**Abstract:**

Bacteriophages, also referred to as phages, are viruses that infect bacteria, reproduce using bacteria as hosts, and lyse the bacterial cells to release new phage particles into the surrounding environment. In recent years, antibiotic resistance has become a growing problem in the medical field, as bacteria become unresponsive to classical antibiotics. Currently, more than 3 million illnesses each year are caused by antibiotic resistance. Subsequently, phage therapy, the therapeutic use of lytic bacteriophages, is a rising form of treatment targeting pathogenic bacterial infections, such as tuberculosis. This study aimed to investigate the viability of bacteriophage genomes for use as candidates in the treatment of tuberculosis, as new phage genomes need to be identified and analyzed to expand and improve clinical treatment options. Specifically, this project analyzed three phage genomes currently being used in treatment of tuberculosis (Muddy, BPs, ZoeJ) and compared the genomes with viable candidates found in the Actinobacteriophage Database. DNA Annotation programs were utilized to determine the feasibility of use in clinical applications based upon data comparisons. Furthermore, advantages and disadvantages of using phage therapy were also investigated, such as the cost, effectiveness, and ethical limitations, to determine the practicality of phage therapy as a replacement for classical antibiotics.

**Keywords:** bacteriophages, phage therapy, tuberculosis, antibiotic resistant bacteria

*Research Mentor:*

*Dr. Kari Clase, ABE*

*Gillian Smith, ABE*

*Ikenna Okekeogbu, ABE*

*Emma Lietzke, ABE*

**Poster Number:** 51 :: Social Sciences/Humanities

**College of Engineering**  
**Mental Health Tracking App**

Author:

Federico A Brandt, Engineering

Ryan Slattery, Engineering

Hannah Paul, Engineering

Abstract:

Abstract Redacted

*Research Mentor:*

*Nan Kong, Biomedical Engineering*

**Poster Number:** 52 :: Physical Sciences

**College of Engineering**

**Enhancing the Energy Efficiency of Desalination via Batch Reverse Osmosis**

**Author:**

Katie Brodersen, College of Engineering

Alec Lanter, College of Engineering

Yi Xie, College of Engineering

**Abstract:**

As the demand for water security expands globally, sustainable desalination technologies become more critical. Traditionally, continuous reverse osmosis (RO) requires that constant, high pressure must be applied to the system to overcome the osmotic pressure. Closed-circuit reverse osmosis (CCRO) recirculates brine into the feed line, increasing the pressure of the system with each pass. This project investigates batch reverse osmosis, which varies the applied pressure over time to closely follow the osmotic curve, conserving the excess energy that is used to maintain a continuous RO system. Unlike CCRO, batch RO avoids the exergy generated when brine and feed are mixed by using a variable displacement cylinder (VDC), into which brine output from the RO membranes recirculates. As the system reacts to increasing brine concentration with each “batch”, the pressure of the system increases. Batch RO has been modeled to achieve the lowest specific energy consumption per volume of water desalinated. This team is currently integrating the batch RO model as a hydraulic system to demonstrate these expected results. The hydraulic system is operated by a control system using conductivity sensors to track the salinity over time, as well as pressure and flow sensors which interface with a variable frequency drive that sets the applied flow rate of the high-pressure pump. Solenoid valves are used to switch the direction of the recirculating brine stream into the VDC with each pass. The goal of this research project is to improve the sustainability of desalination and the economic viability of its use globally.

*Research Mentor:*

*Prof. David Warsinger, Mechanical Engineering*

*Sandra Patricia Córdoba Rentería, Mechanical Engineering*

**Poster Number:** 53 :: Mathematical/Computation Sciences

**College of Engineering**

**Data Mining for Multi-million-year Cycles in Earth History**

**Author:**

Garrett Cagle, Engineering

Eric Langbert, Engineering

**Abstract:**

Data mining is the process of extracting and comparing a wide range of data in hopes of finding correlations. Our project focusses on user-interfaces for the analysis of geological trends of Earth's history, with the goal of finding correlation between multi-million-year datasets. For example, what is the relationships between deep-earth processes and the rates of evolution of life. For this purpose, we are enhancing a Java program that has been in progressive development by VIP teams for many years, known as the Timescale Creator that is used by geologists worldwide. The program allows for the display and customization of a visual representation of many different types of data that have been compiled by Purdue geologists and international teams.

Our initial scientific question is whether there are relationships among the exchange of deep-earth (core-mantle) heat using a proxy of rates of magnetic field changes, the resulting rates of seafloor spreading and uplift of continents using the proxy of strontium-isotopes, and the rates of evolution and extinction of species of life. Extracting these rates-of-change and frequency can allow us to develop theories about the causes of processes such as evolution and climate change. Our initial findings are very enlightening, and we will prepare a paper for a scientific journal.

To achieve our data mining analysis and make these methods available to global users, we have coded data analysis functionality into the program using Java. Another emphasis of our work this year is enabling users to be able to visualize and analyze trends in the appearances of different species, isotope levels of Oxygen (= global temperature), Strontium, Carbon-13 (=global carbon cycle and maybe warming episodes), and many more.

*Research Mentor:*

*James Ogg, Earth, Atmosphere and Planetary Science*

**Poster Number:** 54 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Navigation System for Spider Inspired Robotics**

**Author:**

Adrian Calderon, College of Engineering

Krinal Doma, College of Engineering

Joel Hulsizer, College of Engineering

**Abstract:**

Numerous solutions can be applied to a specific problem, however, not every solution is beneficial to all. Crop pesticides and genetic modification for pest-resistant plants help farmers, yet generate new problems. Pesticides pollute the air, and can cause serious health issues for humans and wildlife. Genetically modifying plants, making them genetically modified organisms (GMOs) produces food that poses potential health risks, such as allergic reactions. Furthermore, approximately 3.7% of 11 million cargo transported to the U.S. is regularly inspected, potentially leading to a number of legal violations. A spider inspired robot, or a spiderbot, can provide a solution to both of these issues. Several spiderbots can autonomously move through crop fields and eliminate pests without using pesticides or GMOs. Spiderbots can also quickly and efficiently inspect ship cargo. For the spiderbot to operate effectively, it requires an autonomous navigation system. For the navigation system prototype, an arduino was used as the microcontroller to connect to a GPS unit that displays the current latitude and longitude. The system was tested by going to certain locations around campus, and comparing GPS's location to the official latitudinal and longitudinal coordinates, revealing a high accuracy of location. Currently, the team is writing a program in Python that tracks, records, and sends the spiderbot's coordinates. Future prospects include the addition of ultrasonic sensors to the system, and to update the interface to include a raspberry pi to allow for tasks of increased complexity to be performed, as well as for data to be stored.

*Research Mentor:*

*Eric Nauman, Mechanical Engineering*

**Poster Number:** 55 :: Physical Sciences

**College of Engineering**

**Development and Characterization of a Stretchable Hydrogel for Intra-Tissue Pressure Measurement**

Author:

Natalie Carter, Engineering

Abstract:

Abstract Redacted

*Research Mentor:*

*Rahim Rahimi, Materials Engineering*

**Poster Number:** 56 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Effect of elevated temperatures on Recycled PP fiber-reinforced cementitious composites performance under flexural stresses**

**Author:**

Alberto Castillo, Engineering

Vito Francioso, Engineering

Carlos Moro, College of Engineering

**Abstract:**

In 2017, plastic generated about 35.4 million tons of waste in the United States. Most of this plastic ends up in landfills or in the sea, causing environmental and health-related problems. Only 9% of the plastic waste is recycled. The use of plastic waste as a compound in concrete and mortar could help to mitigate this problem. Previous research showed that plastic waste recycled in the form of fibers may improve flexural toughness, but it reduces other mechanical properties of the composite. The main reason for this reduction is the weak bonding between the cement paste and plastic fibers. However, no study was found on how recycled polypropylene (PP) fibers affect the performance of mortars after exposure to elevated temperatures. The objective of this research is to study the effects of elevated temperature exposure on recycled fiber-reinforced cementitious composite performance. Four mixtures with different percentages of PP fibers (0%, 0.5%, 1%, and 1.5% by volume) were studied. For each mortar, 9 samples of 40x40x160 mm were cast and cured for 28 days. While 3 samples of each were tested under standard conditions, the other 6 were exposed to high temperature (200 °C) for 2 hours and cooled in two different ways (3 under fast cooling and 3 under slow cooling). After that, flexural strength tests were performed. Samples with plastic fiber showed a higher elevated-temperature resistance. A potential explanation was found in the optical microscope images that suggested a strengthen of paste-fibers bounding after the exposure to 200 °C.

*Research Mentor:*

*Mirian Velay-Lizancos, Civil Engineering*

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

**College of Engineering**

**Can machines see your risk when lifiting?**

Author:

Nan Chen, Purdue Polytechnic Institute

Lohith Chittineni, School of Engineering

Abstract:

Abstract Redacted

*Research Mentor:*

*Denny Yu, Industrial Engineering*

*Guoyang Zhou, Industrial Engineering*

**Poster Number:** 58 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Uncertainty Quantification in Reinforcement Learning**

**Author:**

Zhikai Chen, College of Engineering

Chengjun Guo, College of Engineering

**Abstract:**

Reinforcement learning(RL) is a machine learning method that is widely accepted as the solution of optimal control problems such as power system control. Uncertainty in reinforcement learning is caused by the absence of prior knowledge of the data. The goal of uncertainty quantification is to quantitative characterization and reduce the amount of uncertainty. Uncertainty Propagation is a possible approach to find uncertainty. According to Direct Uncertainty Estimation in reinforcement learning: Uncertainty can be expressed in terms of a probability distribution over the space of environment models, and this uncertainty can be propagated to the action-value function via Bellman iterations. However, uncertainty propagation is computationally infeasible. We should either find another solution or improve the efficiency of uncertainty propagation. There is a huge amount of applications of reinforcement learning in power systems such as intelligent monitoring, intelligent diagnosis of equipment and fault detection. We have been provided an environment of power systems and an algorithm of deep reinforcement learning(DQN). There are some existing solutions for measuring the uncertainty of deep reinforcement learning(DRL). This semester, we are going to test the feasibility of these solutions in measuring the uncertainty of an existing algorithm in the power system.

*Research Mentor:*

*Guang Lin, Departments of Mathematics & Statistics & School of Mechanical Engineering*

**Poster Number:** 59 :: Mathematical/Computation Sciences

**College of Engineering**

**Molecular Dynamics Simulation of Carbon Nanotube**

**Author:**

Jia Lin Cheoh, College of Science

**Abstract:**

Carbon nanotube has shown promising attributes for effective water filtration. Existing literature has investigated on individual attributes of carbon nanotube that enhanced flow properties extensively. However, simultaneous manipulations of many critical variables have not been looked into. We believe that each attribute has even more potential to contribute uniquely to the overall design of the carbon nanotube if we know how one attribute affects the other attribute. For example, the performance difference between a heavily charged carbon nanotube without coating compare to a lightly charged carbon nanotube coated with boron nitride. Our research investigates the inter-relationship between the different characteristics of carbon nanotube such as chirality, charge, applied pressure, water temperature and thickness of pores to understand the optimum design that will allow efficient filtration of heavy metal and seawater. We keep the direction of flow constant in that water will always flow from an area with high salt concentration to an area with low salt concentration while varying the gradient of flow on both ends. We vary the concentration of salt at both ends while retaining the gradient to investigate how these properties correlate to each other in different salt concentrations. We further chemically modified our nanotubes with for example boron nitride to understand its effect in filtering both heavy metal and salt from water. We used molecular dynamics simulations method in our research, in particularly the nanotube plugin from Scalable Molecular Dynamics tool (NAMD) and Visual Molecular Dynamics (VMD). A few critical findings from our research includes (1) carbon nanotube coated with boron nitride can filter heavy metal even more effectively when coupled with vertically aligned charges (2) carbon nanotube that is made higher temperature at one end and lower temperature at the other end generally increases flow rate when coupled with other individual attributes listed above. Our findings portray the effect of the design in each scenario, and finally, propose an optimum design that is suitable for filtering both heavy metal and salt. Our research will hopefully inform the field of desalination science in making seawater or sewage water safe for everyday use.

*Research Mentor:*

*Prof. David Warsinger, Mechanical Engineering*

*Yuhang Fang, Mechanical Engineering*

**Poster Number:** 60 :: Mathematical/Computation Sciences

**College of Engineering**  
**Copy Move Forgery Detection**

**Author:**

Yu Chieh Chiu, Engineering

Zac Robinson, Engineering

**Abstract:**

Imaging technology and conveniently accessible tools for media manipulation have become ubiquitous and freely available to the majority of the digitally aware world. The dark side of this increasing control over media manipulation is that it can be used with malicious motives such as doctoring videos/images to spread misinformation/propaganda. The purpose of this project is to examine media authenticity with respect to copy-move forgery of images. The team aims to detect the type and localization of the modifications made to an image. Both a feature based (SIFT) method and a block-based soft hashing method were implemented to identify the matching regions of the image. In the feature based method, the SIFT (Scale Invariant Feature Transform) algorithm extracts image keypoints that are invariant to scaling, rotation and translation changes. In the block-based soft hashing method, the hashes are computed for each of the segmented blocks. The extracted image keypoints and computed hashes are then matched using the Nearest Neighbor method to detect the duplicated regions within the copy-move forged image. The success of this project has several practical applications of detecting forged images in political campaigns, maintaining the integrity of media, and authentication of image originality.

*Research Mentor:*

*Edward J. Delp, ECE*

*Carla B. Zoltowski, ECE*

**Poster Number:** 61 :: Social Sciences/Humanities

**College of Engineering**

**Decision Making for a College Senior – An Autoethnography**

**Author:**

Emily Cottle, Purdue University

**Abstract:**

College is a unique time for individual development. A person leaves their prescribed environment in which they are often told what they ought to do and are left to make personal and professional choices all on their own. The uniqueness comes from the necessity to make these choices in a high level of uncertainty, given the student's inexperience in adulthood. Studying one female engineering student's journey through narrative analysis, an autoethnography describes the justification she finds for making decisions without prescribed guidelines amid uncertainty. Selected data in the form of journal entries, class reflections, and original poetry, shaped a story explaining the decision-making impact of interpersonal and intrapersonal development in college. This data was analyzed to satisfy Polkinghorne's seven criteria for narrative analysis: cultural context, embodied nature of protagonist, relationships of main character to others, the protagonist's motivations, historical context and foundational habits, a bounded time, and an understandable conclusion. Facing uncertainty in any new environment, it was found that she chose to have the mentality that whatever the choice was, "it's going to be okay." Having that mentality enabled decision making to result in multiple possible "right decisions," and gave her the tools to face uncertainty. This was exposed to her through failures, relationships, and self-discovery. Future generations of young adults can relate to this story to learn how to face decision making through uncertainty. Additionally, this research can expose the methodological procedure of qualitative research through narrative analysis.

*Research Mentor:*

*Dr. Jason Ware, Clinical Assistant Professor and Director of the Faculty Honors Preceptors Program*

**Poster Number:** 62 :: Physical Sciences

**College of Engineering**

**Synthetic Routes to Prepare MEL Zeolite Catalysts with Different Active Site Content and Arrangement**

**Author:**

Rohan Dighe, Engineering

**Abstract:**

Zeolites are solid microporous aluminosilicates that can be used as heterogeneous catalysts in processes that convert shale gas to chemicals and liquid fuels. Because of the large economic impact of shale gas processing, understanding the chemistry that dictates zeolite properties and catalytic behavior is an overarching research goal in the catalysis community.

In zeolites, the distribution and location of active sites is a key variable in determining structural and catalytic properties. Thus, the ability to synthetically control active site location and distribution is essential to synthesizing zeolites with diverse catalytic properties and applications. In this project, the MEL zeolite framework with protons as active sites was studied. Prior work has shown that active site distribution can be probed via liquid-phase divalent cation titration; in this process,  $\text{Co}^{2+}$  ions bind to the zeolite and exchange for two  $\text{H}^+$  sites located at a paired framework Al atom configuration. A  $\text{Co}^{2+}$  exchange isotherm was experimentally measured to confirm that this method is applicable as an Al pair quantification method in the MEL topology.

In this project, MEL zeolites at various Si/Al ratios were successfully synthesized using only organic structure-directing agents (SDAs) and without inorganic SDAs. The effect of charge density in the cationic organic SDA and the zeolite framework Al content was explored to determine the composition range of viable, crystalline MEL zeolites. Further  $\text{Co}^{2+}$  ion exchange experiments to analyze the effects of varying other synthetic parameters on Al siting in MEL will be carried out in the future.

*Research Mentor:*

*Claire Nimlos, Chemical Engineering*

**Poster Number:** 63 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Improved Orthopedic Shoe**

Author:

Ryan Errthum, Engineering

Abstract:

Abstract Redacted

*Research Mentor:*

*Dr. Eric Nauman, Mechanical Engineering*

**Poster Number: 64 ::**

**Withdrawn**

**Poster Number:** 65 :: Life Sciences

**College of Engineering**

**Protein Similarities Among Purdue-Collected Phages That Infect Bacteria Host (*M.smegmatis*)**

Author:

Bridget Fitzgerald, Engineering

Jackson Fields, Engineering

Jocelyn Powell, Krannert

Stephanie Clark, Science

Abstract:

Mycobacteriophages are bacteriophages that infect the host bacteria *Mycobacterium smegmatis*. The purpose of this project was to compare protein structure and function similarities in mycobacteriophage that infect the same host bacterium that were also found at Purdue University via the Science Education Alliance Phage Hunters Advancing Genomic and Evolutionary Science (SEA-PHAGES) Program. This was to determine how similar and how different these phages are to reveal their genetic diversity. The complete genome sequences of 25 mycobacteriophages from nine different clusters collected over the past ten years was analyzed. It is hypothesized that the phages analyzed will have very similar genomes and functions due to their infection of the same host bacteria. Information about Purdue phages was collected from Phages DataBase, and the genome sequences and functions were compared using Phamerator and DNA Master. The findings of this project will reveal the level of similarity between phages found in the same area (Purdue University) to determine the level of diversity. This will lead to a greater understanding of phage evolution and the genomic similarity between phages that share a common host bacterium.

*Research Mentor:*

*Dr. Kari Clase, Agricultural and Biological Engineering*

*Gillian Smith, Agricultural and Biological Engineering*

*Ikenna Okekeogbu, Agricultural and Biological Engineering*

*Rachel Damge, Agricultural and Biological Engineering*

**Poster Number:** 66 :: Life Sciences

**College of Engineering**

**A Genome Comparison Between Mycobacterium Smegmatis and Bacteriophage Tweety**

Author:

Gentry Fleck, Engineering

Ekta Singh, Engineering

Josephine Bauer, Engineering

Annika Stickels, Engineering

Abstract:

Bacteriophages are the most numerous organism on the planet. Commonly called phages, these organisms infect bacteria cells and use them for proliferation. There are many types of bacteriophages found in the air, ground, and water. They are easier to study than other viruses because of their availability, variability, and lack of ethical concerns surrounding experimentation. A comparison between the genome of a phage and its host may allow for better characterization of their relationship. The protein sequences of the host, mycobacterium smegmatis (m.smeg), will be compared to that of the phage Tweety, which is an interesting phage as it is quite dissimilar from most phages and how they usually interact. In order to show the function similarities and differences, using a phage that behaves unlike many other phages can be quite helpful.

By understanding the protein differences between phages and their host, there is potential for information to be obtained as to what makes a host compatible to a phage. This information can be used to efficiently grow phages for study and to gather results in lab settings so that the factor of variability is eliminated in practice. This same information as to what makes a good host for phages carries with it the potential for greater use in phage therapy and expansion into the macro world. Due to the extensive interaction between phages and their hosts, it is paramount that phage therapy targets this interaction; Not just efficiency, but as it contains meaningful and purposeful interactions.

*Research Mentor:*

*Kari Clase, Agricultural and Biological Engineering*

*Gillian Smith, Agricultural and Biological Engineering*

*Ikenna Okekeogbu, Agricultural and Biological Engineering*

*Taylor Sorrell, Agricultural and Biological Engineering*

**Poster Number:** 67 :: Life Sciences

**College of Engineering**

**Heterologous expression of the anaerobic fungal mevalonate pathway**

**Author:**

Elizabeth Frazier, College of Engineering

**Abstract:**

Microbial expression of the mevalonate pathway is an attractive strategy for more sustainable production of many costly but essential drugs, most notably the anticancer agent, Taxol. Currently, commercial mevalonate production costs roughly \$20,000/gram. However, using microbial enzymes to create a biosynthesis pathway presents a cheaper, more efficient alternative. While the microbial mevalonate pathway from the yeast species *Saccharomyces cerevisiae* has received considerable engineering interest, the enzymes are natively membrane-bound. Thus, cytosolic variants of these pathway enzymes found in newly discovered anaerobic fungus species, *Piromyces indianae*, may be better suited for industrial mevalonate production. Initially, heterologous expression of the *P. indianae* pathway genes in *E. coli* reduced growth in a manner consistent with toxic overload due to unfavorable gene expression. Some of this toxicity was alleviated when the *P. indianae* genes were codon-optimized to account for discrepancies in rare tRNA usage, suggesting unfavorable codon bias limits gene expression and overall cell growth. Additionally, the *P. indianae* HMG-CoA reductase gene, which completes the pathway, was found to be 67% more productive under anaerobic conditions, potentially due to a predicted NADH-dependence, rather than the NADPH-dependence seen in yeast homologs. These results suggest the alternative mevalonate pathway, and others derived from anaerobic fungi, may prove beneficial in industrial fermentation processes where cofactor deficiencies limit high-titer production. Ultimately, this work validates the function of the anaerobic fungal mevalonate pathway and rationalizes the sourcing of enzyme homologs from similar organisms for more efficient production of medically-valuable compounds in order to help lower the cost of medicines worldwide.

*Research Mentor:*

*Ethan Hillman (PhD Candidate), Agricultural and Biological Engineering*

*Dr. Kevin Solomon, Agricultural and Biological Engineering*

**Poster Number:** 68 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Objective Analysis of Communication During Surgical Operations**

Author:

Fabio Garofalo, College of Engineering

Abstract:

Effective communication is a major factor in healthcare for ensuring patient safety, especially during significant procedures such as surgical operations. Current assessment of communication among the surgical team members are time-intensive and subjective. The purpose of research is to obtain objective vocal metrics of communication in the operating room to assess non-technical skills scores and investigate the feasibility of extracting automated measurements. Speech analysis was completed of audio files of a surgeon performing surgery to obtain vocal features. Using objective metrics helps counteract the bias that is inherently present in subjective assessment tools, and objectively measuring communication can help with training and assessment of surgical teams.

*Research Mentor:*

*Denny Yu, Industrial Engineering*

*Jackie Cha, Industrial Engineering*

**Poster Number:** 69 :: Mathematical/Computation Sciences

**College of Engineering**  
**Computer Vision for Industrial Safety**

Author:

Isha Ghodgaonkar, Purdue University

Jackson Moffet, Purdue University

Zachery Berg, Purdue University

Aditya Chakraborty, Purdue University

Meenakshi Pavithran, Purdue University

Abstract:

This study proposes a system that detects use of personal protective equipment (PPE) in industrial settings while protecting privacy of workers. The number of work-related accidents in 2018 reached a record 173,105 cases with a total loss of 83 Million USD. Most of these accidents were caused by procedural non-compliance, meaning the workers did not follow proper safety protocol. Thus, a system that can automate the process of detecting procedural non-compliance issues is needed to protect safety of industrial workers. Our proposed system acts as a replacement to traditional industrial security cameras. We use computer vision models to detect faces and to recognize whether workers are wearing safety goggles. The system notifies workers in real time of violations, before encrypting their faces in the frame and sending this encrypted data to a server to ensure privacy protection. Our face detection model is MobileNet-SSD, a popular object detection model. The model was trained on the WIDER Face benchmark and achieves promising results in real-time settings. Our goggle detection model achieves over 90% accuracy on our team's goggle data set, collected at Bechtel Innovation Design Center. We use the Advanced Encryption Standard (AES) to encrypt regions of the video that contain faces. This system will help to reduce accidents in industrial settings by 1) notifying administrators of safety policy violation while protecting worker privacy, 2) increasing individual awareness of proper PPE usage over the system's lifetime, and 3) possibly establishing a future standard for industrial settings to implement safety guideline compliance.

*Research Mentor:*

*Dr. Yung-Hsiang Lu, Electrical and Computer Engineering*

**Poster Number:** 70 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Object Detection and Recognition**

Author:

Elisa Goodman, Purdue University

Siri Vemulapalli, Purdue University

Abstract:

Abstract Redacted

*Research Mentor:*

*Carla Zoltowski, College of Electrical and Computer Engineering*

**Poster Number: 71 :: Physical Sciences**

**College of Engineering**

**Development and Characterization of Orally Disintegrating Films Loaded with High Levels of Ibuprofen Nanoparticles**

Author:

Rohit Harapanhalli, Engineering

Abstract:

Orally disintegrating films (ODF's) have been known for more than 30 years and although they offer several benefits over other conventional dosage forms, only six have been FDA-approved to date. Limited drug loading is the main inhibition, with all approved ODFs having an active content in the range of 200 mcg to 12.5 mg per film. The goal of this research was to develop an ODF containing Ibuprofen nanoparticles. Nanoparticles were prepared using the solvent evaporation technique. Formulation development involved a set of experiments conducted to optimize the film properties using physico-mechanical tests including tensile strength, disintegration time, dissolution time, drug content uniformity, Particle Size Distribution (PSD) by Zetasizer, Confocal Raman Spectroscopy (CRS), and Scanning Electron Microscopy (SEM). Final films had dimensions of 7x7 cm<sup>2</sup> films containing 101.5 mg of Ibuprofen. Films exhibited acceptable tensile strengths with disintegration time less than 30 seconds and dissolution time of 40 minutes. Uniform distribution was confirmed using Raman and SEM and particle size analysis was used to confirm the desired range [400-450 nm]. This research helps demonstrate the ability to develop ODFs with high drug loads.

*Research Mentor:*

*Rutesh Dave, Pharmaceutical Sciences*

*Sawani Talekar, Pharmaceutical Sciences*

**Poster Number:** 72 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Robotic Exploration: Spiderbot**

Author:

Nanami Hariguchi, Engineering

Davis Bradstreet, Engineering

Timothy Unsulangi, Engineering

Abstract:

This project aims to develop a robot that moves in a way similar to a spider. This robot will be used in fields to kill pests and on ships to inspect cargo. Since the robot will need to do these tasks, it will need to be efficient and be able to get over obstacles in its way. With a robot that moves similar to a spider, it should be efficient and it should be able to climb over obstacles. To do this, the type of leg is important, and for this project, a type of 5 or 6 bar linkage is planned on being used. This may increase to 7 or 8 bar linkages if they prove to be more effective at accomplishing the goal.

*Research Mentor:*

*Eric Nauman, ME*

**Poster Number:** 73 :: Life Sciences

**College of Engineering**

**Analysis of Lysin A and Lysin B in Therapeutic Application**

**Author:**

Anthony Hegarty, Engineering

Sarah Murata, Science

Vi Nguyen, Science

Radhika Sahai, Health and Human Sciences

DeShaun Whitfield, Polytechnic

**Abstract:**

Phage therapy, or the therapeutic use of bacteriophages for treating bacterial infections, has been evolving throughout the years, and is becoming a more common method of treatment as antibiotic resistance increases. The incorporation of bacteriophages, parasitic viruses that infect bacteria, in treatment is still controversial as the long-term consequences of the interactions between humans and phages are unknown. With advancing phage therapy, understanding specific phage proteins and how their functions can be implemented in phage therapeutic treatments can contribute to advancing practices. Lysin, a major protein contributor to the lytic cycle, has been known to be included in multiple phage therapeutic studies. There are two types of Lysin, Lysin A and Lysin B. The inclusion of differing enzymes in different phage therapies raises the question of which enzyme is more efficient for ministrational use. This study identifies the differences between amino acid sequences in Lysin A and Lysin B using various bioinformatic programs. The findings are then applied to existing phage therapy practices to understand how Lysin A or B function within the given treatment. These applications are pivotal to acquiring knowledge about effective phage therapeutical practices.

*Research Mentor:*

*Kari Clase, Agricultural and Biological Engineering*

*Emily Kerstiens, Agricultural and Biological Engineering*

*Lauren Oparah, Agricultural and Biological Engineering*

**Poster Number:** 74 :: Mathematical/Computation Sciences

**College of Engineering**

**Dynamic Sparsity Optimizations for Embedded Compilers**

Author:

Brian Helfrecht, Engineering

Nicholas Haythorn, Engineering

Alan Gregorian, Engineering

Atif Niyaz, Engineering

Abstract:

Machine learning (ML) has pervaded into nearly every industry from security to economics to medicine. However, one field that has yet to see a large increase in machine learning technologies is that of small, low power electronics such as wearable electronics or Internet of Things (IoT) devices. Traditional machine learning applications perform billions of computations and therefore require a considerable amount of power to function. Typically, this power draw is a key limiting factor in the integration of machine learning algorithms into portable IoT devices. As such, methods are needed to reduce the number of calculations carried out by a processor. This can be achieved by leveraging sparsity, or the lack of meaningful data produced during the inferencing stage of a machine learning system.

This project targeted sparsity present in RISCv machine code for the AFTx chipset developed by Purdue University. To take advantage of sparsity most effectively, a software system was created to disassemble compiled RISCv machine code and produce an instruction skip table that enables the hardware to ignore potentially sparse instructions. The system first analyzes values loaded from memory and marks them as potentially sparse. Subsequent instructions are checked to determine whether they produce useful outputs if the loaded value is indeed sparse. Potentially sparse values and the instructions that can be skipped are logged in a separate output file that can be utilized directly by the hardware during execution. The final system was found to improve code performance proportional to the sparsity of the input data.

*Research Mentor:*

*Dr. Mark C Johnson, Electrical and Computer Engineering*

*Prof. Samuel Midkiff, Electrical and Computer Engineering*

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

**College of Engineering**

**Radiation Effects on the Thermomechanical Properties of CFRP Thermoset Prepregs and Adhesive Materials**

**Author:**

Peter Hong, Engineering

**Abstract:**

Purdue's Composites Manufacturing and Simulation Center (CMSC) is designing and manufacturing carbon fiber reinforced polymer (CFRP) composite structures for the Inner Tracker Upgrade of the Compact Muon Solenoid (CMS) at CERN. The structural adhesives and CFRP materials used in the design must maintain stiffness within the operating temperature range of - 35°C to 30°C when subject to high radiation doses. The structures will support silicon detectors and services for particle collision experiments. Adhesives and CFRP materials closest to the proton-proton interactions will experience high amounts of gamma radiation up to 1 GRad. This study compares the thermomechanical properties of candidate adhesives and CFRP prepregs pre- and post-irradiation. Explicit data regarding the effects of radiation on the adhesive-composite bonding as well as the degradation of these materials is not currently available. In the initial phase, the adhesives and CFRP panels were irradiated with 100 MRad at Sandia National Labs to filter out materials that did not survive a lower radiation dosage. Tensile response testing and dynamic mechanical analysis (DMA) temperature-frequency sweeps are used to measure the radiation effect on elastic, storage, and loss moduli of these materials. The radiation effect on the microstructure of a CFRP laminate bonded to a conductive carbon foam was inspected using optical microscopy. Additionally, coefficient of thermal expansion over a range of -40 to 60°C is measured. The results of this study will provide a better understanding of the degradation of CFRP and adhesive materials and inform materials selection for radiation resistant composite structures.

*Research Mentor:*

*Dr. Ben Denos, Composites Manufacturing and Simulation Center*

*Sushrut Karmarkar, Aeronautical and Astronautical Engineering*

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

**College of Engineering**

**Interactive Keyword Expansion with WordNet for Improved Social Media Mining**

**Author:**

Jessica Hong, Engineering

**Abstract:**

Social media over recent years has resulted in massive information from all over the world. Despite the data deluge, there is a noticeable lack of tools to efficiently analyze the data by geographic-dependent keywords and topics. The purpose of this project is to introduce novel interactive techniques to an existing application called SMART (Social Media Analytics and Reporting Toolkit) so that users can more efficiently explore and analyze real-time data from social media platforms such as Twitter and Instagram. Specifically, we allow users to input important search keywords and utilize natural language processing methods such as WordNet to automatically expand the provided keywords with related terms for increased search quality. Our approach can assist law enforcement and first responders in making decisions more quickly during real-time criminal activity or natural disasters.

*Research Mentor:*

*Luke Snyder, Computer Science*

**Poster Number: 77 :: Innovative Technology/Entrepreneurship/Design**

**College of Engineering**

**Automated Image Processing in Forest Inventory Works Faster and Better than Humans**

Author:

David Jarufe, College of Electrical and Computer Engineering

Nick Eliopoulos, College of Electrical and Computer Engineering

Yezhi (Andrew) Shen, College of Electrical and Computer Engineering

Abstract:

Forest inventory analysis is time-consuming and expensive. Recent research involving photogrammetry promises to reduce the cost of inventory analysis. State of the art solutions involving the use of stereo photogrammetry have the advantage of being mobile, relatively low-cost, and require modest expertise. Although published photogrammetry methods require substantial data acquisition time, our aim was to minimize this time while obtaining highly accurate diameter estimates and in-forest positioning. In this study, a stereo camera was carried through a plot to concurrently record video footage and generated a point cloud for all measured trees. Our proposed algorithm identifies a tree and measures its diameter at breast height from the recorded footage. It also allows a tree to be virtually tagged with its information, which enables the relocalization of any measured tree inside a forest plot. Video images for the trees were recorded and saved as rosbag .BAG files, a format that allows the generation of point clouds. Footage acquisition time, diameter at breast height root mean square error, GPS coordinates, and mean absolute error were used as comparison metrics with other methods. The virtual point cloud map obtained was accurate by 98.25% when compared to real world GPS measurements. By walking 69.2 meters through a plot, a 67.99 meter wide virtual map was obtained. Moreover, at one meter, three meters, and five meters from the trunk our diameter at breast height RMSE's were 1.28 cm, 1.47 cm, and 2.57 cm respectively.

*Research Mentor:*

*Yung-Hsiang Lu, Computer Science*

*Keith Woeste, Forestry and Natural Resources*

*Guofan Shao, Forestry and Natural Resources*

**Poster Number:** 78 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Halftoning Images with Machine Learning**

Author:

Russell Kim, ECE

Hao Ting Kung, ECE

Abstract:

Our topic of interest is to halftone images using a deep learning model. The result would be used for printing grayscale images. This project is in early stages so there are no results yet. However, our plan is to use a convolutional neural network to replicate the results of a non-machine learning algorithm called DBS, or Direct Binary Search, which successfully halftones images. We will use python to program our model and other functions needed. The data set that we are using is from COCO, which is an online database of random images. We plan to train the network on around 5000 images, which have been grayscaled and cropped by a script that we wrote. Our reason for trying to use machine learning rather than DBS is in hopes that a machine learning model can halftone more efficiently and effectively as it can tailor its output to the specific input as it learns features.

*Research Mentor:*

*Baekdu Choi, PHD Student*

*Runzhe Zhang, PHD Student*

**Poster Number:** 79 :: Mathematical/Computation Sciences

**College of Engineering**

**FPGA VIP team**

**Author:**

Kyung Min Ko, ECE

**Abstract:**

Field Programmable Gate Arrays (shortened by FPGA) consists of semiconductor chips with multiple gate arrays which can be implemented into designed chips. The ultimate goal of our team is to utilize FPGA to verify and simulate the algorithm and logic designed by the software team, before the design proceeds to the next level in our project's chip production process. This allows vast amounts of saving in the cost, since the produced end product of a chip can be simulated for as many times as needed. However, with three members all inexperienced with digital logic design, the priorities of our team was education rather than an immediate contribution to the project. First things first, it was important to learn Verilog and SystemVerilog, the most fundamental foundation of FPGA programming. Our team utilized Altera DE0-Nano board with Cyclone V FPGA processor, with Intel Quartus 18.1 in the learning process. Within weeks, the team conquered assignments such as 'My First FPGA' (Altera created assignment that guides students to program a simple task in the board), and 'Singlecycle' (Purdue University ECE437L's lab), both of which prepared our team to become a better potential asset to the SoCET project. Then, our team is currently learning to program the FPGA in the Linux platform using the board that is actually going to be used in the verification process. Our goal by the end of this semester is to build a password authentication device by programming an FPGA board with a keypad and a LCD screen connected through GPIO. This will be a great stepping stone for our team, because completion of this goal can mean that we are capable of programming FPGA to our preference, and this also means that we are ready to be put into actual practices with just a bit more advancement in programming skills.

*Research Mentor:*

*Mark. C Johnson, ECE*

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

**College of Engineering**

**Prolonged Standing in the Operating Room**

**Author:**

Claire Konz, Engineering

**Abstract:**

Prolonged standing has been repeatedly linked to adverse effects on worker health such as fatigue and discomfort in the lower back and lower extremities. Despite this, tasks that require prolonged standing remain prevalent in many fields, especially in surgery. This study investigated surgeons' standing behaviors during live surgeries ( $n = 30$ ). To collect the data, surgeons stood on pressure mats that tracked their foot patterns and weight distribution while performing extended surgeries. The force mat output was then run through an image processing algorithm that identified data as a left or right foot and calculated the associated weight distributions. Because the surgeons were not restricted in their movement, tracking each foot presented a major challenge and resulted in several erroneously identified frames. To account for these frames, a set of physical constraints were applied and frames that did not meet the associated requirements were excluded. The remaining erroneous frames were grouped into 5 major categories to address each type of issue separately. After modifications, the pressure mat data will be run through the algorithm again, with improved accuracy. The cleaned data from the pressure mat will be used to determine the number of times that the participants shifted weight (body weight change greater than 30%) and center of pressure for each foot. Future work includes making a concrete statement on surgeon standing patterns based on the outputs of the improved image processing algorithm.

*Research Mentor:*

*Denny Yu, Industrial Engineering*

*Hamed Asadi, Industrial Engineering*

**Poster Number:** 81 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Spacer Design for Lithium – Ion Battery Cooling**

**Author:**

Odette Kuehn, Engineering

**Abstract:**

With the growing popularity of Electric Vehicles and desire to decrease fossil fuel consumption, the efficiency and longevity of Lithium-Ion Batteries is paramount. With prolonged exposure to high ambient temperatures the life cycle of a battery and its performance may degrade. In a battery assembly, a spacer is used to maintain the distance between individual battery cells and create air channels through which air can be forced for cooling. When in contact with the adjacent sides of the cells the spacer features create an extended surface, or heat sink. In this research, advanced designs for spacer configurations are considered. It is the objective to investigate if corrugated channels would possess better thermal cooling performance than that of the commonly used spacers with straight sided channels. The two variations of spacer geometry were created in SolidWorks CAD software, both with sinusoidal waves. One variant has the identical waves in-phase with adjacent waves while the other has waves out-of-phase with adjacent waves. The samples were realized by the method of 3D printing using a Connex350 Polyjet Printer and Vero White resin. Each sample was embedded into the test system with a fan supplying constant volumetric flow of air. The temperatures of the air and surface of the battery cell were recorded at both the inlet and outlet. The results on maximum surface temperature, and temperature difference between the inlet and outlet for both variations are compared to those for the original straight sided spacer part. In addition, pressure drop data are compared.

*Research Mentor:*

*Thomas Siegmund, Mechanical Engineering*

**Poster Number:** 82 :: Physical Sciences

**College of Engineering**

**Musculoskeletal Fatigue in Isometric Contractions**

**Author:**

Sahana Narayan Kumar, College of Engineering

**Abstract:**

The purpose of the study is to identify musculoskeletal fatigue from isometric contractions. In isometric contractions, muscles had at a fixed length. For example, pushing against a wall, pulling against an immovable object, holding a heavy shopping bag, gripping a tennis racquet, holding bulky items such as parts bins in a production line, and pressing a button on production machinery for a long time. Fatiguing tasks need a prolonged activation of the muscle, where the angular velocity of the joint, firing rates, conduction velocity, degree of synchronization, and intermittent activation are being changed during the performed task. These measurements could be identified using wearables. Electromyography (EMG) wearable sensors will be used to collect muscle activations in isometric tasks; which are wireless and non-invasive, sensors are placed on the surface of the skin. EMG signals will then be analyzed in MATLAB using functions like Short-Time Fourier Transform, Wigner-Ville distribution, Choi-Williams distribution and Continuous Wavelet Transform to identify fatigue. Variables in the EMG signal, such as amplitude and spectral estimates, global frequency, and conduction velocity estimates, could be used to measure fatigue. This project aimed to identify in fatiguing isometric tasks. To achieve this goal, measurements of non-fatigued and fatigued states of the muscle will be used to train the Neural Networks model. Using the trained model on 10 participants, the state of fatigue could be identified. This includes fatigue vs. non-fatigued muscle, transition to fatigue, and the time taken for the muscle to get fatigued will be identified.

*Research Mentor:*

*Denny Yu, Industrial Engineering*

*Hamed Asadi, Industrial Engineering*

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

**College of Engineering**

**License Plate Detection App**

Author:

Patool Kutmah, Purdue University

Yuqing Fan, Purdue University

Tremael Arrington, Purdue University

Abstract:

The goal of this project is to develop a License Plate Detection App by applying image processing to an image of a license plate. The project is currently in the initial phase and an app has been created that is able to capture an image and save it. In addition, code was written to apply grayscale to the image. Afterwards, Gaussian Blur is applied to the image in order to blur edges and reduce contrast. The results achieved so far is a blurred grayscale image after these steps have been applied. The original code was written in Swift, but afterwards it was changed to Python because writing code for these image processing functions is much easier. In addition we began creating a dataset with images that we took of license plates. Our findings so far have been limited to those two processes and our goal is to continue the image processing by applying Otsu's method. Now we are working on implementing a segmentation algorithm utilizing the sobel operator as well as the app's existing functionality. At completion, this project will make the process of license plate detection faster and more accessible.

*Research Mentor:*

*Carla Zoltowski, Electrical and Computer Engineering*

**Poster Number:** 84 :: Life Sciences

**College of Engineering**

**The Effect of BMAL1 Knockout and CLOCK Knockdown in a Mouse Mammary Epithelial Cell Line on the Formation of Alveolar Structures in 3D Cultures**

**Author:**

Jacob Larsen, Engineering

**Abstract:**

Circadian clock disruption during pregnancy due to sleep disruption is related to poorer milk production. Data from previous studies suggests that circadian clock genes, BMAL1 and CLOCK, regulate mammary development, which is characterized by formation of alveoli during pregnancy. BMAL1 and CLOCK function as a transcription factor and regulate expression of several cell-cell junction proteins. The formation of 3-dimensional (3D) alveolar structures is dependent on cell-cell interactions mediated by junctional proteins. We hypothesized that if the BMAL1 and CLOCK genes are disrupted in mammary epithelial cells, the cells will have a reduced ability to form alveolar structures. To test this hypothesis, we established a 3D culture system to study mammary epithelial alveolar formation, and determined the effect of BMAL1 gene deletion (BMAL1-KO) and CLOCK protein reduction (shCLOCK) on formation of alveoli and expression of cell-cell junction proteins zona-occludins 1 (ZO1) and e-cadherin (CDH1). A plating density of 13,000 cells/cm<sup>2</sup> in RPMI media supplemented with 5% serum, 5µg/mL prolactin, 0.375ng/µL hydrocortisone, and 5µg/mL insulin, followed by 7 days of culture was determined to be optimal for alveolar formation. Light microscopy revealed formation of spherical structures, with lumens typical of alveoli. Immunofluorescent staining with CDH1 and ZO1 and counterstaining nuclei with DAPI, showed polarization of cells, and lateral membrane staining of ZO1 and CDH1. Comparative studies indicated good alveolar formation in wild-type cultures, decreased ability of BMAL1-KO line to form alveoli, and no alveolar formation in the shCLOCK cultures. Further quantitative data will be collected to confirm the results.

*Research Mentor:*

*Dr. Theresa Casey, Animal Science*

**Poster Number:** 85 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**AI-based Automation in the Classroom**

**Author:**

Chieh-En Li, Purdue University

Young Jin Jung, Purdue University

Tanvi Bhardwaj, Purdue University

Shu Hwai Teoh, Purdue University

Po Yu Huang, Purdue University

Chien-Hung Wang, Purdue University

Luis Fernando Materon Botelho;Phon Pugkhem;Shreya Ilango ;Ishmeet Kaur;, Purdue University

**Abstract:**

With the growing size of classes in universities and the increasing demand for online courses, professors and teaching assistants are noticing an increasing burden due to trivial classroom tasks. To fulfill these trivial classroom tasks with artificial intelligence, we achieve automatic attendance, engagement, and participation tracking in classrooms by leveraging state-of-the-art facial recognition and pose recognition techniques. Typical users for this system would be higher-level educators with small-medium classroom sizes.

Our end goal is for every classroom to have a webcam attached to a raspberry pi running a lightweight client. All the processing will be done on a server, and the results will be sent back to the client. We accumulate data from a class for the teaching staff to easily view later in a database accumulate system.

We have been able to correctly and efficiently take attendance and identify participation among small class sizes, and are currently working on integrating face recognition, pose recognition, and head-position detection as a whole model.

The team has also created a secure web application to service an intuitive interface for students to record the short videos of themselves, which are required to train facial recognition models. The background API slices each video into frames and creates the hash string based on the "name" and "class" metadata.

Integrating with parallelizing face, pose and head-position detection and running on GPU to strengthen the interrelation among each process; especially the synergy between face and head-position detection is expected to result in more reliable outcomes.

*Research Mentor:*

*Mithuna Thottethodi, School of Electrical and Computer Engineering*

**Poster Number:** 86 :: Life Sciences

**College of Engineering**

**Comparison of Consensus Integrase Secondary Structures across Actinobacteriophage Phams**

Author:

Jacob Long, Engineering; Agriculture

Hailey Szadowski, Engineering; Agriculture

Miles Thompson, Engineering; Agriculture

Matthew Chan, Engineering; Agriculture

Zachary Bebar, Engineering; Agriculture

Abstract:

Bacteriophages are a type of virus that infects bacteria. They use their hosts' genetic machinery to replicate and eventually lyse the bacteria. Some phages have a temperate life cycle: they form lysogens by incorporating their genomes into their hosts using proteins called integrases. This process leaves the host unharmed until the lytic cycle is initiated. A deeper understanding of integrases can help predict and manipulate a phage's life cycle. This could find applications in the delivery of phage therapy, a process by which phages are used to kill infecting bacteria.

The following study examined the differences in secondary structure across over 25 integrase phams found on the PhagesDB actinobacteriophage database. For each pham, a consensus sequence was generated by multiple alignment. Each consensus sequence was run through software that predicted its corresponding secondary structure. Relevant data was collected into a table which highlights the differences between these phams.

The results of this comparison show a variety of secondary structures centered on a common baseline tertiary structure. There are some common archetypes into which secondary structures tend to fall. Future research should involve an in-depth analysis of the role of one integrase's tertiary and secondary structure in its function. This would allow the results of this study to predict the behavior of temperate phages.

*Research Mentor:*

*Dr. Kari Clase, ABE*

*Ikenna Okekeogbu, ABE*

*Gillian Smith, ABE*

*Janice Chan, ABE*

**Poster Number:** 87 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**  
**team beyond 5G poster abstract**

Author:

Tianze Ma, Engineering

Ya-Tuan Yu, Engineering

Siyu Wu, Engineering

Abstract:

In this digital communication age, it is important that the receiver side can successfully receive the correct data from the transmitter side. However, difficulty in identifying the start of a transmitting data can make correcting errors in data hard. Therefore, sending a starting data set and be able to locate where it is can give the potential to implement error correcting codes to the actual data.

- Research Questions (Deal with)

To deal with this, we sought to utilize methods to differentiate the starting data set from the actual data.

- Methods

We use method called “energy detection” to determine the signal received is 0 or 1. With this method, the receiver will detect and estimate the signal energy level in the desired channel. We define our base signal  $f_0(t) = 0$  and  $f_1(t) = \text{sinc}(t)$ . Consequently, when the receiver detects a high level of energy it will interpret it as 1 and when detects a low level of energy it will interpret it as 0.

We also use the method called “frame synchronization.” It is the process by which incoming framed data are extracted for decoding with the help of frame alignment signals.

- Findings

No matter in which process in digital communication, noise is always a problem.

In our energy detection process, we use “hamming code” to calibrate the digitals sent by the transmitter to make sure the accuracy of the communication.

In our frame synchronization process, our straight for noise is to detect the code word three times to determine whether the synchronized mode or unsynchronized mode.

- Conclusion

With our method, data send by transmitter can be received by the receiver at the right time with right value.

- Recommendations/Significance

This technology will make wireless communication like radio or Wifi have better accuracy and quality. This technology can also help the communication system to withstand more intense interference. To make the accuracy even better, we could try Reed-Muller code instead of Hamming code in the future research.

*Research Mentor:*

*Chih-Chun Wang, electrical engineering*

**Poster Number:** 88 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Multimodal Cognitive and Perception Sensing For Situational Awareness**

**Author:**

Charles Yan Ma, College of Science

Kwokhin Wong, Polytechnic Institute

**Abstract:**

Situation awareness (SA) is the perception, comprehension, and prediction of the elements in their surrounding environment by oneself. Current automated-vehicles driving requires drivers to maintain a good level of SA in encountering any accidental breakdowns in human-autonomous driving systems. We aim to assess the perception and comprehension levels of SA under a variety of secondary tasks while driving. To test our hypothesis, we used NADS miniSim to simulate an auto-driving environment. Participants were asked to perform a secondary task while in the simulation for each trial, and they were: fetching the appearing and disappearing red dots on the simulator screen, and picking the largest circle object from dozens of them on a separate laptop. We used SAGAT and SART to measure their SA level. This is a pilot study and it shows that secondary tasks can predict SA levels of perception and comprehension.

*Research Mentor:*

*Denny Yu, Industrial Engineering*

*Jing Yang, Industrial Engineering*

**Poster Number:** 89 :: Mathematical/Computation Sciences

**College of Engineering**

**VAA - GUI Interface**

**Author:**

Sneha Mahapatra, Engineering

**Abstract:**

Poultry Production is a critical aspect of agricultural. It is vital to identify sickness amongst poultry as quickly and as efficiently as possible. Many studies have shown sick animals behave different and their behavior can be analyzed visually. That is why video analytics is a potential automated way to identify such sickness. To present the behavior of animals through video analysis we present a GUI Interface. This interface showcases an automatic method that combines a self-trained object detection model and a modified object tracker that tracks turkey. This interface allows for interactivity between the user and the data. A user can upload videos of their data and watch the video analysis through a media player. Users can also add data collected from the video and display graphs as well. In total, this GUI interface allows for user to visualize data and extract meaningful analysis from it.

*Research Mentor:*

*Professor Amy Reibman, ECE*

*Professor Fengqing Maggie Zhu, ECE*

**Poster Number:** 90 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**A MATLAB Testbed for Ultra-low Latency Transcoding Applications**

**Author:**

Jacqueline Malayter, Engineering

Fangrui Qin, Engineering

**Abstract:**

Utilization of higher frequency bands in 5G networks promises higher data rates and more bandwidth for an increasingly crowded spectrum. Millimeter waves attenuate quickly and require relay stations to receive and retransmit the signal from a device to a main base station, which been one of the main research focuses of 5G under the umbrella of integrated access and backhauling. Traditionally, base stations decode and perform error-correction on the incident message; however, performing full decoding at every relay may introduce excessive delay to the message. A new method of decoding at relay stations is called 'transcoding', where a message is partially decoded with weaker error-correction codes that introduce less delay, while being concatenated with a more powerful code to ensure low error probability for end-to-end communications. Such architecture is called concatenated coding, which employs different outer and inner codes to maximize efficiency. This process allows some error-correction capabilities at the relay, without the immense delay of decoding large block codes.

This project consists of the creation of a MATLAB testbed to simulate encoding and decoding concatenated codes for transcoding applications. First, our project explores concatenating an outer convolutional block code with (7,4) hamming codes as the inner code, and assessing the results. In future work, our project will replace a convolutional block code with a more advanced state-of-the-art low-density parity check (LDPC) code. The results of these simulations will be used to assess transcoding performance for various encoding parameters, such as code type and codeword size.

*Research Mentor:*

*Chih-Chun Wang, Electrical Engineering*

*Borja Peleato-Inarrea, Electrical Engineering*

*David Love, Electrical Engineering*

*James Krogmeier, Electrical Engineering*

**Poster Number: 91 ::**

**Withdrawn**

**Poster Number:** 92 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Optimization of Real-Time Detection of *Vibrio cholerae***

**Author:**

Mariah McDonald, Engineering

**Abstract:**

Cholera is an acute diarrheal disease caused by the bacterium *Vibrio cholerae*. The World Health Organization estimates there are up to 4.0 million cholera cases and 143,000 resulting deaths worldwide each year. The gold standard cholera detection method in water requires laboratory equipment, trained technicians, and several days to obtain results. Our team has developed a smartphone-based platform that combines a nucleic acid assay, loop-mediated isothermal amplification (LAMP), with a particle imaging technique, particle diffusometry (PD), to detect toxic strains of *V. cholerae* within 30 minutes. As pathogenic DNA concentration increases, viscosity increases, a change measurable by analyzing the Brownian motion of added fluorescent particles. This combined method has an environmentally relevant limit of detection (LOD) of 10 cells/reaction; however, the LAMP assay and PD measurement remain separate steps because adding particles prior to the LAMP assay causes a significant loss in sensitivity ( $10^5$  cells/reaction). To achieve integrated, real-time detection of *V. cholerae* using PD, we must optimize the *V. cholerae* LAMP assay to enable successful amplification down to 10 cells/reaction in the presence of the fluorescent particles. We hypothesize that the particles sterically hinder the reaction; therefore, we investigated the effects of adding a linker to the LAMP primers to distance them from the particles. Integrating a tetraethylene glycol linker achieved an LOD of 1,000 cells/reaction, which is above the target sensitivity but better than the standard assay with particles. This suggests there may be more effective linkers available that we could investigate, potentially of different lengths or compositions.

*Research Mentor:*

*Dr. Tamara Kinzer-Ursem, Biomedical Engineering*

*Taylor Moehling, Biomedical Engineering*

**Poster Number:** 93 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Poster Submission Abstract**

**Author:**

Mohammed Metwaly, Engineering

Benjamin Castro, Engineering

**Abstract:**

Terms like “5G technology” and “5G networks” have become more relevant in the recent years. Many times, it is unclear what people are precisely referring to when they use those terms. Realistically, 5G networks are a complex and multiphase systems. Such networks encompass technological innovations across different subareas of digital communication. One of the most important innovations that is making 5G networks possible is the introduction of millimeter-wave massive Multiple-Input Multiple-Output (MIMO) technology. MmWave MIMO technology targets two of the most pressing challenges that stand in the way of establishing 5G networks across the globe. The first challenge that mmWave MIMO addresses is the need for larger amounts of bandwidth to transmit information. Mm waves, which have very high frequencies (30GHz – 300GHz), open the possibility to use a whole new set of bandwidths. The second challenge that mmWave MIMO addresses is the need for higher spectral efficiency. With massive MIMO, a large assemblage of antennas is used by the receiver and the transmitter to send information at a faster rate. Opportunely, both mm waves and massive MIMO systems complement each other in a way that allows 5G networks to be efficiently implemented. To further investigate 5G networks, the team is looking at methods of channel simulating. One method proven to be very effective at channel simulating is the New York University Simulator (NYUSIM). The team is also comparing different precoders and their performance with the NYUSIM; each different precoder can improve a different aspect of the 5G technology.

*Research Mentor:*

*Chih Chun Wang, ECE*

**Poster Number:** 94 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Optimizing Charging Configurations for Autonomous Ride Sharing Vehicles**

**Author:**

Nicholas Mori, School of Industrial Engineering

**Abstract:**

Optimizing Charging Configurations for Autonomous Ride Sharing Electric Vehicles

Nicholas Mori, Mustafa Lokhandwala, Hua Cai

The combined detrimental effects of pollution with increasing congestion in cities have been topics of discussion in the search for alternative, environmentally-friendly, and cost-effective transport solutions. Recent ideas such as ride sharing (RS), autonomous vehicles (AV), and electric vehicles (EV) are increasingly seen as potential solutions to help relieve the demand. There is plenty of pre-existing literature on the three ideas individually, though few compare to the breadth and depth of this model. The study utilizes a model that analyzes the impact of behaviors regarding EV charging through autonomous and non-autonomous RS vehicles. Utilizing data provided by the New York City DOT, the agent-based model generates charging demand in the city and simulates the citing of optimal EV charging station configurations. We investigated the impact that certain variables have on the model outputs by analyzing the two-factor interactions through fractional factorial designs for experimentation. Using this method, we were able to gain an understanding of certain relationships between variables. Our results demonstrate that by adjusting identified input parameters in the model, we are able to improve the system based on success metrics. The information gathered allows us to further optimize the configurations on the model for future studies and applications.

*Research Mentor:*

*Hua Cai, Industrial Engineering*

**Poster Number:** 95 :: Mathematical/Computation Sciences

**College of Engineering**  
**VIP Remote Sensing - SOOP**

**Author:**

Christopher Morrison, Engineering

Jason Qian, Polytechnic

Joseph Bushagour, Engineering

Jagan Krishnasamy, Engineering

Kai Wilson, Engineering

Renaissa Ghosh, Engineering

**Abstract:**

Remote sensing is a technique of measuring Earth's surface properties without a need for physical contact. Remote sensing can be used to take soil moisture measurements, which are of great interest to farmers and hydrologists as they can be used to predict droughts, floods, and crop yields. Accurate soil moisture measurements that penetrate into the root zone (20cm - 100cm), have not been achievable with remote sensing in the past because previous techniques use L-band or higher frequencies, which only penetrate the top 5cm of soil. This is because the radio spectrum is tightly controlled by government restrictions and emission of lower frequency signals for the purpose of remote sensing is prohibited. Utilization of preexisting low frequency signals (a technique known as using Signals of Opportunity) from ORBCOMM communication satellites allows analysis with lower frequency signals that can reach the root zone soil. Our system consists of a tower that has two antennas: one to receive the signals directly from the ORBCOMM satellites, the other to receive the same signals reflected off of the ground. Cross-correlation between these two signals allows for reflectivity of the soil to be calculated, thus allowing root zone soil moisture to be measured. A software defined radio is used to record both signals, while a computer below the tower to log data from auxiliary sensors, such as temperature sensors, used in the analysis.

*Research Mentor:*

*Jared Covert, AAE*

*Eric Smith, AAE*

**Poster Number:** 96 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Purdue Lunabotics**

Author:

Tom Neafus, College of Engineering

Matthew Glimcher, College of Engineering

Bryce Sasser, College of Engineering

Victor Akan, College of Engineering

Lander Greulich, Engineering

Abstract:

Purdue Lunabotics is a university organization dedicated to the design and manufacture of an autonomous lunar mining rover. Students work in subdivided teams, with the ultimate goal of creating a rover capable of autonomously operating within a simulated lunar environment. Teams are formed around rover subsystems, with Drivetrain developing the chassis, Excavation-Deposition developing excavation systems, Power and Hardware handling electrical hardware and instrumentation, and Software providing navigational and general software capabilities. Additionally, each team is responsible for the manufacture of its components when the component in question is not commercially procured. The purpose of the robot is to compete against devices from other universities in the NASA Robotic Mining Competition, where it will perform various mining tasks in the simulated lunar environment of the Kennedy Space Center.

*Research Mentor:*

*Eric A. Nauman, Mechanical Engineering*

**Poster Number:** 97 :: Mathematical/Computation Sciences

**College of Engineering**

**Implementation of DFT Techniques for SoCET**

**Author:**

Cole Nelson, Engineering

Fredric Owens, Engineering

Karthik Maiya, Engineering

Xianmeng Zhang, Engineering

**Abstract:**

The Joint Test Action Group (JTAG) protocol is an industry standard serial protocol designed for silicon verification and testing. The current System-on-Chip (SoC) developed by the SoC Extension Technologies (SoCET) team over the past several years currently does not support this standard. The primary application of a JTAG module is reading and writing a chain of shift registers, known as a boundary scan, connected to the SoC's I/O pins in order to perform board-level connection tests and internal logic tests. Additionally, a custom instruction was added to allow device programming over the JTAG connection. The implementation of the JTAG module was developed and tested using SystemVerilog. The testing process utilized sub-module-level SystemVerilog testbenches as well as a top-level testbench for sub-module integration. The testbenches were used to confirm the functionality of the design in both simulation and gate-level synthesis. The JTAG module will allow SoCET to more effectively test and program chips after fabrication. Additionally, in the future the JTAG can be leveraged for software debugging tasks via adding custom instructions.

*Research Mentor:*

*Dr. Mark Johnson, Electrical & Computer Engineering*

*Dr. Matthew Swabey, Electrical & Computer Engineering*

*Jacob Covey, Electrical & Computer Engineering*

**Poster Number:** 98 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**  
**Image-to-Image Translation**

Author:

Tony Nguyen, College of Engineering

Tohme Tohme, College of Engineering

Cole Stecyk, College of Engineering

Robert Sego, College of Engineering

Abstract:

Our project aims to translate images between different domains, for instance translating between sketch images and real images of an object. Specifically, we are designing a model that takes as inputs images from one domain and uses Machine Learning algorithms and architectures to translate these inputs to images in another domain. The approach to design the model involves using the specific architecture Cycle Generative Adversarial Networks (CycleGANs). While there have been several implementations for the purpose of translating images between different domains using supervised learning methods, further improvement can be made using unsupervised learning methods. For supervised learning methods, datasets of paired samples are required, which are more expensive and more difficult to acquire. CycleGAN architecture allows us to employ unsupervised learning method, where independent datasets are sufficient enough to train the model. We are using a large dataset consisting of several thousand sketch images of objects (shoes, bags, chairs, etc.).

We have spent this first semester of the project extensively learning about Image processing techniques, CNNs, GANs and CycleGANs to be able to create our desired model. We referenced several published peer-reviewed papers for examination and decision-making on what approach and models would help us best achieve the image-to-image translation method we hope to create. We are currently in the processing of coding, training, and testing our model. We cannot predict the accuracy that we will be able to achieve, but we hope to have a holistic working model that is applicable to images outside of the dataset as well.

*Research Mentor:*

*Prof. Edward J. Delp, Electrical & Computer Engineering*

*Prof. Carla B. Zoltowski, Electrical & Computer Engineering*

**Poster Number:** 99 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Communication and Data Storage for Autonomous Boat**

**Author:**

Hanshen Ni, Engineering

**Abstract:**

Pesticides and pollutants pose a constant threat to river systems. Upstream spillage can potentially affect the entire downstream system. Remote locations like the Amazon is even harder for data collection. An autonomous boat can provide insights and keep tabs on these issues. A boat can autonomously move through water streams and track key water characteristics. On the boat, an Arduino is responsible to drive different sensors and store data locally on a SD card. Attached are GPS, Bluetooth, and RF transceivers that delivers code wireless for remote control and data access. On the dock end, a Raspberry Pi stores received data and stores a received data again for redundancy. The Raspberry Pi also runs a python code that analyzes data and outputs a visual presentation of GPS data.

*Research Mentor:*

*Eric Nauman, Mechanical Engineering*

**Poster Number:** 100 :: Life Sciences

**College of Engineering**

**Comparative Analysis of DNA Master Annotation to fgenesh Annotation**

Author:

Kaitlyn Niebrugge, Engineering

Sarah Ettestead, Engineering

Grace Mitchell, Engineering

Dalton Saylor, Engineering

Abstract:

DNA Master is a computer program that auto-annotates genomes. Its current use is to annotate bacteriophage genomes. DNA Master uses Glimmer and GeneMark algorithms to determine the most probable start sites; however, these programs are limited since they use bacterial genes to determine start sites. Often, incorrect start sites are chosen because bacteriophage genomes have different guiding principles than bacteria genomes. Bacteriophage genomes are smaller, include less gaps, and have longer genes, resulting in a denser genome than bacteria. The new program, fgenesh, is cited as the fastest and most accurate gene finder available, using Critica and Glimmer to annotate genomes. Critica is trained on more than just bacterial genes, which could yield better results during the auto annotation of phage genomes. This could increase the efficiency of genome annotation if fewer initial mistakes are made during the auto annotation process. This research involves obtaining a better understanding of fgenesh, using the program to annotate a genome that has already been annotated through DNA Master, and comparing the accuracy of each program. With these results, future researchers could have more confidence in choosing a program with a higher rate of accuracy, allowing researchers to spend less time modifying start sites.

*Research Mentor:*

*Dr. Kari Clase, Agricultural and Biological Engineering*

*Jacob Ridel, Agricultural and Biological Engineering*

**Poster Number:** 101 :: Life Sciences

**College of Engineering**

**Comparison of GeneMark and Glimmer Start-Site Annotations**

**Author:**

Renee Noland, Purdue University

Corey Kmetz, Purdue University

Kunming Shao, Purdue University

George Rickus, Purdue University

**Abstract:**

This research project was aimed at comparing accuracy of the auto-annotation programs Glimmer and GeneMark for start sites of genes in different bacteriophages in different clusters. Bacteriophages are a type of virus that infects bacteria and archaea by injecting genetic material inside the cells. Glimmer and GeneMark are different annotation tools that agree or disagree on start sites of bacteriophage genes based on algorithms. Both programs had algorithms giving different rankings to certain values determining start site, resulting in differences in start site predictions. Differences in these algorithms were analyzed through research on their methods and code, then compared. These programs more accurately annotate some clusters than others. At least one of each (higher and lower accuracy annotation clusters) compared the programs' respective accuracy and where they each failed. Common or repeated areas of failure were observed to determine if they could be improved. With the results of predicted start sites and the auto-annotated start sites, the number of false positives and false negatives were calculated and compared to determine which program tended to have the least of both. This indicated which program's auto annotations were generally more accurate. This can be a piece of information for future annotators on similar genes in the clusters analyzed. Specific analysis of where the programs both and individually lack accuracy could be used to improve the parameters for a greater range of genes and clusters in the future.

*Research Mentor:*

*Kari Clase, Biological Engineering*

*Ikenna Okekeogbu, Agricultural and Biological Engineering*

*Gillian Smith, Agricultural and Biological Engineering*

*Taylor Sorrell, Agricultural and Biological Engineering*

**Poster Number:** 102 :: Mathematical/Computation Sciences

**College of Engineering**  
**Earth History Visualization**

**Author:**

Karan Oberoi, Electrical and Computer Engineering

Yuzhen Qian, Electrical and Computer Engineering

**Abstract:**

Earth History Visualization

By: Karan Oberoi and Yuzhen Qian

The purpose of the earth history visualization research team's timescale project is to develop and in depth understanding of web development and develop solutions for consumers over the world to use. The research team is currently split into a few groups that are working on separate projects, firstly we have a team working on a database for storing and allowing users to contribute to a database with data on rock formations. The users of the web interface can easily search the information which they want to modify. We are currently working on improving stability, adding images and making the website look better. We have another team working on data mining which uses reliable rock data to find similar trends and develops tools to help identify these trends. The website team has successfully managed to create a complete version of the website that performs all basic expected functionality with a very reliable UI and are currently working on bug fixing and adding additional features that customers (in this case, other geologists) would utilize and other improvements that would make the user experience better. The data mining team is currently working on a new tool to help identify more relationships between the data from rocks. Our work on this website for geologists (along with all the other tools that our research team produces) we try and the goal of the website part of the project is to give others some ideas on how to design and manage their own database at an administrative level which would allow them to have complete control over the server, database and website allowing them to delete data, create new pages and even restart the server. This is important because with the use of the website, people who need information may access it easily, and children could also use it for learning. It also brings an easier way for the manager of the database to update and publish the information on time.

*Research Mentor:*

*James Ogg, Department of Earth, Atmosphere and Planetary Science*

**Poster Number:** 103 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Low-Power Phase Locked Loop Design for use on a System on Chip**

**Author:**

Matthew Olinde, Engineering

Evelyn Ware, Engineering

**Abstract:**

Phase Locked Loops (PLLs) are used for a variety of reasons, and are a major part of many radio, telecommunications, and computer applications. The PLL allows the synthesis of new frequencies much higher than the steady reference frequency of its input. Rather than a 32k input, it can output frequencies in the range of MHz, or even GHz. The challenges with designing a PLL are minimizing spur and phase noise, while also being able to operate in the desired frequency range. This is what we have accomplished through our PLL design. Our PLL was designed and simulated in Cadence Virtuoso, then optimized to decrease noise and increase the frequency range. Individual design considerations were made for the phase-frequency detector, charge pump, loop filter, voltage controlled oscillator, and frequency divider to create the best PLL for our application. Through simulation, the topologies that we found worked best with our desired results were a mixed signal phase-frequency detector, passive second order loop filter, current-starved ring oscillator, and a programmable frequency-divider. The building blocks were then combined to create a PLL that is able to multiply an input reference frequency of 32kHz by an integer multiplier to produce an output frequency up to 50MHz, which is the maximum desired frequency for future SoCET team microprocessors. Our design features low phase noise and spur, which makes it an attractive option as well. The PLL design can be incorporated in future SoCET chip designs to be used as a steady low-noise clock generator at different frequencies.

*Research Mentor:*

*Mark Johnson, ECE*

**Poster Number:** 104 :: Mathematical/Computation Sciences

**College of Engineering**

**Assessing Voltage Stability Utilizing Reinforcement Learning**

**Author:**

Owen Prince, College of Engineering

Yourong Tang, College of Engineering

Kaiwen Shen, College of Engineering

Rachit Pasricha, College of Engineering

Paul Han, College of Engineering

**Abstract:**

A reinforcement learning algorithm based tool will be developed to predict the voltage stability of a power system and determine appropriate actions to regain and maintain stability. Voltage stability is critical to ensure that every system in a power grid receives adequate power; outages in buildings such as hospitals have major consequences. The research project will focus on the implementation of a neural network into an agent and the development of an appropriate reward function to predict and maintain the voltage stability. Pypowernet, a power grid simulation package, will be used to simulate the power grid. It serves as an environment that tracks the current power grid state, implements a reward function, and processes actions performed by an agent. This reinforcement-learning based tool will be implemented by a neural network that will use environment variables as an input layer and output a prediction in the output layer. Scenarios with various line outages will be randomly generated to train the reinforcement-learning based tool. The reinforcement-learning based tool will predict voltage stability and suggest possible corrections as actions. A reward function will evaluate these outputs and provide an associated reward. It is projected that the reinforcement-learning based tool will be able to achieve a significant prediction and correction accuracy. By further increasing prediction accuracy, the reinforcement-learning based tool could provide reliable insight into stabilizing power systems after natural disasters and other catastrophic events.

*Research Mentor:*

*Guang Lin, Mechanical Engineering*

**Poster Number:** 105 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**  
**Virtual Teaching Assistant**

**Author:**

Chayaphon Pugkhem, Engineering

Shreya, Engineering

**Abstract:**

Advances in AI and the ability to achieve high-quality training using large datasets have proven to be extremely beneficial to various industries as evident by many automated tasks. In this project, we focus on the opportunity of automation in the education sector. Specifically, we explore automating communication between instructors and students in large classes to enhance the classroom experience. This project aims to create an AI-powered Virtual Teaching Assistant chatbot (VTA) to aid professors and teaching assistants in answering common questions about assignments, exams, and scheduling appointments.

Currently, our VTA is built upon an open-source chatbot engine called “ChatScript” which we use to create a knowledge base for the chatbot. With an adequate knowledge base, our current VTA can provide proper responses to only structured data such as student’s questions about deadlines. Last semester, we proposed two solutions to improve the overall abilities of our VTA: 1. To integrate BERT, a pre-trained NLP model, into ChatScript to expand the capabilities of our VTA, and 2. To integrate WebSocket to improve the server concurrency of the VTA.

We have demonstrated that BERT can be used in a Q&A task regarding unstructured data such as texts in particular documents. The high-level plan of the integration of ChatScript and BERT is that ChatScript will be detecting keywords from questions entered by the user. Using that keyword, BERT will know which particular documents the answers would be at. With BERT question-answering capabilities, VTA will be able to answer a wider variety of questions and with better accuracy.

We have also noticed that our VTA is not scalable. It can only handle one user at a time. With WebSocket protocol, we expect our VTA to be used with multiple students at any given time.

*Research Mentor:*

*Mithuna Thottethodi, ECE*

**Poster Number:** 106 :: Physical Sciences

**College of Engineering**

**Passive Water Collection via Radiative Cooling Nanosurfaces**

**Author:**

Akshay Rao, Engineering

Aidan Chappell, Engineering

George Elias, Engineering

Abhimanyu Das, Engineering

Joseph Peoples, Engineering

**Abstract:**

Nanoscale radiative cooling aims to engineer a material at the nanometer scale to optimize wavelength-dependent radiation properties. This opens up the possibility for passive cooling of a surface due to the material properties. From thermodynamics, water vapor condensation from air is enhanced with large temperature differences below the ambient conditions. Our technology uses nanoscale geometries of common elements which, when dried as a paint, create ultra-high reflectivity to solar irradiation. The surface is capable of a cooling power of over  $100 \text{ W/m}^2$  for a temperature drop of up to  $10^\circ\text{C}$  below the ambient temperature. Further, we create a world map of the potential for water collection with this paint. While optimal operating conditions are in high-humidity regions outside of direct sunlight, this surface has demonstrated high cooling power in less optimal environments. Initial testing showed up to a  $5^\circ\text{C}$  temperature drop below ambient in direct sunlight. To reduce the high computing cost associated with non-linear physics models, we create a linearized regression model to maintain high accuracy with low computing time. Previously, scalable radiative cooling technologies for passive vapor harvesting were only considered viable for extreme-high humidity regions. We use a novel modeling approach to accurately describe the newfound potential for harvesting water vapor in the world. This radiative cooling paint has the highest potential for cooling power ever demonstrated in a paint-based application. Further efforts will aim to optimize the application will aim to increase the surface hydrophobicity to improve the mass transport of water droplets across the surface.

*Research Mentor:*

*David Warsinger, Mechanical Engineering*

*Xiulin Ruan, Mechanical Engineering*

**Poster Number:** 107 :: Mathematical/Computation Sciences

**College of Engineering**  
**Dynamic Routing in DeepPool**

**Author:**

Daniyaal Rasheed, Electrical and Computer Engineering

Aarushi Banerjee, Science

**Abstract:**

DeepPool is a deep reinforcement learning algorithm designed to maximize the profits of ride-sharing platforms. It achieves this by reducing the supply demand mismatch for different locations within the city and by decreasing resource usage such as gas. The current algorithm assigns a vehicle multiple passengers from the same location. The vehicle must serve all of these passengers before it is allowed to serve new ones. The goal of this project is to allow vehicles to choose to serve a new passenger at every drop off location. This would result in a more resource efficient model as it increases the number of vehicles available to serve a passenger.

*Research Mentor:*

*Vaneet Aggarwal, Electrical and Computer*

**Poster Number:** 108 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Utility Image Spring 2020**

Author:

Yasin Kubilay Sahin, Engineering

Abstract:

Abstract Redacted

*Research Mentor:*

*Jan Allebach, ECE*

**Poster Number:** 109 :: Life Sciences

**College of Engineering**

**Finding the Genes Specific to Fighting *P. aeruginosa* Bacterial Infections in Cystic Fibrosis**

Author:

Makayla Schacht, Science

Aaron Gin, Agriculture and Biological Engineering

Jack Maher, Agricultural and Biological Engineering

Madhu Prakash, Agricultural and Biological Engineering

Abstract:

Cystic fibrosis is a genetic disease that results in persistent bacterial infections in the lungs, making it difficult to breathe. The main bacteria player in these infections is called *Pseudomonas aeruginosa*. There is currently no cure for cystic fibrosis including their bacterial infections. Although antibiotics are often used as a treatment option to fight these bacterial infections, they can often lead to bacterial resistance to making the bacterial infection increasingly difficult to treat. Bacteriophage are viruses that infect bacteria by injecting their genetic material into bacteria and often kill bacteria. They are unique in their ability to target and combat specific types of bacteria, unlike antibiotics which kill a broad range of bacteria including healthy bacteria. Bacteriophage that are specific in targeting *P. aeruginosa* are currently being tested in clinical trials as a more personalized treatment option that avoids the build-up of bacterial resistance.

The goal of this research was to identify which genes are essential to fight *P. aeruginosa* infections and cross reference them with other bacteriophage to find new potential candidates for cystic fibrosis treatment. Clinical trials use a cocktail of phages for treatment and we compared their gene sequences and functions to identify genes that are key in fighting *P. aeruginosa* infections. These sequences and functions were then cross referenced with those in other phage databases like PhagesDB to discover phages with these characteristics. Therefore, these phages could be potential treatment options for cystic fibrosis patients.

*Research Mentor:*

*Dr. Kari Clase, Agriculture and Biology*

*Emily Kerstiens, Agriculture and Biology*

*Lauren Novak, Agriculture and Biology*

**Poster Number:** 110 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Studying the Detonation Structure Inside an Optically Accessible Rotating Detonation Engine**

**Author:**

Hannah Mackin Schenck, Engineering

**Abstract:**

The purpose of this research was to study the structure of the detonation wave in a hydrogen-air rotating detonation engine (RDE) by analyzing high speed images of the detonation front. The images we collected, were analyzed using MATLAB code to create a phase-averaged image of the detonation wave. The structure of the detonation wave was compared at mass fluxes ranging from 400 to 750 kg/m<sup>2</sup>. All tests were run at an equivalence ratio of one with the same start-up and run sequence. The results show a two lobed wave structure with a trailing secondary wave. The primary wave is much taller than expected based on the calculated fill height of fresh reactants. The secondary wave is much weaker than the primary wave and about a third of the height. We believe the secondary wave structure that we saw is a product of the three-dimensional motion of the wave in the annulus. The main detonation wave is likely anchored to the inside wall of the channel and the secondary wave is an oblique shock interacting with the outer wall. Further testing will be done on this RDE using other optical diagnostic techniques to study the effects of the channel environment on the detonation wave and the RDE's performance.

*Research Mentor:*

*Terrance Meyer, Mechanical Engineering*

**Poster Number:** 111 :: Physical Sciences

**College of Engineering**

**Density Functional Theory Study of Propane Dehydrogenation on Ni-Zn Alloys**

**Author:**

Justin Senyk, Engineering

**Abstract:**

Propylene is an important raw material in the production of many higher value chemical intermediates and end use products. As demand for propylene continues to rise, on-purpose production of propylene by catalytic dehydrogenation of propane is becoming increasingly more significant. Pure platinum and palladium-based materials were used as catalysts for dehydrogenation reactions, but they suffer from low selectivity towards propylene and coke formation. Alloying Pt or Pd with other metals such as Zn increases the propylene selectivity, but are expensive due to the use of rare metals.

In this study, density functional theory was used to evaluate Ni-based alloys as catalysts for propane dehydrogenation. Calculations were carried out on terrace surfaces of Ni, Ni<sub>3</sub>Zn, and NiZn. The binding energy of propylene along with dehydrogenation and C-C bond breaking barriers were used as descriptors of propylene selectivity. Segregated surfaces where surface atoms switch positions compared to the clean surfaces were also examined.

The results demonstrate weaker binding energies of propylene on the nickel alloys as compared to Ni. The binding energies of coke precursors such as ethylidyne and methylidyne were also found to be significantly weaker on the nickel alloys. Furthermore, the increased barriers for deep dehydrogenation of propylene for alloys indicate their improved selectivity towards propylene. Finally, the calculations on Ni alloys will be compared to similar Pd alloys (PdZn and Pd<sub>3</sub>Zn) and published literature values for Pt.

*Research Mentor:*

*Jeffrey Greeley, Chemical Engineering*

*Ranga Rohit Seemakurthi, Chemical Engineering*

**Poster Number:** 112 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**VIP Robotic Exploration - Dock Design**

**Author:**

Nicolas Sersch, School of Elec & Computer Engr

Tim Osifchin, College of Engineering

Seyi Akinwumi, College of Engineering

Erik Holm, School of Mechanical Engineering

**Abstract:**

The problem of water pollution has been exponentially getting worse over time as more and more pollutants are introduced to the world. These effects can be seen throughout the globe, even in places with little to no Human activity. We were tasked with developing an autonomous dock to retrieve data from and charge a self-propelling boat that is traveling through the Amazon River. The boat would be collecting data on water pollutants, temperature, and other vital information regarding the river's condition. During the design process of the dock, it was imperative to limit the human interaction with both the dock and the boat in order to be able to gather information in even the most remote locations. The implementation of solar energy to power both the dock and the boat proved to be the most reliable source of energy. Outside of the electrical components, the dock was designed to lift the boat out of the water to electrically charge the boat while transferring collected data from the boat to a safe data storage location on the dock which will then send the data to us when prompted. With pollution reaching an all-time high every year it is important to collect data on the effects on all areas of the globe. The information gathered in the Amazon can prove to be an effective way to put the deterioration of remote ecosystems under a microscope and to further understand humanities impact on the planet.

*Research Mentor:*

*Eric Nauman, School of Mechanical Engineering*

**Poster Number:** 113 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Robomaster Dart System Design**

**Author:**

Henry Silva, FYE

Kurtis Dressel, Noah Boursier, Dansen Wang, Yuan-Cheng Chen, Engineering, Science

**Abstract:**

The goal of the Robomasters VIP team is to design and build a miniature self-guided dart that is launched up to 30 meters and is capable of hitting a 10 cm x 10 cm target indicated by a green light and sensor plate. This multidisciplinary team has designed an aerodynamic, missile-like main body with 3 equally spaced fins which are controlled by custom built actuators. The dart itself is controlled using a Raspberry Pi Zero, which takes input from the front facing camera and on-board IMU and uses OpenCV along with a custom closed loop control algorithm to signal the fin movement, altering the dart's trajectory. The custom algorithm will use a PID controller to signal fin movement, altering the dart's trajectory. The actuators are custom built to be small, lightweight, and strong enough to move the control surfaces of the dart. Using a test-rig setup, the team will optimize the dart's control system and fine-tune the actuator's impact on the aerodynamic vectors of the missile body. A testing interface will be created that can send and receive data from the dart to collect display and collect sensor data and to control the fins live. Ultimately, we hope to be able to consistently hit our mark on the Robomaster battlefield.

*Research Mentor:*

*Michael Linnes, Mechanical Engineering*

**Poster Number:** 114 :: Physical Sciences

**College of Engineering**

**Direct Oxidation of Electron Poor Amines with Potassium Superoxide**

**Author:**

Dawson Smith, Engineering

**Abstract:**

Nitro substituents are important contributors to the properties of molecules in a variety of fields, namely in the industries of explosives and chemical synthesis, though they see niche use in industries such as pharmaceuticals and medicine. These functional groups are rarely found in nature, and thus must be chemically synthesized for use - the most common method of which employs mineral acid mixtures that are both dangerous to work with and generate environmentally harmful waste. The developed synthesis route allows for a safe, one-step, direct oxidation of electron poor amines to produce nitro substituents in high yields. This oxidation is facilitated through the superior reactivity of potassium superoxide and is a method unavailable to standard oxidizing agents. To complete the synthesis, an electron withdrawing molecule bearing an unreactive amine is stirred with potassium superoxide in a polar aprotic solvent over molecular sieves. After ample reaction time, the solution is quenched and extracted into an organic solvent for the desired work up.

*Research Mentor:*

*Davin Piercey, Materials*

**Poster Number:** 115 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**  
**Quantum Transport Simulator**

**Author:**

Kyeonghoon Son, Purdue University

**Abstract:**

As the dimension of transistor has already been scaled down to only few nanometers, semi-classical transport theory can no longer precisely describe the behaviors of carriers due to quantum effects. In order to easily understand the operating principles of nano-transistors, it is necessary to build a quantum transport simulator with a user-friendly graphical user interface (GUI). The purpose our research is to build and upgrade the simulator that will offer a straightforward way for people to design their own nanowire transistors and investigate the underlying physics. The simulator will be upgraded by replacing OMEN output to NEMO5 output which will reduce the run time of the simulator. Building the quantum transport simulator will help people to easily understand the nanowire transistors and it will also help to save the total budget in the experimental wise.

*Research Mentor:*

*Gerhard Klimeck, Electrical and Computer Engineering*

*Han-Wei Hsiao, Electrical and Computer Engineering*

**Poster Number:** 116 :: Mathematical/Computation Sciences

**College of Engineering**  
**Processor Functionality Using Software**

**Author:**

Tucker Swan, Purdue University

**Abstract:**

With the development of the new SoCET processor and its related hardware, it becomes essential to utilize its various functionalities using libraries and scripts. Using both C and assembly language, libraries can be created to reduce the complexity of usage for the processor through functions and other declarations. In order to create libraries for the chip, it has to be studied and understood for its functionality. Following this, various and pre-existing software libraries are to be consulted to set the basis of library formatting. Working with the chip designers and related professors, the functionality of the library will be created, setup in such a way for easy adjustment in future generations. This generation of the chip and its package will contain 4 different peripherals, each containing between 3 and 18 software configurable registers. In total, that allows for approximately  $16^{256}$  different bit combinations across the 4 peripherals. The libraries will reduce the configurations of the chip to 38 different functions which each require between 0 and 2 inputs. These libraries will be verified using simulations of the chips architecture and test programs. Once verified, the chips architecture will be loaded onto an field programmable gate array (FPGA) and demonstrated using simple, but more realistic applications. These libraries will be the first time software libraries are available for all peripherals of this device. They will allow for more efficient and simple operation of the chip for new and existing users and provide a basis for future libraries.

*Research Mentor:*

*Mark Johnson, School of Electrical and Computer Engineering*

**Poster Number:** 117 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Deep learning approaches for prediction of heavy metals concentrations in food or water**

Author:

Uday Thapar, Engineering

Dainong Hu, Engineering

Abstract:

This paper reports the implementation of deep learning models for the detection of heavy metals, such as mercury and arsenic in food and water. Chemical sensitive cotton pads were designed to change color based on their contact with mercury and arsenic, and their respective concentrations. Images of these pads were then taken and administered into Keras based deep learning models to identify color changes and classify each image. These models consist of convolutional neural networks trained to identify changes in images and eventually classified them into 5 classifications based on the concentration of each heavy metal by ppm (Parts Per Million). The denoted accuracy for this classification has been upwards of 70% with variations in a number of classification groups varying from 2-5. The obtained results and model will prove useful in further developing research of their use within a mobile app setting, for the purposes of ease of testing for heavy metals.

*Research Mentor:*

*Min Zhao, electrical and computer engineering*

*Qiyue Liang, Electrical and Computer Engineering*

**Poster Number:** 118 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Improving Workplace Safety: IoT Sensor Network**

**Author:**

Kevin Tian, College of Science

Joven Garces, College of Engineering

Shivam Bhatia, College of Engineering

Nicholas Petersen, College of Science

Charles Geraci, College of Engineering

**Abstract:**

In 2018, there were on average 14 deaths every day, resulting in over 5,000 fatal workplace injuries according to the Bureau of Labor Statistics. The aim of our project is to reduce the severity of workplace injuries and lower the frequency of fatal incidents by developing a cluster of sensors that monitor workplace hazards such as suspended particulate matter, toxic substances, and excessive noise exposure. The cluster of sensors will communicate in an IoT (Internet of Things) system using a microcontroller to relay information to the cloud. The data collected by the network of sensors will be passed to a machine-learning algorithm to determine threshold models of toxicity at the Bechtel Innovation and Design Center (BIDC), per the Occupational Safety and Health Administration's (OSHA) permissible limits. This model will be used to alert workers of potentially hazardous situations before they occur.

By analyzing all severe injuries reported to OSHA from 1/1/2015 to 8/31/2019, we were able to identify particulate matter, toxic substance exposure, and various methods of poisoning to be the most targetable injury categories for our project. Using this information, we narrowed down potential sensors and microcontrollers that could be utilized in our network.

This work suggests that the common workplace injuries and fatalities that we target are preventable, and could have large implications on the safety of students at BIDC, and others in workplace environments. Reducing such injuries will be beneficial to multiple industries, from construction and manufacturing, to finance and insurance.

*Research Mentor:*

*Dr. Matthew A. Swabey, Director of the Bechtel Innovation and Design Center*

**Poster Number:** 119 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**System on Chip Extension Technology**

**Author:**

Minh Tran, College of Engineering

**Abstract:**

The System-on-Chip Extension Technologies (SoCET) group is a student led organization that works on iteratively improving, prototyping, fabricating, and testing a System-on-a-Chip. Two fundamental goals for the team are to follow best practices in the SoC industry as well as to serve as a platform for prototyping the work of many research groups at Purdue. SoCET divides chip development into digital design, verification, analog/physical design, software design and printed circuit board development subteams. The team has recently fabricated its 5th chip a general-purpose RISC-V based SoC which utilizes machine learning optimizations to more efficiently handle sparsity. Currently the team is developing its 6th iteration of this design.

*Research Mentor:*

*Mark Johnson, Electrical and Computer Engineering*

**Poster Number:** 120 :: Life Sciences

**College of Engineering**

**Comparison of the Genomes of Phages Located in Relation to Shared and Differing Clusters**

Author:

Amala Manasa Uli, Engineering

Charles Levine, Science

Maddie Jensen, Engineering

Zachary Nelson, Engineering

Abstract:

During the isolation of bacteriophages, viruses that infect bacteria, and annotation of their genomes, the concept of clustering of phage arose. Clustering phages is the process of grouping phages with other phages that share at least 50% genomic similarity<sup>1</sup>. Clusters are a scientific construct invented to form a better categorical understanding of phages, and don't offer a strong definition of the basic genetic components that define a phage. Using bioinformatics programs such as Phamerator, NCBI BLASTp, and PhagesDB, as well as current available literature, a map of the genetic content within phages across clusters and among phages within a single cluster were constructed to define a range of genetic commonality and how that commonality can vary. It was also important to determine how physical characteristics and phage functionality vary with genetic composition. Basic building block genes, such as the placement and length of the capsid protease, were thought to remain constant amongst phages of different clusters, while position and length of secondary genes, such as tail chaperone assembly proteins, were thought to vary across different clusters. To ensure samples considered would represent a wide variety of genomes without endeavoring to map the genomes of too many phages at once, only phages within "B" clusters were considered.

References:

1. Grose, Julianne; Casjens, Sherwood. US National Library of Medicine National Institutes of Health. (2014, November). Understanding the enormous diversity of bacteriophages: the tailed phages that infect the bacterial family Enterobacteriaceae. Retrieved February 21, 2020.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4301999/>

*Research Mentor:*

*Dr. Kari Clase, Agricultural and Biological Engineering*

*Emily Kerstiens, Agricultural and Biological Engineering*

*Jacob Riedel, Agricultural and Biological Engineering*

**Poster Number:** 121 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Hummingbird Robotics Design: Power Driver**

Author:

Michael van der Merwe, Purdue

Abstract:

Abstract Redacted

*Research Mentor:*

*Xinyan Deng, Mechanical Engineering*

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

**College of Engineering**

**Sensor-Based Teamwork Analysis in the Operating Room**

**Author:**

Ryan Villarreal, Engineering, Health and Human Sciences

**Abstract:**

Robot-assisted surgery (RAS) has been rapidly gaining popularity as a non-invasive technique. RAS enhances surgeons' capabilities through increased precision, making for more effective surgeries with shorter recovery times. RAS utilizes robotic arms over the patient that are controlled by a surgeon on a console away from the sterile field and the rest of the team. With these changes in technology and team set up in the operating room, it is critical that surgical team members are communicating effectively. Limited studies have investigated the effect of RAS on surgeon communication; however, current methods are still observer-based. This study aims to objectively measure teamwork between the surgical team during RAS.

An Inertial Measurement Unit (IMU) was attached via headband to the primary and assisting surgeons' foreheads to estimate their visual field throughout surgery. A location sensor (Pozyx Creator Kit) was used to track the team in the operating room.

Using visual field and positioning data, the proximity between team members and face-to-face communication was calculated among the team members. These tools can be applied to further analyze how surgeons act as a cohesive unit inside the operating room. Future work should investigate the content of the communication, and how communication occurs during times that surgeons are not facing each other.

*Research Mentor:*

*Jackie Cha, Industrial Engineering*

*Denny Yu, Industrial Engineering*

**Poster Number:** 123 :: Life Sciences

**College of Engineering**

**2D Microscopy Image Segmentation and Synthesis**

**Author:**

Rui Wang, College of Engineering

Jiahui Zhu, College of Engineering

**Abstract:**

The purpose of this research is to build on previous work where a software tool that identifies biological segments such as nuclei and microtubules in fluorescent cell images was created. To improve this software tool, more data are needed. However, collection of microscopy images can be expensive in both time and monetary values. The current way to collect one set of such images requires a genetically-modified rat worth of around 4000 USD to be experimented which is lethal for the rats experimented. Moreover, the time and effort put into human labelling of such data are unfortunately prohibitively high for large-scale experiments. This research work has been supplied with 200 labeled fluorescent cell images taken by a well-known university, and uses Generative Adversarial Networks to model the distribution of the true data in order to synthesis more data as a way of data augmentation for the previous segmentation tool and also for many more exciting possibilities to come.

*Research Mentor:*

*Carla Zoltowski, Engineering Education*

*Edward J. Delp, Electrical and Computer Engineering*

**Poster Number:** 124 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**CAM2 - Human Behavior Team**

**Author:**

Tong Wang, College of Engineering

Mert Zamir, College of Engineering

Siddhartha Kumar Senthil Kumar, College of Engineering

**Abstract:**

In lab safety applications, person re-identification is a crucial component because it is able to track the identity and location of each unique person and analyze their behavior to prevent safety hazard. In order to analyze human-behavioral data, every single person in the frame should be identified and be assigned a unique ID to track their movement. This process can be complicated by limited camera angles or obstructed views. If a person exits a camera's scope and re-enters, this person should be identified as the same ID. The re-identification project is a camera based neural network which re-identifies a person based on attribute features. One subsystem of the re-id model is 2D mapping of people's locations, which is highly dependent on the re-identification accuracy. The ultimate goal of 2D mapping is to generate a heatmap which shows the areas subject to congestion in order to avoid placing heavy machinery in proximity to those locations. The 2D mapping system analyzes the tracks which people take, the time spent, and patterns in machine use. Currently, the re-id system is 95% accurate with re-identifying people using data collected from controlled interior spaces, using 4 people as the test subjects.

*Research Mentor:*

*David Barbarash, Horticulture and Landscape Architecture*

*Yung-Hsiang Lu, Electrical and Computer Engineering*

**Poster Number:** 125 :: Mathematical/Computation Sciences

**College of Engineering**

**Characterizing the Capacity Region of a Two-Queue Loss System**

**Author:**

Xiaotian Wang, Engineering

**Abstract:**

How should limited resources be optimally allocated across a network? For instance, given a fixed total number of available tests for a disease, a given amount of time to administer the test and obtain the results, and a given level of demand for the test in different geographic locations, what is the optimal allocation of the fixed number of tests, so as to minimize the probability that an arriving patient is denied the test? We develop an abstract queuing model to study this problem. For simplicity, we consider a two-queue system modeling 2 geographic locations with no buffer and independent arrivals to either queue. Given a fixed total number of servers, we seek the optimal allocation of servers such that the blocking probability (i.e. the probability that a customer shows up but cannot be served at that time) of the system is minimized. We are particularly interested in mathematically characterizing the region of arrival rate pairs in which the blocking probability is at most a given threshold. Our results indicate that this 'capacity region' is actually non-convex, implying that there are pairs of arrival rates where the individual queues might be able to achieve the blocking probability, \emph{but the network as a whole cannot}. This is in contrast to existing results in the literature that show that the capacity region is convex when the objective is to maximize the mean number of customers served per unit time (or 'throughput'), implying the optimal number of servers required is exactly equal to the sum total arrival rate. On the other hand, our results indicate that the total number of servers required is strictly greater than the sum of total arrival rates, to achieve the blocking probability threshold. The study of a two-queue system provides useful insights into more complicated many-queue systems, which are also encountered frequently in reality.

*Research Mentor:*

*Harsha Honnappa, Industrial Engineering*

**Poster Number:** 126 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Low-Power Rail-to Rail Operational Amplifier Design**

**Author:**

Evelyn Ware, Engineering

**Abstract:**

Operational amplifiers are fundamental components for analog and mixed signal circuits. As new applications emerge that require lower power, operational amplifiers will have to continue to evolve with new novel designs to keep up. Challenges to these designs include stability issues, lower gain, and reduced bandwidth. The ultra low-power rail-to-rail operational amplifier designed in this project uses CMOS 45nm technology and was designed and simulated in Cadence Virtuoso. The unique design consists of two folded cascode OTAs (operational transconductance amplifiers) in parallel, one with a PMOS input stage and one with an NMOS input stage. This allows rail-to-rail input capability. The outputs of the OTAs are combined in a cross-coupled output stage which allows rail-to-rail output operation. Currently this op-amp has a simulated power dissipation of 3.85uW with a VDD of 0.9V while achieving an open-loop gain of 81dB. Future work will include testing the op-amp on a chip to confirm performance and design specifications. Additionally, modifications will be made to the design of the op-amp so that it can function in the sub-threshold region to further lower the power consumption and VDD.

*Research Mentor:*

*Saeed Mohammadi, ECE*

**Poster Number:** 127 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Urban Farming: Fish and Plant Symbiosis**

**Author:**

Troy Weber, Engineering

Diana Del Real, Engineering

Ryan Rospond, Agriculture

**Abstract:**

The purpose of this study is to determine the symbiotic relationship of fish and plants in a stacked system through aquaponics. The study followed a design of a small-scale prototype to measure the health and growth of pea microgreens and bluegill in a three tier stand by the measurement of pH, concentrations of ammonia, nitrite, nitrate, height of the plants, and length of the fish. High levels of pH was widely affected by several contributors in the system, slowing the growth of the peas and bluegill, since they must live in a range of 6.5-7.0 pH. Large concentrations of ammonia and nitrite, above 0.25 ppm, resulted in poor conditions of both the plants and fish, as these are poisonous chemicals to both species. To prevent the high levels of pH, acidic concentrations of chemicals that are safe for plants and fish, considerably vinegar, was added to the water. Nitrifying bacteria was added to the system in low concentrations, but exponentially grew in population because of the amount of food (ammonia) available to the bacteria. Precautions about bacterial growth need to be taken into consideration, so the system can maintain a healthy environment for the plants and fish in the small-scale prototype.

*Research Mentor:*

*Tamara Benjamin, Horticulture and Landscape Architecture*

*rahman17@purdue.edu, Agriculture and Biological Engineering*

**Poster Number:** 128 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Spider Bio-Mechanics**

**Author:**

Chase Weinstein, Engineering

**Abstract:**

The purpose of this project is to analyze the forces required to make a spider move and use this to create spider robots in the future. A spider moves using hydraulics which makes it an efficient system. The overarching goal of this project is to create a spider robot, but the main focus of this sub-team is to analyze the forces on a spider's leg when it walks and to create a new cage. We are conducting this study by capturing a video of a spider walking on a force sensor. We are then analyzing the video and capturing how each of the spider's leg segment moves while comparing it to the data we collect from the force sensor. As of right now we do not have conclusive data because it is difficult to get accurate data from the spider. However, we will use this information to create a new cage and data collection system for future projects. The project has two main goals, to collect meaningful data of the spider to then create a spider robot, and to create a new cage for better analysis.

*Research Mentor:*

*Professor Eric Nauman, Mechanical Engineering*

**Poster Number:** 129 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Vibration Assisted Microencapsulation of Single Phase and Core-Shell Microparticles**

**Author:**

Brandon Wells, Engineering

**Abstract:**

One thing that bubble-tea, cleaning products, and plant fertilizers all have in common is that they utilize a technology called microencapsulation. Vibration assisted microencapsulation enables the high rate production of uniform monodisperse droplets that can be crosslinked to form solid particles. Particles and capsules templated from drops are widely used in pharmaceutical, agricultural, and cosmetic industries to protect and control the exchange of heat or chemicals compounds depending on the conditions of the surrounding environment. This microencapsulation technique utilizes vibration to break a fluid jet emerging from a mm to sub-mm sized nozzle and form equal-sized drops at rates that correspond with the applied frequency. This method is promising for microparticle production because it produces droplets at rates orders of magnitude faster than precision microfluidics, and with a narrower size distribution than batch interfacial polymerization. The focus of this project is to determine the size and production rate limits for creating spherical single phase and core-shell microparticles. The system was tested using bio-based or bio-inert solutions made from alginate, vegetable oil, and photo-sensitive polyethylene glycol diacrylate that were crosslinked into particles through solution gelation or UV exposure. Droplet sizes and production rates were calculated using a Photron high-speed camera. Even though  $510 (\pm 10) \mu\text{m}$  1.5 wt% alginate drops can be formed around 2500 drops/sec using a single-axial nozzle and  $500 (\pm 60) \mu\text{m}$  1 wt% alginate drops can be formed around 3400 drops/sec using a co-axial nozzle, collection methods will have to be improved to reduce particle coalescence and deformation.

*Research Mentor:*

*Carlos Martinez, Materials Engineering*

**Poster Number:** 130 :: Mathematical/Computation Sciences

**College of Engineering**

**Literature Review and Bibliometric Analysis for Digital Game-Based Learning**

**Author:**

Jingjing Xu, Purdue University

**Abstract:**

**Literature Review and Bibliometric Analysis for Digital Game-Based Learning**

As an interesting topic, game-based learning is gaining more and more attentions. The number of publications of game-based learning area has been rapidly increasing with rapid development on digital games and concentration in educational in recent decades. More and more literature reviews on those topics and relative fields of game-based learning have been published. To better understand the background and foresee the future research direction and development, the ability of gathering and analyzing information using scientific method is useful. To deal with numerous of papers or publications in this area, it is necessary to abstract the essence and draw the guidance from them. Based on the topic I chosen in this project, we are doing research on literature reviewing on the digital game-based learning area and obtaining a systematic mapping of the current research using data mining resources and bibliometric tools. The analysis includes gaining word clouds and key words from publications chosen, key research topics searching, the trend of focuses for publications and relations between topics. During project for this semester, the bibliometric analysis will cover over 10 publications for presenting the whole procedures in analysis of further exploration and providing some references in this fields. The overall process and findings will give a constructive pattern of how researches on this area went through for past decades and provide some inspiration for researchers to decide the topics and focuses in the future. The scientific methods of approaching this field will also provide some references and instructions for other areas.

*Research Mentor:*

*Vincent Duffy, Industrial Engineering*

**Poster Number:** 131 :: Physical Sciences

**College of Engineering**

**Quantification of Murine Cardiac Function Following Hypertension-Driven Hypertrophy**

**Author:**

Alexis M. Zavitsky, Pharmacy

**Abstract:**

Cardiac hypertrophy is abnormal enlargement or thickening of the heart muscle, resulting from increased cardiomyocyte size. One factor leading to cardiac hypertrophy is increased cardiac afterload, which is driven by hypertension. However, the degree to which hypertrophy is reversible remains uncertain. The purpose of this study was to uncover evidence that cardiac function can return to normal post-hypertension using a murine model. To accomplish this, we subcutaneously implanted mini-osmotic pumps containing either saline (n=5) or angiotensin II (AngII; n=10) for 28 days. The AngII osmotic pumps induce hypertension in mice, leading to cardiac fibrosis and hypertrophy. In half of the AngII mice (n=5), the AngII pumps were removed after 14 days to quantify recovery. Ultrasound images and blood pressure measurements were obtained on days 0, 7, 14, 21, 28. The ultrasound images were analyzed using Simvascular and Vevo LAB, and revealed that the saline group had a constant left ventricular mass over time, while the day 28 group had increased LV mass. The day 14/14 group had increased LV mass until day 14, and then a decrease in LV mass after removal of the pump. These results confirm that the heart can return to normal size post-cardiac hypertrophy. However, a fibrotic phenotype still persisted, as indicated by decreased cardiac function. Current work now focuses on understanding the timecourse involved in recovery, with the ultimate goal of assessing therapeutics to prevent fibrosis of the heart post-hypertrophy, allowing for retainment of normal cardiac function in patients.

*Research Mentor:*

*Craig J. Goergen, Biomedical Engineering*

*Alycia G. Berman, Biomedical Engineering*

**Poster Number:** 132 :: Social Sciences/Humanities

**College of Engineering**

**Investigating Gender Bias in Peer Evaluation Results for College Engineering Students**

**Author:**

Chuhan Zhou, College of Science

**Abstract:**

Nowadays, since teamwork becomes common in engineering courses, peer evaluations are widely used. Peer evaluations has its own strengths, but could also be biased to many factors, such as gender. In this study, we discussed whether gender bias exists in peer evaluations of engineering courses. We collected the data from a Purdue FYE course and a civil engineering course in an Australian University, and we used ANOVA to analyze the results. Our results show that no evidence of gender bias between male and female students exists, which is a positive outcome. However, male and female students have different rating behaviors, as female students generally rate peers more strictly than male students.

*Research Mentor:*

*Behzad Beigpourian, Engineering Education*

**Poster Number:** 133 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**IBAC Research Abstract**

**Author:**

Vidur Zimmerman, Purdue University

**Abstract:**

In the clinical, food science, and biomedical fields, researchers are very familiar with the area of bacterial counting, since it's the basic step of identifying the cell number in the patient or food sample. Today, a good number of end users and laboratories still manually count bacterial colonies with a clicker pen, however more people have started to create automatic or semi-automatic bacterial colony counters. Automatic and semi-automatic bacterial colony counters reduce the time needed to get the count of certain plates, provide objective quantitation of colony counts, and provide a digital database of the counts for future reference. Our research team created an image processing algorithm with MATLAB to count bacterial colonies automatically, that would eventually be transferred to smartphone application. In our individual teams we constructed algorithms that worked on a real image dataset and produced accuracy counts vs the manually counted colony numbers, which served as a gold standard. Using the current algorithm, which includes circular Hough transform, masking, sharpening, etc., colony counts are at least 75% accurate. The inaccuracies arise from attempting to correctly count touching colonies where two or more bacterial colonies conglomerate and form a single large blob. As the algorithm is improved, the method will allow students, faculty, and doctors in the biomedical field to receive bacterial counts at a much faster rate. By the end of the semester, we want to be able to take any real image, apply our algorithm, and produce a count that is at least 90% accurate.

*Research Mentor:*

*Euiwon Bae, Mechanical Engineering*

**Poster Number:** 134 :: Life Sciences

**College of Health and Human Sciences**

**Differences in Lipid Metabolism Gene Expression Between Non-Metastatic and Metastatic Breast Cancer Cells**

**Author:**

Josie Asher, Health and Human Sciences

**Abstract:**

Breast cancer is estimated to be the second leading cause of cancer-related deaths in females. Because the majority of cancer deaths are caused by the metastasis of the disease, it is critical to understand differences between non-metastatic and metastatic breast cancer cells. One notable difference is increased lipid accumulation in metastatic cells, which is associated with metastatic potential of tumor cells. Stored lipids in breast cancer cells may be utilized for energy production to support the energy-demanding process of metastasis, or play other critical roles in metastasis, such as activating signaling pathways and providing substrates for new membranes. However, the mechanism driving and the role of lipid accumulation in metastasis is not known. We hypothesize that lipid metabolism, including synthesis and utilization for energy production, are increased in metastatic cells, with a balance towards lipid storage. To test this hypothesis, we employed human non-metastatic MCF10A-ras and metastatic MCF10CA1a cells. The mRNA expression of the genes, ATP citrate lyase and fatty acid synthase (fatty acid synthesis) were 3-fold higher and 2-fold higher, respectively, in the metastatic compare to the non-metastatic cells. In addition, palmitoyl transferase 1 $\beta$  and long-chain-acyl-CoA synthetase (fatty acid oxidation), were 2.5-fold higher in the metastatic compare to the non-metastatic cells. Another isoform of the rate-limiting enzyme of fatty acid oxidation, carnitine palmitoyl transferase 1 $\alpha$ , had similar mRNA levels between the two cell lines. These results support the hypothesis that metastatic breast cancer cells may have increased lipid metabolism compared to non-metastatic cells, which may promote breast cancer metastasis.

*Research Mentor:*

*Dorothy Teegarden, Nutrition Science*

*Chaylen Andolino, Nutrition Science*

**Poster Number:** 135 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Measuring wellbeing among school-aged children: Seeking a developmentally appropriate qualitative approach**

Author:

Lauren Bellamy, HHS, CLA

Abstract:

Abstract Redacted

*Research Mentor:*

*Dr. Jason Ware, Honors College*

*Dr. Zoe Taylor, HDFS*

**Poster Number:** 136 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Big Sister, Big Brother: A Mixed Methods Study on Older Siblings' Role in Infant and Young Child Feeding and Care in Rural Tanzania**

**Author:**

Morgan Boncyk, College of Health and Human Sciences

**Abstract:**

Nutrition interventions to improve infant and young child feeding (IYCF) and care in developing countries have targeted mothers, leaving other family members' roles unknown. A cluster-randomized trial (ClinicalTrials.gov: NCT03759821) sub-study examined older siblings' role in IYCF and care in rural Tanzania. This study aimed to (1) describe who cares for a child (0-18mos), the care provided, and under what circumstances, (2) evaluate sibling caregivers' tasks by age and gender, and (3) identify determinants of sibling engagement. Interviews (July-August 2018) on a purposive sample were transcribed and translated from Kiswahili. Qualitative findings assisted in developing a questionnaire on sibling IYCF and care, administered (December 2018-May 2019) to mothers (n=959) and siblings (n=352, 7-17 years). Inductive and deductive analyses found siblings played a significant role in IYCF and care around school schedules when mothers had other household responsibilities. Half of households (51%) indicated an older child aided in infant care. Engaged siblings were younger (median 10 years) and predominantly female (61%). Care included feeding (84%, including snacks (43%) and beverages (83%)), responsive care (85%), hygiene (69%), and care during illness (23%, including giving medicine (9%)). The majority (60%), especially girls ( $p<0.001$ ) and older children ( $p<0.001$ ), helped in food preparation. Gender differences arose in hygiene ( $p<0.001$ ), and age differences in hygiene ( $p<0.001$ ) and caring when sick ( $p<0.001$ ). To our knowledge, this is the first mixed methods investigation of older siblings' role in IYCF and care in a low-resource setting. Nutritional interventions should incorporate the significant role of older siblings in IYCF and care.

*Research Mentor:*

*Nilupa Gunaratna, Department of Public Health*

**Poster Number:** 137 :: Innovative Technology/Entrepreneurship/Design

**College of Health and Human Sciences**

**The Impact of Virtual Simulation-based Training on Speech-Language Pathology Students in the Graduate Dysphagia Course: A pilot study**

**Author:**

Jennine Bryan, Health and Human Sciences

**Abstract:**

With speech-language pathology graduate class sizes increasing, it is difficult for students to gain the experience necessary to display proficiency and confidence in treating patients with swallowing difficulties (a.k.a., dysphagia), especially in the classroom setting. To start addressing this gap, we developed a virtual simulation-based training. We aimed to assess the impact of our virtual simulation-based training (SBT) on the perceived confidence, and clinical reasoning performance of 12 first-year, speech-language pathology graduate students. The virtual SBT module consisted of a simulated traumatic brain injury patient with dysphagia. Students completed a comprehensive swallowing evaluation and provided treatment recommendations. The evaluation included a bedside swallowing evaluation (including a cranial nerve exam and trial swallows), and, if deemed necessary by the student, a videofluoroscopic swallow study (VFSS). Before and after the SBT activity, students completed a 19-item questionnaire, which was used to collect information on the students' perceived confidence in a medical environment; and the second consisted of a diagnostic testing form. Analysis of the questionnaire responses before and after virtual SBT revealed that training increased the students' confidence levels by an average of 34% ( $p < 0.001$ ). Patient diagnostic testing forms indicated an average agreement level of 88% between student clinicians and a certified SLP. These results illustrate that students who completed our virtual SBT for dysphagia demonstrated increased confidence in clinical aspects of dysphagia assessment and treatment recommendations. This study supports the potential for simulation-based training to be incorporated into dysphagia graduate courses as a useful learning experience.

*Research Mentor:*

*Dr. Georgia Malandraki, Speech, Language, and Hearing Sciences*

**Poster Number:** 138 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**The Effect of Intimate Partner Violence on Neural Reactivity to Idiographic Stimuli**

**Author:**

Lehar S. Chellani, HHS

**Abstract:**

Intimate partner violence is a pertinent problem that affects many people and has extremely severe negative effects on those that are affected by it. It is known to be linked with the occurrence of mood disorders such as depression, anxiety disorders, and post-traumatic stress disorder in those that experience it. The current study seeks to examine the effect of intimate partner violence on neural reactivity to idiographic stimuli (i.e., the partner's face). Data will come from a larger, ongoing study which is examining neurobiological correlates of mood disorders for people in close relationships. As part of the study, participants are asked to complete a self-report measure that assesses the frequency of perpetration and victimization of psychologically and physically abusive acts and injuries. Participants also complete an image viewing task that includes their partner's face while an EEG records their brain activity. Event-related potential data in the form of late positive potential (LPP) amplitude collected from the EEG indicate the participant's level of affective reactivity to the stimuli. The data will be analyzed by testing a correlation between the scores on the IPV measure and ERP amplitude. It is hypothesized that the findings will replicate previous work in the area that demonstrated that survivors of IPV show a blunted neural response to emotional stimuli (Invitto et al.). If a clear difference is observed, then this could serve as a potential neural marker for internalizing mental disorders in individuals facing IPV.

*Research Mentor:*

*Susan C. South, Ph.D., Psychological Sciences*

*Samantha H. Ingram, M.S., Psychological Sciences*

*Dan J. Foti, Ph.D., Psychological Sciences*

**Poster Number:** 139 :: Life Sciences

**College of Health and Human Sciences**

**Nursing Student Performance Evaluated with Eye Tracking Data**

**Author:**

Sarah Clemmons, College of Engineering

**Abstract:**

Nursing students are often tested in simulated clinical environments, using tools that aim to make their scenario as realistic as possible. One of these such tools are mannequins that can “speak”, “blink”, etc. They are also given various informational sources, detailing the state of the patient. Our research aims to identify the effectiveness of these different tools and resources by gathering eye tracking data while students are in simulated environments. We will attempt to find correlation between students’ performance and performance metrics calculated from the eye tracking data (time spent looking at patient, time spent looking at information sources, etc.). Measuring their gaze points will show to what they are devoting their attention. Their pupil diameters can give information regarding their cognitive status while looking at different objects of interest. 15 data samples have been collected by observing senior level nursing students. Their eye tracking data is currently undergoing analysis.

*Research Mentor:*

*Denny Yu, Industrial Engineering*

*Guoyang Zhou, Industrial Engineering*

*Amy Nagle, Nursing*

*Tera Hornbeck; Beth Smith;, Nursing; Nursing;*

**Poster Number:** 140 :: Life Sciences

**College of Health and Human Sciences**

**Exploring Bariatric Surgery Patients' Barriers with Dietary and Oral Supplementation**

**Author:**

Allison Drook, Purdue University

**Abstract:**

Bariatric surgery is an effective surgical procedure for the treatment of severe obesity and involves alterations to the gastrointestinal system that leads to weight loss. Patients who undergo bariatric surgery are expected to make strict dietary changes, including taking multiple nutritional supplements, which are often difficult to follow. However, little research has been done on the potential barriers that bariatric surgery patients face when changing their diet post-surgery. The purpose of this study was to explore the barriers that bariatric surgery patients face in following diet recommendations post-surgery. Data was collected in two focus groups that took place on the campuses of Indiana University and Purdue University. Nine questions were asked over the course of two hours, and demographic data as well as qualitative data were collected using surveys and the service Transcribe Me from San Francisco, CA. Participants included five women and one man, around the age of fifty-six, who had all had a RYGB. Reported barriers to consuming a food-based diet included an inability to consume enough protein, having to wait fifteen minutes before and after eating solid food to consume liquids, food intolerances, nausea, lack of general understanding, lack of support groups, chewing time, medical complications, and lack of finances. These barriers suggest that consuming sufficient nutrients from food alone is challenging. Therefore, dietary supplements should continue to be recommended post bariatric surgery. Further research should be done to determine strategies for how to overcome these reported barriers that limit compliance to post surgery dietary recommendations.

*Research Mentor:*

*Nana Adowa Gletsu-Miller PhD, 2Department of Applied Health Science*

*Dorothy Teegarden PhD, Department of Nutrition Science*

**Poster Number:** 141 :: Life Sciences

**College of Health and Human Sciences**

**Interactions between Selenium and Lead: Relations to Alzheimer's Disease**

**Author:**

Sai Dwibhashyam, Health and Human Sciences

**Abstract:**

Alzheimer's disease (AD) is a neurodegenerative condition that has been previously linked to the toxic effects of lead (Pb). The disease is characterized by the presence of  $\beta$ -amyloid plaques ( $A\beta$ ). Selenium (Se) is an essential trace element carried by Selenoprotein P (SEPP) (Burk et al. 2011). Our labs have recently found a substantial deposit of Se in brain tissue of mice exposed to Pb and in control mice, both in proximity to Pb deposits. A literature review was conducted to understand the relationship between Pb exposure and AD, and what role Se may play in the association. In a past study, when AD mice were fed with Se-containing compounds, there was a significant reduction of  $A\beta$  deposition in the hippocampus (Zhang et al. 2016). Because Pb is associated with the formation of  $A\beta$ , it is important to understand if Se supplement acts as a preventative measure against AD. It has been found that Se supplementation results in more SEPP formation in the cerebrospinal fluid (Cardoso et al. 2019). Therefore, we hypothesize that Pb and SEPP bind with each other, decreasing available SEPP. With less available SEPP, more  $A\beta$  aggregation would result. Additionally, we expect that increasing Se supplementation may result in fewer deposits of  $A\beta$ . To test this hypothesis, we plan to conduct the study with three groups of mice: control, Pb exposed with low Se supplement, and Pb exposed with high Se supplement. The study will shed light on potential preventative strategies against Alzheimer's disease.

*Research Mentor:*

*Linda Nie, Medical Physics*

*Alexis Webb, Medical Physics*

**Poster Number:** 142 :: Life Sciences

**College of Health and Human Sciences**

**Gene and Environment Interaction Behind Comorbid Alcohol Use Disorder and Parkinson's Disease**

**Author:**

Soyol Enkh-Amgalan, Health and Human Sciences

Rachel Foguth, Health and Human Sciences

**Abstract:**

The purpose of this project was to explore the complex gene and environment interaction behind co-occurring Parkinson's Disease (PD) and Alcohol Use Disorder (AUD). The study used a combination of an environmental paraquat exposure model for PD and a genetic animal model for AUD with high (HAP) or low (LAP) alcohol-preferring male and female mice. The locomotor sensitization test was used as a measure of alcohol-induced neuroadaptation. HAP and LAP mice received paraquat (10 mg/kg) once a week for three weeks. One week later, mice received 6 locomotor sensitization treatment trials where they were given intraperitoneal injections of alcohol (3 g/kg) followed by locomotor activity assessment. A lower alcohol dose of 2 g/kg was used to test for alcohol-induced locomotor sensitization. Paraquat exposure is anticipated to produce greater locomotor sensitization to alcohol in HAP mice than in LAP mice. Additionally, females are expected to show greater sensitization than males. Exploring common genetic risk factors and biological mechanisms behind comorbid AUD and PD will lead to refined treatment and prevention strategies.

*Research Mentor:*

*Julia Chester, Psychological Sciences*

*Jason Cannon, Health Sciences*

**Poster Number:** 143 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Service Dogs and their Effect on Interpersonal Relationships of Veterans with PTSD**

**Author:**

Ian Fiechter, Purdue University

**Abstract:**

Veterans with Post Traumatic Stress Disorder (PTSD) face many struggles in their day to day life. With these daily struggles researchers have focused on new interventions. PTSD service dogs have become a more popular form of aid for veterans, yet there are gaps in the scientific literature. One major gap is the impact that service dogs have on the veteran and spouse relationship, which is the focus of the current study. A total of 104 participants (n=70 veterans, n=34 spouses) were recruited from K9s For Warriors, a national service dog provider. Veterans and spouses completed a two-week study period in which they filled out surveys, collected saliva, and participated in ecological momentary assessments and actigraphy. Qualitative survey data was analyzed through content analysis and several themes emerged. Preliminary findings showed that themes emerged in reference to interactions with family, self, service dog and environment. Findings will give us understanding to the benefits or drawbacks veterans face within multiple relationships in their lives. These findings inform the impacts of service dogs on veterans with PTSD giving us insight into the influences a service dog may have on the veteran spouse relationship. Future studies should continue to examine this relationship in an effort to aid in clinicians' responses to veteran relationships.

*Research Mentor:*

*Marguerite O'Haire, Department of Comparative Pathobiology*

*Leanne Nieforth, Department of Comparative Pathobiology*

**Poster Number:** 144 :: Life Sciences

**College of Health and Human Sciences**

**Comparison of Metastatic and Nonmetastatic Breast Cancer Cell Survival in Glutamine Depleted Extracellular Matrix Detached Conditions**

**Author:**

Kanika Garg, HHS

**Abstract:**

For women, breast cancer is the most commonly diagnosed cancer with metastasis being the primary cause of most breast cancer-related deaths. During metastasis, cells detach from the extracellular matrix (ECM) to move to a secondary site. Unlike normal cells, metastatic cells are resistant to cell death upon ECM detachment. The amino acid glutamine is used as an energy source during metastatic progression via replenishing the TCA cycle. Breast cancer cells have decreased viability in the absence of glutamine, but the effect of glutamine in ECM detached conditions in metastatic cells is not known. We hypothesize that metastatic and non-metastatic cells have a decreased viability in ECM detachment in glutamine deprived conditions. In this study, metastatic MCF10CA1a cells and non-metastatic Harvey-ras oncogene transfected MCF10A-ras cells were employed. As expected, in ECM detached conditions, the MCF10A-ras cells had a greater decrease in viability (58.4%) in comparison to the MCF10CA1a cells (32.7%). However, in glutamine deprived conditions, the MCF10CA1a cells decrease in viability was greater (15.2%) compared to the MCF10A-ras cells. Additionally, mRNA expression of the glutamine metabolizing enzyme, glutamate dehydrogenase, was decreased, while the glutamine synthesizing enzyme, glutamine synthetase, mRNA expression was increased in detached conditions in the non-metastatic cells. The greater effect of glutamine depletion on viability of the metastatic cells suggests greater dependence on glutamine metabolism in ECM detached conditions. Comparison of metastatic and non-metastatic breast cancer cells will provide insights to direct the development of new targets for the prevention of breast cancer metastasis.

*Research Mentor:*

*Madeline Sheeley, Nutrition Science*

*Dorothy Teegarden, Nutrition Science*

**Poster Number:** 145 :: Life Sciences

**College of Health and Human Sciences**

**Exploring language use within a parent-mediated intervention for children exhibiting social communication difficulties**

**Author:**

Emily Garza, Health and Human Sciences

**Abstract:**

For infants/toddlers experiencing social communication difficulties, parent-mediated interventions (PMI) are the current field standard to promote development within a natural context. Previous research highlights the importance for parents to scaffold language learning opportunities beyond clinical settings to maximize children's potential. However, for infants/toddlers exhibiting social communication-based difficulties currently enrolled in a family routines-based PMI, less is known about the individual contributions of communication between child and parent in order to promote optimal language development.

The present study expands our understanding of children's communication by examining whether (1) children exhibit language impairments at enrollment; (2) whether observed mother-child communication during play increases following an eight-session intervention; and (3) associations between children's language impairments and observed communication. As part of an ongoing PMI, 16 children were assessed with the Mullen Scales of Early Learning (MSEL) at enrollment to index their receptive (RL) and expressive language (EL) skills. Home visit recordings of play-based interactions were rated for child EL use (e.g., single words; two-word phrases) and mothers' language-learning opportunities (i.e., symbol highlighting). Overall, children on average received MSEL-RL and MSEL-EL scores within the concerns range for their age. A series of repeated measures ANCOVAs to assess communication during play were conducted and revealed a significant increase in child EL use,  $F(1,15)=5.87, p=.03$ . To examine associations between children's MSEL scores and play-based observations, a series of partial correlations were conducted. No significant associations were observed. In sum, these findings highlight the importance of monitoring language development and the modest impact of an 8-week PMI on children's language use.

*Research Mentor:*

*Ashleigh Kellerman, Human Development & Family Studies*

*Christi Masters, Speech, Language, & Hearing Sciences*

*AJ Schwichtenberg, Human Development & Family Studies*

**Poster Number:** 146 :: Life Sciences

**College of Health and Human Sciences**

**Nuclear Security Culture Assessment of Radiation Users at an Academic Institution**

Author:

Naomi German, Health and Human Sciences

Abstract:

Abstract Redacted

*Research Mentor:*

*Dr. Jason Harris, Health Physics*

**Poster Number:** 147 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Investigating heart rate variability and internalizing symptoms within the context of the mother-infant relationship**

**Author:**

Christine Grosso, Health and Human Sciences

**Abstract:**

Heart rate variability (HRV) captured through electrocardiogram (EKG) is a measure of autonomic control and seems to relate to both anxiety and depressive symptoms in adults (Braeken et al., 2013; Carney et al., 2001; Kemp et al., 2010; Licht et al., 2008). HRV seems to be heritable, as evidenced by adult twin studies (Golosheyken et al., 2017). Furthermore, prior work has suggested that low HRV may be an endophenotype for internalizing disorders, such that it is present in adults with a life history of anxiety without current symptoms and is also present in infants at increased familial risk (Braeken et al., 2013). Because of the significance of this measure in identifying early risk markers and treatment targets, it is of the utmost importance that the psychometric properties of HRV as measured by EKG are assessed. The aim of the current study is to extend upon previous research by addressing the following questions: (1) What are the psychometric properties of HRV in both adults and infants? (2) Is HRV related between mother and infant? (3) Is there a relationship between mothers' lifetime diagnoses of depression and/or anxiety and infants' HRV? To answer these questions, 3-minute resting state HRV was collected from mothers and their 12-month infants (N = 37 dyads). Planned analyses include estimates of internal consistency of HRV for mother and infants, estimates of the correlation between mothers' and infants' HRV, and correlational analyses investigating the role of mothers' lifetime diagnoses (i.e., depression and anxiety) in this relationship to infants' HRV. By conducting this work, we hope to extend findings on the relation between HRV and internalizing disorders, specifically within the context of mom-infant relationships, as well as assess the measurement properties of HRV as a possible clinical tool.

*Research Mentor:*

*Kaylin Hill, Psychological Sciences*

*Dan Foti, Psychological Sciences*

*Bridgette Kelleher, Psychological Sciences*

**Poster Number:** 148 :: Life Sciences

**College of Health and Human Sciences**

**Sex-specific effects of ketogenic diet on metabolic outcomes and stress response after pre-exposure to a high-fat, high- sugar diet**

**Author:**

Anna Hallowell, College of Science

Brent B. Bachman, College of Science

**Abstract:**

The continued high rate of overweight and obesity in the United States contributes to the development of diabetes, heart disease, and premature death. To combat obesity and associated diseases, the use of ketogenic diets (KD) is increasing. Evidence in support of KD for weight loss and other health conditions exists in literature, however the association between diet- induced ketosis and beneficial effects in males and females remain equivocal. The objectives of this study were to evaluate the relationship between the ketone body beta-hydroxybutyrate and improvements on metabolic parameters in both sexes using a pre-clinical model of obesity. Sprague-Dawley rats were given access to a diet high in fat and sugar (HFS) for 12 weeks. After HFS, animals then switched to either chow (CH) or KD for 4 weeks to model a dietary intervention. The effects of HFS on body weight, adiposity, and stress response were reversed in males that switched to CH (HFS-CH group). These same improvements were observed in females, although they had impaired glucose tolerance. Males and that switched to KD (HFS-KD group) showed improvements, however, they still had higher body weight and adiposity than control (CTL). Interestingly, the beneficial effects of KD correlated with plasma BHB levels in females but not in males. These data model effects reported in clinical literature and serve as a valuable translational tool to further test causal mechanisms that lead to desirable outcomes of KD. These sex-specific relationships are particularly important, as KD could potentially affect endocrine mechanisms differently in males and females.

*Research Mentor:*

*Kimberly P. Kinzig, Psychological Sciences*

*Elizabeth Sahagun, Psychological Sciences*

**Poster Number:** 149 :: Life Sciences

**College of Health and Human Sciences**

**Effects of Concord Grape Juice with a Meal on Glycemia, Appetite, and Cognitive Function in Healthy Adults**

**Author:**

Aidan Hannon, Health and Human Sciences

**Abstract:**

**Objective:**

Literature suggests that dietary polyphenols and intensely flavored foods/beverages can have a positive effect on glucose homeostasis. The purpose of this study was to determine if the high phenolic content and strong flavor intensity of Concord Grape Juice (CGJ) could hold beneficial effects on appetite, glycemia, and cognitive function.

**Subjects:**

Thirty-four adults (23 M, 11 F) categorized as overweight/obese.

**Methods:**

Over a three week period, participants consumed 12 oz. of an intervention beverage along with a standard breakfast in three different treatments separated by a 6 day washout period: CGJ, a standard CGJ placebo drink, and a beverage matched to CGJ on appearance and energy with less CGJ essence. Glycemia was continuously monitored using a Dexcom G6 monitor. Appetite and cognitive function were measured hourly using visual analog scales. Results were analyzed using a SPSS repeated measures and linear mixed model ANOVA.

**Results:**

Preliminary results suggest that there was no significant treatment\*time effect for 24-hour average glycemia, post-prandial glycemia, appetite, nor mood. However, there was a significant treatment effect on perceived energy levels with ROS having significantly higher energy level ratings compared to JED ( $p=0.042$ ) and a trend toward a significant treatment effect on alertness with ROS having significantly higher alertness level ratings compared to JED ( $p=0.052$ ).

**Conclusion:**

Phenolic content and flavor intensity found in Concord Grape Juice did not have an effect on post-prandial glycemia or appetite, but may have an effect on energy levels and alertness.

*Research Mentor:*

*Dr. Richard Mattes, Public Health*

**Poster Number:** 150 :: Life Sciences

**College of Health and Human Sciences**

**Cytotoxicity of Methylmercury on a Mouse Striatal Cell Lineage in a Variety of Media Types**

**Author:**

Madeline R. Henley, Health and Human Sciences

**Abstract:**

Methylmercury (MeHg) is globally recognized as a neurotoxicant, with a powerful effect on the developing central nervous system and is associated with cognitive and motor deficits. Developing nigral dopaminergic (DAergic) and cortical glutamatergic (GLUergic) neuronal lineages have been shown to be susceptible to MeHg, but differences in susceptibility between DAergic and GLUergic neuronal lineages and the stages of development most susceptible are unclear. In vitro differentiation is triggered by cell culture media, with each differentiation time point requiring a different type of media. The variety of media types used could alone have an effect on MeHg cytotoxicity, necessitating an understanding of this before proceeding with susceptibility studies. Therefore, we aimed to understand how media type could play a role in MeHg cytotoxicity and uptake. Using a mouse striatal cell model, we sought to determine the lethal concentration where 50% of the cells will die (LC50) in different media types. We exposed the cells to 0, 0.1, 1, and 10uM of MeHg in a variety of media types. Our preliminary data suggest 80% to 100% cell survival at 1uM but 0% to 25% cell survival at 10uM and was similar across all media types. This suggests an LC50 between 1uM and 10uM of MeHg. Our future directions are to measure MeHg uptake in different media and discerning if intermediate MeHg concentrations may yield media-type specific LC50 values, to enable accurate assessment of media effects on MeHg sensitivity.

*Research Mentor:*

*Aaron B. Bowman, Health Sciences*

*Lisa M. Prince, Health Sciences*

*Morgan G. Thomas, Health Sciences*

**Poster Number:** 151 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Factors Associated with Shared Decision Making during Medical visits with patients who have Chronic Pain.**

**Author:**

Madison Jordan, Purdue University

**Abstract:**

Aim of the study is to examine the association between patient and physician self- reported characteristics with observed shared decision making during medical visits. Methods were analyzing confidential medical records and coding them into excel templates where we could analyze the dialogue between patient and physician qualitatively to understand communication processes related to opioid tapering. Up to 3 clinics were audio-recorded, and individual interviews were conducted with patients and their providers. This data was put into a statistical analysis program called STATA and 4 themes were revealed.

*Research Mentor:*

*Cleveland Shields, Health and Human Sciences*

**Poster Number:** 152 :: Life Sciences

**College of Health and Human Sciences**

**The Behavioral and Morphological Effects of Developmental Copper Exposure on Zebrafish**

**Author:**

Christina Kaucic, Health and Human Sciences

**Abstract:**

Copper is an essential metal that is key in many metabolic functions and is a cofactor in many enzymes. Excess copper has been associated with minor symptoms such as fatigue, weakness, and memory loss as well as with neurological disorders 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 as well as abnormalities in morphology. To test this, zebrafish embryos were obtained through natural spawning and exposed to a control or one of three experimental groups: 13ppb, 130ppb or 1300ppb copper. Fish were exposed through 120 hours post fertilization (hpf). Survival was assessed every 24 h and behavioral analysis was performed at 120 hpf. Copper caused mortality at 1300ppb and decreased time spent moving as well as decreased counterclockwise rotation frequency at 130ppb ( $p < 0.05$ ). In morphological analysis, exposed larvae exhibited significantly decreased head width, head length, total length, brain length, and eye diameter at 130ppb ( $p < 0.05$ ). Developmental exposure to copper produces dysfunctional locomotor behavior, mortality, and abnormalities in morphology at concentrations lower than the regulatory concentration in US drinking water.

*Research Mentor:*

*Dr Jennifer Freeman, Health Sciences*

**Poster Number:** 153 :: Innovative Technology/Entrepreneurship/Design

**College of Health and Human Sciences**

**Development of device for Achilles tendon imaging in rodents**

**Author:**

Sukhmani Kaur, College of Health and Human Sciences

Alycia Berman, College of Engineering (Biomedical Engineering)

Vijay Udayamohan, College of Engineering

**Abstract:**

Ultrasound imaging, also known as ultrasound sonography is an essential noninvasive diagnostic tool in medicine. It uses high-frequency sound waves in order to create images of structures within the body. We have begun to develop a novel ultrasound approach for measuring Achilles tendon morphology in live mice. Previously, we have utilized ultrasound and magnetic resonance (MRI) methodologies to examine tendon mechanical and morphological properties in humans. For this project, we wished to develop a similar approach in a rodent model. Our first goal was to design and construct a custom device that will allow for a mouse to be examined with the Achilles tendon in a fixed position, while also allowing for movement of the ankle through a full range of motion. After the construction of our stabilization device, our second goal was to utilize high-frequency ultrasound imaging to reproduce a 3D volume reconstruction of the Achilles tendon in a sedated mouse. Our ultimate goal is to utilize these our new device to measure Achilles tendon strain throughout a full range of motion. Our device was capable of mouse anatomy and allowed for the effective imaging of the Achilles tendon. Further refinement will be required to optimize image quality, but this initial work demonstrated the feasibility of our approach. In future studies, we will continue to refine our image analysis and positioning device so that we may obtain repeatable volume and strain measures.

*Research Mentor:*

*Chad C. Carroll, Department of Health and Kinesiology*

*Craig J. Goergen, Weldon School of Biomedical Engineering*

**Poster Number:** 154 :: Life Sciences

**College of Health and Human Sciences**

**Is self-diagnosed lactose intolerance real? Recruitment for lactose intolerance results in only 16 percent of subjects verified with symptoms following a blinded milk challenge.**

**Author:**

Tara Kazemi, Health and Human sciences

Rachel Hyun, Health and Human Sciences

**Abstract:**

We describe the recruitment of self-selected milk intolerant subjects, with only sixteen percent of subjects meeting objective blinded intolerance criteria. The results suggest that a large number of self-selected milk avoiders have an unnecessary aversion to milk products. Avoiding milk causes a deficit in an important source of dietary calcium and other nutrients which can lead to poor bone health. Methods: Subjects responding to recruitment advertisements for entering a study of lactose intolerance completed a phone screening to assess their initial eligibility. Major reasons for subject exclusion from the initial phone screening were no avoidance of milk (in the past month) and the use of concurrent lactose intolerant therapies. If subjects used laxatives, Pepto Bismol®, or Lactaid Dietary Supplements® within 7 days of screening, subjects were given the option to participate in a 7-day avoidance of the therapy and be re-screened for eligibility. Subjects deemed eligible from the phone screening entered an in-person screening to affirm milk avoidance and self-perceived lactose intolerance. Confirmed milk avoiders were given a blinded milk challenge. Hydrogen concentration in the breath was measured to determine the existence of maldigestion of lactose, and intolerance symptoms were recorded for 6 hours following the treatment. Results: From the 853 potential participants who volunteered and self-identified as having lactose intolerant symptoms, 258 were phone screened. The remaining 595 did not respond to requests for screening. Of the 258 subjects, 49 were excluded for lack of milk avoidance, 74 for other medical issues and ten for use of Pepto Bismol®, or Lactaid dietary supplements within 7 days of screening. Five of these ten participants were re-screened for eligibility. Ninety-four of the remaining 130 subjects participated in the milk challenge and 36 chose not to continue, with 35/94 experiencing significant symptoms. Thus, excluding subjects who chose to leave the study, only 35 of 222 (258-36), or 16% self-perceived lactose intolerant individuals were determined to be lactose intolerant, based on objective exclusion criteria and a blinded milk challenge. These results question the incidence of lactose intolerance, and the perception that it is a common gastrointestinal disorder. Many self-perceived lactose intolerant individuals could obtain the necessary dietary requirements of calcium from dairy to improve bone health.

*Research Mentor:*

*Dennis Savaiano, Nutrition Science*

*Tracy Eaton, Nutrition Science*

**Poster Number:** 155 :: Life Sciences

**College of Health and Human Sciences**

**Comparative Developmental Toxicity and Acute Toxicity of Perfluorooctane Sulfonate (K-PFOS) and Perfluorobutane Sulfonate (K-PFBS)**

**Author:**

Hanna King, Health and Human Sciences

**Abstract:**

Perfluoroalkyl substances (PFAS) are synthetic compounds that are composed of a fluorinated carbon chain. PFAS are persistent in the environment and bioaccumulate in organisms. The concerns of PFAS toxicity led to voluntarily phasing out of perfluorooctane sulfonate (PFOS) by its manufacturer. Shorter chain PFAS, such as perfluorobutane sulfonate (PFBS), are suggested to be less toxic alternatives with decreased environmental persistence. In this project, zebrafish embryos were used to compare developmental toxicity of K-PFOS and its replacement K-PFBS. To determine the LC50 of K-PFOS and K-PFBS, embryos were exposed to a range of concentrations of each chemical within 1 hour post fertilization (hpf). The toxicity of these compounds was assessed by monitoring the survivability every 24 hours through 120 hpf. LC50s were determined using GraphPad Prism software. Behavioral analysis using a visual motor response (VMR) test was performed at 120 hpf after exposure to sublethal concentrations during embryogenesis (1-72 hpf). All data obtained was analyzed with a repeated measures ANOVA by phase ( $\alpha=0.05$ ). Results showed that LC50s for K-PFOS and K-PFBS were 23.24 and 2,409 ppm, respectively, supporting that K-PFOS is more lethal. Behavioral analysis showed that an embryonic exposure to K-PFOS or K-PFBS induced hyperactivity in larvae. These results indicated that although K-PFOS is more lethal, at the more subtle functional endpoint of behavior, K-PFBS has similar impacts as K-PFOS. This finding is significant to public health in that PFBS appears not to be a less toxic alternative to K-PFOS.

*Research Mentor:*

*Jennifer L. Freeman, School of Health Sciences*

*Ola Wasel, School of Health Sciences*

**Poster Number:** 156 :: Life Sciences

**College of Health and Human Sciences**

**Toxicity of lead and atrazine mixture using the larval zebrafish model system**

**Author:**

Anusha Kotapalli, College of Health and Human Sciences

**Abstract:**

Lead (Pb) and atrazine (ATZ) are hazardous environmental toxicants present in drinking water systems by exposure through pipes of plumbing systems in households built prior to 1986 and herbicide runoff from broadleaf treated weeds, respectively. Pb is a known heavy metal having adverse human health effects, which contributes to a continued concern for global health. ATZ, on the other hand, is a known endocrine disrupting chemical (EDC) which has the potential to alter biological pathways and is also a suspected carcinogen. We hypothesize that Pb and ATZ mixtures result in a greater than additive toxicity, causing increased adverse health outcomes than single chemical exposure. In this study, the sublethal concentrations of chemicals used were: 3 ppb ( $\mu\text{g/L}$ ) ATZ, 30 ppb ATZ, 10 ppb Pb, and 100 ppb Pb. The toxicity in this study was evaluated by testing the behavior of the larvae from all treatment groups after 120 hours post fertilization (hpf) using the Noldus DanioVision. The cumulative locomotor data was analyzed with an analysis of variance (ANOVA) and post-hoc least significant difference test when appropriate ( $\alpha=0.05$ ). Behavior data with 100 ppb Pb mixtures supports that the 3 ppb ATZ/100 ppb Pb and the 30 ppb ATZ/100 ppb Pb mixtures showed hyperactivity in almost all behavior parameters compared to the control treatment (0 ppb;  $p<0.05$ ). An additional analysis of the light and dark phases will be performed to further evaluate the trends of larval behavior. Additionally, analysis is also being completed with 10 ppb Pb mixtures for comparison.

*Research Mentor:*

*Jennifer Freeman, Health Sciences*

**Poster Number:** 157 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Anticipated Regret and Product Return Policy**

**Author:**

Jui-Hsien Lin, College of Health and Human Sciences

**Abstract:**

According to the Prospect Theory (Kahneman and Tversky 1979), people perceive gains and losses asymmetrically for the same monetary amount under gambling games. In this research, we aim to explore such loss aversion effects when purchasing a newly introduced technology product. When consumers anticipate a regret and hence a high perceived loss (more than their perceived value), they are unlikely to make their purchase. We study whether firms can use return policy to mitigate such anticipated regret and find under what market conditions, this strategy will result in a win-win effect for both retailers and consumers.

*Research Mentor:*

*Jiong Sun, Department of Consumer Science*

*He Zheng, Department of Consumer Science*

**Poster Number:** 158 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Toxic Chemicals in Consumer Goods and Supply Chain Network**

Author:

Shuhao Liu, College of Health and Human Science

Abstract:

Abstract Redacted

*Research Mentor:*

*Jiong Sun, Consumer Science*

**Poster Number:** 159 :: Life Sciences

**College of Health and Human Sciences**

**Impact of long-term local heat stress on skeletal muscle structure and function in humans**

**Author:**

Nivedha Madhan, Health and Human Sciences

**Abstract:**

Short-term exposure to heat stress has shown to increase muscle strength and cause mitochondrial adaptations in humans. Our previous study reviewed that exposure to five sessions of heat therapy accelerates recovery of fatigue resistance following exercise-induced muscle damage. However, the long-term effects of repeated exposure to heat stress on muscle function and structure remain unknown. The goal of the present study was to examine the impact of 8 weeks of daily local heat stress on muscle strength, fatigability, fiber size, and mitochondrial content in human skeletal muscle. Twelve healthy young adults were randomly assigned to receive 8 weeks of heat treatment in one thigh while the other thigh served as a control. The 90-minute heat therapy was provided through a water-circulating garment with ~52°C water. Fatigue resistance and knee extensor strength were assessed using isokinetic dynamometry before and after treatment at 4 and 8 weeks. To determine the myofiber cross-sectional area and maximal citrate synthase activity, biopsies were obtained from participants' vastus lateralis muscle at 8 weeks. A significant treatment effect was observed for the changes from baseline in peak isokinetic torque. On average, the changes for the heat therapy leg were ~2 fold higher than control at week 4 and ~4 fold higher at week 8. There were no significant differences in fiber size and mitochondrial content following the intervention. Our results suggest that daily exposure to heat therapy for 8 weeks enhances muscle strength in humans, and can be used as a therapeutic approach to improve muscle function.

*Research Mentor:*

*Bruno Roseguini, Health & Kinesiology*

**Poster Number:** 160 :: Life Sciences

**College of Health and Human Sciences**

**Carrying Objects and Falling Behavior in Infants**

**Author:**

Kylee Martin, Health and Human Sciences

Emily Shalit, Health and Human Sciences

**Abstract:**

Walking infants frequently carry objects (Karasik et al., 2012). This ability to transport objects is one benefit of transitioning from crawling to walking (Adolph & Tamis-LeMonda, 2014) and aids early walking by resulting in fewer falls (Karasik et al., 2012). It is unknown what walking infants do with held objects when they fall. Standing infants maintain hold of toys when they fall (Arnold & Claxton, 2017). However, these infants always stood in a stationary position holding small light-weight toys and were frequently caught by their parents. This experimental setting might not be reflective of real-world behaviors. Therefore, we observed falls in 39 13-month-old novice walkers and 39 24-month-old experienced walkers while walking with differently sized and weighted toys during a 20-minute free-play session. When walking, novice walkers fell more often than experienced walkers (44 vs. 24 falls). Novice walkers most often carried light toys of varying sizes, whereas experienced walkers did not have a size or weight preference. There was no apparent benefit to stability when carrying a toy for novice walkers ( $p=0.09$ ); however, experienced walkers fell less often when walking with a toy than without a toy ( $p=0.05$ ). Novice walkers were more likely to drop the toy when falling ( $p=0.04$ ), but experienced walkers were more likely to maintain hold of the toy (9 holds and 2 drops, too few to test significance). Novice walkers may prioritize balance over maintaining hold of the toy. Given that experienced walkers have better balance abilities, they may prioritize holding the toy.

*Research Mentor:*

*Laura Claxton, Health and Kinesiology*

**Poster Number:** 161 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Make our planet great again: The influence of restorative vs. progressive change frames on concerns for environmental sustainability**

**Author:**

Katherine Mason, Health and Human Sciences

**Abstract:**

Although previous research has examined the impact of temporal orientation on climate change skepticism, the roles of past, present, and future orientations on belief in climate change and pro-environmental action are not fully understood. For instance, individuals often prefer the present and resist efforts to create a future that deviates from or threatens the status quo. This preference to protect present socioeconomic arrangements, known as system justification, is a strong predictor of climate skepticism. Other research suggests that a preference for the past is also associated with low support for socioeconomic change, but when climate change action framed as restoring a positive past it is evaluated more positively compared to future-oriented change. Therefore, climate change skepticism could be explained by a preference for the past and support for restorative change, or a preference for the present and defense of the status quo. The current research examines the relationship between temporal orientation and proenvironmental attitudes in the U.S. In one study with 800 participants, we found that positive orientations to the past and present were negatively associated with climate change belief, however, the correlation for past orientation was low. Only system justification was negatively associated with support for government action to address climate change. A consideration for future consequences, but not a future orientation, was associated with climate change belief and support for government action. This suggests that although individuals with a past positive orientation have lower concern for climate change, concern for maintaining the status quo is a stronger predictor.

*Research Mentor:*

*Dr. Erin Hennes, Psychological Sciences*

**Poster Number:** 162 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Cognitive decline in aging adults: A possible protective role for positive relations with others**

**Author:**

Meghan Mitoraj, Health and Human Sciences

**Abstract:**

Cognitive decline is a concern for aging adults, affecting quality of life and independent function. Social relationships are linked to well-being and longevity. To date, most studies of social relationships focus on either social integration (number of social and community connections) or availability of social support, particularly in times of stress. Less attention has been paid to social relationship quality and links to cognitive function. The current study examined associations between relationship quality and cognitive function in a national sample of older adults, the MIDUS study. Relationship quality was assessed using the Ryff Positive Relations with Others scale. Social integration was determined by marital status, participation in community groups, seeing friends and family, and attending religious services. Episodic memory (e.g., verbal recall) and executive functioning (e.g., task switching) were assessed using the Brief Test of Adult Cognition by Telephone (BTACT). Results showed that higher scores on Positive Relations with Others predicted higher scores on episodic memory cross-sectionally ( $p=0.01$ ) and reduced declines in memory over the 7-8 year follow-up period ( $p=0.01$ ). These results were unchanged when social integration was added to the models. Positive relations with others was unrelated to levels of or change in executive function. These results suggest that Positive Relations with Others may act as a protective factor against episodic memory decline in aging adults. Moreover, Positive Relations with Others appears to be a unique aspect of social relationships that can be the focus of future research on the links between social experience and health in later life.

*Research Mentor:*

*Elliot Friedman, Human Development and Family Studies*

**Poster Number:** 163 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Reproductive Health Decision-Making: Extending the Shared Decision-Making Model into the Community Space**

**Author:**

Natalie Murdock, College of Health and Human Sciences

**Abstract:**

**Background:** Shared decision-making represents an opportunity to increase patient involvement, and may be particularly relevant in women's health where decisions are frequently preference-sensitive. However, limited research exists on how women's contexts impact their decision-making. The purpose of this study was to explore the factors affecting women's decision-making, and how to translate findings into practice.

**Methods:** Researchers completed 6 focus group discussions with women (18-45 years) and 20 interviews with non-physician healthcare providers in Indiana. Grounded theory techniques were used to explore patient-provider decision-making processes. Coding schema and constant comparison identified emerging themes.

**Results:** Women indicated initiating involvement and listening during healthcare consultations was critical. Providers identified these skills as intuitive to their practice, rather than trained. Both provided recommendations for improving interactions along these dimensions to support decisional involvement. Additionally, quality time was more important than quantity of time during consultations, suggesting opportunities to reduce provider concerns about engaging in shared decision-making. Prior negative healthcare experiences related to interaction with healthcare providers colored decision-making perspectives and healthcare engagement, as did family/friends and race in focus group and interview narratives. Participants suggested any healthcare touchpoint in the patient journey could influence whether healthcare was perceived as positive or negative, citing community-based reproductive healthcare.

**Discussion:** Findings offer recommendations for healthcare providers to engage in shared decision-making, including practical opportunities to fulfill women's patient-provider communication needs. Additionally, findings illustrate ways to incorporate women's experiences into materials to improve patient experience along the continuum of healthcare, including community-based services.

*Research Mentor:*

*Andrea L. DeMaria, Department of Public Health*

*Stephanie Meier, Division of Consumer Science*

**Poster Number:** 164 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**The Role of Supportive Relationships in Severity of Depression**

**Author:**

Sanjana Murthy, College of Health and Human Sciences

**Abstract:**

The current study examined the relationship between adolescents' supportive relationships and severity of depressive symptoms. Using a sample of 1,262 juvenile offenders from the Pathways to Desistance study, we hypothesized that a greater number of relationships with supportive adults would be associated with less severe depressive symptoms. Depressive symptoms were measured using the Brief Symptom Inventory, in which participants rated the extent they were distressed by various symptoms (0 = "not at all" to 4 = "extremely"). Supportive relationships were assessed using the Contact with Caring Adults inventory, in which participants identified the total number of adults they found to be supportive within eight domains (higher scores indicate a greater number of relationships). One-way ANOVA analyses were conducted on three dimensions of the Contact with Caring Adults inventory to determine the effect of social support on depression severity and revealed a significant effect at the  $p < .05$  level [ $F(3, 1258) = 6.87, p = .000$ ] for domains of social support, an insignificant effect [ $F(2, 1259) = 1.49, p = .227$ ] for diversity of social support, and a significant effect [ $F(2, 1259) = 6.30, p = .002$ ] for depth of social support. Consistent with our hypothesis, our results indicate that individuals who display significant depressive symptoms are associated with having relationships with supportive adults in a few domains, as compared to 0 domains and several domains, in addition to having no relationships with different people in 3 or more different domains. Implications of these findings are discussed.

*Research Mentor:*

*Dr. David Rollock, Department of Psychological Sciences*

*Adilene Osnaya, Department of Psychological Sciences*

**Poster Number:** 165 :: Life Sciences

**College of Health and Human Sciences**

**Association of Glutamate and Glutamine levels in the periaqueductal grey with neuropathic pain in IBS patients**

**Author:**

Isabelle Olejniczak, HHS

**Abstract:**

Glutamate serves as the principal excitatory neurotransmitter used by afferent neurons in the spinal dorsal horn (Wozniak et al 2012). The periaqueductal gray (PAG) functions as an essential part of the descending pain modulatory system (DPMS) in the human CNS. As a part of the brain stem, it involves both the ascending and descending pain modulatory systems. The PAG sends excitatory and inhibitory projections to the dorsal horn of the spinal cord by projecting to the rostroventral medulla (Millan 2002). The relationship between altered descending pain modulation and chronic pain disorders has been observed in previous studies. In our study, we evaluate how increased descending inhibition relates to an increase in levels of excitatory glutamate in the PAG, and the level of neuropathic pain experienced. Our goal is to use <sup>1</sup>H MR spectroscopy (MRS) to measure glutamate concentrations in the PAG of both healthy patients, as well as Irritable Bowel Syndrome patients (IBS). Irritable Bowel Syndrome is a chronic, gastrointestinal disorder that is characterized with abnormal bowel changes. Although no biochemical or structural abnormalities in the bowel have been detected, patients continue to experience symptoms of abdominal pain, discomfort, diarrhea, bloating, and constipation (Saha 2014).

*Research Mentor:*

*Uzay Emir, Health Sciences*

**Poster Number:** 166 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Examining the relationship between physiological regulation and problem behaviors in children with autism**

**Author:**

Jing Tong Ong, Health and Human Sciences

**Abstract:**

**Background.** Behavioral problems are a common concern in children with autism spectrum disorders (ASD). There is some evidence that psychological regulation as measured with respiratory sinus arrhythmia (RSA) is associated with behavioral problems in typically-developing (TD) children (Dietrich et al., 2007); however, the relationship is unclear within children with ASD (Baker et al., 2019). The purpose of this study was to investigate whether there is a relationship between behavior problems and autonomic physiologic response using RSA.

**Method.** This study includes children with ASD (N=10; 36.4% female) and TD children (N = 28; 25% female) within the ages of two and seven. The participants had their RSA recorded while being exposed to activities that were designed to elicit frustration across two conditions: social and nonsocial. Externalizing behaviors and autism symptoms were measured via parent report: the irritability subscale of the Aberrant Behavior Checklist (ABC) and the total score from the Social Responsiveness Scale (SRS). Predictors of externalizing behaviors (age, group, RSA social condition, RSA nonsocial condition, SRS) were analyzed within a regression model.

**Results.** Mean RSA in both conditions did not significantly predict behavioral problems. Interestingly, SRS significantly predicted aggression,  $b = 0.45$ ,  $t(32) = 3.178$ ,  $p < 0.01$ .

**Implication.** Behavioral problems were strongly associated with autism symptoms, but not physiological regulation as measured by RSA. These results do not support a relationship between physiological regulation and behavioral problems, but findings should be replicated with a larger sample size and with simultaneously measured behaviors.

**Research Mentor:**

*Carolyn McCormick, Human Development and Family Studies*

**Poster Number:** 167 :: Life Sciences

**College of Health and Human Sciences**

**Characterization of Phages Used to Treat Cystic Fibrosis**

Author:

Sophie Pecher, ABE

Christina Tully, ABE

Olivia Didat, ABE

Erick Forkpah, ABE

Abstract:

Phages are widely responsible for driving bacterial evolution because bacteria need to adapt to avoid being killed by viral predators. Temperate phages, specifically, can convert free-living bacteria in our body that have little effect on our health to aggressive pathogens. Currently, the Germ Theory, which states that exposure to negative factors such as carcinogens in our diet and lifestyle can cause genetic variation, is attributed to the cause of cancer. Genetic variations may be the result of a mutation inherited from parents or due to mutations caused by influences in one's environment. These changes contribute to the development of human disease, but do not directly cause it. The purpose of this research was to investigate the direct connection between phages and the formation of bacterial carcinogens. We examined different genomes of phages that were connected to cancerous bacteria, and pin-pointed similarities in those genomes. Specifically, we found which genes were similar and identified their function. If there was a connection between these similarities and the formation of carcinogenic bacteria, our findings could potentially help us understand how to create antibiotics that counter changes before they have the chance to affect the body's bacteria.

*Research Mentor:*

*Dr. Kari Clase, ABE*

*Ikenna Okekeogbu, ABE*

*Gillian Smith, ABE*

*Rachel Damge, ABE*

**Poster Number: 168 ::**

**Moved to oral presentations - LLLC.**

**Poster Number:** 169 :: Life Sciences

**College of Health and Human Sciences**

**Characterization of Nanoparticles Produced from a Spark Discharge System with Manganese and Iron Alloy Electrodes**

**Author:**

Kaushal Arvind Prasad, Health and Human Sciences

Mishaël Theis, Health and Human Sciences

**Abstract:**

Welding fumes consist of a mixture of metal oxide particles and gases containing hazardous metals such as manganese (Mn), chromium (Cr), and cadmium (Cd), which can be as small as 0.005  $\mu\text{m}$  to as large as 20  $\mu\text{m}$ . Nanoparticles (<100 nm) deposit deeper in the lungs and they can translocate to other organs in the body, unlike large particles. In this study, a spark discharge system (SDS) was used to simulate welding fumes with varying contents of manganese to determine the differences in total number concentration and size. An applied voltage of 5 kV and loading current of 0.5 mA were used to produce the simulated welding fumes for two continuous hours. Separate experiments were conducted for electrodes consisting of pure iron (Fe), 90% Fe + 10% Mn, 50 % Fe + 50% Mn, and pure manganese (Mn). A scanning mobility particle sizer (SMPS) was used to obtain total number concentrations and geometric mean diameters, thus creating a particle size distribution. The total number concentrations and geometric mean diameter of particles ranged from  $7.13 \times 10^6$  -  $8.60 \times 10^6$  particles/cm<sup>3</sup> and 46.3 – 67.4 nm, respectively. The particles were collected on a mixed cellulose ester (MCE) filter, which were later analyzed using X-ray fluorescence (XRF) to confirm the metal contents of the welding fumes. The results indicated that higher Mn content resulted in higher total number concentration, geometric mean diameter, and generation rate. The SDS technology and these results will be used in future toxicology studies regarding welding fume exposure.

*Research Mentor:*

*Jae Hong Park, Health Sciences*

**Poster Number:** 170 :: Life Sciences

**College of Health and Human Sciences**

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

**Author:**

Charles G. Price, Health and Human Sciences

**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:*

*Dr. Jason Cannon, Health Sciences*

*Rachel Foguth, Health Sciences*

**Poster Number:** 171 :: Life Sciences

**College of Health and Human Sciences**

**Predictive Analytics for Coronary Heart Disease and its Impact on Population Health Management**

**Author:**

Megha Reddy, Health and Human Sciences

**Abstract:**

**Goal:** This project focuses on predictive risk analytics for coronary heart disease (CHD) and its impact on population health management.

**Methodology:** The dataset is publicly available and acquired as part of the Framingham Heart Study (FHS). Logistic regression models combined with machine learning approaches like principal component analysis (PCA) were used to build the predictive model. Statistical analysis was done using R and SPSS.

**Data Analysis:** Exploratory data analysis drew insights into risk-stratification by age group and previous medical history. For example, the prevalence of stroke was a significant predictor of ten year CHD for the age group 62-70 years.

**Results:** Logistic Regression identified age, gender, smoking, blood pressure, and glucose levels to be significant predictors of ten year CHD outcome. The final model had fair accuracy and an area under the curve of 0.71.

**Implications:** Unlike other risk models, this project aims to identify CHD risk groups and provide recommendations to inform health policies. These recommendations go beyond managing heart disease care and will be focused on managing high-risk CVD groups during COVID-19.

*Research Mentor:*

*Zhan Pang, Supply Chain and Operations Management*

**Poster Number:** 172 :: Life Sciences

**College of Health and Human Sciences**

**Tracking The Progress of Pulmonary Fibrosis Due to Irradiation In a Mouse Model**

**Author:**

Elizabeth Roach, Health and Human Sciences

Gianna Porro,

Daniel McIlrath,

**Abstract:**

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. Specifically in the lungs, radiation damage first presents as pneumonitis which eventually leads to scarring and formation of pulmonary fibrosis. The purpose of this project was to measure pathology in order to characterize a mouse model of lung fibrosis due to radiation. This study utilized around 100 C57BL/6 male mice which were irradiated with 20Gy in a single fraction to the entire thoracic cavity. The mice were then imaged with a micro CCT biweekly until noticeable changes were visible. Imaging was performed with respiratory gating to obtain separate inspiration and expiration datasets. Images were subsequently analyzed in the software program ITKsnap in order to differentiate healthy tissue from fibrosis and to track the progress of scarring in the lungs. We observed that as time continued, more fibrosis appeared. This project allowed us to successfully track the process of lung damage due to radiation utilizing a mouse model. Future directions include quantifying and comparing histology slides to CT images.

*Research Mentor:*

*Dr. Carlos Perez-Torres, Radiological Health Sciences*

**Poster Number:** 173 :: Life Sciences

**College of Health and Human Sciences**

**Manganese Exposure and Iron Homeostasis in Semi-Trailer Factory Workers**

**Author:**

Meredith Robbins, Health and Human Sciences

**Abstract:**

Manganese (Mn) exposure is a serious occupational health hazard for many welders, smelters, and miners that may cause severe neurological effects. Prior research shows an association of Mn exposure with increased concentrations of hepcidin. Hepcidin is a hormone which regulates iron concentrations within the bloodstream. It is suggested that altered iron concentrations in the brain could lead to neurological symptoms. Therefore, the goal of this project is to explore the relationship between manganese and hepcidin as an indicator of altered iron (Fe) homeostasis. Population demographics were collected from semi-trailer factory workers in a cross-sectional study via a questionnaire. Demographic information includes age, race, body mass index, smoking, and alcohol use. Toenail clippings and questionnaires were collected on the same day; blood and air concentrations were sampled on a different day within a short time period. Statistical analyses include descriptive statistics and regression analyses. Unadjusted linear regressions were run using hepcidin and transferrin as dependent variables with air Mn, toenail Mn, blood Mn and welder status as independent variables. Toenail Fe and air Fe measures were also used as independent variables to predict hepcidin. Mean air concentrations for the metals were below recommended exposure limits. Mn toenail concentrations were consistent with levels found in other studies on welding exposure, while Fe toenail concentrations were significantly higher compared to the same studies. Welding (vs. not) was significantly associated with higher hepcidin concentrations (p-value=0.025). Higher toenail Fe was also significantly associated with higher hepcidin (p-value=0.047). A relationship of higher air Mn with higher hepcidin concentration was approaching significance (p-value=0.068). Other associations were not significant. Our initial results are partially consistent with our hypothesis. However, this will be confirmed in the near future with continued analysis of the relationship between manganese exposure and iron homeostatic mechanisms using adjusted linear regressions.

*Research Mentor:*

*Ellen Wells, Health Sciences*

*Ulrike Dydak, Health Sciences*

**Poster Number:** 174 :: Life Sciences

**College of Health and Human Sciences**

**Object Transportation in Infants**

**Author:**

Maria Stiens, Health and Human Sciences

Alyssa DeJoan, Health and Human Sciences

**Abstract:**

Newly walking infants frequently choose to carry small, light-weight objects (Arnold, 2019; Heinen et al., 2019). Carrying objects leads to fewer falls (Karasik et al., 2012) and more time spent in motion (Arnold, 2019) suggesting an increase in stability. Given that crawlers also frequently carry objects through their environment and rarely fall during these object carriage bouts (Karasik et al., 2012), an open question remains if carrying objects while crawling also leads to more time spent in motion and if crawling infants prefer to transport small, light-weight objects. We observed crawling behavior in 39 13-month-old infants while they were crawling with differently sized and weighted toys during the middle 10-minutes of a 20-minute free play session. Contrary to expectations, infants spent more time in motion when crawling without a toy ( $p=0.036$ ). Similarly, infants crawled more often without a toy ( $p=0.04$ ). Crawling infants more frequently transported the toy by pushing it along the ground and rarely held the toy off the ground ( $p=0.013$ ). Crawling bouts rarely ended in a fall (only 2 bouts: one with a toy and one without). Unlike walking infants, crawling infants did not have a preference in terms of toy size ( $p=0.634$ ) or toy weight ( $p=0.093$ ). Unlike walking, crawling with a toy does not appear to lead to stability benefits. Given that the infants in our study could also walk, they may have preferred walking with objects over crawling. Future research should investigate crawling with objects in younger infants who are only capable of crawling.

*Research Mentor:*

*Dr. Laura Claxton, Health and Kinesiology*

**Poster Number:** 175 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Exploring consumer insights to improve condom vending machine promotion and use in Italy**

**Author:**

Olivia Strube, Health and Human Sciences

Nicole Kinman, Health and Human Sciences

**Abstract:**

**Introduction:** Despite the vast knowledge of condom use importance, 46% of Italian men and women practice unprotected sex. Condom purchase outlets are plentiful (i.e., grocery stores, pharmacies, etc.); however, condom vending machines (CVMs) are particularly unique. Prevalent in European countries, CVMs offer condoms for purchase while reducing commonly experienced barriers. Even with easier access, many individuals still display limited willingness to purchase products from CVMs. Exploring hesitation surrounding CVM use across genders is key in developing efforts to improve CVM marketing, promotion, and uptake.

**Methodology:** Semi-structured in-depth interviews with 42 aged 18-50 years ( $29.08 \pm 7.94$ ) living in or near Florence, Italy were conducted between May–June 2019. Techniques from expanded grounded theory were used for data analysis, allowing for a constant comparative approach to contextualize data and identify emergent themes.

**Results:** Three primary themes emerged: 1) attitudes and barriers toward CVMs, 2) gender-specific purchasing influences and behaviors, and 3) CVM improvement and promotion. Women and men described varied concerns surrounding CVM purchasing, illuminating reasons for hesitancy. Additionally, focusing on CVM quality and improving product offerings was suggested by participants to increase use.

**Discussion:** Men were cited as primary CVM users, expressing practical concerns surrounding CVMs, while for women, CVM visibility was as much of an advantage as a drawback. Reflecting consumer needs via diversified product offerings should be considered a priority for increased CVM use. Working to promote CVMs requires clear messaging that attends to gender norm limitations, details product safety, and establishes CVMs as a reliable condom purchase outlet.

*Research Mentor:*

*Andrea DeMaria, Public Health*

*Jaziel Ramos-Ortiz, Consumer Science*

**Poster Number:** 176 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Conflict control and memory**

**Author:**

Fangqin Sun, College of Science

**Abstract:**

This research reexamines the semantic conflict (congruent vs incongruent) and the response conflict (proceed and inhibit), as well as their impact on the memory. A categorization task with two categories (male vs female, natural vs manmade) is adopted where the two conflicts are simultaneously reflected. Also, a memory task tests participants' memory on stimuli shown in the categorization task. We designed two with-in group experiments using two tasks mentioned above: one with response conflict binding to the categorization and the other with response conflict independent of the categorization. 84 college students participate in experiment for course credits. The results replicate (or not, in progress) previous findings: congruent and inhibition stimuli lead to better memory. Furthermore, we find (or not, in progress) an interaction between semantic conflict and response conflict. The current study is insufficient to fully explain the cause of the interaction, but there are indications for further study.

*Research Mentor:*

*Yu-Chin Chiu, Psychology*

**Poster Number:** 177 :: Life Sciences

**College of Health and Human Sciences**

**Aerobic Fitness Positively Impacts Executive Function In Young Adults**

**Author:**

Alexis Swingendorf, Health and Human Sciences

Brandon Muczynski, Health and Human Sciences

**Abstract:**

The purpose of this study was to examine the relationship between aerobic fitness and the three domains of executive function: (1) working memory, (2) inhibitory control, and (3) cognitive flexibility in young adults. 120 young adults, aged 18-30 years, were recruited to complete a health questionnaire and a VO<sub>2</sub>max test, a standard measure of aerobic fitness utilizing graded exercise to determine maximum oxygen consumption. Participants completed a series of n-back tasks (n=1, 2, or 3) requiring varying degrees of working memory, a flanker task in which one condition prioritizes response accuracy and the other prioritizes response speed, and a task-switching task which required decision-making processes by utilizing a fixed rule (homogenous) or two alternating rules (heterogenous). Results showed an increased level of aerobic fitness was associated with faster reaction times during the 1-back condition and higher response accuracy during the 2-back condition. Increased aerobic fitness was associated with smaller decreases in response accuracy from a switching to non-switching trial during the heterogenous condition of the task-switching task. When controlling for age, sex, and total amount of self-reported physical activity, the observed associations remained statistically significant. While young adults are considered at their peak for executive function, individual differences in aerobic fitness may contribute to variability in executive function in this population, particularly working memory and cognitive flexibility. The implication of this study is that being aerobically fit may play a role in increasing cognitive health in young adults.

*Research Mentor:*

*Shih-Chun (Alvin) Kao, Health and Kinesiology*

*Christian Nagy, Health and Kinesiology*

*Nicholas Baumgartner, Health and Kinesiology*

**Poster Number:** 178 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Messaging and Access Strategies for Improving Emergency Contraceptive Knowledge and Uptake among Italians**

**Author:**

Lexi Umberger, College of Health and Human Science

Allie Giannone, School of Nursing

Cayley Mason, School of Nursing

Michelle Szabo, College of Pharmacy

**Abstract:**

**Objectives:** Over-the-counter EC purchase was legalized in Italy in 2015. However, knowledge and access gaps remain. Therefore, the goal of this study was to explore women's and men's EC informational and access needs.

**Methods:** As part of a larger reproductive study, researchers conducted 42 in-depth interviews (May–June 2019) with English-speaking women and men aged 18-50 years ( $M=29.08\pm7.94$ ) living in or near Florence, Italy, and using the Italian health care system. Researchers completed qualitative data analysis to identify emergent themes related to emergency contraception knowledge, attitudes, and access. HyperRESEARCH aided data organization and analysis. Researchers used a comparative method to contextualize data and identify emergent themes.

**Results:** Findings demonstrated peer communication and experiences served as influential factors in others' choice to use EC. This propagated misinformation, however, reducing participants' confidence in EC efficacy and safety. Women described the relevance of relationship type in whether or not to engage men in EC discussion while men desired to play a more active but supportive role. Finally, participants described various messaging and access channels and outlets to increase EC knowledge and access.

**Conclusions:** Findings offer practical recommendations to guide the creation of social marketing and behavior change interventions to increase EC access and uptake among women and men living in Italy. These should consider men's and women's needs. Additionally, opportunities for communication strategies and access campaigns to improve attitudes and increase knowledge and uptake of over-the-counter EC are discussed. Finally, the utility of pharmacists to patients when accessing EC is explored.

*Research Mentor:*

*Andrea L. DeMaria, Department of Public Health*

*Stephanie Meier, Division of Consumer Science*

**Poster Number:** 179 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Prenatal gummy vitamins smell worse than men's or women's vitamins**

**Author:**

Madison Wierenga, Health and Human Sciences

**Abstract:**

Indiana has one of the highest infant mortality rates in the US, 7.3 infant deaths per 1,000 compared to the national average of 5.8 infant deaths per 1,000 in 2017. Causes of death can include birth defects, preterm birth and low birth weight, and maternal pregnancy complications. Prenatal vitamins can help mitigate the risk for many of these pregnancy issues, by filling vital nutrient gaps in a pregnant women's diet. However, many women choose not to use them. One reason women report not using vitamins is due to sensory issues, such as the size and flavor of the vitamins. For this study, we recruited women to rate the aroma of gummy and tablet versions of men, women, and prenatal vitamins, attempting to identify common patterns of ingredients that might contribute to "off-flavors" among these vitamin types.

Initial testing (N=41) indicated that there was, unsurprisingly, a difference in aroma intensity with gummy supplements stronger in aroma than tablets. Additionally, prenatal gummies had less pleasant overall and stronger unpleasant aroma intensity than both men's and women's gummies, within a brand. Men's and women's multivitamins had stronger pleasant aromas intensity than the prenatal vitamin. Considering the patterns of responses, we suspect that the aroma differences among the vitamins are due to the actual nutrient content differences among prenatal, men's, and women's vitamins. Notably, ingredients typically known to worsen flavor in vitamins (iron, calcium) are actually present at very low concentrations in gummy vitamin formulations. Thus, the source of the off-flavor in prenatal vitamins is currently unknown. Further tests ongoing are to determine what ingredients may be contributing to the unpleasant aroma profile of the prenatal vitamins so that efforts can be made to improve its flavor.

*Research Mentor:*

*Cordelia Running, Nutrition Science*

**Poster Number:** 180 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**Influence of the Salient Tip on Spoon Compatibility Effects**

**Author:**

Yaqi Xu, Health and Human Sciences

**Abstract:**

This study examined transfer effects with horizontally-displayed spoon stimuli. Participants responded to tip or handle location with left-right key-presses in two sessions. In Experiment 1, all participants practiced with an incompatible tip-response mapping. At test, they responded to the tip or handle with compatible or incompatible mapping. Reaction time decreased across the experiment. For the test, reaction times were shortest for tip-compatible mapping, although practice was with the tip-incompatible mapping. The handle-incompatible mapping yielded faster responses than the handle-compatible mapping, suggesting a strategy of responding compatibly to the tip. Experiment 2 examined strategy development by having participants respond with an incompatible handle-response mapping for both sessions. For practice, participants were only told to respond to the stimuli; for test, they were told to use a strategy to respond fast if they were not already using one. Participants who reported using the tip-compatible strategy responded faster than those who did not.

*Research Mentor:*

*Dr. Robert Proctor, Psychological Sciences*

*Dr. Aiping Xiong, Information Sciences and Technology*

**Poster Number:** 181 :: Life Sciences

**College of Health and Human Sciences**

**Comparison of Two Samplers**

**Author:**

Eileen Yan, HHS

Sarah Neky, HHS

Elisabeth Aikins, HHS

**Abstract:**

Groundwater in Martinsville, Indiana has been contaminated with volatile organic compounds (VOCs), mainly tetrachloroethylene (PCE) and trichloroethylene (TCE), which have negative neurocognitive and carcinogenic effects. A study was conducted using two types of samplers to assess exhaled breath, the most reliable and feasible means to analyze PCE exposure from multiple pathways. The objective was to compare the accuracy of two sampling devices, the Tedlar bag and Bio-VOC, in terms of their specificity and sensitivity to various VOCs.

Methods: Exhaled breath samples were collected from n=22 Martinsville residents living in the contaminated area, and analyzed for 11 chlorinated VOCs by Gas Chromatography/Mass Spectrometry, following an EPA standard method (TO-15). Four different compounds were detected by the Bio-VOC and two by the Tedlar bag. While the Tedlar bag detected PCE in all 22 samples (1.9 - 44 ng/L), the Bio-VOC detected PCE in four samples (0.27 - 48.6 ng/L). Results of PCE from the Tedlar bag and Bio-VOC were more consistent at high concentrations (44 vs 48.6 ng/L) than low concentrations (4.23 vs 0.51 ng/L). The limit of detection was 0.26 µg/m<sup>3</sup> for the Tedlar bag and 0.3 µg/m<sup>3</sup> for the Bio-VOC. Experiments have been developed to further investigate the sensitivity and background interferences of these samplers. In conclusion, the samplers agreed at high PCE concentrations, but not at low concentrations. Further investigation and standard field sampling protocols are needed to produce reliable data from these much-needed sampling devices

*Research Mentor:*

*Sa Liu, Environmental and Occupational Health Science*

**Poster Number:** 182 :: Social Sciences/Humanities

**College of Liberal Arts**

**Archival of Material and Documents from Fort Ouiatenon**

**Author:**

Samuel Bakeis, Liberal Arts

**Abstract:**

Fort Ouiatenon was built by the French on the Wabash river in the year 1717 to secure fur trading interests in the area and as an outpost to sell to local native groups. It was eventually burned down by American forces in 1791 and later converted to farmland until it was rediscovered in the 1960s. Major excavations in the 1970s and 1980s by Michigan State University generated a wealth of data, e.g., paper records, unit forms, photographic slides, and physical artifacts, but relatively little analysis has been performed on this material. This collection belongs to the Tippecanoe County Historical Association and is stored in Lafayette, IN. The purpose of this project is to digitize the images and records from these excavations in order to share it with Michigan State University and the larger public. Because many of the paper documents are also in poor condition, digitizing ensures the permanence of these records. Materials in the TCHA Fort Ouiatenon collection were photographed with a digital camera, measured, and registered. Text and photo materials were processed with Epson Scanners and Adobe Acrobat software for digital storage at the Tippecanoe Country Historical Association. This information will be invaluable for future researchers and will help guide future research on the site and Native American and French relations during the fur trade.

*Research Mentor:*

*Harold Kory Cooper, Anthropology*

**Poster Number:** 183 :: Social Sciences/Humanities

**College of Liberal Arts**  
**Good Decisions, Good Data**

**Author:**

Carter Bruns, College of Science

Jack Harber, Krannert School of Management

Sarahy Duenas, Pre-Communications

Vishnu Kamagere, College of Engineering

David Nickel, College of Engineering

Alexander Patton, Health and Human Sciences

**Abstract:**

Through partnering with the City of Lafayette, we generated primary research data and analyzed secondary data sources to focus on Lafayette's transportation methods, neighborhood revitalization, and affordable housing outcomes. In researching modes of transportation, we found that City of Lafayette residents mainly drive alone, car-pool, and/or use public transportation. Workers 16-and-over in owner-occupied housing units were primarily found to carpool while workers 16-and-over in renter-occupied housing units were primarily found to use public transportation. In analyzing neighborhood revitalization, we conducted phone interviews and online surveys with Lafayette residents that participated in the Habitat for Humanity home building process. We found that citizens' quality of life and happiness levels improved after having their new home built. Additionally, we studied the possible effect of race, age, and gender on poverty/homelessness rates. Initial data gathered suggests there may also be a correlation between the shift of populations in these neighborhoods and the poverty rate. Lastly, for affordable housing, we examined demographic and financial trends of Northend Lafayette mortgage purchasers. In many Northend neighborhoods, the median income of mortgage applicants has consistently hovered around 50% of the Greater Lafayette area's median income. The value of the mortgages also has greatly concentrated toward \$70k over time, with more FHA-Insured loans originating in 2018 than previously. These trends show a stable and affordable environment within the Northend housing market, but also show that the city may need to put greater emphasis on neighborhood revitalization to increase the overall attractiveness of living in these areas.

*Research Mentor:*

*Jason Ware, Honors College*

**Poster Number:** 184 :: Social Sciences/Humanities

**College of Liberal Arts**

**The Impact of Language in News Media**

**Author:**

Mary Caltrider, College of Liberal Arts

**Abstract:**

Language is a powerful tool of presentation and persuasion. In the past, news media comported themselves via “professional” presentations, an objective presentation of the facts. Today, news media and blogs are engaging in hyperbolic language, which may contribute to polarization of groups and even a loss of professional credibility for newscasters or news programs. As the hyperbole, and especially powerful metaphors increase in intensity, which are meant to draw audiences in, they may be having a more deleterious effect, loss of trust. Before addressing the negative impact on audiences it is important to explore the language itself, especially the use of hyperbole and metaphor in newscasts. This study explores if and how metaphor and hyperbole are used in newscasts. Articles from two main sources, MSNBC and Fox, are compared. The study randomly selected five articles the week before the Senate impeachment trial of President Trump from each source, and then five articles from each source a week after the trial. The following research questions were asked: Is metaphorical hyperbole present in newscasts or news blogs? If so, what kind of metaphors are used? Is metaphorical hyperbole more prominent in conservative or liberal leaning news media? Is there a shift in language (metaphor choice) before or after significant events (impeachment trial)? Fox and MSNBC were selected because one is known to be radically right while the other leans left. This study found both outlets used enhanced, metaphorical language that falls into the category of war theme, religious rhetoric, hyperbole, or action language.

*Research Mentor:*

*Professor Robin Clair, Communication*

**Poster Number:** 185 :: Social Sciences/Humanities

**College of Liberal Arts**

**Using Spy Satellite Images in Archaeological Research**

**Author:**

Miranda Carter, College of Liberal Arts, College of Science

**Abstract:**

The purpose of this project was to georectify satellite and drone photos onto modern day satellite images of Armenia, in an effort to track archaeological sites and the regions landscapes have changed due to human development since the Soviet Period. Two sets of images were geo-mapped onto modern satellite photos. The first set of images was taken via satellite in the early 1940s and rectified using ArcGIS 10.6. This process involved placing points on the raster image and matching them to points on modern satellite imagery. Permanent landscapes such as lava flows, some road intersections, and mountain ranges in the area were the primary referencing tools. The second set of images are declassified imagery from the Corona Spy Satellite program, taken during the 1960s and 1970s. These images were rectified using software available through the University of Arkansas, which works in collaboration with archaeologists around the world to georectify these declassified Corona images. The georectification of these two sets of photos resulted in two complete images of Armenian countryside at two different points during the Soviet Period. Newly georectified images provide archaeologists with accurate geographic representations of Armenia almost a century ago. This allows for better remote sensing of archaeological sites, for which the evidence has been destroyed by modern era industrialism. Specifically the images from the Corona satellite will be uploaded to a public database after rectification for any to view or use for further research purposes.

*Research Mentor:*

*Ian Lindsay, Anthropology*

**Poster Number:** 186 :: Social Sciences/Humanities

**College of Liberal Arts**

**Morphometric Comparison of Early Hominin Butchery Evidence to Carnivore Modifications within a Bayesian Framework**

**Author:**

Sarah Coon, College of Liberal Arts

**Abstract:**

The emergence of stone tools used for butchery by early hominins is a contested topic due to a scarcity of early stone tool evidence. In the absence of tools, the primary trace evidence for their use as butchery implements is bone surface modifications (BSM). However, current BSM recognition protocols are subjective and can lead to conflicting identifications - for example, between cut marks and BSM from carnivores. Canidae species such as *Eucyon wokari* are present in the African Pliocene fossil record at a time when early tool-wielding hominins begin to appear. As canids are known to gnaw on bones, and create BSM that can be incorrectly identified as the result of human butchery behavior, Pliocene canids are candidates for having created BSM currently identified as cut marks. To alleviate this problem, 3D technology coupled with modern geometric morphometrics and Bayesian inference have emerged to differentiate between cut marks and other BSM. Here, we use carnivore modifications on bone, made by wolves (*Canis lupus*) under controlled conditions to compare against experimentally-produced butchery BSM. While canid BSM can appear visually similar to butchery marks, Bayesian inference used in this study can differentiate them and provide a level of probability to their distinction.

*Research Mentor:*

*Erik Otarola-Castillo, Anthropology*

**Poster Number:** 187 :: Social Sciences/Humanities

**College of Liberal Arts**

**#YouTubeBlack and the Politics of Platform and Promotion**

**Author:**

James Darschewski, College of Science

Nathan Garrison, College of Science

**Abstract:**

Discrimination of Black content creators on YouTube has become evident in recent years as more and more viewers and creators utilize the platform. In 2016, Google created the event #YouTubeBlack as a response to this discrimination within and outside of the platform. Despite the initial purpose of #YouTubeBlack, over the years it has become a pseudo-event which focuses on promoting token Black content creators instead of building up the aspiring Black YouTubers who want to be included in the #YouTubeBlack movement. Using Grounded Theory and the method of Open Coding, we compiled 100 YouTube videos using hashtag #YouTubeBlack as a search protocol, we categorized the video content using the metadata of views, likes, dislikes, number of subscribers, comments, and additional video content data. Based on this data collection and categorization, we discovered that certain videos were more popular and frequently recommended than other videos within the platform. Using this initial observation, we developed research topics and questions that would spearhead our investigation into the #YouTubeBlack movement. The research questions are as follows: "What are the norms of recommendation and promotion on YouTube?", "What is the logic behind the popularity of specific #YouTubeBlack Videos?", and "What are the strategies that content creators are using to increase their visibility within the platform?". This research project should encourage future change in the YouTube platform and bring awareness to the discriminatory design that indirectly privileges certain creators and content while actively suppressing others.

**Research Mentor:**

*Dr. Faithe Day, Purdue Library and School of Information Studies*

**Poster Number:** 188 :: Social Sciences/Humanities

**College of Liberal Arts**

**The effect of exposure to foreign film on second language speech imitation**

**Author:**

Anthony Faulkner, College of Liberal Arts

Clara Villalon, College of Liberal Arts

**Abstract:**

Previous research has demonstrated the ability of foreign film to aid in various aspects of second language (L2) acquisition, such as cultural competence (Dubreil, 2011) and development of new L2 vocabulary (Kaiser, 2011). However, as the effect of exposure to foreign film on L2 speech production (i.e. how L2 sounds are pronounced) has yet to be investigated, the present study aims to explore this potential relationship. The current study collected speech production data from 75 native speakers of American English who indicated that they had limited exposure to other languages. Upon arrival to the lab, participants were asked to repeat, or imitate, French words into a microphone after a French native speaker prior to foreign film intervention. After this pre-testing phase, experimental group participants viewed an episode of Chef's Table France in French (control group participants viewed an English-dubbed version of the episode) and then completed the same imitation task following the episode. Pre- and post-test results will be compared statistically and it is anticipated that experimental group participants will significantly improve their French word pronunciation after receiving foreign film intervention. Demonstrating the effectiveness of foreign film on L2 speech development would encourage language learners and instructors to incorporate foreign film more consistently into the second language acquisition process as an accessible alternative to authentic input from native speakers.

*Research Mentor:*

*Olga Dmitrieva, Linguistics*

*Amy Hutchinson, Linguistics*

**Poster Number:** 189 :: Social Sciences/Humanities

**College of Liberal Arts**

**Analysis of Microwear Dental Morphology**

**Author:**

Amanda Gozner, Liberal Arts

**Abstract:**

Dental microwear morphology can be used to show the effects that different subsistence strategies and dietary lifestyles may have upon dentition. This study analyzes the morphology of dental microwear between different foragers and farmers to identify statistically different shaped microwear modifications. Using 3D images of microwear dental modifications from hunter-gatherers and farming societies, individual modifications were isolated to discriminate between microwear morphology. The overall 3D shape of the isolated modifications were then compared. These data are used to show differences in the modification's morphologies and exhibit statistical differences. Using this approach allows future use of morphometrics with Bayesian methods to compare unidentifiable or questionable microwear modifications.

*Research Mentor:*

*Erik Otarola-Castillo, Anthropology*

**Poster Number:** 190 :: Social Sciences/Humanities

**College of Liberal Arts**

**Russian Lexicon: From Structure to Meaning**

**Author:**

Micah Graber, Liberal Arts

Tristan Schefke, Science and Liberal Arts

**Abstract:**

One of the most time-consuming aspects of learning any language is building a working vocabulary. The average person entering college knows roughly 40 thousand words, so trying to catch up to that amount of known vocabulary takes quite a long time. The Russian language wields a wealth of productive models of word formation due to the specifics of its morphological construction and the richness of possibilities it allows. As a result, Russian learners can expand their lexicon exponentially by understanding how words are formed with prefixes and suffixes around a root. For example, if students in lower level Russian courses had resources which gave a root, like "уч-", (meaning teach/learn) followed by a list of familial words (words with the same root), and an explanation for how these words were created using the productive prefixes, suffixes, and endings within the language, the acquisition period could be shortened greatly. Our project focuses on creating a working lexicon that contains the most common Russian roots, prefixes, and suffixes. Our poster/presentation will explain the principles used to compile the lexicon and highlight the most productive models of word formation for words which are covered in the first years of learning Russian.

*Research Mentor:*

*Olga Lyanda-Geller, Russian*

**Poster Number:** 191 :: Social Sciences/Humanities

**College of Liberal Arts**

**The Use of Feminism in Marketing: Where is the Line Drawn?**

Author:

Gabby Hamill, College of Liberal arts

Abstract:

Abstract Redacted

*Research Mentor:*

*TJ Boisseau, School of Interdisciplinary Studies*

**Poster Number:** 192 :: Social Sciences/Humanities

**College of Liberal Arts**

**The Supreme Court's Effect on Public Issue Awareness**

**Author:**

Jared C. Huber, Liberal Arts

**Abstract:**

The Supreme Court is one of the singular institutions of justice in the American government and as such, previous research generally demonstrates some vestigial indications that the topics they render decisions on subsequently experience an increase in public awareness of that topic. However, there is no conclusive link between the two. This project attempts to establish a statistically significant link between Supreme Court decisions and increased awareness of the topic the court decided upon in the years following a court decision. Additionally, the project seeks to understand if some topics experience this effect more than others, particularly abortion, and if there are certain case characteristics that may affect how much, or if, public awareness of that topic increases after the Court's decision. To do so, we analyzed all of the Court's 2013 decisions and mention of those cases' topics in the New York Times archive from 3.5 years before the case and 3.5 years after the case. We also gathered data on specific topics for all court cases approximately after the 1980s and analyzed mentions of those cases' topics in the New York Times archive from 3.5 years before the case and 3.5 years after the case. Initial results suggest that there is a conclusive link and further analysis will be conducted to demonstrate the relationship.

*Research Mentor:*

*Dr. Logan Strother, Political Science*

**Poster Number:** 193 :: Social Sciences/Humanities

**College of Liberal Arts**

**Three-Dimensional Scanning of Egyptian and Nubian Crania from Tombos, Sudan Part 2**

**Author:**

Anna Jenkins, College of Liberal Arts

**Abstract:**

The site of Tombos, located at the third cataract of the Nile River in northern Sudan, showcases interactions between Egyptian colonists and local Nubians. Using geometric morphometrics, preliminary results of this analysis suggest that there are significant differences in the cranial morphology of individuals buried in different tomb types, which may have been used by distinctive social groups. The use of 3D scanning technology has been helpful in examining the skull because of the flexibility in placing landmarks on a complex shape that would not be possible in the traditional ways of doing morphological study.

*Research Mentor:*

*Michele Buzon, Anthropology*

**Poster Number:** 194 :: Social Sciences/Humanities

**College of Liberal Arts**

**Explore Prosocial Relationships on Twitch Communities**

**Author:**

Yihan Jia, College of Liberal Arts

**Abstract:**

This project intends to investigate the prosocial relationships between live-streamers and their viewers on Twitch (or similar live-streaming services). The goal is to understand what makes a Twitch community successful, with the preliminary hypothesis that the live-streamer's personality is a key factor. In particular, this study examines the role of parasocial interactions or relationships – the sense that the live-streamer is directly addressing the community, as a friend – in community success. The general hypothesis is that people who feel more parasocially connected to the live-streamer will feel a stronger sense of community. The project will rely on a purposive and snowball sampling technique to survey the unique population of Twitch community members. Furthermore, the research process also includes a literature review on parasocial relationships and on sense of community, and data analysis. We expect results that could indicate a positive connection between live-streamers and viewers. The outcome of this project would further aid live-streaming platforms to upgrade their services and features to promote the positivity among live-streaming communities.

*Research Mentor:*

*Brett Sherrick, Lamb School of Communication*

**Poster Number:** 195 :: Social Sciences/Humanities

**College of Liberal Arts**

**Consent Culture & Comprehensive Sex Education**

**Author:**

Anna Kelley, Polytechnic Institute

Quinn Kelly Houlihan, College of Liberal Arts

**Abstract:**

The purpose of this study is to further elaborate and educate viewers on consent culture and comprehensive sex education. This work encompasses two separate forward-thinking movements that can be paired to reach all communities. From personal experiences and shared stories, both authors have seen the negative effects of our current systems' lens and hope to change the judgments surrounding these topics into proactive understandings.

By qualitatively analyzing research, both in academia and beyond, on consent and various versions of sex education the authors have found that there is a need for more consent-based learning and a more inclusive comprehensive sex education for both children and teens.

Research shows that teaching children about body autonomy and what healthy and informed consent looks like in nonsexual relationships, will help build a solid foundation of consent that they will carry out through their lives. By the time they reach puberty and it is time for sex education, consent will become normalized. Further research shows that there is a gap in state sexual education requirements and that curriculum is not available that is inclusive to LGBTQAI+ and disability communities.

The research done recognizes the ability to teach children at a young age about body autonomy, consent, and healthy relationships (non-sexual and sexual). Throughout their growth process, young adults will have the ability to practice what they have learned into adulthood, overall forming a new and safe environment for everyone to enjoy.

*Research Mentor:*

*Maria Mears, American Studies and Women's, Gender, and Sexuality Studies*

**Poster Number:** 196 :: Social Sciences/Humanities

**College of Liberal Arts**

**Reason for Breastfeeding**

**Author:**

Paige Kinder, Liberal Arts

**Abstract:**

We have spent the past semester looking at the reasons why women choose to breastfeed their babies as opposed to other forms of providing nutrients. Some women find breastfeeding to be empowering and believe it helps them reach their full womanhood, others do it so that they look better in the eyes of their peers and to improve their social standing, while some do it for different reasons all together. After conducting a series of interviews with women of different backgrounds, statuses, and experiences, we have analyzed the results of the interviews in order to see the way in which different women come to the conclusion to breastfeed their baby.

*Research Mentor:*

*Elizabeth Hoffman, Sociology*

**Poster Number:** 197 :: Social Sciences/Humanities

**College of Liberal Arts**

**Using Photogrammetry to Produce 3D Models of Material Culture: A Methodological Study for Small Institutions**

**Author:**

Elizabeth Kriebel, Liberal Arts

**Abstract:**

Exhibiting material culture in virtual, three-dimensional space is a rising trend across cultural institutions such as museums, libraries, and archives. 3D object exhibitions allow for greater access, and as a result, provide greater opportunities for teaching and learning. Since this is an emerging and evolving methodology, there is no unified body of literature or standardization of the practices for creating repositories of 3D models. The goal of this project is to create and execute a methodology for creating, storing, and making discoverable 3D models of material culture for a small-scale archival or museum space. In collaboration with Purdue Archives and Special Collections, six objects of significant interest to the public were chosen. Through a process called photogrammetry, 3D models of these objects were created. The objects were photographed extensively, and the photographs were stitched together using Agisoft, a specialized software used to create 3D models. These models, accompanied by a metadata schema based on Dublin Core, were then stored and made discoverable through an open access institutional repository. Photogrammetry was determined to be the better option over 3D scanners because of the affordable access, whereas quality 3D scanners can be difficult to obtain on a limited budget. Additionally, photogrammetry suited the varied types of objects chosen because of the level of visual precision depicted over the 3D scanners tested previously. Based on this study, we recommend the use of photogrammetry to any small cultural institution interested in exploring 3D representations of material culture.

*Research Mentor:*

*Sarah Huber, Library Science*

*Dr. Ian Lindsay, Anthropology*

**Poster Number:** 198 :: Social Sciences/Humanities

**College of Liberal Arts**

**Using GIS to Store and Analyze Archaeological Data**

**Author:**

Emma Lashley, College of Liberal Arts

**Abstract:**

Archaeology is a field in which spatial analysis of data, using Geographical Information Systems (GIS), can be exceptionally useful. GIS gives archeologists a new and vital way to analyze, visualize, and store their collected data which is often inherently spatial. However, much archaeological data from past excavation, survey, and analysis, remains stored either as two-dimensional spreadsheets or even simply as paper copies filed away somewhere. The goal of this project is to create a GIS geodatabase to store and analyze previously collected archaeological data from the Fort Ouiatenon Preserve in West Lafayette. The database will also be designed so that any future data collected from excavations at this site can be added, allowing all the data to be analyzed together. The database also contains additional data that is useful to understanding and interpreting the archaeological materials, like soil surveys and LiDAR data. A Geodatabase was created first using ArcGIS Pro to obtain the ideal data structure, then it was populated with the relevant data. The project was then mounted on ArcGIS Online so that team members working at the reserve would be able to access and utilize the data. This project has allowed us to show how GIS software can be applied to small scale archaeological excavations to improve the way data is stored and analyzed.

*Research Mentor:*

*Ian Lindsay, Anthropology*

**Poster Number:** 199 :: Social Sciences/Humanities

**College of Liberal Arts**

**Microlending, an innovative approach to reducing recidivism**

**Author:**

Devyani K Pejathaya, Krannert

**Abstract:**

The prison system in the United States has been labeled a “merry-go-round” due to the exponentially high rates of recidivism within the past decade. According to federal tracking, 67.8% of incarcerated individuals are arrested for crimes different from their prior arrest, and 76.6% of them find themselves back in the prison system within 5 years of release. The conventional solution, prison reformation, is not only expensive, costing the American taxpayer millions, but also ineffective in seeing immediate results. This problem requires an innovative solution, and thus the concept of micro-loans for formerly incarcerated inmates was conceptualized. Micro-loaning, a peer to peer lending program, is a short-term loan that can be designed to rehabilitate freshly released incarcerated individuals by helping them regain their footing in society. By applying for the loan, individuals would have a chance to find stable housing, secure employment status, and ultimately reintegrate back into society successfully. The symbiotic nature of the loan allows for lenders to receive high interest on their investments, and borrowers to pay back installments once their loan has matured through the income they receive. This research poster discusses the importance of micro-loaning in society today with applications specific to reducing recidivism rates in the United States. By understanding the severity of the problem of recidivism and the possible socio-economic benefits of this type of micro-lending to society I aim to educate individuals on how their savings can be invested wisely to assist with this social problem.

*Research Mentor:*

*Allegra Smith, Department of English*

**Poster Number:** 200 :: Social Sciences/Humanities

**College of Liberal Arts**

**A Name to Remember:**

**Author:**

Jessica Perkins, Liberal Arts

**Abstract:**

My research began with the question of what Amelia Earhart's impact was on Purdue University, specifically in regards to campus buildings and her interactions with students. The focus of my research examined the response to Earhart's time during and after Purdue from students and staff. Most of my research was done by with access to primary source documents from the George Palmer Putnam Collection of Amelia Earhart Papers and interviews with individuals that have unique relationships to Earhart's legacy. In accordance with the archival material, I also used secondary sources to gain a greater perspective of the community's relationship with Earhart such as The Exponent newspaper. The interviews I conducted examine how students interact with the constant reminders of Earhart around campus, such as residents of Earhart Residence Hall, and the Purdue Airport. My research conclusions will highlight how Purdue students have a unique relationship with Earhart during and after the few years she was employed, and also argue the impact of physical representations of her that students see everyday after her.

*Research Mentor:*

*Sammie Morris, Archives and Special Collections*

**Poster Number:** 201 :: Social Sciences/Humanities

**College of Liberal Arts**

**Male vs. Female Representation in Chimpanzee Behavioral Studies**

**Author:**

Diana Quintero, College of Liberal Arts

Kamryn Dehn, College of Agriculture

**Abstract:**

In science, unintentional biases towards one particular demographic group over others can lead to malformed interpretations and conclusions. Within anthropology, it has been theorized that a sex bias, or an overrepresentation of and overemphasis on males and their contributions to ancient hunter-gather societies, has neglected contributions by women to subsistence and sociality. Anthropologists frequently include chimpanzees as modern analogs to develop conceptual models of early hominin behavior, such as the hypothesized effects of hunting and provisioning on the evolution of human social relationships. Although male chimpanzees hunt more often, females also hunt but considerably less is known about them. Biases in sampling chimpanzee study subjects could be producing problems similar to those previously theorized. To determine if there is a sex bias in behavior sampling, we reviewed 189 studies from three long-term study sites. We extracted metadata from these papers regarding study group and sample size demographics (e.g. sex and age class). We predicted that males were sampled at a higher rate than expected. We found that males comprised 45% of study group members and females and males were sampled equivalently. However, sampling varied among research sites. Our next steps include a behavioral topic analysis of male/female representation and integration of additional long-term study sites into our database. If we detect a sex-bias, then our findings could be used to broaden the scope of chimpanzee behavioral research, shed light on potential explanations for this bias, and address neglected but important perspectives on the evolution of early hominin behavior.

*Research Mentor:*

*Dr. Stacy Lindshield, Anthropology*

*Nicholas Johnson, Anthropology*

**Poster Number:** 202 :: Social Sciences/Humanities

**College of Liberal Arts**  
**Women in Viking Culture**

Author:

Sivakami Ramakrishnan, College of Liberal Arts

Abstract:

Abstract Redacted

*Research Mentor:*

*Shaun Hughes, Department of English*

**Poster Number:** 203 :: Social Sciences/Humanities

**College of Liberal Arts**  
**Pronunciation in L2 French**

**Author:**

Lucinda Ray, College of Liberal Arts, Honors College

**Abstract:**

The "Pronunciation Instruction in L2 French" project is an ongoing research project investigating the effect of pronunciation instruction on advanced learners of French as a foreign language. It specifically emphasizes the production of the sound /p/ (reduction of word-initial aspiration) and the distinction between /u/ and /y/ vowel pronunciation. This is done by recording native English speakers learning French at the college level and analysing the recordings using the phonetics software Praat. The purpose of the analysis in this report is to determine what improvements have been made in pronouncing and distinguishing vowel sounds /i/ and /y/ by students in the control group over the course of two or more semesters.

*Research Mentor:*

*Dr. Jessica Sturm, French*

**Poster Number:** 204 :: Social Sciences/Humanities

**College of Liberal Arts**

**NMM-eyegaze in Classifier Predicates in LSOR**

**Author:**

Esther Rivera, Liberal Arts

**Abstract:**

This paper focuses on the role of the Non-Manual Marker eyegaze (NMM-EG) in classifier predicates. The goal is to understand its function within the village sign language (VSL) of Orocovis, Puerto Rico (LSOR). VSLs, or shared SLs, are languages used by both deaf and hearing individuals in predominantly deaf, rural communities. They are often underrepresented and endangered by local Deaf Community SLs (such as ASL or PRSL.) SLs were once thought to share universal structures but most research has only focused on Western and European SLs. Modern research shows that VSLs do not have some of the features once thought to be universal (Bauer 2014). Unique grammatical structures found in some VSLs include the absence of directional verbs, and whole identity classifiers, (Zeshan 2012). Research on ASL, has shown that the eyegaze “on a constituent constitutes as an agreement marker in plain, agreeing and spatial verbs,” (Niedle et al 2000). Eyegaze in LSCu (SL of Cuba) appears “on [the] internal argument and on the locative” (only when telic) in motion predicates, (Calderon et al 2018). Does eyegaze behave differently in LSOR? The information presented here is part of a larger documentation project for LSOR. This study presents data collected through individual and family interviews on family history and their community’s living conditions. There are 25-50 predominantly Afro-Caribbean families in the LSOR community, experiencing a limited access to education. The interviews were recorded by a frontal and side camera in a family home, and elicitations were conducted by individuals fluent in both LSOR and PRSL. All recordings were transcribed through the linguistic annotating program, ELAN. Preliminary results show that the NMM-EG is coarticulated with the predicate’s argument and with the predicate classifier. Further research will focus on how eyegaze in LSOR compares to other VSLs.

*Research Mentor:*

*Elena Benedicto, Linguistics*

**Poster Number:** 205 :: Social Sciences/Humanities

**College of Liberal Arts**

**Renovating the Hicks Undergraduate Student Lounge/ Space For Practice**

**Author:**

Lauren Robbers, College of Liberal Arts

Taylor Robbins, College of Liberal Arts

**Abstract:**

The Hicks Undergraduate student lounge is being renovated under the supervision of the Director of the Purdue Libraries Facilities. As part of this renovation, ethnographic data is being collected to evaluate the needs, wants, and perspectives of undergraduate students for the renovation project. Focus groups will be conducted by undergraduate Wilke research interns from the Purdue Anthropology Department. This research study is intended to use focus groups to discover what the students want most out of the Hicks Undergraduate student lounge, and how it should be redesigned.

*Research Mentor:*

*Sherylyn Briller, Anthropology*

**Poster Number:** 206 :: Social Sciences/Humanities

**College of Liberal Arts**

**Indian Removal Act: Analysis of the causes of relocation of Cherokee Nation to New Environment**

**Author:**

Elio Silva Rossel, Purdue University

**Abstract:**

After the American Revolution War, the American government had the vision of expanding westward in order to increase their territory, extension of ownership and acquisition of agricultural wealth. Several native communities were affected by the idea of American expansionism, being relocated from their own lands. In the case of the Cherokee nation that once lived in the southern Appalachians, thanks to their claims in hunting areas that spread throughout Kentucky and southern states during the 18th century, they were removed from their lands and taken west of the river Mississippi from the promulgation of the Indian Removal Act in 1830. This drastically changed the Cherokee's lifestyle and affected their environment during the Andrew Jackson's period. Therefore, this research project will analyze why the creation of the Cherokee nation with its own constitution was the main reason for its relocation to the east of Mississippi River. First, the analysis will include the historical background of Cherokee nation during the first part of 19th century since the adoption of the Constitution of United States (1787) until the Indian Removal Act (1830). Second, it will explain why Cherokee people due to their own constitution, their own government with separation of powers, their own political leader, had a conflict with Southern States and Federal governments. Third, it will be analyzed how they used all the legal means to fight for their rights and the consequences of their legal defeat that led them to live the drama of the "Trail of tears". For this research project, archives from that time will be analyzed, such as government and official documents, newspapers, letters, etc., and secondary sources which study Cherokee nation and the effects of the Indian Removal Act on the native population.

**Research Mentor:**

*Trenton Cole Jones, History*

**Poster Number:** 207 :: Physical Sciences

**College of Liberal Arts**

**Lithic Tool Analysis Wilke Project**

**Author:**

Nina Scheel, Liberal Arts

**Abstract:**

This project is part of a larger effort creating a teaching collection of lithic tools housed in the Department of Anthropology's teaching lab in Stone Hall. The collection, which consists of unprovenienced lithics, is derived from the legal activities of private collectors and were given to other organizations, such as the Tippecanoe County Historical Association before being given to the department. The Department of Anthropology took these artifacts to prevent them from being sold, which would only encourage collecting activities. Although there is no contextual information associated with these artifacts, they can still be useful for teaching students of all ages about Culture History, Lithic Technology and Innovation, and Archaeological Ethics. Before making educational kits to use in teaching college students and local school children about archeology and lithic tools we will learn as much as we can about these artifacts and organize them using current archaeological typology methods. We are currently sorting and organizing lithics into distinctive groups based on a variety of characteristics including: overall shape, base, stem, and edge. Once this material has been organized typologically we will begin the process of creating chronologically representative kits of lithic tools for educational purposes at Purdue and in the community.

*Research Mentor:*

*Dr. Kory Cooper, Anthropology*

**Poster Number:** 208 :: Social Sciences/Humanities

**College of Liberal Arts**

**The United States Citizenship Exam: Purdue Students Are Not Performing To The Level You Might Believe**

**Author:**

Jessica Searles, Krannert School of Management and College of Liberal Arts

**Abstract:**

This research examines the Purdue students' results on the United States Citizenship exam. Currently, many Americans are calling for reform regarding the exam, though few are aware of the test content. Few formal studies exist showing how natural U.S. citizens would perform on the test. For this study, over 200 Purdue students were given the exam. Students' major college was recorded along with other demographic factors. Correlations were assessed between individual question scores and majors or involvement on campus. Among the interesting findings is the correlation between lower scores and STEM majors and a passing score from only a few colleges. Though the Purdue student body represents a highly intelligent segment of society, overall we did not have a passing score from our student body. This suggests that here at Purdue, and perhaps in the society at large, efforts need to be made to increase civic knowledge and involvement. Another interesting finding is that a high number of test-takers were able to name an American Indian Tribe, one of the test questions. It is not clear that this question relates to the knowledge of American civics. Considering this, we make some suggestions on how to improve the validity of the test.

*Research Mentor:*

*Gary Evans, Quantitative Methods*

**Poster Number:** 209 :: Social Sciences/Humanities

**College of Liberal Arts**

**Three-Dimensional Scanning of Egyptian and Nubian Crania from Tombos, Sudan Part 1**

**Author:**

Alyssa Seeman, College of Liberal Arts

**Abstract:**

The site of Tombos, located at the third cataract of the Nile River in northern Sudan, showcases interactions between Egyptian colonists and local Nubians. This study uses geometric morphometrics to study the cranial morphological variation between different burial types as a proxy for Egyptian and Nubian populations. The Artec Spider scanner, a 3D white light scanner, was used to create a three-dimensional replica of each cranium. The application of osteometric landmarks to these replicas allowed us to determine if individuals buried in similar tomb types have similar morphology.

*Research Mentor:*

*Michele R. Buzon, Anthropology*

**Poster Number:** 210 :: Social Sciences/Humanities

**College of Liberal Arts**

**A Name to Remember: A Comparative Analysis over Amelia Earhart's Impact on Woman at Purdue University**

**Author:**

Rachel Small, College of Liberal Arts

**Abstract:**

This archival study explores Amelia Earhart through the lens of her activism on Purdue University's campus. The archival collection, "Amelia Earhart at Purdue," along with other outside research, and multiple books written about Earhart and the 30s were analyzed to identify key moments in Purdue's history that the famous and daring pilot made a lasting impact on student's and perspectives at Purdue. In 1935, Earhart was hired to be the first and only Women's Career Counselor on campus. Along with this position, Purdue gifted Earhart the money and space for the plane that would transport her across the world. Archival data was collected, recorded, and analyzed with the purpose of forming a manuscript to be written in collaboration with the Purdue Archives Head Archivist, Sammie Morris, by the Summer of 2020. The goals of this research are to illuminate the relationship Earhart had with Purdue, raise awareness on the importance of this relationship within Earhart's life and legacy, and to place that story in the context of women's lives in the 1930s to provide empowerment among Purdue's current student body. In turn, the argument is placed that Earhart's activism, impact, and experience at Purdue stand as a representation of how important it is to support women in STEM. Furthermore, action can be taken through implementing programs and positions like the ones Earhart held, to support past, present, and future advancements made by women, so that they too have a better chance to excel like Earhart did decades prior.

*Research Mentor:*

*Sammie Morris, Libraries and special collections*

**Poster Number:** 211 :: Social Sciences/Humanities

**College of Liberal Arts**

**Intersecting Dimensions of Inequality: How Stereotypes of Gender and Sexual Orientation Combine**

**Author:**

Cheryl Sutton, College of Liberal Arts

Gabi Ruderman, College of Liberal Arts

**Abstract:**

Both gender and sexual orientation are categorical distinctions that carry labor market consequences. In this project, we explore why these particular categories influence evaluations of job candidates. On one hand, overt discrimination may lead individuals to prefer men and heterosexual job applicants. However, gender and sexual orientation categories signal more than just a categorical distinction. In particular, we explore how stereotypes of masculinity and femininity associated with gender and sexual orientation categories lead to differential evaluations in the hiring process. Using an experimental design, hiring managers were selected to evaluate job application materials and provide their evaluations of job candidates; the candidates were experimentally manipulated to vary on their gender category, sexual orientation category, and in their gender-typical behavior. For this poster, we focus on the open-ended evaluations that the hiring managers provided about the overall pros and cons of the job applicants. We developed a content-coding scheme in order to quantify the frequency of different themes that appeared in the responses—as well as the ability to examine how the frequency of certain themes varied for different applicants. In addition, we highlight representative quotes from the hiring managers that illustrate common themes as well as idiosyncratic evaluations of certain applicants.

*Research Mentor:*

*Trenton Mize, Sociology*

**Poster Number:** 212 :: Social Sciences/Humanities

**College of Liberal Arts**

**Face Everything and Rise: The History of the Purdue Dance Team**

**Author:**

Meaghan Tracy, Health and Human Sciences

**Abstract:**

In 1968, the Pep Committee, a student organization on Purdue's campus dedicated to promoting school spirit, established a new pep squad, known as the Pep Girls, who would appear at university athletic events and sell pep buttons around campus. With over 52 years of history at Purdue University, this pep squad has evolved into a competitive dance team that is self-funded, self-organized and self-maintained, however this evolution has never been documented. This paper attempts to provide a comprehensive historical narrative of the history of the Purdue Dance Team to fill that gap; addressing topics such as Purdue Athletics and Title IX, through the use of school yearbooks, local newspapers, and oral histories. This paper documents and analyzes the Purdue Dance Team's transition from being supervised by the Purdue Athletic Department to becoming a student organization in the midst of Title IX and the uprising of women's athletics at Purdue University. In addition to contributing to the greater understanding of the student's experience on college campuses in the late half of the 20th century, this project argues for more research on topics regarding the impact of societal changes on female athletes' experience at Purdue University.

*Research Mentor:*

*Dr. Nancy Gabin, History*

**Poster Number:** 213 :: Social Sciences/Humanities

**College of Liberal Arts**

**The Impact of Job Anxiety on Tone in News Coverage of Terrorism and Climate Change**

**Author:**

Stefanie Walsh, College of Liberal Arts, College of Health and Human Sciences

**Abstract:**

Do journalists who experience economic anxiety in their jobs write in more negative terms about terrorism and climate change? We examine the factors that influence the way journalists write about terrorism and climate change. Social scientists argue that journalists respond to economic pressure with more negative reporting because negativity helps sell the news. Journalists often reject this idea by citing their strict adherence to reporting standards that guards them against violating established reporting practices. We address this debate using an experimental design to examine whether job anxiety causes journalists to report more negatively about a hypothetical FEMA report warning that either climate change or terrorism poses a “significant and increasing risk to US water supplies.” After being randomly assigned to a climate change or terrorism condition journalists read the hypothetical story, write headline and lede sentences, along with answering questions about story placement and information they would include in the story. This design removes the possible impact of editorial decisions on the final article. The findings will help further our understanding of the relationship between economic pressures and news reporting. They also help us understand the writing process before editorial review.

*Research Mentor:*

*Dwaine Jengelley, Honors College*

**Poster Number:** 214 :: Social Sciences/Humanities

**College of Liberal Arts**  
**Mapping Post-colonial Literature**

**Author:**

Echo Yan, Health and Human Science

**Abstract:**

Post-colonialism is an important area of study in literary texts of the twentieth and twenty-first centuries. As many new nations were formed out of the collapse of the British and French empires, novelists became interested in representing the clash of cultures in these new nations. Attention to space and place is important, but there is little previous work that has mapped geolocation data even though computational methods have made locational study more accessible. To develop this project, we collected data by generating a corpus of post-colonial novels within the Hathi Trust Digital Library. We then used the Hathi Trust Research Center to execute an algorithm to scrape named entities related to locations. After collecting locational data in a spreadsheet, we clean the data to eliminate false locations and cluster variations using Open Refine to generate a list of key geographical data. Researchers will then input the data into an interactive GIS digital map, which will allow users to explore and experience space and place in a corpus of twenty post-colonial novels. Our final project will feature a website with interactive map where users can connect literary passages with geolocations. This resource will also help scholars and students who are interested in exploring post-colonial geography represented in literature, and we anticipate our method can be implemented in other humanities scholarship.

*Research Mentor:*

*Matthew Hannah, Information Studies*

**Poster Number:** 215 :: Social Sciences/Humanities

**College of Liberal Arts**

**Exploring Narratives of Menstrual and Premenstrual Symptoms in Indian culture**

**Author:**

Swanna (Lu) Yu, College of Liberal Arts

**Abstract:**

Women have been influenced by the cultural taboos of menstruation and PMS in many places. This study focuses specifically on how cultural taboos, along with the lack of information and misinformation, have impact women in Indian society. The study explores how what and why college women in India manage their period. Information used for the study was collected by researchers, Rawat and Shields, in two colleges in different Indian cities. About 600 participants were asked to complete a survey. Some individuals and their mothers and/or sisters were invited to focus groups and one-to-one interviews. Although the analysis part of the study is still on-going, the study aims to provide Indian college women the guidance to communicate about menstruation and have a better understanding of PMS.

*Research Mentor:*

*Meghana Rawat, Brian Lamb School of Communication*

**Poster Number:** 216 :: Social Sciences/Humanities

**College of Liberal Arts**

**The Empowerment of Marginalized Musicians on YouTube**

**Author:**

Siming Zhao, College of Liberal Arts

Haoying Wang, College of Liberal Arts

**Abstract:**

The research studies how marginalized musicians speak out through music on YouTube, and how they inform musical educators about creating productive communities for students in their classrooms, setting them up for success. By examining the approaches of three amateur YouTube video creators, this project aims to identify the practices, trends, and learning strategies that they used to share their stories with virtual audiences and develop counter-narratives that lead them to more fulfilling and successful lives. The findings of this project can then be used to make suggestions to educators addressing how they might provide not just safe learning environments that are conducive to learning, but also spaces for marginalized students to explore their identities, develop their voices, and thrive through music video creation and performance.

*Research Mentor:*

*Christopher P Cayari, Patti and Rusty Rueff School of Design, Art, and Performance*

**Poster Number:** 217 :: Physical Sciences

**College of Pharmacy**

**Impact of Particle-Level Attributes on Amorphization Rate During Amorphous Solid Dispersion Preparation by Hot Melt Extrusion**

**Author:**

Kevin Altman, Science

**Abstract:**

Hot melt extrusion (HME) is a pharmaceutical manufacturing process that utilizes heat and shear flow to molecularly disperse a crystalline drug into a polymer matrix, a solubilization strategy known as amorphous solid dispersion (ASD). Although several ASDs are commercially available and HME is only one of the two industrial methods used to manufacture them, the mechanism by which drug particle dissolution occurs is unclear. To gain an understanding of this physical process and how particulate attributes may modify dissolution behavior, batches of bicalutamide were recrystallized to achieve different particle sizes and morphologies. The bicalutamide crystals were extruded with polyvinylpyrrolidone/vinyl acetate (PVPVA), and the resulting extrudates were characterized for their residual crystallinity. Extrudates with low residual crystallinity exhibit optical homogeneity, which corresponds to efficient particle dissolution. As expected, more efficient particle dissolution occurs when batches with smaller crystals and crystals with surface defects are used. This reflects the significant drug particle size- and morphology-dependence of particle dissolution into a polymer melt.

*Research Mentor:*

*Dana Moseson, Industrial and Physical Pharmacy*

*Lynne Taylor, Industrial and Physical Pharmacy*

**Poster Number:** 218 :: Life Sciences

**College of Pharmacy**

**ATP as an Immunogenic Functional Surface Ligand for Poly(lactic-co-glycolic acid) Nanoparticles**

**Author:**

Devin Bingham, College of Pharmacy

**Abstract:**

Cancer is one of the major causes of death worldwide. Cancers are often difficult to treat because of their ability to evade the immune system. Increasing the ability of the immune system to recognize cancer cells is a major goal in the cancer therapeutics. Current anticancer drugs are often limited in efficacy due to poor bioavailability and suboptimal specificity. Paclitaxel is a highly lipophilic chemotherapeutic drug with potential immunogenic effects. Its clinical use is limited mainly by its poor water solubility and dose-limiting excipients. Nanoparticles have been explored as drug carriers to increase the bioavailability and pharmacokinetics of anticancer drugs. Further, nanoparticles can be functionalized with various ligands to optimize their interactions with cancer and immune cells. Literature has shown that ATP may have potential as an attractant for leukocytes. My lab utilizes poly(lactic-co-glycolic acid) nanoparticles coated with polydopamine and functionalized with ATP to encapsulate paclitaxel. The goal of this drug delivery system is to increase the therapeutic efficacy of paclitaxel by optimizing its pharmacokinetics with the nanoparticles, and by strengthening its potential immunogenic effects through the recruitment of dendritic cells via the conjugated ATP. My lab has shown that monocytes migrate towards a well containing ATP. If ATP can similarly serve as a chemical attractant for dendritic cells, then it would make an ideal nanoparticle surface ligand, adding immunogenic potential to the nanoparticle-drug carrier system.

*Research Mentor:*

*Soonbum Kwon, Industrial & Physical Pharmacy*

**Poster Number:** 219 :: Physical Sciences

**College of Pharmacy**

**Competition of Dissolution and Matrix Crystallization in Amorphous Solid Dispersions Containing Residual Crystals**

**Author:**

Isaac Corum, Pharmacy

**Abstract:**

In recent years, the preparation of amorphous solid dispersions (ASDs) to enhance the bioavailability of poorly water soluble active pharmaceutical ingredients (APIs) has become an increasingly more common approach. ASDs are made by the combination of amorphous drug with an amorphous polymer, along with the addition of other excipients in an attempt to increase dissolution rate and extent, decrease crystal nucleation and growth, and maintain supersaturation levels long enough to cause an appropriate pharmacological effect in the body. The goal of this study is to evaluate the competing dissolution and crystallization mechanisms of ASDs with various levels of residual crystallinity.

Hot melt extrusion was used to prepare 30% BCL / 70% PVPVA ASDs using various processing conditions to generate samples of a range of residual crystalline (content ranging from 0-30%). Dissolution studies were conducted at 37C in pH 6.8 phosphate buffer using 50-1000 mL media volume to probe the impact of supersaturation conditions on dissolution profile. Raman spectroscopy was used to monitor the crystallization kinetics of amorphous bicalutamide into its various crystal forms during dissolution.

BCL/PVPVA ASDs free of crystalline content showed complete but variable release during dissolution studies. The undissolved solid was found to crystallize into the metastable form 2 polymorph. BCL/PVPVA ASDs containing crystalline content (of form 1) were found to have incomplete dissolution. The undissolved solid crystallizes rapidly into form 1 because of the presence of the crystal seeds.

This study highlights the complexity of ASD dissolution and crystallization kinetics.

*Research Mentor:*

*Dana Moseson, IPPH*

**Poster Number:** 220 :: Life Sciences

**College of Pharmacy**

**Identification of a Suitable Cell Line for Efficient Production of Bovine Adenovirus Vector-based Vaccines**

**Author:**

Lynnet Francesca Kimera, Pharmacy

**Abstract:**

The replication-defective (E1 & E3 deleted) bovine adenovirus (AdV) type 3 (BAdV3)-based vaccine delivery system is one of the best platforms among the currently available AdV vector systems for developing recombinant vaccines for the following reasons. (i) BAdV3 utilizes  $\alpha(2,3)$ -linked as well as  $\alpha(2,6)$ -linked sialic acid as major receptors for virus internalization. (ii) Immunogenicity and efficacy of protection conferred by a BAdV vector-based influenza vaccine was significantly better than that of the human AdV type C5 (HAdV-C5) vector-based vaccine due to a short-term activation of innate immunity even at a low vector dose. (iii) Even exceptionally high levels of HAdV 'vector immunity' do not have any impact on the levels of humoral or cell-mediated immune (CMI) responses against an influenza virus antigen. (iv) Immunogenicity and protection following mucosal immunization were significantly better than the systemic vaccination. There is a need to determine the BAdV vector growth kinetics in different cell lines to find out the most efficient cell line for the development of recombinant vaccines. Three cell lines (MDBK, MBDK 221A, and BHF5) were selected to determine the replication kinetics of BAdV- $\Delta$ E1FE3 or wild-type BAdV3. Our results suggest that BHF5 will be the best cell line for the production of large quantities of BAd vector-based vaccines.

*Research Mentor:*

*Suresh Mittal, Comparative Pathobiology*

**Poster Number:** 221 :: Life Sciences

**College of Pharmacy**

**Assays for diagnostic of progression patterns in synucleinopathy patients**

**Author:**

Ana Pascual-Garrigos, Agriculture

**Abstract:**

Parkinson's disease (PD) is a progressive nervous system disorder that is not greatly understood within the scientific community. One of the main characteristics of PD are protein aggregates known as Lewy bodies. Aggregated forms of  $\alpha$ -Synuclein (aSyn), one of the key proteins associated with the pathology of the disease, are the main constituent of these Lewy bodies and are known to play a significant role in the disease by evoking toxicity to dopaminergic neuronal cells. The aggregation of aSyn fibrils has shown to propagate from neuron to neuron and induce propagation of the disease. However, different forms of fibrils in different patients may have varying propensities for disease progression. In this project, we are trying to develop two assays with which we can distinguish the various kinds of fibrils derived from patient brains. We have used concentration gradients of GnHCl and proteinase K to test the intrinsic packing strength of fibrils. The salt denaturant GnHCl has shown clear gradients of defibrillation after applying different concentrations to aSyn fibrils. Proteinase K, a broad-spectrum serine protease which digests the accessible non aggregated portions of aSyn fibril, has also shown digestion of the aSyn fibrils but not a gradient as clear as GnHCl. In vitro fibrils prepared from different familial aSyn mutations are being tested for their structural differences and will be further correlated with electron micrographs. Fibril will be extracted from mouse and human brain tissues. This type of test would eventually be helpful for diagnostic of progression pattern in synucleinopathy patients.

*Research Mentor:*

*Chris Rochet, MCMP*

*Sayan Dutta, MCMP*

**Poster Number:** 222 :: Life Sciences

**College of Pharmacy**

**Targeting IIIS5-3P loop of CaV 1.2 and CaV 1.3 to develop subtype selective inhibitors**

**Author:**

Paxton Sample, Pharmacy

**Abstract:**

Selective inhibition of the L-type voltage-gated Ca<sup>2+</sup> channel CaV1.3 in dopaminergic neurons of the substantia nigra is currently being explored as a potential target for therapeutic treatment of Parkinson's Disease. CaV1.3 is also implicated as a potential target for the treatment of cardiac arrhythmia, due to its localization in the SA node. Inhibition of the closely related channel, CaV1.2, is a popular approach for treatment of cardiovascular disease. However, there are currently no known selective inhibitors of CaV1.3. CaV1.2 and CaV1.3 are highly similar in their amino acid sequences, although, we have discovered that the extracellular IIIS5-3P loop is a highly divergent region and is a key differentiator of pharmacology between the two channels. Work in our lab has involved optimization of growth of the recombinant fusion protein containing the IIIS5-3P loop of CaV1.2 in BL21 (DE3) E. coli and purification using Ni<sup>2+</sup> affinity chromatography with a 6xHis tag. Our goal is to target the divergent IIIS5-3P loop region to develop selective modulators of CaV1.2 and CaV1.3 via a DNA-encoded chemical library and utilization of biolayer interferometry to measure affinity of free ligands to the loop. Completion of these goals will aid in the development of subtype-selective L-type Ca<sup>2+</sup> channel blockers and contribute to further research targeting selective inhibition of CaV1.3.

*Research Mentor:*

*Greg Hockerman, MCMP*

**Poster Number:** 223 :: Life Sciences

**College of Pharmacy**

**High-throughput screening for novel therapeutics of epilepsy via inhibition of veratridine-induced Nav1.2 activation in dye-loaded HEK293 cells.**

**Author:**

J Marshall Shafer, Pharmacy

Maria Olivero-Acosta, Pharmacy

**Abstract:**

Voltage-gated sodium channels in neuronal and cardiac cells play an important role in action potential initiation and propagation. Mutations in the gene encoding sodium channel 1.2 (Nav1.2) have been implicated in autism, epilepsy, and other neurodevelopmental and neuropsychiatric disorders. Non-selective inhibitors of sodium channels such as phenytoin and carbamazepine have been used to prevent and treat seizures; however, their side effect profiles are undesirable due to off-target effects. The aim of this study was to high-throughput screen for novel therapeutics that specifically inhibit Nav1.2 as a treatment for epilepsy.

Human embryonic kidney cells (HEK293) transfected with Nav1.2 were loaded with a fluorescent dye responsive to changes in membrane voltage potential. Fluorescence was measured using the Hamamatsu FDSS plate imager in Purdue Institute of Drug Discovery. Nav1.2 was activated using veratridine. Various concentrations of known inhibitors (phenytoin and carbamazepine) were then used to inactivate the channel and elucidate dose-response curves for baseline control. IC<sub>50</sub> values were obtained and consistent with the literature. Well-to-well consistency of the plates was assessed and a Z' value of 0.69 determined the assay was suitable for high-throughput screening. Initial screening has been performed and inhibitor "hits" have been identified. Future studies will utilize this assay to screen additional chemical libraries. Inhibitors can be rescreened for selectivity for Nav1.2 among other sodium channel isoforms to determine structural characteristics responsible for activity and selectivity. Selective Nav1.2 modulators have potential for treating epilepsy with fewer cardiac and neurological side effects.

*Research Mentor:*

Yang Yang, MCMP

**Poster Number:** 224 :: Life Sciences

**College of Pharmacy**

**Designing and Synthesizing Inhibitors for Protein N-terminal Acetyltransferases**

Author:

Yuanrui Zhao, College of Pharmacy

Abstract:

Abstract Redacted

*Research Mentor:*

*Rong Huang, MCMP*

*Zhi Huang, MCMP*

**Poster Number:** 225 :: Life Sciences

**College of Science**

**Automated Cleaning of Doppler Spectra from a Vertically Pointing Weather Radar**

**Author:**

Matthew Asel, Science

**Abstract:**

This study focuses on quality control and recovery of contaminated data from a vertically pointing Doppler weather radar deployed for six weeks in northern Alabama during a 2016 field campaign. These data were contaminated with noise spikes caused by a switching power supply in the radar amplifier. Originally, these data were processed using a median filter to remove the noise spikes, but some of the larger spikes were merely blunted by this technique and resistant to filtering. The spikes in the spectra caused undesirable streaks within the derived products, specifically, the Doppler velocity and reflectivity fields, hindering further analysis.

We have applied the “in-painting” noise removal method of Chan et al. (2016) to remove the noise spikes in the data. Comparisons between the original contaminated Doppler spectra, median filtered spectra, and “in-painted” spectra are shown for a variety of meteorological situations. It is shown that the in-painting method gives superior spike removal performance to the median filtering method, while better preserving the underlying meteorological signals. The cleaned Doppler spectra will allow a new, clearer set of Doppler velocity and reflectivity profiles to be produced for the six-week observation period.

*Research Mentor:*

*Robin Tanamachi, Earth, Atmospheric, and Planetary Science*

*Daniel Dawson, Earth, Atmospheric, and Planetary Science*

**Poster Number:** 226 :: Physical Sciences

**College of Science**

**Reactivity of the Thorium(IV)-Iminoquinone Reductive Series**

**Author:**

Makayla R. Baxter, Science

**Abstract:**

Thorium complexes primarily exist in the thermodynamically stable (IV) oxidation state with only a few low-valent thorium(III) complexes having been isolated. As a result, redox chemistry with thorium at the metal center is challenging without carefully designed ligand environments. This redox-restricted nature of thorium(IV) makes redox-active ligands an attractive option to facilitate multi-electron redox chemistry with thorium. A series of thorium(IV) complexes featuring the redox-active iminoquinone ligand and its derivatives, including the iminosemiquinone and amidophenolate species, were synthesized. Current work is focused on exploring reactivity of the iminosemiquinone and amidophenolate complexes. Preliminary work with the iminosemiquinone complex surprisingly indicated no reactivity with salts, azides, and diazenes. Potential reactivity was observed in the amidophenolate complex with oxygen-transfer compounds and azides, and further characterization is underway. Characterization was completed through nuclear magnetic resonance spectroscopy, electronic absorption spectroscopy, and X-ray crystallography.

*Research Mentor:*

*Suzanne C. Bart, Chemistry*

*Ramitha Rupasinghe, Chemistry*

**Poster Number:** 227 :: Physical Sciences

**College of Science**

**Dark Matters at Purdue: Searching for Multiple Scatter Nuclear Recoil Events**

Author:

Faith Bergin, Science

Rebecca Hackett, Science

Zach Comer, Science

Abstract:

We are analyzing data from the XENON1T experiment to determine instances of multiple-scatter (MS) nuclear recoils. The XENON1T experiment uses a dual-phase xenon time projection chamber to search for dark matter particles. The apparatus is highly sensitive to background events -- a category which includes the MS events our team is interested in. Our group is improving the method of distinguishing MS recoils from the entire set of background collisions. After we identify MS events, we can attempt to verify the models used in XENON1T analysis. As one theory of dark matter includes weakly interacting massive particles (WIMPs), it is important to correctly identify the massive collisions that do not come from WIMPs. By identifying MS recoils, we can do two key things: directly rule out possible WIMPs and indirectly rule WIMPs out by verifying the ratio of multiple to single scatter events. The exact likelihood of multiple scatters is unknown and through improving our understanding of MS and SS events, we can ensure XENON1T predictions become more accurate. It is also possible that the study of MS recoils could lead to new physics and an improved understanding of background events in all particle detectors.

*Research Mentor:*

*Juehang Qin, Physics and Astronomy*

**Poster Number:** 228 :: Life Sciences

**College of Science**

**Embryonic expression of zebrafish kcnn family genes**

Author:

Maya Black, Science

Abstract:

Abstract Redacted

*Research Mentor:*

*Dr. GuangJun Zhang, Comparative Pathobiology*

**Poster Number:** 229 :: Innovative Technology/Entrepreneurship/Design

**College of Science**

**Effect of Substrate Type on Diameter of Inverse Opals**

**Author:**

Jacob Brejcha, College of Science

**Abstract:**

Inverse opal structures provide optical, fluidic, and sensing applications, among others. These structures are created by (1) depositing opals (small spheres) on a substrate, (2) filling the interstitial space with sol gel precursor, and (3) removing the opals, leaving a thin sol gel layer with neatly-arranged voids (inverse opals). The purpose of this study is to determine how a sol gel matrix on different substrates affects the diameter of the voids. The sol gel precursor was created by mixing tetraethyl orthosilicate, hydrochloric acid, and water. The precursor was pipetted into two vials along with water and opals of 170 nanometer diameter. At an angle of approximately 45 degrees, an aluminum substrate was placed in one vial, and a titanium substrate was placed in the other. The vials were put in an oven at 65 C for 48 hours to allow steps (1) and (2) to occur. Then, the substrates were heated to 600 C over 6 hours to remove the opals and then cooled to room temperature. Using a scanning electron microscope, the voids in the sol gel matrix on a part of each substrate were visualized, and image processing software was used to measure the diameter of all the voids in each image. Using statistics, the hypothesis that the population mean diameter of the voids for each substrate was equal was tested. From the test, it is concluded that the population mean diameters are not equal, indicating that the sol gel matrix contracts to different degrees according to the substrate type.

*Research Mentor:*

*Yuhang Fang, Mechanical Engineering*

**Poster Number:** 230 :: Physical Sciences

**College of Science**

**Xenon1T muon veto nuclear recoil search**

Author:

Ben Bressette, Science

Keller Swartzentruber, Science

Jeremy Frederick, Science

Abstract:

The XENON1T experiment uses a dual-phase liquid xenon time projection chamber (TPC) used to measure nuclear and electronic recoils from potential dark matter particles interacting with the contained xenon. The TPC is made of two arrays of photo-multiplier tubes (PMT) installed on the top and bottom of the tank and has given us the data to observe and compare data suspected to be nuclear recoils. There is a portion of the data that is flagged to be ignored in analysis whenever a muon passes through the system. Our research aims to search for nuclear recoils occurring during the period of a muon event. Nuclear recoils in the tank are the transfer of momentum from massive elementary particles, to the xenon nuclei found in the tank. These massive particles that cause the recoil could range from electrons and muons to the far more illusive neutrinos and WIMPs. Which brings us to the reason in which we are searching out these nuclear recoils. Since we know that dark matter must have mass, due to its interaction with the force of gravity, we know that its interaction with xenon nuclei will come in the form of a nuclear recoil. Therefore, by eliminating background and electronic recoil interference we can see a clearer picture of our nuclear recoil candidates.

*Research Mentor:*

*Juehang Qin, Physics*

*Rafael Lang, Physics*

**Poster Number:** 231 :: Life Sciences

**College of Science**

**Modification and validation of a genotypic sexing protocol to enable examination of sex-specific effects of per- and polyfluorinated alkyl substances (PFAS) in the African clawed frog (*Xenopus laevis*)**

**Author:**

Lucy Burcham, College of Science

**Abstract:**

Per- and polyfluorinated alkyl substances (PFAS) pose risks to human and environmental health because they do not degrade, they bioaccumulate, and they are toxic. Existing PFAS studies suggest that there are sex-related differences in elimination rates and toxicity. The African clawed frog (*Xenopus laevis*) is an excellent model for toxicological studies, but early-stage larvae (a sensitive life stage frequently used for toxicity testing) are not sexually differentiated, necessitating genotypic sexing for evaluation of sex-specific effects in this species. The purpose of this project was to adapt and validate a published protocol for the genotypic sexing of *X. laevis* so that sex-related studies on PFAS can be conducted prior to sexual differentiation. We extracted DNA from undifferentiated *X. laevis* larvae (around 24 hours old) and used Polymerase Chain Reaction (PCR) to amplify the DMRT1 and DM-W genes; DMRT1 is found in both sexes while DM-W is found only in females. We visualized products using gel electrophoresis. Results suggest that the protocol is successful in identifying genotypic sex in undifferentiated individuals, as some individuals presented bands corresponding to both DMRT 1 and DM-W (putative females), while others only displayed bands corresponding to DMRT-1 (putative males). We are currently validating the protocol with DNA extracted from buccal swabs of adult *X. laevis*, for which phenotypic sex is known. The validated protocol for genotypic sexing of *X. laevis* resulting from this work will enable future studies aimed at elucidating if and how genotypic sex mediates toxicity of PFAS.

*Research Mentor:*

*Tyler Hoskins, Forestry and Natural Resources*

*Maria S Sepulveda, Forestry and Natural Resources*

**Poster Number:** 232 :: Life Sciences

**College of Science**

**Characterization of lung cancer exosomes and their impact on non-cancerous lung epithelial cells**

**Author:**

Anjali Byappanahalli, College of Science

**Abstract:**

Exosomes are a class of cell-derived extracellular vesicles (EVs) that are implicated in cell-to-cell communication and transmission of disease states. They act as mediators in the redistribution of proteins, lipids, mRNA, miRNA, and DNA, as well as factors in the development of several diseases, such as cancer. Recent evidence has shown that cancer-derived exosomes contribute to the recruitment and reprogramming of cells in the tumor-microenvironment. Understanding the nature of this exosome-mediated communication between cells may enable us to understand how cancer spreads, metastasizes, and increases in oncogenic potency. Further comprehension of the exosome-mediated communication process may enable early detection through non-invasive screenings, as well as the development of advanced, targeted therapies. To understand this, exosomes were isolated from a lung cancer cell line and the morphological effects they induced in normal lung epithelial cell line was examined. Particularly, the study characterized the isolated exosomes and analyzed their impact on inducing invasion and migratory phenotypes in lung epithelial cells, as well as their ability to induce anchorage-independent colony formation.

*Research Mentor:*

*Andrea L. Kasinski, Biological Sciences*

*Zulaida Soto-Vargas, Biological Sciences*

**Poster Number:** 233 :: Innovative Technology/Entrepreneurship/Design

**College of Science**

**Enabling Near Real-Time Feature Indexing StorageSystem on Live Video Streams**

Author:

Aditya Chakraborty, College of Engineering

Sripath Mishra, College of Science

Abstract:

Abstract Redacted

*Research Mentor:*

*Yung-Hsiang Lu, Electrical and Computer Engineering*

**Poster Number:** 234 :: Life Sciences

**College of Science**

**Dual-functional small-molecules for immune checkpoints**

**Author:**

Yingqi Chen, science

**Abstract:**

Abstract Redacted

*Research Mentor:*

*Krupal Jethava, Chemistry*

**Poster Number:** 235 :: Innovative Technology/Entrepreneurship/Design

**College of Science**

**Optimus: A Software Bot For Automated Code Review**

**Author:**

Akhil Chinnakotla, Engineering

Noah Curran, Science

Ryan Chen, Science

Connor Chadwick, Engineering

Vishnu Banna, Engineering

Stephen Davis, Science

Jack Lecroy, Ryan Firestone, Ved Dave, Seoyung Lee, Science, Engineering, Engineering, Engineering

**Abstract:**

During the software engineering life cycle, code review consumes large amounts of time due to its repetitive nature. Since code reviewers have a limited time to work in a day, it should be an objective to stop them from having to commit time to these repetitive and tedious tasks. Automated testing suites can be used through continuous integration, but this requires substantial time to develop test cases for each possible defect. Rather than using repository mining and automated testing suites, Optimus collects user reported defects to analyze future code. Unlike repository mining, user collected defects will be more specialized towards defects that are identified to be common. Also, because the code is analyzed without any input, time-consuming test cases are not required. Optimus is currently implemented through the command line of a GitHub Pull Request and has functionality that allows it to manage User and Issue Dependencies, conduct linting, and has a way for users to report labeled defects. It has the ability to analyze code statically to find evolvability defects such as redundant or dead code as well as logical defects such as infinite while loops. It will conduct error ranking onto the defects found and sort them from most important to least. In future work, Optimus will look to utilize the data it has collected to create a more accurate form of error ranking. Furthermore, Optimus has other features that intend to save code reviewers' time, including a new Tools API that allows for easy addition of tools.

*Research Mentor:*

*Yung-Hsiang Lu, Electrical and Computer Engineering.*

*George Thiruvathukal, Computing*

**Poster Number:** 236 ::

**Withdrawn**

Author:

Abstract:

*Research Mentor:*

**Poster Number:** 237 :: Life Sciences

**College of Science**

**Interleukin-1beta promotes IL-2-independent Th9 cell differentiation**

**Author:**

Maia Clare, Science

**Abstract:**

CD4<sup>+</sup> T helper (Th) cells play an important role in adaptive immunity by regulating inflammation through their production of cytokines. IL-9-producing T helper cells (Th9) promote host defense and inflammation and differentiate in response to TGF- $\beta$  and IL-4. Additionally, in vitro studies have found IL-2 to be critical for Th9 differentiation. However, in vivo-derived Th9 cells often co-develop with IL-17-producing Th17 cells that are repressed by IL-2. These data suggest that other inflammation-specific signals may promote IL-9 production when IL-2 is limiting. Previous work has demonstrated that nuclear factor  $\kappa$ B (NF- $\kappa$ B) signaling is enhanced in inflammatory disease and promotes both Th9 and Th17 differentiation in vitro. We therefore asked if NF- $\kappa$ B activating cytokines/cell surface receptors could rescue IL-9 production in the absence of IL-2. In our studies, we found that IL-1 $\beta$  enhanced the Th9-associated transcription factor, BATF, and IL-9 production in vitro in the absence of IL-2 signaling. Further, IL-2-independent IL-9 production occurred in a BATF-dependent manner. These data suggest that IL-1beta-mediated NF- $\kappa$ B activation may promote Th9 differentiation in settings of chronic inflammation where IL-2 is limiting.

*Research Mentor:*

*Matthew R Olson, Biological Sciences*

**Poster Number:** 238 :: Innovative Technology/Entrepreneurship/Design

**College of Science**

**Analyzing Participant Motivation at Hackathons and Its Effects on Future Participation**

**Author:**

Matthew Der, Science

**Abstract:**

Hackathons are events where participants work to design and create solutions aimed towards a particular theme or issue, often reflecting the state of the real world. Recently, hackathons have gained popularity due to their innovative nature and collaborative environment. This research project will explore the theme of maintaining participants' motivations throughout the extent of a hackathon by analyzing the following questions: What initially motivates competitors to participate in hackathons?; What trends, if any, exist amongst participants who compete in the entire hackathon?; If trends emerge, what role might they play in determining the likelihood of the competitor attending future hackathons? We conducted a literature review, interviewed hackathon participants, then analyzed the interview responses to determine that a main reason why participants join hackathons is their interest in certain fields and the opportunity to learn more. Furthermore, participants are more likely to compete in future hackathons when they are collaborative and group-based, rather than working individually.

*Research Mentor:*

*Bethany McGowan, 1530 Libraries*

**Poster Number:** 239 :: Life Sciences

**College of Science**

**Hackthons: Motivation and Mantaining Members**

**Author:**

Calvin Du, Purdue University

**Abstract:**

Hackathons are interdisciplinary, competitive, and theme-oriented events where participants aim to find efficient solutions through an educational experience. Completed both individually and collectively, they are becoming increasingly popular, gaining traction for their advocacy of problem-solving techniques and innovation. This project will analyze the following two questions: What are the participants' motivation for joining hackathons? And what methods can we employ to improve participant retention? In order to answer these, we used a four-step process. First, student preliminary survey data consisting of skills level, year, and major were collected and analyzed. Then, as each week of the hackathon passed, dropouts were interviewed to understand their motives, as well as to find possible improvements to the overall process. Finally, literature reviews were conducted and participants' response patterns were analyzed. This helped us create written and visual models, which illustrate initial motivation, participant information, and successful hackathon layouts. Ultimately, we discovered that a main reason participants join hackathons is to learn data analyzing skills to apply to their respective majors; and in order to maintain their motivation and interest throughout the entire process, two main characteristics must be well-executed: a well-organized planning phase as well as an effective and friendly mentor-hacker relationship.

*Research Mentor:*

*Bethany McGowan, library science and health sciences*

**Poster Number:** 240 :: Physical Sciences

**College of Science**

**Removing Muon Spallation and Muon Track Background in XENON1T**

**Author:**

George Economou, Purdue University

Tara Harmon, Purdue University

Hetvi Desai, Purdue University

Alex Huynh, Purdue University

**Abstract:**

The primary reason for the lack of success in the XENON series detectors is their frequent bombardment by outside radiation. One of the primary sources of this radiation comes in the form of muon-induced tracks and nuclear spallation within the detector. To remove the background caused by this muon background in the data set retrieved from the detector, our research group performed analyses to determine what kind of energy signatures muon spallation might exhibit. In essence, this analysis involved taking data with short muon veto trigger values and examining their cs1 signals compared to their cs2 signals, their CES Rates, and their s2 widths compared to their s2 areas, and comparing these qualities to other normal background. The research has revealed two unique data populations unique to the appropriate muon veto trigger range, one with larger s2 widths and s2 areas than the normal ER/NR band, and one with even larger s2 widths and s2 areas comparable to the ER/NR band. They are likely the desired muon spallation and muon tracks, respectively, but this cannot be said conclusively since their raw waveforms were not examined in this project and the suspected muon tracks occur at energies significantly lower than what was expected from a Bethe-Bloch formulation.

*Research Mentor:*

*Rafael Lang, Physics*

*Amanda Depoian, Physics*

**Poster Number:** 241 :: Physical Sciences

**College of Science**

**Integrating Digital Technology Into a Metal Ion Sensor Experiment**

**Author:**

Rudan Feng, Science

**Abstract:**

Many General Chemistry students at Purdue conduct a “Metal Ion Sensor” experiment, in which students build an electrochemical silver ion sensor. Students test the sensor’s performance to determine its effectiveness in detecting silver ions. Our work makes substantive changes to this experiment. First, the technology equipment was updated to make use of digital data collection techniques. The current devices used in this experiment only allow students to collect and analyze their data on a desktop computer. Furthermore, the deficiencies of the conductivity sensor require students to enter data points manually which increases the possibility of human error in the experiment. Our work enhances the experiment through integration of wireless, digital data collection. We have successfully replaced the conductivity sensor with a wireless sensor connected directly to an iPad. An additional benefit of our digital enhancements is that we are able to significantly reduce the amount of generated hazardous waste. The Metal Ion Sensor experiment generates a substantial amount of silver waste, about 370 mL per group. The original experiment requires students to perform four titrations in total to obtain accurate results. With the aid of a wireless drop counter, students are now able to collect their titration data more accurately. This has led to the reduction of toxic silver waste produced by up to 50%, while maintaining the same data accuracy. We believe that the revised experiment will help enhance the learning experience of General Chemistry students while also making the experiment more environmentally friendly.

*Research Mentor:*

*Jonathan Rienstra-Kiracofe, Chemistry*

**Poster Number:** 242 :: Life Sciences

**College of Science**

**HLA Alleles and Interactions Associated with Myasthenia Gravis**

**Author:**

Alyssa Flint, College of Science

**Abstract:**

Myasthenia Gravis (MG) is an autoimmune disease of the neuromuscular junction. The purpose of this study was to determine the key components of genetic risk for MG arising from Human Leukocyte Antigen (HLA) alleles and test for independence between HLA alleles. For this study we used MG data from three different sources; dbGaP, UK Biobank, and Greek-Cypriot GWAS resulting in 1416 MG cases and 3267 controls. For each dataset, we extracted the SNPs located in the Major Histocompatibility Complex (MHC) region (28477797: 33448354bp) and then imputed the HLA types using the program SNP2HLA with a European ancestry reference panel (T1DGC). Only the SNPs that we determined to be imputed with high accuracy ( $R^2 > 0.9$ ) were kept. Principal component analysis (PCA) was ran on all of the datasets and outliers that were more than 6 standard deviations from the mean were removed. Association analysis implementing a logistic regression model adjusted for necessary covariates accounting for population stratification. For the merged dataset, the protective HLA-DRB1\*13:01 allele showed the top association with MG (P value =  $2.308E-10$ , OR = 0.445). This allele was then used for the initial conditional analysis in order to test for interactions between the HLA alleles. Conditional analyses showed two independent loci associated with MG; HLA-DRB1 and HLA-B. These results will allow for a better understanding of the genetics in the MHC locus contributing to MG and identify loci that could be new therapeutic targets.

*Research Mentor:*

*Peristera Paschou, Biological Sciences*

**Poster Number:** 243 :: Physical Sciences

**College of Science**

**Chemistry Laboratory Experiment: Molecular Interactions in Liquid Crystals**

**Author:**

Carissa Getelfinger, Science

Kylie Smith, Science

**Abstract:**

We are presenting a general chemistry laboratory experiment that relates optical properties of liquid crystals to molecular interactions. For example, the wavelength of reflected light can be changed by liquid crystal molecules in a film when the molecules interact and arrange in a specific way. As a result, a change in color can be observed as function of mechanical stimulation, electricity or temperature. Applications for liquid crystals are plentiful including liquid crystal displays for computers, sensors for electronics or simple fewer thermometers.

This chemistry laboratory experiment has three objectives. i) Develop hands-on skills on how to prepare and formulate liquid crystal mixtures that will change colors. ii) Observe and record color changes of liquid crystal mixtures as function of temperature. iii) Analyze and evaluate results in terms of molecular interactions and generate evidence supported conclusions.

Students learn about the anisotropic structures of rigid liquid crystal molecules. The polar and nonpolar parts of these molecules may lead to hydrogen bonds, ionic interactions, dipole-dipole and dipole-induced dipole interactions. The molecular arrangements in liquid crystals are important in controlling optical properties for specific applications.

*Research Mentor:*

*Gudrun Schmidt, Chemistry*

**Poster Number:** 244 :: Physical Sciences

**College of Science**

**pH Dependent Performance Of Adhesives Made From Corn Protein**

**Author:**

Jana Hawthorne, Science

Logan J. Miles, Science

**Abstract:**

Adhesives are in many consumer products we use each day. Many of them are permanent and some of them are toxic. Plant-based adhesives are low cost alternatives that can be nontoxic and degradable. Here we present the pH dependent performance of adhesives made from corn protein and tannic acid. Tannic acid is a large polyphenolic molecule composed of gallic acid units. The many functional groups within one tannic acid molecule can provide cohesive strength to the corn protein through cross-linking. This property is quite useful when designing nontoxic polymer glues for wood and packaging materials. We use lap shear testing experiments to determine the adhesive strength of various zein-tannic acid compositions under different conditions. By changing the pH of the adhesive precursor solutions, the performance of the cured glue improves for specific substrates such as wood, aluminum and bronze. We also present Fourier transform infrared (FTIR) spectroscopy data to provide molecular-level information about oxidation reactions that may have taken place during curing. Our results are compared to the cross-linking chemistry of other phenolic components found in the literature in an attempt to elucidate the role of the tannic acid in making glue.

*Research Mentor:*

*Gudrun Schmidt, Chemistry*

**Poster Number:** 245 :: Physical Sciences

**College of Science**

**Comparing sources of aerosol sulfate using d34S isotope tracers from two cities in Southern California**

Author:

Bode Hoover, Science

Abstract:

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. Los Angeles has a history of intense smog caused by unregulated manufacturing and the natural bowl shape of the city which trapped fumes. While California now has the nation's strongest air quality regulations and has reduced smog levels, there is still concern about the amount and source of these aerosols. This study compares air quality at a coastal urban area, the city of Wilmington, CA and an inland rural area, the city of Mojave, CA in the United States. Air filters that measured total suspended particles were collected weekly in 2007 on Marine Avenue in Wilmington, CA and Mojave, CA for a total of 103 samples. Sulfur isotope ratios were measured using an elemental analyzer and mass spectrometer and sulfate concentrations were measured using ion chromatography after the particulates were extracted from the filters. For Wilmington, the sulfate concentration ranged from 0.74 to 7.48  $\mu\text{g}/\text{m}^3$  while in Mojave the sulfate concentration ranged from 0.34 to 2.59  $\mu\text{g}/\text{m}^3$ . The sulfate concentrations were lower in Mojave than in Wilmington due to the higher population and amount of shipping in Wilmington. The d34S measurements are still being recorded but the average d34S value for Mojave is 7.7 per mil with a standard deviation of 2.0 per mil. The d34S for Wilmington is expected to be lower. Determining the source of these aerosols allows legislators to target regulations on the largest contributors to air pollution which is known to have serious health effects.

*Research Mentor:*

*Greg Michalski, Earth, Atmospheric, and Planetary Sciences*

*Elizabeth Olson, Earth, Atmospheric, and Planetary Sciences*

*Jianghanyang Li, Earth, Atmospheric, and Planetary Sciences*

**Poster Number:** 246 :: Life Sciences

**College of Science**

**Structure-Function Study of Methylmalonyl-CoA Epimerase**

**Author:**

Tyler Huth, Agriculture

**Abstract:**

Natural products are a large source of potential drug precursors produced in plants, fungi, and bacteria and the enzyme systems responsible for their production are popular focuses in bioengineering projects. Generation of natural product derivatives in bacteria or fungi systems could be useful for drug development. Polyketide synthases (PKS) are modular enzyme complexes that produce a variety of biologically active natural products. One limitation to PKS natural product derivative development is the selectivity of the complex modules. PKS are stereoselective towards their extender unit substrate (2S)-methylmalonyl-CoA (MMCoA). Methylmalonyl-CoA epimerase (MMCE) is a key enzyme which catalyzes the interconversion between (2S)- and (2R)-methylmalonyl-CoA. This reaction is necessary to incorporate 2-substituted malonyl substrates into PKS for combinatorial biosynthesis. The mechanism of MMCE is poorly defined, yet it plays a key role in substrate preparation for the PKS system and elucidating the mechanism will aid future bioengineering projects. In order to understand the MMCE mechanism and its substrate selectivity, we aim to study the mode of catalysis of MMCE. To address this challenge, we used near natural methylmalonyl-CoA analogs to study MMCE and solved 1.2 Å data sets of MMCE with no substrate, the natural substrate (2S)-MMCoA, and an analog. Structural data has provided insight into potential catalytic residue targets and possible catalytic mechanisms. Future aims include enzymology experiments where known active site residues will be mutated and we will observe the corresponding activity of MMCE.

*Research Mentor:*

*Dr. Jeremy Lohman, Biochemistry*

**Poster Number:** 247 :: Life Sciences

**College of Science**

**Hypoxia Drives CD4+ Cytotoxic T Lymphocyte Differentiation**

**Author:**

Gwen Joseph, Science

**Abstract:**

Under normal conditions, CD4+ T helper (Th) cells contribute to protective immunity and inflammation through the production of cytokines. However, in chronic inflammation, Th cells acquire the capacity to produce cytolytic mediators (i.e. perforin, granzymes) that can contribute to disease. Despite the importance of these cells, little is known about the factors that drive their differentiation. In our studies, Th cells that expressed high levels of granzyme A (GrA) co-expressed the hypoxia-induced transcription factor Hif1a, suggesting that hypoxia may contribute to their differentiation. To address this point, we cultured naïve Th cells in the presence of differentiating cytokines in normoxic or hypoxic conditions. Hypoxia spurred the development of GrA-producing Th cells which was inhibited in the presence of TGF- $\beta$ , a cytokine previously shown to promote Th Cytotoxic T Lymphocyte (CTL) differentiation via modulation of ThPOK and CD8a. Hypoxia-derived Th CTLs did not exhibit alterations in ThPOK or CD8a but still expressed GrA, suggesting that hypoxia- and TGF- $\beta$ -induced Th CTLs may be functionally distinct. Taken together, hypoxic conditions that are present during chronic inflammation may promote differentiation of Th CTLs.

*Research Mentor:*

*Matthew Olson, Immunology*

**Poster Number:** 248 :: Life Sciences

**College of Science**

**Characterizing Disease Progression for Night Blindness in the Zebrafish Model**

**Author:**

Truc Kha, College of Science

**Abstract:**

Vision loss impacts an individual's quality of life and can be caused by retinal degeneration. A common form of retinal degeneration is night blindness, also known as retinitis pigmentosa (RP). RP affects 1 in 4,000 people across the world and has no cure. Current treatments, such as gene therapy and optogenetics, are experimental and costly. A cost-effective treatment can be found using an animal model such as zebrafish. Zebrafish are a good model to study human eye diseases due to their comparable physiology, high fecundity, and easy maintenance. We studied the disease progression of RP in zebrafish using transgenic lines genetically modified to carry human RP rhodopsin mutations Q344X and P23H. These mutations belong to mutation classes I and II respectively. They are common mutations in human rhodopsin that cause RP by different mechanisms. We visualized rod degeneration in these transgenic lines from 5 days post fertilization (dpf) to 7dpf using histological analysis. In order to determine if the visual behavior is affected by the transgenic lines, the visual motor response (VMR) experiment is used. The Q344X and P23H lines begin to exhibit rod degeneration at 5dpf. At 7dpf, Q344X and P23H larvae displayed a reduced VMR. The results from the histological and behavioral analyses provide information about the disease progression in the P23H model. These models will be used as one of the first steps in drug screening to assess for drug effects that combat RP. The model will ultimately identify new cost-effective drugs for treating RP patients.

*Research Mentor:*

*Yuk Fai Leung, Department of Biological Sciences*

*Logan Ganzen, Purdue Interdisciplinary Life Sciences Program*

**Poster Number:** 249 :: Life Sciences

**College of Science**

**Effects of Arbuscular Mycorrhizal Fungi Diversity on Bioavailability of Cadmium in Carrots**

**Author:**

Hannah Komanapalli, Science

**Abstract:**

Heavy metal uptake in crops is a critical issue across the world, and consumption of contaminated plants leads to adverse health conditions. Arbuscular mycorrhizal fungi (AMF), which increase crop productivity, appear to have differing effects on heavy metal uptake in plants depending on a variety of environmental conditions, including AMF community structure. To understand how AMF community structure affects heavy metal uptake, carrots were grown in soils with different AMF communities, and were subject to cadmium or left uncontaminated. These treatments included: a control (no microbes), an AMF inoculant (*Rhizophagus irregularis*) with no other microbes, a mixture of AMF and other microbes derived from organically managed soil, a mixture of AMF and other microbes derived from conventionally managed soil, organic or conventional soils with the AMF inoculant, and lastly, the organic or conventional soils with AMF communities removed. Results to date indicate that carrots subjected to cadmium had higher root weights, except for the control and inoculant treatments. Organic and conventional soil treatments had higher root weights than other treatments, but these dropped with inoculant. A glomalin assay was conducted to quantify fungal activity levels. Results indicate that the control and inoculant treatments had the highest concentration, and the inoculated organic and conventional soils had the least. This could be due to competitive interactions between fungi. Cadmium treatments also appeared to have lower levels. Sequence analysis will be performed to characterize the AMF community structure in the different treatments, and ICP analysis will be conducted to quantify total cadmium uptake.

*Research Mentor:*

*Lori Hoagland, Horticulture and Landscape Architecture*

**Poster Number: 250 ::**

**Withdrawn**

**Poster Number:** 251 :: Life Sciences

**College of Science**

**Suppression of Sickle Cell Disease Using Gene Therapy**

**Author:**

Susan Lam, College of Science

**Abstract:**

Since its discovery, sickle cell disease (SCD) has been one of the most researched molecular diseases. Globally, it is a chronic disease that has affected thousands of people, with a high mortality rate in early childhood. There is a broad spectrum of treatments for SCD, however they are either temporary to those with severe SCD or inaccessible to those in developing countries. Due to the lack of curability in treatments, scientists are focused on the advantages of biotechnology, especially in humans. In particular, a possible lasting treatment for sickle cell affected people is gene therapy, which is the manipulation of DNA. Because of the substantial knowledge of genetics and innovative biotechnology, the survival rate of SCD to age eighteen has increased from 84% to 96% through the years 2004 to 2010 in the United States (Chakravorty and Williams 48). As scientists are putting emphasis on gene therapy as a treatment for genetic abnormalities, they can exploit the ability of gene modification to eradicate diseases and establish gene therapy as the most effective alternative for the treatment of SCD.

*Research Mentor:*

*Alejandra Ortega, English*

**Poster Number:** 252 :: Physical Sciences

**College of Science**

**Classifying Standard Model and Supersymmetry Physics with Deep Neural Networks**

Author:

Daniel Lense, Science

Eric Reinhardt, Science

Nolan Kruger, Science

Yao Chen, Engineering

Abstract:

The work of this research team aims to develop a deep neural network capable of classifying proton-proton collision behavior as belonging to either Standard Model or Supersymmetry processes. Our analysis is focused on the dilepton events associated with these collisions, wherein we examine several physical quantities using Monte Carlo data. Included in this analysis are the azimuthal angle ( $\Delta\phi$ ), pseudorapidity ( $\Delta\eta$ ), and transverse momentum of lepton products, all of which have been selected by our observation of their ability to sufficiently distinguish between the two processes being considered. Ultimately, in constructing this network, we hope to have a computational system trained to select events resembling Supersymmetric processes for further inspection such that we can more efficiently identify evidence of potentially new physics.

*Research Mentor:*

*Amandeep Singh Bakshi, Department of Physics and Astronomy*

*Andreas Jung, Department of Physics and Astronomy*

**Poster Number:** 253 :: Mathematical/Computation Sciences

**College of Science**

**An Introduction to Homotopy Colimits**

Author:

Samuel Mercier, College of Science

Abstract:

We give an expository account of the homotopy colimit functor. We provide a brief introduction to model categories. We then construct the projective model category structure on the functor category  $M^J$  where  $M$  is a cofibrantly generated model category and  $J$  is a diagram category. We then construct the homotopy colimit functor as the left derived functor of the colimit functor. Finally we apply this construction to the calculation of the homotopy orbits of a topological space  $X$  with group action  $G$  (a construction used in equivariant cohomology).

*Research Mentor:*

*Jeremy Miller, Mathematics*

*Paul VanKoughnett, Mathematics*

**Poster Number:** 254 :: Innovative Technology/Entrepreneurship/Design

**College of Science**

**Automated Discovery of Network Cameras in Heterogeneous Web Pages And Enabling Near Real-Time Feature Indexing Storage System on Live Video Streams**

Author:

Sripath Mishra, College Of Science

Abstract:

Abstract Redacted

*Research Mentor:*

*Yung-Hsiang Lu, Electrical and Computer Engineering*

**Poster Number:** 255 :: Life Sciences

**College of Science**

**Interactions of Various Probiotic Preparations with Zearalenone**

**Author:**

Vignesh Nathan, Science

**Abstract:**

Mycotoxins are compounds derived from fungal species and can produce toxic effects. Zearalenone is a mycotoxin which is prevalent in agricultural foodstuffs and has unwanted estrogenic properties resulting in severe reproductive disorders. Zearalenone continues to be a problematic contaminant in the livestock industry with financial losses and debilitated animal welfare being a few of the noteworthy consequences. In this preliminary study, various bacterial probiotic supplements from BioMatrix International were tested against Zearalenone to measure sequestration under physiological conditions. Samples of Zearalenone (2.5 ppm) were incubated with the probiotic samples (MS, MC, MCE, EW) over the course of 48 h. Treatments were then analyzed via ELISA at specific time points to determine the percent unbound toxin. The study revealed that the degradation potential of different probiotic treatments was time dependent. Among the various probiotics evaluated, the maximum binding of Zearalenone for MS, MC, MCE, and EW were found to be 82.22 % (15min), 81.34% (24 h), 83.63 % (15 min), 88.76 % (24 h), respectively. Based on the initial findings, the bacterial probiotics have shown potential utility in Zearalenone neutralization.

*Research Mentor:*

*Dr. Rishi Drolia, Food Science*

*Dr. Arun K. Bhunia, Food Science*

**Poster Number:** 256 :: Life Sciences

**College of Science**

**Protein Encapsulation to Improve Sample Quality for Cryo-Electron Microscopy**

**Author:**

Hannah Pletcher, Science

**Abstract:**

Cryo-electron microscopy (cryo-EM) is a method of structure characterization of proteins that does not require crystals. However, complete structure characterization can be prevented by sample heterogeneity and preferred orientations. Sample heterogeneity prevents the achievement of the highest resolution. The air-water interface can denature samples and induce preferred orientations, which inhibits the reconstruction of a complete three-dimensional structure. The hypothesis of this study is that the negative effects of heterogeneity and preferred orientations could be reduced by the encapsulation of the sample in cage-like proteins. This study suggests using the human norovirus virus-like particle (VLP) to encapsulate cargo-proteins to be imaged under cryo-EM. This system is achieved via molecular cloning into vectors and expression in insect cell lines. The use of the human norovirus viral capsid protein shell for the protein targets could allow for higher resolution of the protein target, reducing the effects of heterogeneity by making the protein more compact and less flexible, and preferred orientations by trapping the protein within the virus shell and preventing contact with the air-water interface and grid substrate.

*Research Mentor:*

*Frank Vago, Biological Sciences*

*Dr. Wen Jiang, Biological Sciences*

**Poster Number:** 257 :: Life Sciences

**College of Science**

**Using Convolutional Neural Networks to Identity Sounds Sources in Audio Recordings for Biodiversity Research**

**Author:**

Liam G Quaas, College of Science

**Abstract:**

A specialization in ecology, soundscape ecology, recognizes that sounds in the environment could help us understand and track changes in biodiversity trends. Acoustic monitoring results in a massive number of sound files that require manual labeling which is time-intensive. We hypothesize that spectrograms can be used to automatically identify broad taxonomic classes of sound sources using a convolutional neural network to help reduce manual labeling. To test this, we conducted a research study using common sounds collected in Indiana. The sounds were evaluated using two methods: 1) label while listening and looking at its spectrogram and 2) use resulting labeled spectrograms in a convolutional neural network. Two reviewers labeled the audio recordings with qualitative scores, purity and confidence, and calculated an inter-reliability score. Then, this labeled data was used for training and testing data of an artificial intelligence algorithm, TensorFlow. The inter-reliability results showed that all class labels were agreed upon by the two reviewers with 85% agreement or higher. The reliability scores for purity had a 62% agreement. The confidence level of the taxonomic class label for both reviewers was 85%. The convolutional neural network model was trained with a subset of spectrograms resulting in an accuracy rating of 65%. We can improve the model accuracy by using more data in the training dataset. Overall, this study shows that using spectrograms for automatic labeling in a convolutional neural network could benefit ecologists.

*Research Mentor:*

*Bryan C Pijanowski, Forestry and Natural Resources*

*Kristen M Bellisario, Forestry and Natural Resources*

*David T Savage, Forestry and Natural Resources*

**Poster Number:** 258 :: Life Sciences

**College of Science**

**Illuminating biased agonism at the kappa opioid receptor: A potential therapeutic approach for treating alcohol use disorder**

**Author:**

Hawk Royer, College of Science; College of Health and Human Sciences

**Abstract:**

Alcohol use disorder (AUD) affects nearly 16 million people in the United States, due in part to a lack of efficacious treatments. Therefore, the investigation of novel therapeutics is essential to mitigating the negative societal impacts of AUD. Becoming addicted to alcohol dysregulates the brain's ability to cope with stress. In an addicted individual, stress acts as both a symptom of withdrawal and as a major contributor to continued alcohol consumption. This stress-response pathway is, in large part, regulated by the kappa opioid receptor (KOR) and its endogenous agonist, dynorphin. Hence, the KOR is a promising therapeutic target for combating AUD. However, current KOR agonists, have sedative and dysphoric side-effects, which consequently diminish their effectiveness. The KOR is a G-protein-coupled receptor (GPCR) that induces several signaling pathways when it is activated by dynorphin; at least one of these pathways is implicated in sedation and/or dysphoria. The ability of novel KOR agonists to preferentially induce one signaling cascade over another is termed "biased agonism." Manipulation of the KOR via biased agonism to trigger beneficial pathways and avoid side-effects could potentially increase the effectiveness of its use in treating AUD. To this end, we investigated various KOR agonists to establish their degree of biased agonism through the measurement of cellular signaling profiles. We compared this data to their elicited behavioral changes in a two bottle choice drinking paradigm to determine the impact of drug signaling profile on voluntary alcohol consumption in mice.

*Research Mentor:*

*Alex French, Molecular Pharmacology and Medicinal Chemistry*

**Poster Number:** 259 :: Life Sciences

**College of Science**

**Exploring an Anti-Plasmodial Mechanism of Action of Quinine Against Plasmodium Falciparum**

**Author:**

Ruhani Sansoya, College of Science, Honors College

**Abstract:**

Malaria is a mosquito-borne disease that is caused by an erythrocyte-invading parasite. Quinine is a drug that is currently being used as a therapeutic agent to treat malaria. It is hypothesized that quinine works in a mechanism similar to a popular drug with a known mechanism of action called chloroquine, but this has not been proven. The fact that widespread resistance to chloroquine but not to quinine has developed in malaria patients' overtime, leads us to believe that quinine uses a different mechanism of action. From a previous project, we concluded that cell lysis can be potentially avoided by inhibiting a process called band 3 tyrosine phosphorylation. We hypothesize that inhibiting lysis, or rupturing of the cell membrane, through this mechanism would prevent malaria from exiting the in-tact cell. If malaria cannot leave the cell, it cannot enter the bloodstream to infect other cells but rather die within the host cell. To prove that this is the correct mechanism of action, we must first show that quinine inhibits orthovanadate-induced band 3 tyrosine phosphorylation in vitro. This is measured by gauging the extent of band 3 tyrosine phosphorylation using western blot, and stability of erythrocyte's membrane's through quantitation of microparticle discharge by flow cytometry, and cell-free hemoglobin levels through colorimetric assays. Finally, we must perform the same experiments with malaria-infected cells. These quinine experiments must be done side by side with chloroquine for comparison and determining the relationship between the two drugs. If our hypothesis is supported, this will open a new door in the medical world to alternative treatments to combat malaria and drug resistance against other therapeutics.

*Research Mentor:*

*Panae Noomuna, Chemistry*

**Poster Number:** 260 :: Physical Sciences

**College of Science**

**Modeling Fluid Flow Pattern Inside Dark Matter Detector**

**Author:**

Hayden Schennum, Engineering

**Abstract:**

The XENON project aims to detect dark matter using a time-projection chamber (TPC) filled with liquid xenon. The most troublesome source of detector background is beta decay from lead-214 to bismuth-214 – this event has a similar interaction energy as a hypothesized dark matter interaction, thus making them indistinguishable. To distinguish these background events, it is possible to identify isotopes in the radon-222 decay chain to predict when lead-214 decay occurred; however, since the fluid in the TPC is moving, it is difficult to predict where lead-214 decay occurred. This project aims to use ANSYS Fluent, a computational fluid dynamics software, to replicate the known flow patterns within the TPC. Knowledge of the boundary conditions can then be used to optimize the TPC and reduce the flow velocity, making it easier to distinguish lead-214 decay events. However, when boundary conditions were varied, all simulations diverged – Fluent was not able to minimize residual error, resulting in unrealistic flow patterns that were different if the same simulation was run multiple times. Therefore, properties of liquid xenon were manipulated to understand when a model converges: it was noted that models converge when the Raleigh number, a dimensionless number associated with natural convection, is low and diverge when the Raleigh number is high. Furthermore, the flow regime in the TPC was noted to be turbulent based on the large calculated Raleigh number. A model must converge for its results to be trustworthy; thus, future efforts should be prioritized on producing a converged model.

*Research Mentor:*

*Dr. Rafael Lang, Physics and Astronomy*

*Juehang Qin, Physics and Astronomy*

**Poster Number:** 261 :: Physical Sciences

**College of Science**

**Inorganic Chemistry Experiment: Why Metals and Ligands Like Each Other**

**Author:**

Kylie Smith, Science

Carissa Gettelfinger, Science

**Abstract:**

Metals often exist in solutions as coordination complexes. Because these complexes are important to the function of proteins found in nature, the biological activity of metal complexes has found many clinical applications. The optical and magnetic properties as well as the catalytic activity of metal complexes have also resulted in diverse industrial applications. We are presenting an inorganic chemistry laboratory experiment that relates color changes and solubility during metal complex formation to the molecular interactions between metals and ligands. The central metal atom or ion is the coordination center that is bound to molecules called ligands. Many metal ligand combinations are possible but some form more readily than others do. This chemistry laboratory experiment has three objectives. i) Develop hands-on skills on how to prepare a series of Ni, Fe or Cu based metal complexes in solution. ii) Observe and record color changes and solubility of metal complexes and compare to UV-vis spectra. iii) Analyze and evaluate results in terms of metal-ligand formation and generate evidence-supported conclusions. Students learn about transition metal chemistry, coordination complexes, oxidation-reduction chemistry and solubility.

*Research Mentor:*

*Gudrun Schmidt, Chemistry*

**Poster Number:** 262 :: Life Sciences

**College of Science**

**Investigating Fic Proteins Encoded by the Gastric Pathogen *Helicobacter pylori***

Author:

Alexandra Stiffler, Science

Vandana Reddy, Science

Abstract:

Abstract Redacted

*Research Mentor:*

*Seema Mattoo, Biology*

**Poster Number:** 263 :: Physical Sciences

**College of Science**

**Primary Vertex Reconstruction via Quantum Annealing**

Author:

Trevor Teague, Engineering

Dominic Seidita, Science

Austin Beasley, Science

Yinqi Shen, Engineering

Abstract:

Quantum annealing offers a solution to many classically computationally challenging problems including multiple NP-hard and NP-complete problems. The methods offered by this paradigm applied to the reconstruction of primary vertices is investigated by casting it as a clustering problem solvable on a quantum annealer. These primary vertices represent the theoretical location of particle collisions at the compact muon solenoid (CMS). The methods for translating this clustering problem to a quadratic unconstrained binary optimization (QUBO) problem is outlined, and this algorithm's performance is analyzed.

*Research Mentor:*

*Andrew Wildridge, Physics and Astronomy*

*Andreas Jung, Physics and Astronomy*

**Poster Number:** 264 :: Mathematical/Computation Sciences

**College of Science**

**Exploration and Scientific Applications of IBM's Quantum Processors**

**Author:**

Berkley Weyer, Science

**Abstract:**

Our group focuses on gaining proficiency in IBM's quantum processor to apply it in other fields of physics. We are creating quantum gates and understanding the theory behind them to apply them on systems of qubits. Now we are beginning to branch out into more complex tools and algorithms for quantum circuits. Our group utilizes IBM's Quantum Experience to create quantum circuits to then run on their quantum processors. Due to the probabilistic nature of quantum mechanics, we run these circuits numerous times recording each output in a histogram. Interpreting the output histogram is done by taking many trails in order to approach the theoretical probability of each output. However, a drawback of more trails is a longer runtime of the circuit. As time increases, heat begins to excite the qubits to different states manifesting as differences between the theoretical histogram and the histogram from the quantum processor. Our group has replicated Grover's algorithm which specializes in database searching. This has widespread applications for potentially faster searches especially in particle tracing done at the CMS Detector. We have formulated a general proof for quantum teleportation and verified it with a quantum processor as an alternative form of sending information. Finally, we have explored the concept of Fourier transforms on a system of qubits that allow for a larger variety of operations to be done by the quantum processor.

*Research Mentor:*

*Andreas Jung, Physics and Astronomy*

*Souvik Das, Physics and Astronomy*

**Poster Number:** 265 :: Innovative Technology/Entrepreneurship/Design

**Krannert School of Management**

**A Dynamic Pricing Model for Professional Sports Teams**

Author:

Brian Cain, Krannert School of Management

Nikolai Saporoschetz, Krannert School of Management

Theo Ginting, Krannert School of Management

Abstract:

We develop a dynamic ticket pricing model that determines a ticket price to maximize attendance and revenue for an NFL organization. This research is primarily motivated by the recent rapid adoption of dynamic ticket pricing by professional sports organizations. In collaboration with an NFL organization, we extend the literature in this area by developing a two-phase model, where the first phase uses primary and secondary ticket market data to predict the probability of a ticket being sold at a particular price, while the second phase maximizes the revenue dynamically while minimizing the probability that a ticket goes unsold. By utilizing this model, professional sports organizations would be able to refine their ticket pricing strategies to capture revenue that otherwise would go to the secondary ticket market.

*Research Mentor:*

*Matthew A Lanham, Department of Management*

**Poster Number:** 266 :: Social Sciences/Humanities

**Krannert School of Management**

**Implicit Bias Training Tool**

**Author:**

Alexandrea Crouch, Krannert

**Abstract:**

Implicit or unconscious bias is a buzzword floating around many corporate offices these days. As organizations work to be more diverse and inclusive, they are turning to implicit bias trainings. Organizations are creating their own material or turning to tools such as the Harvard Implicit Association test (<https://implicit.harvard.edu/implicit/takeatest.html>). The problem is that many of these trainings lack interaction and the opportunity to truly understand what implicit bias is. The purpose of this study is to determine the effectiveness of perspective taking as a tool to identify implicit bias. Participants of the study are shown two videos in which a team of students are solving a business problem while instances of implicit gender bias happen. One video shows all the team members and the other is taken from the perspective of the female student. After watching the videos, we asked participants to think aloud about things they noticed and how they felt. While we are still analyzing results, emerging patterns show when students take on the female perspective, they have a more emotional reaction to the bias she is experiencing. We plan to use this data to build a more interactive implicit bias training tool.

*Research Mentor:*

*Denise Driscoll, Graduate Program*

**Poster Number:** 267 :: Social Sciences/Humanities

**Krannert School of Management**

**City Size, State, and Inflation's Effect on the Compensation of City Employees**

Author:

Kaitlyn Frawley, Krannert School of Management

Abstract:

The purpose of this study was to understand if the salaries of city employees in the United States have, on average, kept up with inflation. It also delves into how compensation of city employees differs among city size and among states. This was done by tracking employees in each city who had the same job between 2014 and 2018 and computing their real wage for each year using the Consumer Price Index. Statistical modeling was then used on the data to analyze patterns and determine whether compensation has kept up with inflation. These findings were then compared between city size and state. This study focused on cities in California and Indiana such as Lakewood, CA, Chula Vista, CA, Bloomington, IN, and Fort Wayne, IN between 2014 and 2018.

*Research Mentor:*

*Dr. Kelly Blanchard, Economics*

**Poster Number:** 268 :: Social Sciences/Humanities

**Krannert School of Management**

**The Effect of Legalizing Sunday Carryout Alcohol Sales on Alcohol-Related Traffic Accidents in Indiana**

**Author:**

Jack Harber, Krannert School of Management

**Abstract:**

On February 28, 2018, Gov. Eric Holcomb signed a new law which made Indiana the 41st state to legalize carryout alcohol sales on Sunday. While people may drink more as a result of this policy change, it is unknown whether people may drink and drive more since they can consume their alcoholic beverages at home after buying them on Sunday. This is the motivation of my project, and I analyze the effect of the policy on alcohol-related traffic accidents. This paper analyzes the effect of the policy by first looking at the total change in alcohol-related crashes after the policy change. Second, I analyze the effect this policy has on only Sunday alcohol-related crashes. I find no statistically significant change in the total number of alcohol-related traffic accidents following the policy change. When looking only at Sunday, I find that alcohol-related crashes increased by about 14% statewide and 20% in nonborder counties. However, there was no statistically significant change in border counties.

*Research Mentor:*

*Joe Mazur, Economics*

**Poster Number:** 269 :: Innovative Technology/Entrepreneurship/Design

**Krannert School of Management**

**Text Mining and Predictive Model: Our Arsenal Against the COVID-19 Pandemic**

**Author:**

Sayyid Muhammad Hariz Ab Latiff, Krannert School of Management

**Abstract:**

With the current pandemic of COVID-19 that has reached more than 400,000 cases worldwide, the medical community across the globe are working extensively to understand COVID-19 to handle this pandemic. This project uses the power of predictive analytics by aiding the medical community and authoritative bodies in 2 steps. The first step is utilizing the application of text mining by extracting important insights from over 44,000 scholarly articles pertinent to COVID-19, SARS-COV-2, and related coronaviruses. These insights have the potential to answer key scientific questions drawn from the NASEM'S SCIED research topics and WHO's R&D Blueprint for Covid-19. The second step is by creating a predictive model from various datasets based on the gathered insight to predict the fatalities between March 25 and April 22 by region. However, the goal of this model is not on the accuracy of the forecast but rather in understanding the factors that impact the transmission rate of COVID-19. By analyzing these factors and insights, authoritative bodies around the world could take countermeasures to minimize the transmission of Covid-19 while the medical community could gain a better understanding of COVID-19.

*Research Mentor:*

*Matthew A. Lanham, Management*

**Poster Number:** 270 :: Social Sciences/Humanities

**Krannert School of Management**

**The Importance of Business in High School Curriculum**

Author:

Megan Pinkley, Krannert

Anna Satek, Krannert

Abstract:

In high school, many students are given courses in STEM related fields, but business courses are often optional and neglected. The issues arise when students are picking their majors for college and they often look to their experiences in high school classes. With a grasp on the various STEM related topics, students often find themselves comfortable in pursuing those types of majors, without acknowledging that a business education is critical and has a significant impact on all professions.

We aspire to create change in high school curriculums to give students the opportunity to experience various business topics in one course, which will help prepare them for a future in business, if it interests them. Based on several observations we have made, many undergraduate students at Purdue University were not offered a business course in high school. The goal of our research is to inform, not to persuade, students on important business topics: Accounting, Finance, Management, Supply Chain, Economics, Industrial Management, and Marketing. We understand that business is difficult to define, so are addressing the question “How important is business in the foundations of learning?”.

*Research Mentor:*

*Meara Habashi, Organizational Behavior and Human Resources*

**Poster Number:** 271 :: Mathematical/Computation Sciences

**Krannert School of Management**  
**Synergies in Mergers and Acquisitions**

Author:

Merritt Wright, Krannert School of Management

Abstract:

Abstract Redacted

*Research Mentor:*

*Sergey Chernenko, Finance*

*Cara Putman, Business Law*

**Poster Number:** 272 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Landing Take-off Cycle (LTO) Modeling Optimization for General Aviation Aircraft**

**Author:**

Adam Boczar, College of Engineering

**Abstract:**

The aviation industry connects passengers and cargo around the world, and additionally provides opportunities for recreational flight. In 2018, the Federal Aviation Administration reported more than 25 million general aviation flight hours, an increase of more than 2 million flight hours compared to five years ago in 2013. With these flight activities, there are significant energy and noise emissions that must be considered during landing and take-off (LTO) cycles for general aviation aircraft. In order to increase accuracy of noise and energy emission predictions of aircraft, this research seeks to accurately classify the LTO phases using an ADS-B based system to collect general aviation operations data. Using the Cessna 172 as a case study with routine air traffic operations at Purdue University Airport, a model for estimating the segments of LTO is developed using a combination of R code and ADS-B data at Purdue University. From the data analysis, predictions of the time duration of each LTO phase can be created and applied to future Cessna 172 flights at the Purdue University Airport. Future applications of this research include applying the LTO model to different types of aircraft and ultimately linking the model with FAA aircraft databases to connect aircraft LTO models with aircraft type.

*Research Mentor:*

*John Mott, Aviation and Transportation Technology*

*Kristoffer Borgen, Aviation and Transportation Technology*

**Poster Number:** 273 :: Social Sciences/Humanities

**Purdue Polytechnic Institute**

**SLT & Fraudulent Scams**

**Author:**

Matthew Camino, Polytech

**Abstract:**

Phishing scams (e.g., fraudulent links or websites) are an extremely common form of social engineering in which a fraudster will try to steal a victim's sensitive information via communication technology. Previous literature focuses on why people fall victim to phishing attacks rather than why perpetrators engage in these acts in the first place. According to social learning theory, conforming and non-confirming behavior is learned through others. The goal of this research study is to determine if the mechanisms of learning (i.e., definitions, differential reinforcement, differential association, and imitation) in social learning theory predict phishing behaviors. Our recipients completed an anonymous Internet-based survey via Amazon's Mechanical Turk. The findings of this study will be discussed.

*Research Mentor:*

*Dr. Kathryn Seigfried-Spellar, Computer & Information Technology*

**Poster Number:** 274 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Material Properties Analysis of 3D Printed Drone Arms**

**Author:**

Matthew Decloedt, Polytechnic

**Abstract:**

As 3-D printing become continuously easier, better, and faster along with drones becoming more popular, there is a rising demand to fix parts on the spot and even make full drones from this method alone. The aim of this study was to analyze the different properties of 3-D printed materials to be used in drone arms. A sample of 3 prints of each material was used to ensure no extraneous or outlier data was collected. The way each part was printed remained constant as well using the same infill type and amount as well as print speed. Materials that were tested included PLA, ABS, PETG, Polycarbonate, Nylon, TPU Flexible, Carbon Fiber Polycarbonate, and Carbon Fiber. Each of these products was pull tested the exact same way with a slow-motion camera recording it to ensure accuracy. Each material was evaluated based on their strength and deformation. Different types of drones require different properties, so no single filament was chosen as better than another, but merely compared based on data and analysis showing which has better properties for specific applications.

*Research Mentor:*

*Michael Nolan, School of Aviation and Transportation Technology*

**Poster Number:** 275 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Development of a Robotic 3D Printer**

**Author:**

Iveindigo Djianto, Polytechnic Institute

Ittichot Suwanmungkool, Polytechnic Institute

**Abstract:**

Although Fused Filament Fabrication (FFF) is currently the most commonly used 3D printing approach, it has limitations in printing certain complex structures. Researchers have developed many robust and versatile 3D printing approaches, such as Stereolithography (SLA) and Digital Light Processing (DLP). These 3D printing approaches usually require high maintenance and expensive source material. In order to achieve low maintenance 3D printing with economic source material, this project proposes a novel 3D printing approach utilizing a robotic arm. The robotic 3D printing approach employs a KUKA robotic arm with six degrees of freedom and a customized filament-feeding system with the inspiration of the traditional fused filament fabrication. The motion of the 3D printing nozzle is generated by the robotic arm and thus, this approach allows a more versatile motion of the 3D printing nozzle. Both the orientation and the position of the 3D printing nozzle can be controlled while the traditional 3D printing approaches (e.g., the FFF approach) controls only the position of the 3D printing nozzle. In order to prove this concept, an experiment is conducted to create a 3D T-shaped structure. Such a T-shaped structure is challenging for traditional 3D printing approaches due to the hanging feature (i.e., the horizontal section of the T-shaped structure). Experiments show that the robotic 3D printing approach can produce parts with complex structures that the FFF approach cannot achieve.

*Research Mentor:*

*Prof. Xiumin Diao, Robotics*

**Poster Number:** 276 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Survey Research Instrument for the Data Visualization Process**

**Author:**

Nicole Dwenger, Polytechnic Institute

**Abstract:**

Visualizing data is a multi-stage process. To assist with the process data visualization activity worksheets were developed for an undergraduate data visualization course. The activity worksheets were previously completed manually through a download and upload process from Word document to PDF. This process only allowed individual user analysis and lacked an outlet to view responses holistically between all users. Previous researchers have taken this manual process and populated a website with worksheet questions; however, this neglected a database to automate and analyze answers. In this work, the paper based worksheets have been transformed into digital surveys that can be populated by users online and saved as data for analysis. The goal of this work is to enable web-based access to the digital instruments with embedded Qualtrics surveys to capture the user's responses. Transferring research instruments into comprehensible, easy-to-digest surveys requires additional insight. This project will include researching methods to reduce survey fatigue to provide users with better survey experiences. I will utilize draw.io to create a flow diagram to illustrate different survey questions based on user inputs. Upon survey completion, users are able to download their responses for personal reporting while these responses are also sent to Qualtrics for future analysis of trends throughout the data visualization process. This platform is designed to simplify and automate worksheet completion to data analysis during any data visualization project.

*Research Mentor:*

*Vetria Byrd, Computer Graphics Technology*

**Poster Number:** 277 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Determining Resonant Frequency in Varying Guitar Bodies**

**Author:**

Cassandra Foster, Purdue Polytechnic

**Abstract:**

Guitars can vary greatly in terms of physical characteristics that can effect the resonant frequency. The different sizes of guitars offer unique sounds due to characteristics such as body volume, neck length, guitar strings, sound hole size, etc. However, the information that is currently eluding guitar users and makers is how the sound hole size and body volume effect the resonant frequency of the guitar. This information is important because the resonant frequency effects the tone that is heard when playing it. If the relationship between the resonant frequency and guitar volume and sound hole size become known guitar manufacturers would be able to design for a desired resonant frequency. Since the math that could determine the relationship isn't currently known, if the relationship becomes known this could also open the world to finding this relationship in other systems as well. There is no equation that currently explains the relationship accurately. The closest approximation is the Helmholtz resonator model. However, this model is inaccurate due to the fact in most guitars the back oscillates slightly. This make the volume of the air inside the guitar body varying instead of constant. The Helmholtz model assumes a completely rigid structure. The experiment conducted used a fully rigid testing structure in order to comply with the assumptions made in the Helmholtz model.

*Research Mentor:*

*Richard Mark French, School of Engineering Technology*

**Poster Number:** 278 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Comparison of computer vision based activity classifiers on construction site applications**

**Author:**

Lakshya Goyal, Engineering

Shubham Hemant Bhokare, Engineering

**Abstract:**

Increasing efficiency and sticking to plans are issues faced on many construction projects. Identifying areas where productivity is slow automatically would be a helpful tool for managers. The research aims to analyze and compare efficiency and accuracy of different activity recognition algorithms for construction sites. We compare the accuracy of using YOLOv3, skeleton-based, and two-stream algorithms on our own dataset to compare the accuracy of the activity recognition. The authors selected these algorithms for comparison because they incorporate various state-of-the-art activity recognition techniques, such as bounding-box prediction and skeleton-based. Although there are many different implementations, the authors chose to compare recent implementations. The comparison of these models was done with a dataset consisting of 4 activities with frames from 8-10 videos for each. The dataset was created by extracting frames from the videos and labelling the activities taking place. The comparison results of this experimentation show that YOLO is faster, but has a lower accuracy. Whereas skeleton-based will have higher accuracy, but may be inefficient for real-time processing. This paper will help give a better understanding of how to detect construction site activities for construction site applications.

*Research Mentor:*

*Ran Ren, Construction Management Technology*

*Jiansong Zhang, Construction Management Technology*

**Poster Number:** 279 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Modulation of LED Photo-Luminescence for Underwater Optical Communications**

Author:

James Hidalgo, Purdue Polytechnic

Abstract:

Abstract Redacted

*Research Mentor:*

*Walter Daniel Leon-Salas, School of Engineering Technology*

*Xiaozhe Fan, School of Engineering Technology*

**Poster Number:** 280 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Exploring Lexical Irregularities in Hypothesis-Only Models of Natural Language Inference**

**Author:**

Qingyuan Hu, Polytechnic Institute

Yi Zhang, Polytechnic Institute

**Abstract:**

Natural Language Inference (NLI) or Recognizing Textual Entailment (RTE) is the task of predicting the entailment relation (entailment, neutral, or contradiction) between a pair of sentences (premise and hypothesis). This task has been described as “a valuable testing ground for the development of semantic representations” (Bowman, 2015), and is a key component in natural language understanding evaluation benchmarks. Models that understand entailment should encode both, the premise and the hypothesis. However, experiments by Poliak et al (2018) revealed a strong preference of these models towards patterns observed only in the hypothesis. They compared the performance of hypothesis-only models on 10 datasets which were classified into three types: (1) human elicited, (2) human judged, (3) datasets automatically recast from external tasks (no human contribution). Their results indicated the existence of statistical irregularities present in the hypothesis that bias the model into performing competitively with the state of the art. While recast datasets provide large scale generation of NLI instances due to minimal human intervention, the papers that generate them do not provide fine-grained analysis of the potential statistical patterns that can bias NLI models. For example, Poliak et al. (2018) found a positive correlation between grammaticality and NLI labels in a recast dataset, FN+, which could be exploited by hypothesis only models. In this work, we analyze hypothesis-only models trained on one of the recast datasets provided in Poliak et al. (2018) for word-level patterns to reveal potential lexical biases that could contribute to the models’ performance.

*Research Mentor:*

*Kanishka Misra, Computer and Information Technology*

*Julia Rayz, Computer and Information Technology*

**Poster Number:** 281 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Using Information Visualization Techniques to Uncover Patterns in Pubescent Lupus Data**

**Author:**

Nathan Kanter, Polytechnic Institute

**Abstract:**

Systemic Lupus Erythematosus (SLE) is a chronic autoimmune disease, also known as lupus, that can affect children and adolescents, disproportionately affecting females. It can target any organ in the body and can present many different symptoms. SLE, is most dangerous for adolescents in the first year after diagnosis but has significant impact in the initial 5 years from discovery. The aim of this research is to apply data visualization techniques to examine adolescent lupus data and determine if the effects of puberty increase the number of symptoms or the severity of SLE. The study began by assessing secondary data from a longitudinal Lupus study in collaboration with Riley Hospital for Children at Indiana University Health. This research utilizes information visualization and visual analytics to explore the role of data visualization in the comparison between SLE and puberty by examining symptom count and puberty milestones. Preliminary results indicate outcomes from this work will inform the following research questions: (1) Is there a connection between the severity of SLE and the progression of puberty? (2) How can information visualization techniques and visual analytics be used in the detection of possible patterns between SLE and puberty? The visualization software used to complete the task was Tableau. By using a subset of the full Adolescent Lupus dataset, the visual results indicated that there appeared to be no clear connection between where a child was through puberty, and the severity of their SLE. (IRB #1807020849). This work is sponsored by The Center for Science of Information – NSF Science and Technology Center funded by NSF CCF-0939370.

*Research Mentor:*

*Vetria Byrd, Computer Graphics Technology*

**Poster Number:** 282 :: Life Sciences

**Purdue Polytechnic Institute**

**Analysis of Growth Media Water Moisture Over Time to Optimize Plant Performance in a Biowall**

Author:

Elaina Ludwig, College of Engineering

Abstract:

Abstract Redacted

*Research Mentor:*

*Bill Hutzal, Mechanical Engineering Technology*

**Poster Number:** 283 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Dynamic Visualization in Game Theory**

**Author:**

Natalie McGuckin, Polytechnic

**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 analyzing the results of 37 years of computation on Purdue's clusters, resulting in 72 petabytes of data. The goal is to understand the underlying structure of the mathematics for a large game theory problem. We have built a tool where we can pick any three points in the parameter's space of the problem and have our visualization show us the structure of the game in that region. We are able to look at the visualization as a whole. At any (x,y,z)-coordinate, we can use an interactive "hover" feature that reveals the underlying mathematical structure to the user. We are using D3.js, a javascript library, to visualize the data. The visualization approach is crucial because the mathematical structure is recursive. We routinely use the visualization tool to zoom into the space, revealing the fine-grain details of the attributes for the space, in a way that would be impossible without this tool. This research is related to a foundational game theory problem that has been open since the 1960s. By conducting this research we will further the understanding of this foundational game theory problem. The research team is supported by the National Science Foundation Grants #0939370, #124f6818, #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 and (by courtesy) of Mathematics*

**Poster Number:** 284 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**"Reading between the data points": Analysis of a Government-sponsored Virtual Internship Recruitment Process**

**Author:**

Jayjay Jeongjin Park, Krannert School of Management

**Abstract:**

Internships are an important, and in many cases necessary, compliment to most any undergraduate experience. Unfortunately, internships can be very competitive and thus, hard to obtain. In an attempt to overcome this issue and introduce potential graduates to service-oriented government jobs, the U.S. Department of State has established the Virtual Student Federal Service (VSFS) internship program, which allows student interns to work "virtually" from their home institution within the United States. Specifically, VSFS provides a service-learning opportunity to students, through semester-long internships working with government-based community partners. For example, student interns can work with the Bureau of Indian Affairs (BIA) on improving the web user interface for people with disabilities, the Veterans Affairs (VA) Department to optimize access to trauma counseling for veterans, and the Centers for Disease Control and Prevention (CDC) to create awareness around public health emergency preparedness. The purpose of this study is to understand what qualitative factors have the greatest influence on internship interest (as measured by the quantity of applicants). Preliminary mixed-methods analysis (qualitative coding conducted using NVivo software) has resulted in 5 key thematic factors including level of virtualness, conciseness of posting, disciplinary focus area, clarity of responsibilities, and level objectivity in job requirements. Preliminary findings have resulted in recommendations related to best practices for creating internship recruitment materials. These recommendations will not only be a benefit to the VSFS internship program (to increase access to service-learning projects), but also for other organizations attempting to recruit university-level student interns.

*Research Mentor:*

*Lisa Bosman, Technology Leadership & Innovation*

**Poster Number:** 285 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Virtual Reality Environment Optimization based on Real Environment Constraints**

**Author:**

Varun Ramakrishnan, Purdue Polytechnic

Krishna Suresh, College of Science

**Abstract:**

We present a novel method for real, and virtual constraint based level generation for 3D games, and virtual simulations where the user's physical space does not match with the game's virtual-space. These levels are generated using input from the user which will decide constraints like the difficulty of the level, length of game etc., The generation is also constrained by a set of parameters that can be altered by the user, or designer should they wish to do so. This approach minimizes the amount of pre-made assets that are needed for a game and tailors levels to not only each user, but also to each environment that the user is in. Our results show that this method produces a wide variety of unique levels, and tasks for users to participate in, all of which are fully playable. As VR is a relatively new field, our research will have applications in almost every field that includes virtual environments - video games, computer-aided physical therapy, general computer graphics etc.

*Research Mentor:*

*Christos Mousas, CGT*

**Poster Number:** 286 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Flight Operations Quality Assurance Integration**

**Author:**

Neil Sharma, Engineering

**Abstract:**

During the aircraft flight tracking process, issues can arise with the lack of update frequency of location data. There may be gaps in the data collected by an aircraft's navigation system, due to aircraft location, receiver location, interference, or other issues. Ideally, an aircraft should transmit its location data at pseudorandom, but frequent, intervals; however, the receiving system may miss data over extended periods of time. Even if data collection ceases for a second, the aircraft travels rapidly enough to cover a significant distance in this short amount of time. If air traffic control is unaware of the position of the aircraft for this brief amount of time, dangerous situations may arise when considering the number of aircraft airborne at a given time. The application of a Kalman filter will allow for a more precise prediction of an aircraft's location during these gaps in the data. The Kalman filter provides a much more accurate estimation on the aircraft's location during the flight by removing errors from GPS data and filling in missing data points with calculated points that best fit the data's trend. This research investigates the implementation of such a filter in an effort to more accurately track the Purdue flight student training aircraft fleet. Once a more accurate location has been calculated by a Kalman filter, the flight paths of all training aircraft in the air during the time period selected will be compared to determine if there are any airspace conflicts. This will display how often, if any, a student pilot's flight path intersects another student pilot's path which can potentially lead to a hazardous situation if not handled carefully.

*Research Mentor:*

*John Mott, Aviation and Transportation Technology*

*Kristoffer Borgen, Aviation and Transportation Technology*

**Poster Number:** 287 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Ground Support Equipment Damage Mitigation**

**Author:**

Nathan Smith, Engineering

Curtis Bouchie, Polytechnic Institute

**Abstract:**

Damage from ground support equipment collisions are costly for airlines and often result in logistical issues. Ground support equipment, such as bag loaders, aircraft stairs, and service vehicles, are required to operate in close proximity to the aircraft. If a vehicle is improperly operated and collides with an aircraft, significant damage may result. This damage often leads to compromised aircraft structural integrity, increased maintenance costs, and lost revenue from removing the aircraft from service.

To mitigate the likelihood of collisions, an off-the-shelf infrared range finding system was integrated into a belt loader. Although similar systems based on ultrasonic sensing are in existence, airports are high noise environments and may exhibit various forms of audio interference. An IR- based system is less prone to interference than a comparable ultrasonic system. The IR rangefinder will mount to ground support equipment and function as a limit switch during operation to prevent collisions when the equipment is moved too close to the aircraft. The research focused on a belt loader that is readily available, however the system can be adapted for use on any ground support equipment as needed. The research demonstrated that an older system can be retrofitted with collision avoidance technology, making it comparable to newer, costlier systems that are fitted with collision avoidance systems as standard equipment.

*Research Mentor:*

*John Mott, Aviation and Transportation Technology*

*Kristoffer Borgen, Aviation and Transportation Technology*

**Poster Number:** 288 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Effects of Avatar Heights in Work and Learning Abstract**

**Author:**

Jason Su, Polytechnic Institute

**Abstract:**

In most virtual environments, particularly in recreational settings, avatars in the surrounding populace are of same heights with small variations in size. Few virtual environments feature large size discrepancies between different virtual avatars, and few experiments have studied how this discrepancy influences users. To investigate how users react differently to other avatars of different size, we created a game environment with two enemy types differing in height. We then studied which enemy types players decided to attack first. Data is recorded across multiple rounds via time-stamped values. The results from our study will be presented. Although preliminary, we hope that these results can lead to further studies in both play and non-play contexts (a virtual training center with teachers of different heights, a virtual doctors' office with medical professionals of different heights).

*Research Mentor:*

*Dominic Kao, Computer and Information Technology*

**Poster Number:** 289 :: Social Sciences/Humanities

**Purdue Polytechnic Institute**  
**Trolling, Strain, and Individual Differences**

Author:

Ryan Tom, Polytechnic Institute

Abstract:

Abstract Redacted

*Research Mentor:*

*Kathryn Seigfried-Spellar, Computer and Information Technology*

**Poster Number:** 290 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Augmented Reality app for Pilots of Unmanned Aerial Systems**

**Author:**

Casey Vargovcik, Polytechnic

**Abstract:**

This research was intended to facilitate the development of an augmented reality application compatible with any Apple iPhone or IOS device. The application will allow pilots of Unmanned Aerial Systems (UAS) to locate and visualize manned aircraft operating in the same airspace to prevent potential collisions. Today, UAS are an increasingly popular tool for commercial applications. As their popularity grows, so does the risk of collisions with manned aircraft. This is due primarily to visibility and depth perception issues that result in difficulties with judging the location of aerial vehicles. Currently there are no standard procedures in place to help UAS to avoid flight conflicts, other than the yielding of airspace to manned aircraft. The application will facilitate easier visualization of both UAS and manned aircraft by using AR to generate larger objects for the pilot while maintaining ease-of-use. This would allow the pilot to operate the UAS with greater safety and airspace visualization. The overall goal is to display the UAS and aircraft in the airspace using real-time data.

*Research Mentor:*

*John Mott, Aviation Technology*

*Kris Borgen, Aviation Technology*

**Poster Number:** 291 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**Fatigue in Collegiate Aviation Training**

**Author:**

Sarah Wolfe, Polytechnic

**Abstract:**

This research seeks to collect and analyze data from collegiate flight training students over the course of four weeks in order to determine pilots' level of sleepiness at four measured times throughout the day; sleepiness being measured by two respected sleepiness measurement scales. The goal is to identify both days of the week as well as specific times throughout the day in which pilots are most fatigued. The purpose of this paper is to collect, analyze, and present data so that faculty, staff, and department leaders can make informed decisions about if and how the university flight program should be adjusted to achieve maximum safety and student success.

*Research Mentor:*

*Julius Keller, SATT*

**Poster Number:** 292 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**A Novel Physical Implementation of Optimized Neuromorphic Architecture for Robotic Tactile Sensing Skin**

**Author:**

Yuqing Xu, College of Engineering

**Abstract:**

This project is about building a flexible tactile sensing skin for robots by integrating a printable neuromorphic architecture into a physical implementation with conductive resistive materials to create a soft skin-like structure. The computational component of this architecture is based on an Artificial Neural Network (ANN) that is trained to compute the centroid location and enables the capabilities of sensing and localizing textures. The challenge of creating this tactile sensing skin comes from an implementation of a neuromorphic architecture into a physical circuit. The physical circuit mimics how a biological neuron works by using conventional silicon components of a single resistor and a single transistor. This project validates the circuit implemented with an optimal neural network on both circuit simulation software and physical circuit on PCB. This physical implementation of a novel neuromorphic architecture is a critical step toward the ability to mass produce robotic materials embedded with distributed computation and sensing.

*Research Mentor:*

*Sangjun Eom, School of Engineering Technology*

*Richard Voyles, School of Engineering Technology*

**Poster Number:** 293 :: Mathematical/Computation Sciences

**Purdue Polytechnic Institute**

**A Sequence Model Based Approach to Unknown Words Identification**

**Author:**

Yi Zhang, Polytechnic Institute

**Abstract:**

The recent advancement of contextualized language models, such as ELMo (Peters et al., 2018) and BERT (Devlin et al., 2018) has broadened a path for tackling the unknown word problem in NLP. Specifically, the masking methodology introduced by BERT effectively incorporated unknown words predicting into generic neural network structures. However, from a linguistics point of view, a language machine learning model has its limitations - it does not integrate the semantics of the words during the training phase of the model. This study explores the feasibility of including semantic features into contextualized based machine learning models in resolving the unknown words recognition task. Inspired by a linguistics approach in refining the meaning of the unknowns (Taylor & Raskin, 2011), we propose a heuristic to “understand” the unknown words, particularly nouns, through a sequence learning model. Pre-trained word embeddings, which contribute to the semantics, are applied with an LSTM learning model to train on a Wikipedia corpus. The model is expected to predict a set of candidate words that exhibit similar meaning to an unknown noun based on the contexts. This study aims to examine the effectiveness of semantics in the widely adopted contextualized approaches.

*Research Mentor:*

*Xiaonan Jing, Computer and Information Technology*

**Poster Number:** 294 :: Social Sciences/Humanities

**Purdue Polytechnic Institute**

**Understanding the Complex Canvas of Lafayette Using Data Visualization**

**Author:**

Allen Zheng, Polytechnic Institute

**Abstract:**

The city of Lafayette is rich in culture, creating a complex and diverse canvas of study. The issue of concern involves the equitable balance of resources and opportunity. In order to provide a viable solution to access to resources, population data must be explored to identify where the imbalances are. The purpose of this research is to apply data visualization techniques to understand census data for both Indiana and Lafayette. This work extends beyond basic visual representations of census data and will utilize visualization layouts that provide insights into the socioeconomic indicators that exist in the data. This research aims to address the following research questions: What are the socioeconomic indicators of growth and development that characterize Lafayette? What is the broader impact on the Veteran population in the state and in the city of Lafayette? Are there other unexplored indicators that could provide insight into stakeholders? In this study, 2018 and 2019 census data for Indiana and Lafayette will be analyzed for unexplored trends. Ultimately, the goal is to inform stakeholders of all levels (community, local, state) of how they can more efficiently improve their talent pipeline and workforce. Tableau, d3, Javascript, and Python will be used to visually represent the data in the form of a data dashboard. This dashboard will help identify issues related to poverty and inequitable distribution of resources. The implications of this work will inform future workforce and development decisions based on census data.

*Research Mentor:*

*Vetria Byrd, Computer Graphics Technology*

**Poster Number:** 295 :: Innovative Technology/Entrepreneurship/Design

**Purdue Polytechnic Institute**

**Enhancing Conveniences beyond Remote Control through an Ontology-based Internet of "Kitchen Things"**

**Author:**

Haozhe Zhou, College of Science

Qinglan Wu, College of Engineering

Vick Hung, Purdue Polytechnic Institute

**Abstract:**

The integration of the Internet of Things (IoT) has created a wide variety of smart appliances that enabled new lifestyles and interactions between users and appliances in our kitchens. A smart speaker brewing a coffee or recommending for dinner menu through voice commands is no longer a scene from a Sci-Fi movie that portrayed the lifestyle of a futuristic kitchen. However, the convenience provided from these applications has been limited to "remote control," which requires humans to explicitly specify the commands to perform tasks. The limitation is more evident in complex multi-step activities such as cooking, where humans need to interact with multiple devices and supervise the entire process. TupperwareEarth, a novel semantic network of "Kitchen Things" aims to tackle this limitation by reducing human intervention and enhancing conveniences beyond remote control. While Smart Tupperware, wireless multi-sensory containers, serve as core hardware in collecting extensive data in the status of food ingredients, we use an ontology as a database to infer the context and make comprehensive decisions. By integrating ontological semantics, TupperwareEarth can leverage the context in cooking activities to dispatch tasks to each IoT appliance, bringing convenience to the human at the front-end.

*Research Mentor:*

*Sangjun Eom, School of Engineering Technology*

*Richard Voyles, School of Engineering Technology*

**Poster Number:** 296 :: Life Sciences

**College of Health and Human Sciences**

**The Presence of Sensory Modalities in NGS Compared to LRC In the Purdue Early Phenotype Study**

**Author:**

Patricia Aguilar, College of Health and Human Sciences

Delta Smith, College of Health and Human Sciences

**Abstract:**

Children with neurogenetic syndromes (NGS) display various symptoms associated with hypersensitive sensory modalities regarding eating patterns. We hypothesized the presence of sensory modalities is higher in all NGSs compared to low risk control participants (LRC). 163 children with NGSs (PWS=23, WS=31, AS=34, and LRC=75) aged 12-60 months with relevant data were selected from the Purdue Early Phenotype Survey (PEPS), a longitudinal study on cognitive development. In addition to gustatory and tactile modalities associated with eating behaviors, we also analyzed auditory, visual, and vestibular scores, all from each child's most recent assessment. Gustatory, tactile, and visual were natural log transformed. Wilcoxon t-tests were used to examine the association between each modality and NGS. All mean modality scores were statistically significant across AS, WS, and the all-NGS group, but not PWS. This research will help inform future studies in combating sensory processing challenges faced by individuals with rare genetic syndromes.

*Research Mentor:*

*Anita Aalia Panjwani, Department of Nutrition Science*

**Poster Number:** 297 :: Physical Sciences

**College of Science**

**Measurement of Annual Muon Modulation from XENON1T**

Author:

Luke Foltz, Science

Yinchen Zhou, Liberal Arts

Ian Bowyer, Science

Abstract:

This project aims to measure an annual modulation in the muon flux through the XENON1T Dark Matter Experiment, specifically in the water tank muon veto system surrounding the detector. Muon events are counted over an entire year and are weighted by the amount of time the detector was on. The relationship between muon flux and time will then be compared to atmospheric conditions, specifically the atmospheric temperature. We expect a direct correlation between atmospheric temperature and the flux of muons detected.

*Research Mentor:*

*Abigail Kopec, Physics*

*Dr. Rafael Lang, Physics*

**Poster Number:** 298 :: Life Sciences

**College of Science**

**A Quantitative Analysis of the Rat Estrous Cycle**

**Author:**

Olivia Jimenez, College of Science

Harsh Srivastava, College of Science

Gabriela Fernández, College of Science

Madison Crapo, College of Science

Bailey Mahoney, College of Science

Collin Stark, College of Science

Nathan Stelflug; Isaac Gottschalk; Andrew Edwards; Ashley Birkhimer, College of Science; College of Science; College of Health and Human Sciences; College of Engineering

**Abstract:**

As there are physiological similarities between rats and humans, the rat estrous cycle has been used as a model to understand the menstrual cycle in female humans. The purpose of this study was to identify a quantitative technique that comprehends the estrous cycle of female lab rats, rather than the traditional qualitative method. The test subjects were retired breeding rats. The study followed a 21 day period where the laboratory rats were vaginally swabbed twice a day at specific times. The slides were preserved and stained using an adjusted Papanicolaou staining method. Imaging of the slides was done with 40x and 100x magnification and they were uploaded to MIPAR© (Medical Image Processing and Repository) software to be measured and analyzed. One of the four estrous cycle stages (proestrus, estrus, metestrus, and diestrus) was then distinguished using the slide's varied cell types. It was discovered that due to the breeding history of the subjects, the physiological nature of their cycles and fertility was too disrupted to provide definite results. While the quantification factor of the cells is still unknown, new information was exposed as a result of the research. Imaging analysis showed that female rats are never fully in one stage or another. Rather, the reproductive cycle fluctuates so that the specific cellular characteristics from one stage can be seen between the stages as well. Furthermore, the information gained from this study will have beneficial implications for researchers studying fertility and contraceptive drugs in women.

*Research Mentor:*

*Nancy Pelaez, Department of Biological Sciences*

**Poster Number:** 299 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Identification of type/level of fore exertions in physical exposures using computer vision**

**Author:**

Parker Zehr, Krannert School of Management

**Abstract:**

The purpose of this study is to identify force exertions types/levels from postural and facial videos/measurements during push and pull exposures. A structure will be designed and built to conduct this experiment, which will allow to collect two pull/push exertions along with 3 different angles displayed by push and pull motions above the shoulder, waist level, and below the waist. Digital force dynamometers will be utilized to provide feedback to subjects at different force levels. Five subjects will conduct push and pull exertions at three angles and five force exertion levels of Resting, 30%MVC, 50%MVC, 75%MVC, and 100%MVC, which will give the total of 150 exertions (5 subjects\*2 exertions\*3 angles\*5 levels). Each force level will be demonstrated for 9 seconds. There will be two trials conducted for each force level and an allowable 2-minute resting period between every trial. During each exposure, necessary adaptation data will be collected via cameras and motion capturing system. Facial recordings and postural measurements using infrared postural analysis cameras will be used to produce an algorithm to predict the type and level of force being exerted. This will allow for safety standards to be analyzed automatically from recording the postural and facial videos of subjects.

*Research Mentor:*

*Hamed Asadi, Industrial Engineering*

*Denny Yu, Industrial Engineering*

**Poster Number:** 300 :: Social Sciences/Humanities

**College of Health and Human Sciences**

**The relationship between roommate dyads' self-other ratings of depression and personality traits**

Author:

Alexandria Bien, Health and Human Sciences

Abstract:

Abstract Redacted

*Research Mentor:*

*Mairéad Willis, Psychological Sciences*

*Sean Lane, Psychological Sciences*

**Poster Number:** 301 :: Innovative Technology/Entrepreneurship/Design

**Krannert School of Management**

**A Case Study of the Python Django Framework to Help Recruiters Identify Analytics Talent**

Author:

Xin Leong, Krannert School of Management

Abstract:

We develop a web application for companies seeking analytics talent for Purdue's M.S. in Business Analytics & Information Management program using the python Django framework. The motivation for this work is that university career services functions are often poor at showcasing their students for employment. Secondly, many data science and analytics degree programs either lack a course or opportunities within the curriculum that provide students an opportunity to design and develop open-source analytics tools for their end users. Our study provides a case for such a course where a student might extend their python programming skills to develop a front-end GUI using the Django framework for a real critical need within a universities' career services function.

*Research Mentor:*

*Matthew Lanham, Management*

**Poster Number:** 302 :: Social Sciences/Humanities

**College of Liberal Arts**

**Bosnia and Herzegovina: climate change adaptation**

**Author:**

Paulina Dawidowska, Liberal Arts

**Abstract:**

Bosnia and Herzegovina is a small country in South-East Europe. Among many problems, it is struggling with negative consequences of climate change. Floods are the most dangerous threat so far, disproportionately affecting people in rural and underdeveloped regions of the country. Example is 2014 flood in Vrbas Basin, with estimated cost of \$2.7 billion. This research is focused on adaptation of local communities to negative consequences of climate change, while preserving their traditional and valuable ways of living. It is focused on reasons for crisis faced, problems it causes, and evaluation implemented solutions based on the Sustainable Livelihood Framework.

*Research Mentor:*

*Andrew Flachs, Anthropology*

**Poster Number:** 303 :: Innovative Technology/Entrepreneurship/Design

**College of Engineering**

**Risk Assessment and Literature Review**

**Author:**

Nicholas Masso, School of Aeronautics and Astronautics

Darya Corry, School of Aeronautics and Astronautics

**Abstract:**

Extraterrestrial habitats have to survive under incredibly harsh environments. This project is meant to analyze the amount of damage done to an extraterrestrial habitat due to planetary dust interference and meteorite impacts. A set of specifications for robotic agents meant to correct the damage done to the system can be drawn from this research to help ensure the survival of the habitat. The habitat should be self-sustainable with these robots such that human interference is not necessary in the maintenance of the habitat.

*Research Mentor:*

*Ilias Bilonis, Mechanical Engineering*

*Murali Krishnan Rajasekharan Pillai, Mechanical Engineering*



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