



2024-1

UREP-C & NEXO CALDAS

FINAL SYMPOSIUM



UREP-C & NEXO CALDAS, 2024

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West Lafayette, IN

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Publication Date

Published: August, 2024

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UREP-C & NEXO CALDAS

The Nexo Global Rural program was born in 2021 with the purpose of enhancing the research capabilities of undergraduate students at the Caldas University, in the development of 6 month research internship at Purdue University (Caldas University, 2023).

As members of the Nexo Global Rural program and the latest participants in the program, It is a privilege to be able to be part of this experience. We deeply appreciate all parties involved who made this possible; people like Juan Diego Velasquez, Luz Ines Tascon, Carolina Zamorano, Mateo Acosta who contributed with their effort and dedication to make this possible.

We commit as a Nexo team, members of our alma mater Caldas University and ambassadors of Colombia at Purdue University, to give back all our knowledge acquired here to all those who trusted us, especially to the rural community to which we belong, providing a teaching of culture, improvement, knowledge and resilience. Also be an example for future generations, leaving an open door to knowledge at Purdue University for those who decide to follow their dreams on the path to research and cultural exchange.

With love: María Alejandra Osorio, Vanessa Valencia, Sebastián Franco, Stephanie Castaño, Andrea Taborda & Alejandro Daza Gallo.
Latest cohort Nexo Global Rural 2024-1

One day, an email arrives with an announcement. You send all the documents and apply, have an interview, feeling nervous about your pronunciation. Next thing you know, you are in the embassy waiting for your visa, thinking about the seasons and clothing for the next six months. Here we go, first time for many of us on an airplane, in another country, getting lost in a huge airport, questioning your speaking and listening skills, loaded with heavy backpacks and suitcases, and hungry. When you finally arrive in Lafayette, you receive the keys to the apartment. You open the door and see with whom you will be living and where you will be for half a year, with an empty pantry, a bed without sheets, and all your belongings still in the suitcases.

You go outside and see the snow for the first time, feel the cold going through your clothes, go to a store for the first time, thinking in pesos instead of dollars. Thinking about getting lost, your phone with no signal, feeling overwhelmed, until you get to campus and see the building where you will be working. You send the email to your advisor for the first meeting, get to know your team, learn how to pronounce better little by little, and train your ears to this new language with all the different accents thereof.

You get to know a little more about your roommates every day, their life, and you share yours, cooking together and going to explore together, learning the names of over 50 people. Getting to the apartment every day without feeling like it is your home, until a month passes, and the cold goes away. You learn to be punctual to catch the bus, and you don't get lost on campus anymore.

Between karaoke Tuesdays, salsa class on Wednesdays, and workshops all over campus, you begin to see that there are many opportunities to continue your studies in graduate school; learning and knowing new perspectives, creating a future as many people share their insights with you. This gives you the chance to know yourself, making you able to recognize skills that maybe you haven't developed as much before, becoming more independent, and rediscovering yourself. It also helps you to be thankful for your family's support back in Colombia, missing the food, the people, the weather, etc.

This program allowed us to share important moments with peers, building friendships that will last a lifetime. We learned so much about Colombia from each other, from the different meanings of words to the unique accents we bring, making us even prouder of our heritage. You might think that traveling within the United States would be impossible, but many of us have had the opportunity to explore more than we ever expected, with still so much left to see and do!

In a blink, five months have already passed, and now when you enter the apartment, and you see it as home, it is time to start getting ready to go back. We are eternally thankful for this experience, for the times shared with our roommates, the lab teams, our advisor for teaching us and guiding us, Juan and Lucy for making these programs a reality, and our families for their support!

Colombia Purdue Partnership

Juan Diego

Velásquez De Bedout



Luz Inéz
Tascón-Villa

The Colombia Purdue Partnership aims to establish itself as the leading global university partner for the Republic of Colombia. By fostering high-impact collaborative research, education, and economic development activities, this partnership seeks to bring substantial benefits to Colombia, Purdue, and the State of Indiana. Leveraging Purdue's Land Grant excellence in Learning, Discovery, Engagement, and Innovation, the partnership endeavors to build strong, mutually beneficial relationships that drive progress and strengthen the connections between Colombian and Purdue communities and their stakeholders.

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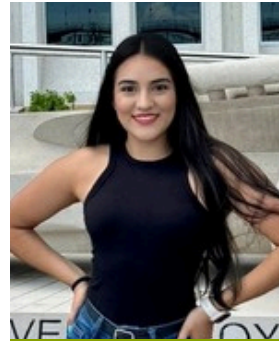
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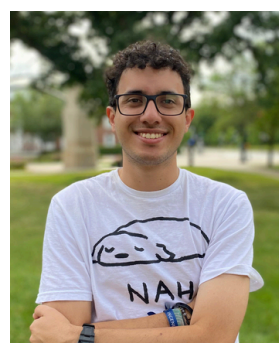
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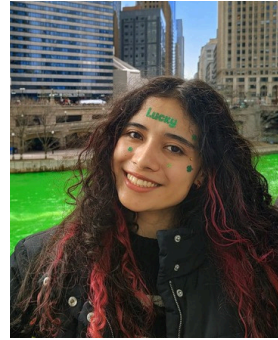
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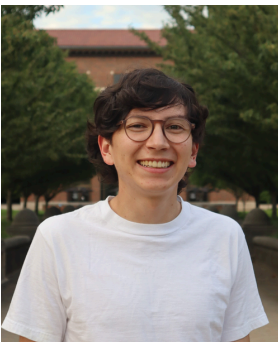

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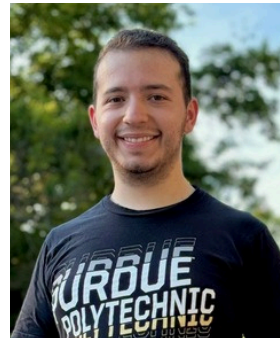
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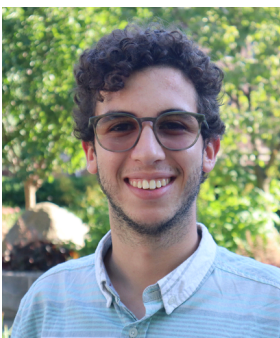
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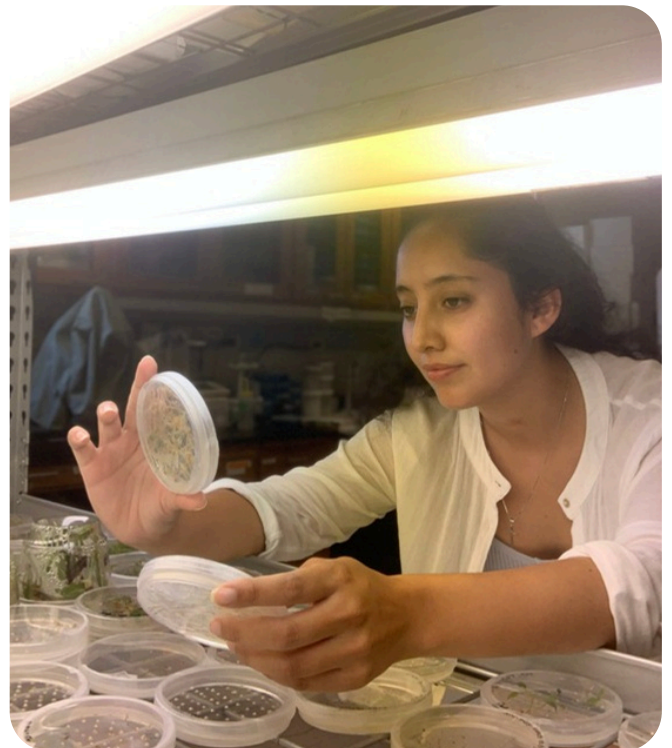
Transformation protocol employing the *Agrobacterium tumefaciens*-mediated transformation method, integrated with tissue culture techniques in quinoa (*Chenopodium quinoa*)

I worked in the crop molecular physiology lab of Dr. Cankui Zhang. There, I worked on my project to develop a transformation protocol employing the *A. tumefaciens*-mediated transformation method integrated with tissue culture techniques in quinoa. For this, we tested multiple combinations of three *A. tumefaciens* strains and six explant types to establish successful transformation systems for various quinoa accessions. We adopted the 35S-RUBY reporter system because it exhibits a purple/red color that can be detected easily by the naked eye in transgenic calli and plants. Until now, we have obtained important advances, where it is accentuated that purple/reddish colorations occurred only in the treatments with one strain, in the explants of leaves, roots, hypocotyl, petiole, and meristems in three different

accessions. Additionally, we proved the different morphogenic genes to induce the regeneration in the leaves and petiole tissues.

This project presents a contribution to my development and understanding of genetic transformation protocols in all the stages. And how this process in quinoa cultivation is a remarkable advance for the future obtaining of new cultivars, that present adaptations to be planted in different regions of the world, given that it is a potential crop for the challenges that arise in agriculture due to climate change.

The opportunity of the UREP-C program permitted me to improve my skills and academic knowledge in the biotechnology field. This experience enriched my cultural understanding, generated new friendly relationships, and shaped my personal and professional development. I appreciate the support of my university and professors Joaquin Ramirez, Helber Balaguera, and Luis Ernesto Rodriguez. In the same way, I extend my gratitude to Dr. Velasquez for this opportunity and Dr. Zhang for his guidance and patience in this experience.



“Be strong and courageous. Do not be afraid; do not be discouraged, for the Lord your God will be with you wherever you go”

- Joshua 1:9

Valentina Valle Velasco

Agronomic Engineering

Support in the curation and morphological analysis of specimens of *Cerotoma* (Galerucinae: Chrysomelidae) and *Ozolais* (Tenebrioninae: Tenebrionidae).

The project that I've been working on is about studying a genus of beetles which cause damage to legume crops. I've been examining specimens from collections in Colombia such as Museo Entomológico UNAB and Colección Taxonómica Nacional de Insectos; and also from Purdue Entomological Research Collection and Field Museum. By examining adult specimens and their genitalia, and comparing with existing literature, I could discern differences between species. The outcomes will significantly improve our understanding of *Cerotoma* diversity in Colombia and provide valuable tools for pest management and conservation efforts.

Additionally, I assisted Dr. Smith with a similar project focusing on beetles from *Ozolais*. I contributed to the development of a character matrix which will aid in the taxonomic revision of this genus. My role involved curating and identifying morphological characters that potentially distinguish between species.



Purdue Advisor **Colombia Advisor**
Aaron D. Smith Francisco Serna Cardona

The UREP-C program has been my most valuable academic and personal experience to date. I formed meaningful connections with colleagues and new friends who have significantly enriched my experience, and they will always hold a special place in my heart.

I'm deeply grateful to Dr. Smith and the Smith lab team for their guidance and for enhancing my research skills. I also appreciate Dr. Serna and Arturo's remote support, patience, and knowledge sharing. Furthermore, I'm thankful for the Purdue-Colombia Partnership, particularly Dr. Velasquez and Lucy who provided this opportunity to us. Saving the best for last, I am grateful for the unwavering support of my boyfriend, family and friends to accompany me in the way to get better opportunities, hold me and encourage me always to learn, love and be patient.

“Science, my lad, is made up of mistakes, but they are mistakes which it is useful to make, because they lead little by little to the truth”

- Jules Verne





Carlos Andres Erazo Garzon

Systems Engineer

Purdue Advisor

Jian Jin

Colombia Advisor

Andrea del Pilar Rueda Olarte

Automated nitrogen irrigation using leafspec scanner

This opportunity comes into my life to continue studying my areas of interest, and in the process, it has provided me with a group of experiences that I cherish. Being constantly surrounded by researchers creates a motivating environment. It is fascinating to hear my peers' ambitions and watch their projects gradually develop. Sharing with such ambitious people inspired me to achieve great results with my own project.

Throughout my studies as a Systems Engineer, I became obsessed with the idea of hydroponic farming. As an agriculture enthusiast, imagining soil-less crops that can be distributed vertically is very interesting. From my perspective, having a space that can accommodate something like this must be heavily automated to collect the maximum amount of data and achieve the best results. This concept not only enhances agricultural productivity but also contributes to sustainable farming practices, which is a critical issue in today's world.

To achieve this, small components need to be turned into reality. During my stay here, I developed a nitrogen irrigation system for twenty plants from scratch, where each plant needed individual irrigation. The project involved a closed system of pipes and electronic valves connected to a microcontroller that waits for orders from the cloud, which is controlled via an application. This hands-on experience has been invaluable, allowing me to apply theoretical knowledge in practical scenarios, thereby deepening my understanding and skills.

I am very grateful to the university and to programs like this one that allow for the continued development of ideas like mine. Such support has been instrumental in helping me and others to pursue innovative solutions and contribute positively to our fields.

"You have to try to make your own wishes come true."

- Meg Shaffer



María Camila Prieto Perdomo

Biology

Purdue Advisor

Scott McAdam

Colombia Advisor

Litta Samari Perico Franco

Stomatal and Hormonal Development in Leaves

During my time at Purdue University, I participated in the “Stomatal and Hormonal Development in Leaves” project of the Plant Physiology and Evolution research. I contributed to the understanding of abscisic acid biosynthesis and its relationship with stomatal development by establishing laboratory protocols.

I performed homogenization and centrifugation for the extraction of abscisic acid from *Pinus* sp. Protocol called for the preparation of permanent slides including samples from *Fagus grandifolia* and photographic register for future calculation of the stomatal index by epidermal cells. As part of a side-project, I performed an analysis of the enzymatic mechanism of xanthoxin oxidase in the conversion of xanthoxin to abscisic acid. This led to the final development of a new protocol for the isolation of xanthoxin from *Pisum sativum* seedlings.

Being a research scholar in a top-class university strengthened and developed valuable skills for my career. Working as part of a plant physiology laboratory taught me to deliver high-quality outputs from my work, and to communicate my ideas in an assertive manner.

This experience contributed significantly to my personal growth; it made me more adaptable, more tolerant of frustration, and more open to change. It provided moments that showed me new possibilities for my personal and professional future.

I will be forever grateful to UREP-C’s program, Dr. Litta Perico, Dr. Scott McAdam and his Lab team. I want to thank the existence of my nuclear family, my friends and the plants.

“Living for the simple moments and the shooting stars”

Maria Alejandra Osorio Marulanda

Food Engineering



Purdue Advisor

Bruce Hamaker

Thaisa Cantu-Jungles

Colombia Advisor

Cristina Alvarez Barreto

Whole food fibers for support of key gut bacteria for human health

Maria Alejandra Osorio Marulanda arrived at a new place with high expectations of learning opportunities. She is passionate about research, considering it an art that resonates with her. Her curiosity drives her, and her career has exposed her to countless learning experiences. At Purdue, she explored topics related to fruits, vegetables, grain products, dairy, and meats within the United States. This academic exchange allowed her to improve her language skills and immerse herself in different cultures. Purdue has opened doors for her, enhancing her personal growth and fueling her passion.

During my time at Purdue, I explored everyday products rich in nutritional content, particularly beneficial for intestinal health. My research centered on the fascinating world of the intestinal bacterial wall, where various bacteria influence nutrient absorption. Specifically, I studied dietary fibers that promote butyrate production—a crucial component protecting our intestinal wall and benefiting overall health. My project aimed to distinguish between inulin (used by companies to enhance fiber content but potentially causing gut issues) and natural, unaltered dietary fibers, creating an ideal blend for consumption.

I deeply appreciate my mentors for their patience and kindness throughout this process, to Juan Diego Velasquez and Luz Ines for assisting us during this process, to Lauren Sofia Yepes my workmate in the lab, for her patience and help in all this process. I also express gratitude to all the members of the University of Caldas and those who sponsored our stay; without them, none of this would be possible.



"I'm going to touch to the sky, before day I die"

- Kim Nam-joon

William David Quintero Gallego

Industrial Engineering

Resilient Foods Project

During my time at Purdue University, I had the privilege of working in the Agricultural Informatics Lab under Dr. Ankita Raturi, with the mentorship of PHD student Megan Low. In the lab, I contributed to the Resilient Foods Project, where I engaged in two projects. The first involved developing a database to model agents for an Agent-Based Model (ABM). The second project focused on conducting a content analysis of food maps in the Midwest to understand the organizations behind their creation and assess their key features and data sources.

This experience has been transformative both personally and professionally. I have improved my skills in GIS mapping, ABM, and data collection, while also strengthening my problem-solving abilities, creativity, and resilience. The lessons I have learned during my time here have prepared me for future endeavors and have helped me become a better professional and a more well-rounded individual.



Purdue Advisor

Ankita Raturi

Colombia Advisor

Carlos Eduardo Moreno

Life at Purdue has been vibrant and fulfilling. In my free time, I engaged in conversational clubs and English workshops to improve my communication skills. Additionally, I joined the salsa club, initially as a member and later as an instructor. This club not only allowed me to connect with friends from different parts of the world but also gave me the opportunity to teach and share a part of my culture, enriching my overall experience.

I extend my deepest gratitude to my advisor, Dr. Ankita Raturi, and my mentor, Megan Low, whose guidance has been invaluable. I also deeply thank Juan Diego Velazquez and Luz Tascon for their incredible work impacting the lives of many Colombian researchers through the Colombia Purdue Partnership, and to Dr. Carlos Eduardo Moreno, who enriched my academic journey. Lastly, I am profoundly grateful for the unwavering support from my family and friends back home, who have been my backbone throughout this journey.

"You should never sacrifice what you could be for what you are."

- Jordan Peterson

Lauren Sofia Yepes Fernandez

Biology



Purdue Advisor

Bruce Hamaker
Thaisa Cantu-Jungles

Colombia Advisor

Alejandro Caro-Quintero

Whole food fibers for support of key gut bacteria for human health

I want to reflect on this invaluable experience of learning, discovering myself and having a blast at Purdue. First of all I am immensely grateful for Dr Thaisa and Dr Bruce for letting me expand my passion for applied microbial research. My research project focused on the crucial role of gut microbiota in human health, specifically targeting a beneficial bacterium that reduces colitis. Given the Western diet's lack of plant-based foods and fibers, I aimed to design a fiber to promote this bacterium's growth and enhance gut health.

Throughout this research, I learned molecular biology techniques such as automated DNA extraction, qPCR, and in vitro fecal fermentation. As well as clinical trial design, literature reviews, and carbohydrate analysis. I presented my preliminary results at the Purdue Applied Microbiome Sciences, Annual Industrial

Associates Meeting and the Annual Food Science Meeting. It was rewarding to learn about Purdue's diverse research and meet the extraordinary individuals behind it.

While at Purdue, I enjoyed participating in extracurricular activities like the salsa club, basketball match, the eclipse, 4th of July fireworks, which helped me to immerse in the American college culture. Also I got to visit the beautiful Chicago and Indianapolis meeting people from all over the world, enriching my overall experience.

This experience at Purdue not only enhances my love for research in aim to improve human health but also expands my limits and makes me work harder and better to have a significant outcome in my research.

I want to thank Juan Diego Velasquez for this amazing partnership with Colombia and Purdue, Maria Alejandra Osorio my workmate at the lab for her company and patience in this project, and my professor from Colombia Alejandro Caro for always supporting me and believing in every crazy thing that I want to pursue. This is an unvaluable and unrepeatable experience, enjoy, and give and receive as much as you can.



"We cannot add days to our life, but we can add life to our days."

Stephanie Castaño Ossa

Food Engineering

Evaluation of microbial composition, soil enzymatic activity and induced systemic resistance of tomato plants under Bokashi fertilization

My research experience in the Soil Microbial Ecology Lab with Dr Lori Hoagland has been important and enrichment for me such as food engineering student because I learned new techniques for improve the quality of soil amendments. I was working in the research project using a bin called Bokashi Bucket with compost Bokashi that is an organic amendment and it is innovative technology to improve soil and plant health.

Bokashi Bucket produces an exudate called “Bokashi leachate” that could be useful as a fertilizer & microbial amendment. This product is obtained after fermentation of food waste with Bokashi under anaerobic conditions. I analyzed different chemical properties from Bokashi leachate and indicators of plant health after the fertilizer application. This project is a pilot test for the creation of future smart composting bins with sensors that control physical and chemical conditions to know when the compost is ready.



“Never give up”



Purdue Advisor

Lori Hoagland

Colombia Advisor

Carolina Zamorano

I had the opportunity to participate in the symposiums “Midwest microbiome symposium”, “Urban food systems symposium (Ohio)” and in the “HLA Research and Design Retreat 2024” where for the first time I presented a poster related to the research project. I met people from other countries who taught me new words, new foods and good times. I got to know big and beautiful cities like New York, Chicago, Columbus and Las Vegas where I spent unforgettable moments.

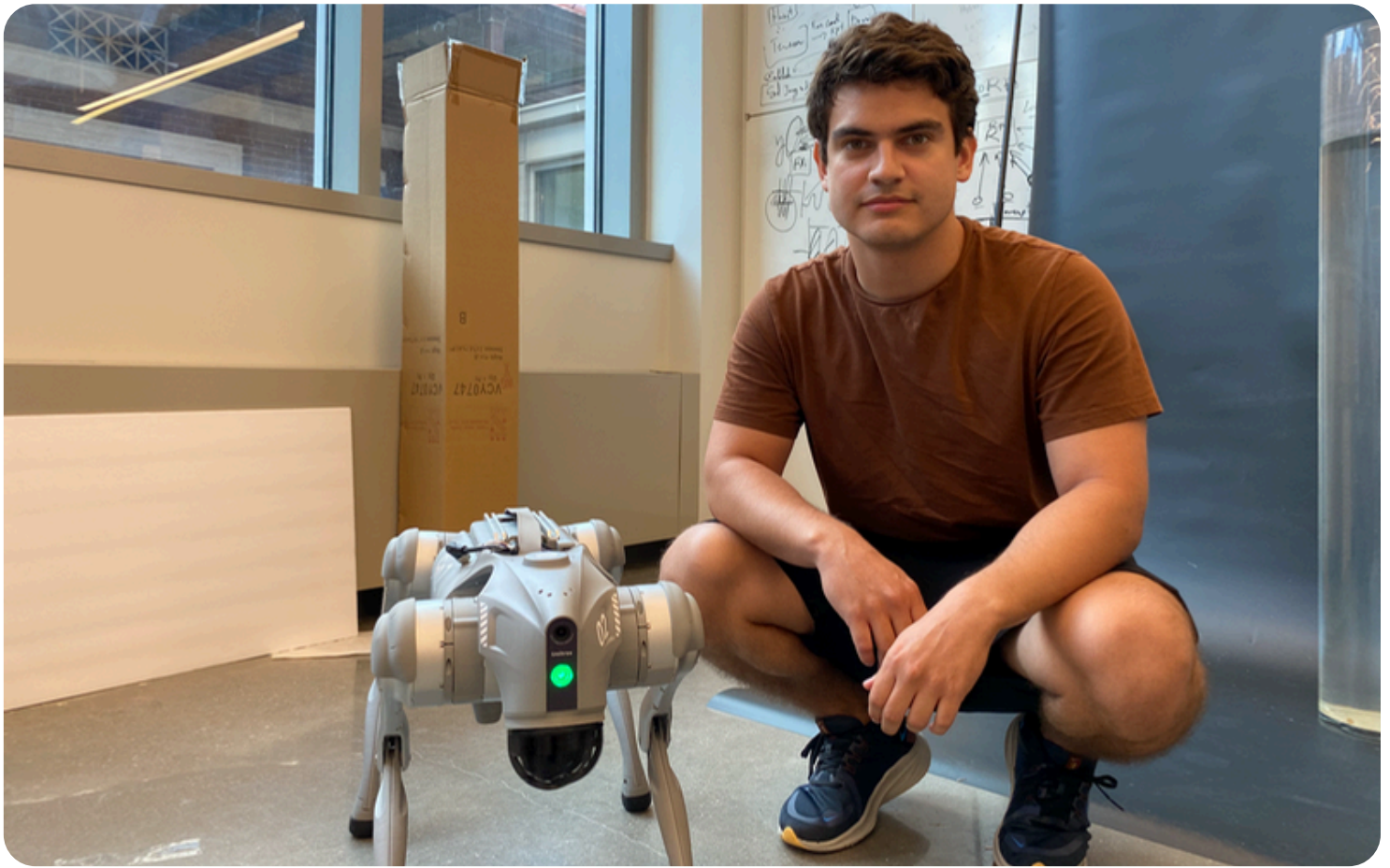
I want to say thanks Dr. Lori Hoagland for giving me a great learning opportunity and also laboratory group for guiding me and helping me in all the activities to complete my project. Thanks to Juan Diego Velasquez, Lucy Tascon, Carolina Zamorano, Mateo Acosta and Caldas University for allowing me to grow professionally with a new experience in the world of research at Purdue University.

Finally, thanks to my parents Sandra and José for supporting me in my dreams, to my grandparents, my uncles and friends for their advice and always accompanying me from a distance. I admit that it was wonderful to be part of the last cohort of Nexo Global Rural alongside incredible and unforgettable people.



College of Engineering





Juan Camilo Soto Martínez

Industrial Engineering

Purdue Advisor

Upinder Kaur

Colombia Advisor

Andres Osorio

Discovering Robot-Animal Interaction

During my tenure at Purdue University, my focus centered on exploring the interaction between animals and robots through deep learning. Despite my background in industrial engineering rather than robotics, my advisor, Upinder Kaur, provided invaluable guidance throughout this journey. Working with diverse teams encompassing animal science, mechanical engineering, electrical engineering, and mechatronics backgrounds significantly broadened my perspective and enhanced my teamwork skills.

My research primarily involved developing models for pose estimation and investigating how robots acquire movements from demonstrations. This not only deepened my understanding of robotics but also advanced my proficiency in deep learning techniques.

Navigating uncertainties and initiating projects from scratch presented challenges, yet discussions with my lab mates and peers from UREPC kept me motivated and aided in overcoming obstacles. Their unwavering support proved instrumental in maintaining focus on my objectives.

Reflecting on my Purdue experience, I cherish the growth and insights gained, motivating me to pursue further exploration in robotics and AI. I am determined to make substantial contributions to these fields in the future. I extend my heartfelt gratitude to Juan Velasquez and my advisor, Upinder Kaur, for their belief in my potential and unwavering support throughout this transformative journey.

“I try to walk and enjoy the journey, because I will never reach the destination”.

Mariana Vélez-Fernández

Builder Architect



Purdue Advisor
John E. Haddock

Colombia Advisor
Yhan Paul Arias Jaramillo

Environmental Product Declaration (EPD) Benchmark Project for Indiana Asphalt and Concrete Pavements

I want to express my gratitude and reflect on my time at Purdue University. It has been an incredible journey filled with growth, challenges, and valuable learning experiences. One of the most significant highlights of my academic career was working on the “Indiana Environmental Product Declaration (EPD) Reference Project for Asphalt and Concrete Pavements” under the guidance of Dr. John E. Haddock. This project, carried out in collaboration with INDOT, APAI, and ACPA of Indiana, aimed to enhance pavement sustainability in Indiana by assessing and comparing environmental impacts.

In this project, my responsibilities included creating an article review database, examining EPDs provided by contractors for various asphalt mixtures, evaluating different software for life cycle assessments (LCA), and compiling detailed reports on the findings.

Being at Purdue has not only expanded my academic horizons but has also pushed me outside of my comfort zone, leading to personal and professional growth. The experience allowed me to develop essential skills in LCA and EPD, overcome research obstacles, and understand the significance of effective teamwork and communication. Moreover, the vibrant campus life, filled with activities, workshops, and memorable events, has enriched my overall experience.

Finally, I want to thank myself for never giving up and believing in my abilities, express my gratitude to my mother, Ana Catalina, for her unwavering support and inspiration, as well as to my family for always loving me and all those who have contributed to my growth. Special thanks to Juan Diego and Lucy for letting me be part of UREP-C, Dr. John E. Haddock for the opportunity to participate in his project, Dr. Vito Francioso for his guidance, and MSc. Yhan Paul for recognizing my potential early in my career. Their support has had a profound impact on my life. I also extend my thanks to everyone who made my internship a truly memorable experience.



"Believe you can and you'll be halfway there"

- Theodore Roosevelt

Mateo Colorado Zapata

Chemical Engineering

Catalytic Depolymerization of Lignin of Corn Stover and Sawdust for Medium-Density Fiberboard (MDF) Production

Lignin is a naturally occurring polymer found in many plants. The goal of this project is to break down lignin into phenolic monomers by cleaving the β -0-4 linkage as well as produce a clean source of cellulose with the goal of creating cleaner sourced chemicals and safer products such as formaldehyde free laminate boards. Since lignin has strong C-O-C and C-C bonds, methanol is introduced as a supercritical fluid and solvent, as it helps to break the bonds by a nucleophilic mechanism.

The reactions were carried out on both sawdust and corn stover samples with a catalyst that is Nickel on Activated Carbon in a 100 and 600 milliliter Parr BSTR reactor. In this project I was able to improve the operating conditions of the reaction and proposed the use of steam explosion for the pretreatment of biomass.

At first, I had uncertainty about what this experience could be, but today, reflecting on the first day, I can say that the entire journey was worth it.



Purdue Advisor

Dr. Enrico N Martínez

Colombia Advisor

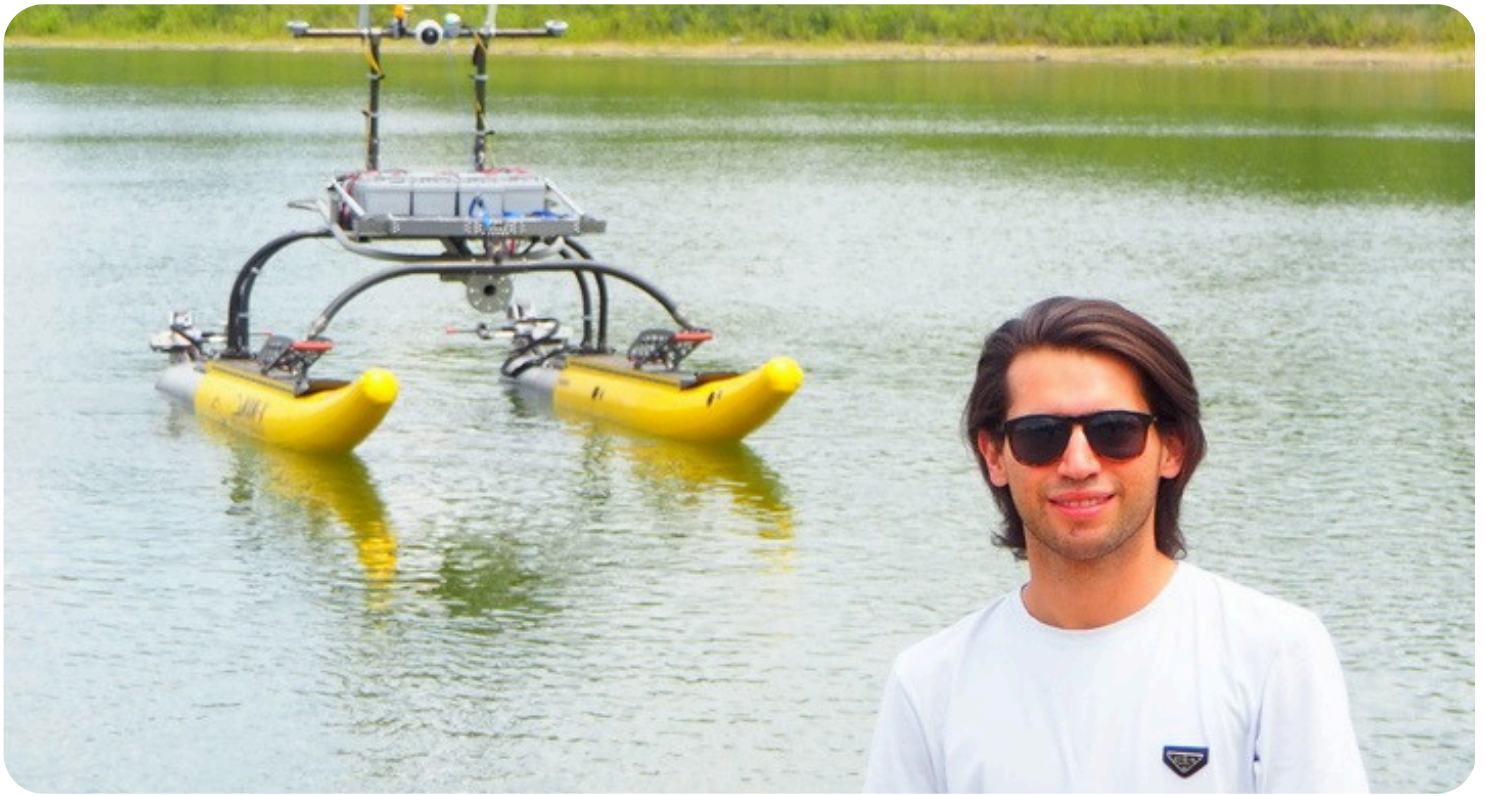
Carlos Sanchez Saenz

I am happy because here I was able to combine academia with two of my great passions: dance and teaching. Being part of the Purdue' Salsa Club as a teacher was a fantastic experience. There, I found great friends and built wonderful memories and smiles.

Purdue has meant a lot to me these past months, and I will always be grateful to Universidad Nacional de Colombia for their support. I deeply thank Juan Diego Velásquez and Luz Tascón for their incredible work through the Purdue-Colombia Partnership program, also with Ms. Rajdeep Deka and Dr. Enrico N Martínez who were a good mentors throughout my laboratory experience. Finally, special thanks to my mom, who has always pushed me towards the path of excellence and fulfilled an outstanding role as both father and mother.

With great sensitivity and joy, I can affirm that all the memories I made will remain in my heart.

"The future is created and belongs to those who seek opportunities, not just to those who wish for them."



Jhair Steven Gallego Mendez

Mechanical Engineering

Purdue Advisor

Nina Mahmoudian

Colombia Advisor

Ernesto Cordoba Nieto

Implementation of Path Planner for Autonomous Surface Vehicle (ASV) based on Dubins Curves

During my time at Purdue I implemented a Dubins curves-based path planner for the BREAM (Boat for Robotic Engineering and Applied Machine-Learning) project, a Surface Water Vehicle, to enhance its persistent autonomous operation. My work also involved integrating the Integral Line of Sight (ILOS) controller on top of a Proportional-Integral-Derivative controller, aiming to reduce the trajectory tracking error magnitude when tested on different trajectory profiles. My efforts resulted in a 50% reduction in the computing workload required to deploy the algorithms on the BREAM's computing devices. This achievement highlights the efficiency improvements and the robustness of the autonomous system developed.

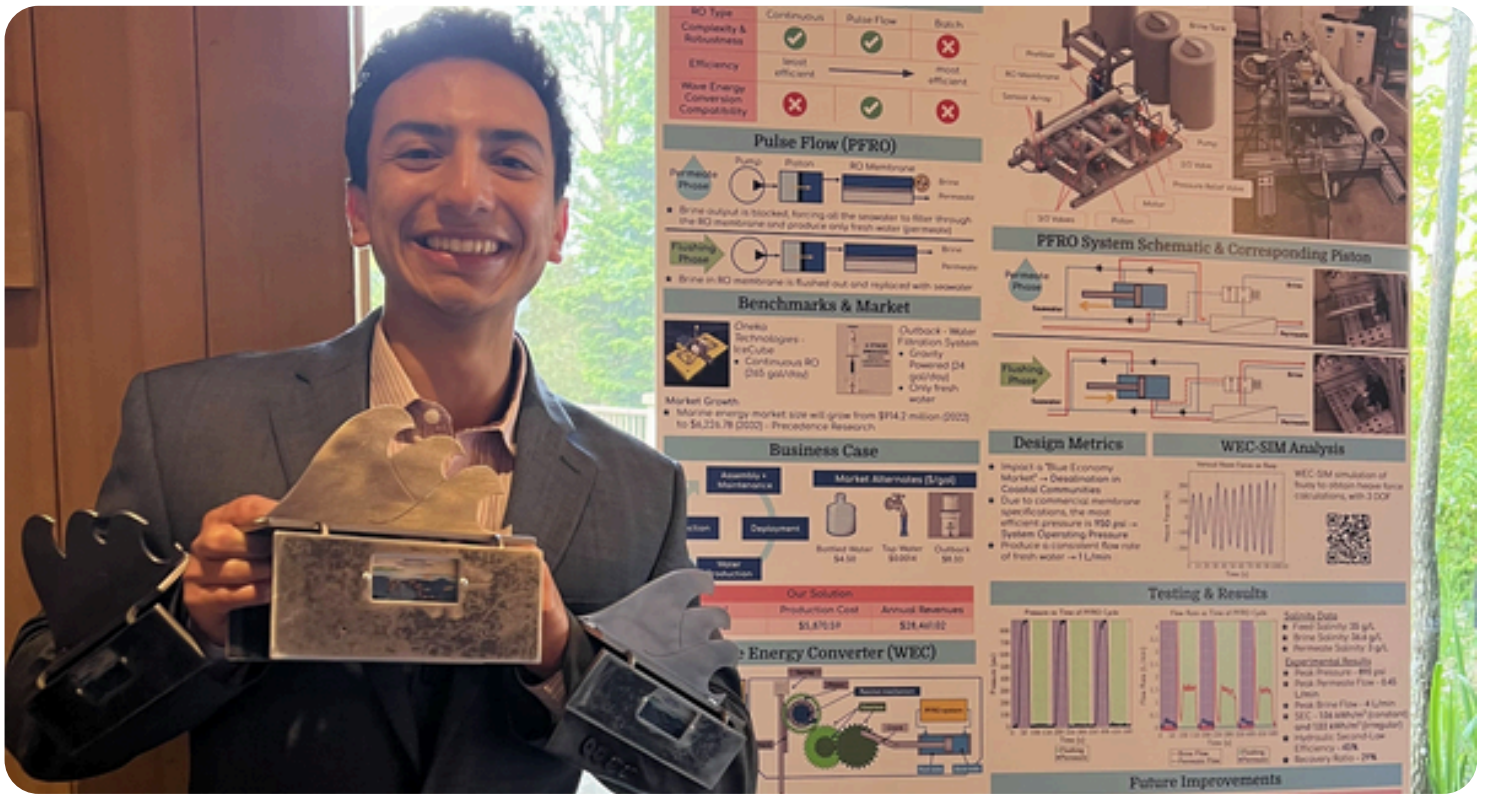
A significant aspect of my contribution lies in the deployability of the work across various platforms. The setup and configuration process now allow for

easy and efficient deployment on surface vehicles of different sizes, facilitating more effective testing of new research ideas that the lab will conduct in the future.

Participating in the UREP-C program profoundly enhanced my personal and professional growth. It fostered greater independence, pushed me out of my comfort zone, and provided opportunities to travel extensively and discover remarkable places. This experience has been invaluable, and I cherish the memories I've made.

I am grateful for the opportunity to conduct research at Purdue, special thanks to my advisors both at Purdue and Colombia. I also want to thank my family, the UREP-C program directors, and especially the people I interacted with at Purdue daily. Their support and companionship made my time at Purdue unforgettable and helped shape my future goals and life perspectives.

*“Stay hungry, stay foolish”
- Steve Jobs*



Oscar Eduardo Botía Sierra

Mechanical Engineering

Purdue Advisor

David Warsinger

Colombia Advisor

Giacomo Barbieri

Wave-Powered Pulse Flow Reverse Osmosis System

Definitely a life-changing experience; you get here being one person and leave being another, richer person. Regarding my research here, I was involved in the Warsinger Water Lab under Dr. Warsinger as my advisor. One of the projects we developed was about using marine energy to power a desalination device in the open sea. We were a 6-person team, and our work was competing in the MECC, sponsored by the U.S. Department of Energy and managed by NREL. The main idea was using the vertical displacement of the waves to lift a buoy that has a mechanism inside to create enough pressure in a piston tank to be able to push water through a reverse osmosis membrane and, thus, desalinate seawater. We built an experimental setup reaching pressures as high as 69 bar in the system, which is crazy. My role was to lead the electronics and controls of the system, and to model the behavior of the buoy under real wave data.

The competition was hosted in Portland, Oregon, and I am grateful I had the chance to go there, present the results with the team, and get to know

that beautiful city. We received several recognitions for our work: Best Poster, Best Community Outreach and Second Place Overall. A beautiful experience!

On the more personal side of the experience, this was my first time living alone, so it was a complete contrast from what I was used to back in Bogota. Though one needs to adapt and go forward with our responsibilities, and I think this changes something in ourselves, it makes us more independent and responsible. The cultural side of the experience was something completely new too, having that many people from all around the globe this close was amazing. Then there are all the places I visited. All these experiences are what made me grow here, so I am thankful to God for giving me this opportunity, to my parents for supporting me all the time from home, to my advisor Dr. Warsinger who gave me the chance, to my mentor Sultan for teaching me a lot of new things, to Juan and Lucy for being attentive to us the whole journey, and to the beautiful people I met here.

When you arise in the morning think of what a privilege it is to be alive, to think, to enjoy, to love..."

- Marcus Aurelius

Linda Julieth Méndez Aroca
Electronic Engineering



Purdue Advisor
Kaushik Roy

Colombia Advisor
Johan Eslava Garzón

Effects on Accuracy and Training Time of Changing Hyperparameters in Different Neural Network Architectures

During my time at Purdue University, I have worked on two projects in machine learning hardware. I was part of Professor Kaushik Roy's Nanoelectronics Research Laboratory (NRL), where I learned about this area.

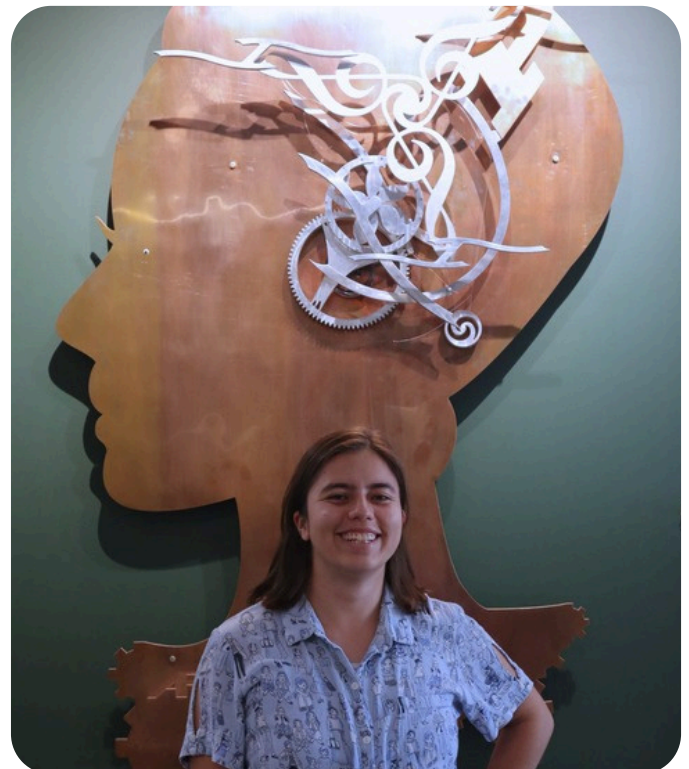
The first project was DvsGesture, which is a project led by PhD students Marco Apolinario and Adarsh Kosta. I used their project to conduct experiments and learn how changes in hyperparameters across different neural network architectures affect training time and accuracy.

The second project involved implementing a bit fusion accelerator, which is a hardware architecture designed to perform multiplication with bit-size flexibility. I learned a lot from these projects and enjoyed working in the laboratory.

In the beginning, I felt scared because all the topics were new to me, but I was determined to contribute to the lab. I realized that the process was to acquire this new knowledge, experiment along the way, try different strategies, seek advice, and discuss solutions with other students.

I like to spend a lot of time at the university, working in the laboratory, learning about hardware implementation, machine learning, programming, algorithms, and mathematics. I also enjoy visiting places on campus such as the fountains, libraries, the church, and basketball courts. All these experiences at Purdue have given me the opportunity to discover myself, develop my skills, and realize that things which once seemed impossible are now closer and within reach.

I thank God for giving me this opportunity to experience Purdue, learn about another culture, and make new friends. I am grateful to my professors, Kaushik Roy and Sebastian Eslava, and to all the students in the laboratory who were kind and willing to share their knowledge with me, especially Deepika Sharma and Marco Apolinario. I also want to thank my family and friends for all their support and motivation during this enriching experience.



"Your ability to solve problems is proportional to the effort and creativity you have applied"

**Juan Pablo
Zapata Castaño**
Chemical Engineering

Depolymeration of lignin

During my time at Purdue, I worked on research on the depolymerization of lignin to produce value-added products from agro-industrial wastes such as corn, rice, and pine sawdust residues. In this project we developed the best reaction conditions either at the level of parameters of the reaction itself or previous procedures in the reaction such as explosion by pressure change or reducing the size of the cell, also studied the effect of changing the form of catalyst and how to prepare it, in which I contributed with my analysis and support of these reactions concluding in finding the reaction coefficients with the different parameters. I learned the value of responsibility and the importance of prior knowledge to speed up the procedures.



Purdue Advisor

Enrico N. Martínez

Colombia Advisor

Angela Adriana Ruiz

I also learned about the local culture by participating in various activities such as St. Patrick's Day, Independence Day, among others. I got to know many places in the area because I rode my bike around the site where I learned about activities such as farmers' fairs. I did several culinary activities, learning about the local culture through their food and reproducing some of these recipes at home, where I learned about coexistence and teamwork to keep the house well.

I would like to thank Purdue University, especially, Lucy Tascon for the support in all the process. Dr. Juan Diego Velasquez de Bedout and Dr. Enrico N. Martínez, who were my advisors and allowed me to have this great experience. Also to the Universidad Nacional de Colombia and to my tutor Angela Adriana Ruiz for supporting me and being attentive to me in a foreign country. The support of my family to make this whole trip possible, especially at the beginning, and my roommates to live in a decent way and above all thanks to the UREPC program for making all this possible.



"If anyone can refute me—show me I'm making a mistake or looking at things from the wrong perspective—I'll gladly change. It's the truth I'm after, and the truth never harmed anyone."

– Marcus Aurelius.



Simón González Zapata

Mechanical Engineering

Purdue Advisor

Marisol Koslowski

Colombia Advisor

Juan Santa Marín &

Alejandro Toro Betancur

Modeling and Simulation of hotspot activation and Shock-to-Detonation (STD) transition in energetic material cyclotetramethylene tetranitramine (HMX) under shock compressive loading

During my stay, I had the opportunity to first start with simpler problems such as fracture mechanics in energetic materials. These simple problems allowed me to get familiar with the program Multi Physics Object Oriented Simulation Environment (MOOSE), a very powerful multi-physics simulation tool developed by Idaho National Labs (INL). Later on, I also had the opportunity to learn concepts of nonlinear mechanics, shock mechanics, plasticity models, and, subsequently, I was able to develop void collapse models for predicting hotspot activation for HMX at the nanoscale.

During the last couple of months, I started working together with a 4-year PhD colleague on a project supported by the Air Force Office of Scientific Research (AFOSR). For this effort, we joined forces with a fellow research group, Strachan group, to create a bridge between Molecular Dynamics (MD) models and Continuum mechanics models for void collapse. This project aims to produce a multi-scale

shock-to-detonation model for HMX to predict detonation failure based on hotspot density, activation and growth. I will be presenting part of this work in the 17th International Detonation Symposium in Kansas City, MO.

I want to deeply thank my advisor, Marisol Koslowski, for believing in my capabilities from day one, for allowing me to take part in important and exciting research projects, and for extending the possibility of rejoining her group for my PhD studies. I also want to thank my advisors in Colombia, Prof. Juan Felipe Santa and Prof. Alejandro Toro for their guidance throughout my undergraduate career and for introducing me to the world of materials science. Also, I want to thank the UREP-C program for making this experience possible. And, finally, I want to thank the friends I made during this program, they were also a key part of this experience.

“Beyond all ideas of wrongdoing and rightdoing there is a field, I will meet you there”

- Rumi



Luis Miguel Morales Lizarazo

Mechanical Engineering

Purdue Advisor
Robert P. Lucht

Colombia Advisor
Juan Miguel Mantilla

Dual-pump Coherent anti-stokes Raman scattering measurements in H₂/C₂H₄ Counterflow Flames

Combustion is a fundamental process in mechanical engineering and plays a crucial role in power generation for a wide range of industrial and domestic applications. My time at Purdue has been an invaluable opportunity to explore this dynamic field. Under the direction of Dr. Robert Lucht in the applied laser spectroscopy laboratory, I have experienced significant growth both personally and professionally.

During my involvement in the project, I focused on studying how flames are generated in the Williams Seshadri counterflow burner. We used the advanced CARS (Coherent anti-Stokes Raman Scattering,) technique to analyze the temperature and concentration of key species within the flame. This allowed us to perform detailed simulations to optimize combustion conditions and ensure their stability, looking closely at how different fuel compositions behave near the extinction point.

Our main objective was to improve flame temperature characterization using the CARS

technique, seeking to obtain more accurate and detailed results. This technique not only allowed us to study the thermal properties of the flame, but also helped us to better understand the combustion processes under specific mixing and oxidation conditions. The results obtained validated the effectiveness of the methodologies used.

In addition to the academic aspect, my stay at Purdue has been enriching on a personal level. Interacting with individuals from diverse cultures has broadened my perspective and enriched my understanding of the world. I have taken advantage of my free time to explore my personal interests and enjoy new experiences, including participating in conversation clubs to improve my English skills.

I am grateful to Dr. Robert Lucht, Juan Mantilla, Victoria de la Trinidad and Ben Murdock for their continuous guidance, and to Purdue University, Universidad Nacional de Colombia, and Purdue Partnership Colombia program for their support. Lastly, I thank my family and friends for their encouragement.

“Talent without work is nothing”

Douglas Daniel Blanquicett Salcedo

Mechatronics Engineering



Purdue Advisor
Luciano Castillo

Colombia Advisor
Emerson Rojas

Advancing Energy Solutions: Integrating Communication Systems in Microgrids

I have always been fascinated by working with renewable energy. The idea that such a valuable resource like electrical energy can be generated from unlimited sources on our planet, such as the sun and wind, has been my primary motivation.

Microgrids are localized energy systems that can operate independently or in conjunction with the traditional grid. They consist of a network of distributed energy resources (DERs) such as solar panels, wind turbines, batteries, and generators. Unlike traditional grids that rely heavily on centralized power plants, microgrids are designed to be more resilient, efficient, and sustainable.

In this project, my focus was on establishing efficient communication among various field devices that typically use manufacturer-specific protocols, which often limit flexibility in development. I implemented data transmission

using the Modbus TCP protocol to a central controller, which simultaneously operated as an OPC UA client-server. This manufacturer-agnostic integration not only facilitated data visualization in a final dashboard for comprehensive system monitoring, but also enabled effective integration between the control and communication systems of the microgrid. Since entering the world of research at Purdue, I knew my efforts would not follow selfish ideals or be to satisfy my ego. I always had the vision to be a source of progress for my educational institution and, above all, for my city. I want to make a real difference in my community, and this experience has been truly enriching, providing me with the knowledge and tools necessary to achieve this, leading me to personal and professional growth.

I would like to thank Professor Luciano Castillo for welcoming me into his incredible research team and Diego Aguilar for being an excellent guide throughout this journey. I also want to express my gratitude to Emerson Rojas for his support from Colombia and for being an example to follow. I hope to live up to their expectations. I'm also grateful to my family for always being there for me and pushing me towards the path of excellence.



*"The present is theirs; the future, for which
I have really worked, is mine"*

- Nikola Tesla

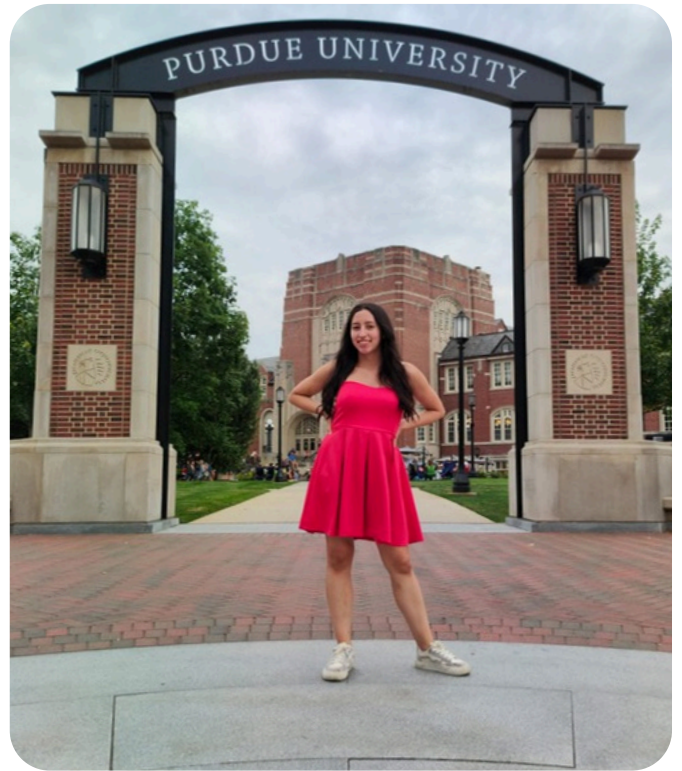
**Ana Milena
Espinosa Jiménez**
Chemical Engineering

Comparative Analysis of Wi-Fi 6 and 5G Network Performance for Smart Manufacturing Applications

always been passionate about the technological advancement of my country and the critical role of engineering in solving problems that enhance people's quality of life. Wireless communication networks are one of the inventions that have connected humanity and undoubtedly made our lives easier. Working in the development and research of wireless networks, especially focusing on 5G communications, fills me with immense pride and gratitude. This opportunity is even more significant given that my country is only just beginning to conduct its first 5G network tests.

The project I worked on involved sending and receiving data from various devices using different protocols and methods, comparing data acquisition between 5G and WiFi6 networks for industrial applications.

Through this project, I gained invaluable knowledge in socket programming and multithreading, focusing on data transmission



Purdue Advisor
Kim Kwang Taik

Colombia Advisor
Gloria Margarita Varon

using Python through NVIDIA JetPack on Jetson Nano cards. Additionally, I delved into deep learning and convolutional neural networks (CNNs), training a model with PyTorch for image segmentation.

Having the opportunity to work with these technologies and learn from experts with profound knowledge has been one of my greatest academic experiences. I am deeply grateful to my advisor, Professor Kim Kwang Taik, and my mentors Cheng Chen and Yuan-Yao (Mike) Lou. Someday, I aspire to attain the knowledge and expertise they possess. I also extend my gratitude to Dr. Juan Diego Velazquez and Lucy from Purdue, as well as Felipe from UNAL Bogotá, for making this program possible and positively impacting the lives of many Colombian researchers. Lastly, I express my gratitude to my family, friends, and Universidad Nacional de Colombia for their unwavering support and for sponsoring this excellent program, making my last semester unforgettable.

"I was taught that the way of progress was neither swift nor easy."

- Marie Curie





Julian Mauricio Cruz Rojas

Physics

Purdue Advisor
Stylianos Chatzidakis

Colombia Advisor
Fernando Cristancho Mejía

Autonomous control & remote operation of microreactors

Throughout my experience at Purdue University, I have worked under the guidance of Professor Stylianos Chatzidakis at the RADiANS laboratory, making progress towards the development of an autonomous control system for nuclear microreactors. This project proposes a novel technology based on AI techniques, such as machine learning and deep learning, capable of controlling a nuclear microreactor with minimal human assistance. These advances would allow state-of-the-art nuclear reactor designs to be used in a wide range of applications where the presence of operators is not possible.

During this experience, I have had the rewarding opportunity to improve my programming skills in a fast-growing field, allowing me to combine my previous interest in nuclear energy with my love for computation, and opening my eyes to new exciting technologies that I believe are of great value for society in addressing current environmental and energy challenges.

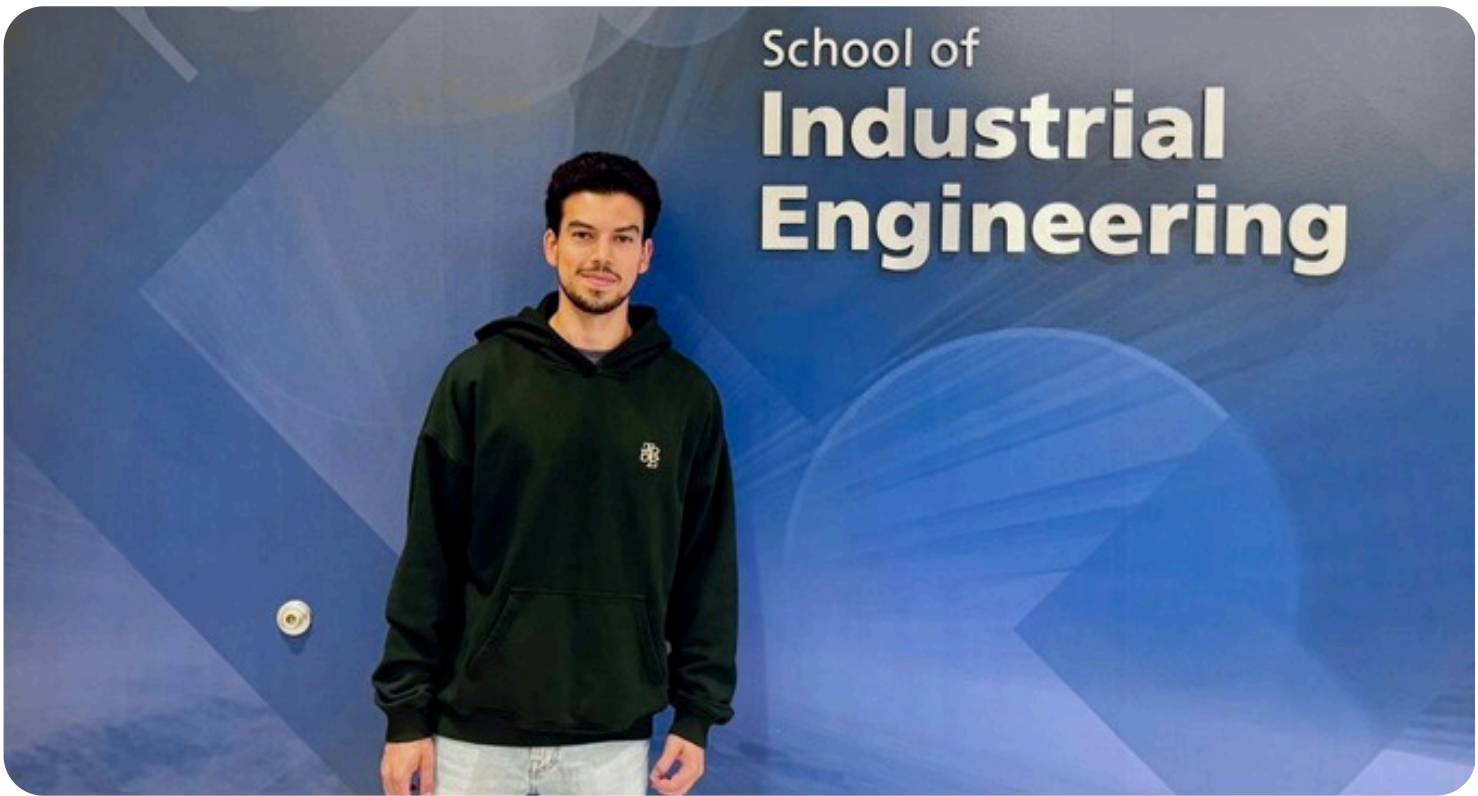
With the support of Professor Chatzidakis and his team, I had the pleasure of contributing to academic publications and writing my undergraduate thesis, achievements that will undoubtedly serve as steppingstones for my pursuit of graduate studies.

Outside of academia, my time at Purdue allowed me to participate in physical and cultural activities. The CoRec facilities offered me an amazing way to clear my mind, while the array of musical and theatrical events hosted on campus and in Lafayette provided opportunities to socialize with colleagues, have fun, and sharpen my English skills.

Overall, I have greatly enjoyed my time at Purdue University, and I am deeply thankful to Dr. Juan Diego Velasquez, Luz Ines Tascon, Professor Stylianos Chatzidakis, and Professor Fernando Cristancho for their support and efforts in making this experience possible.

“What we observe is not nature itself, but nature exposed to our method of questioning.”

- Werner Heisenberg



Camilo Delgado Burbano

Industrial Engineering

Purdue Advisor
Young- Jun Son

Colombia Advisor
Ricardo Barros

Optimizing Robot Control via the Digital Twin of PiCar-X

This project involved developing a digital twin of the PiCar-X, a robotic car popular in research and education. Digital twins are invaluable for cost-effective simulations. Our primary goal was to create a physics-based simulation model using NVIDIA Omniverse.

To begin, I built a 3D model of the PiCar-X with Blender and Isaac Sim, two of the Omniverse connectors. Next, I established communication between the virtual and real car using the MQTT protocol, creating a custom extension in Omniverse Code. This allowed me to control the real Picar-X and simultaneously send data—such as sensor readings, angles, and velocity—from the physical car to its virtual counterpart, ensuring accurate behavioural replication.

Looking ahead, we aim to expand this framework to multiple virtual models, enhancing collaborative tasks among cars. This approach could revolutionize

autonomous operations like warehouse picking processes.

Participating in Purdue University's UREP-C program opened my eyes to international research opportunities and new fields of study. I am deeply grateful to Juan Diego Velasquez and Lucy Tascon, the program's leaders, for this chance.

Special thanks to my advisor, Dr. Young-Jun Son, for his invaluable guidance and encouragement. I also appreciate the hospitality and support of the CIMSLAB team, especially Tariqul Islam, who worked closely with me.

Finally, my deepest gratitude goes to my family in Colombia for their unwavering support and belief in my potential. They have been my constant source of motivation.

“FOCUS: Follow One Course of Action Until Successful.”

- Robert Kiyosaki



Vivian Toca Díaz

Mechanical Engineering

Purdue Advisor

Riley B. Barta

Colombia Advisor

Fabio Sierra Vargas

Test Rig Development and Automation for Characterizing Thermophysical Properties of Refrigerant-Lubricant Mixtures in Extreme Temperature Vapor Compression Cycles

My journey at Purdue University has been nothing short of transformative. Under the esteemed guidance of Professor Riley Barta and Master Student Ganesh Brammanayagam at Herrick Laboratories, I embarked on the groundbreaking project of developing a new test rig from scratch to measure the properties of Refrigerant-Lubricant Mixtures. This endeavor is of global significance, as refrigeration systems consume 20% of the world's energy, according to "The Future of Cooling" report by the International Energy Agency (IEA, 2018). Contributing to this research has been an incredible opportunity to make a meaningful impact on energy consumption and climate change mitigation.

The project's pioneering nature demanded creativity and unconventional thinking, as we ventured into relatively uncharted territory. Undertaking the design, modeling, fabrication, and testing of a sophisticated test rig was a monumental challenge that required sourcing manufacturers and materials capable of meeting stringent, non-standard specifications.

I've learned the importance of thoroughness while avoiding tunnel vision. Overcoming initial setbacks and numerous rejections, I refined my communication skills and learned to navigate complex technical requirements.

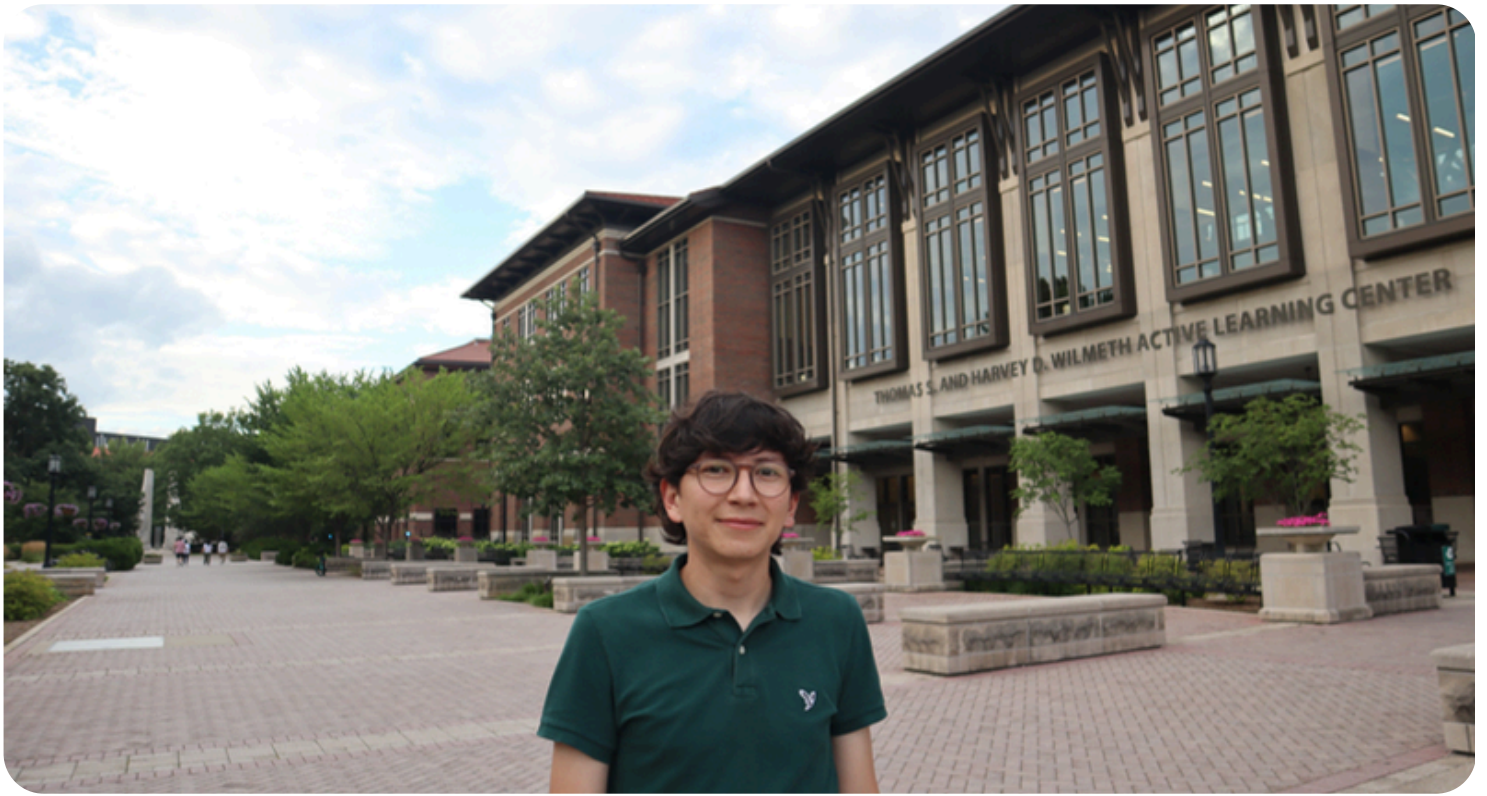
This experience underscored the importance of comprehensive problem-solving and maintaining a broad perspective to drive project success.

On a personal level and beyond the lab, Purdue offered a vibrant campus life. Within its diverse cultural environment, I consistently found common ground and connections with others despite cultural differences. This enriched my perspective and fostered meaningful relationships. The balance of academic rigor and community involvement provided a holistic growth environment.

I am profoundly grateful to my advisor, the dedicated PhD student, and the entire Herrick Laboratories team for their unwavering support. My heartfelt thanks also go to the UREP-C program and the sponsors who made this invaluable experience possible.

"It always seems impossible until it's done."

- Nelson Mandela



Daniel Avila García

Civil Engineering

Purdue Advisor
Dr. Yiheng Feng

Colombia Advisor
William Castro Garcia

Building and Calibration of Microscopic Simulations Models Using SUMO for the Assessment of Intersection Traffic Control Strategies

During my academic journey at Purdue University, under the mentorship of Dr. Yiheng Feng in the Connected Automated and Resilient Transportation laboratory, I developed and calibrated microscopic simulation models using SUMO (Simulation of Urban Mobility). Focusing on a corridor in Ann Arbor, Michigan, I created traffic signal control models and collected performance measures. This project is part of a research initiative aiming to compare the impact of emerging technologies, such as reinforcement learning, on the control of signalized intersections. Technologies like these can potentially reduce travel times and enhance the comfort of urban mobility. Additionally, I participated in the Mcity Challenge, an autonomous vehicle path planning competition, with fellow students in the lab.

This experience not only improved my skills in traffic simulations, programming, and computation, but also deepened my interest in seeing how emerging technologies can transform urban mobility. Through weekly CART lab meetings and various congresses—especially the CCAT 2025 Global

Symposium on Mobility Innovation presented by Mcity and UMTRI—I have been exposed to pioneering topics and have observed the current challenges in traffic management and mobility.

Outside the academic realm, I actively engaged in extracurricular activities, notably the "American Gaming Culture" conversational club, which helped me socialize and integrate into the university community.

These experiences have fueled my motivation to pursue master's studies. My curiosity and passion for addressing current and future mobility challenges drive me to seek a program where I can explore the latest advances in mobility engineering. This path will enable me to integrate technological innovations and equip me with the cutting-edge knowledge necessary to contribute effectively and generate proactive solutions.

Lastly, I would like to express my heartfelt gratitude to Professor Feng, my fellow students at the CART lab, and all the friends I have made, who have played a supportive role throughout this experience.

"Wisdom's a gift, but you'd trade it for youth"

Ana María Medina Ramírez

Biomedical Engineering



Purdue Advisor
Andy Tao

Colombia Advisor
Juan Carlos Cruz

Development of a microfluidic paper-based analytical device (μ PAD) for extracellular vesicle-based biomarker detection and non-invasive early disease detection

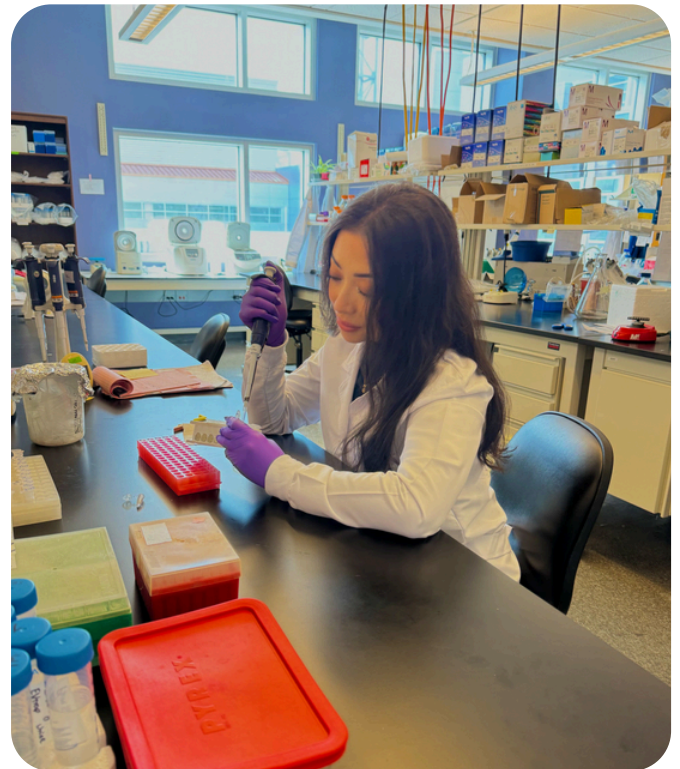
My enriching research experience at Purdue has brought me closer to my aspirations as a biomedical engineer of pushing medical boundaries and developing innovative global health solutions.

The project I worked on at Tao Research Lab under Dr. Andy Tao and Yi-Kai Liu focused on detecting protein biomarkers in extracellular vesicles (EVs) from blood plasma. We were able to do so by using microfluidic paper-based analytical devices (μ PADs) for non-invasive early cancer and Alzheimer's detection. EVs hold vital disease clues, and our goal is to unlock their diagnostic potential and improve medical access through a user-friendly device that efficiently recovers disease-related EV biomarkers with minimal contamination. It allows individuals to take fingertip blood samples at home and send the device to the lab for analysis.

Engaging in this rigorous research environment sharpened my problem-solving skills and deepened my understanding of the engineering-medicine relationship. Witnessing the potential impact of this project on patient care reinforced my commitment to advancing medical science and solidified my passion for biomedical engineering and improving the quality of life for humans.

I wish to thank Juan Diego and Lucy for their incredible work and their commitment to opening doors for young Colombian researchers. I am also deeply grateful to Dr. Tao and Kai for their guidance and support, and to my family, who have always been my rock and have consistently pushed me towards excellence.

This experience made me more adaptable, resilient, and present. The memories I made at Purdue—the incredible people, karaoke nights, campus walks, my first solar eclipse, and trips to Chicago—will forever remain close to my heart. These experiences enriched my life profoundly, and I am excited to continue my journey in biomedical engineering, inspired by my time at Purdue.



"Everybody is a genius. But if you judge a fish by its ability to climb a tree, it will live its whole life believing that it is stupid."

- Albert Einstein

Lina Milena Gómez Morales

Chemical Engineering

Analysis of charge transportation behavior in a blended system

First and foremost, I extend my heartfelt gratitude to Purdue University and Universidad Nacional de Colombia for this incredible opportunity. The agreement between these institutions has afforded students like me a unique experience every semester. Over the past six months, I have not only grown professionally but also embarked on a journey of profound personal development, immersing myself in a new culture, meeting remarkable individuals, and uncovering hidden facets of my own.

On the professional front, I had the privilege of contributing to a project that investigates charge transportation behavior in a blended system composed of polyethylene glycol and a radical called TEMPO, aimed at applications in devices. Under the guidance of Yun-Fang, a dedicated PhD student, I delved into the intricate world of research.

This experience has taught me that research demands more than just academic knowledge; it requires the courage to make informed decisions,



Purdue Advisor
Brian Boudouris

Colombia Advisor
Mario Noriega

the patience to wait for results, and the wisdom to see connections across diverse fields that might initially seem unrelated.

Beyond the laboratory, I found myself embraced by a vibrant international community. I forged connections with people from various corners of the globe, each bringing their unique cultural perspectives and enriching my worldview. Also, my new friends provided a support network during moments of homesickness and frustration, reminding me that resilience and patience are essential life skills.

As I reflect on this transformative experience, I am deeply grateful to God and to all those who have supported me along the way. My family, friends, and advisors—Professor Brian Boudouris and Professor Mario Noriega—played important roles in making this adventure possible. To the new friends who lightened the path, your companionship has been invaluable.

This chapter of my life has been a testament to the power of collaboration, cultural exchange, and personal growth. Thank you to everyone who has been a part of this incredible experience.

“Whatever you are, be a good one.”
- Abraham Lincoln



College of Pharmacy

Isabella Ordóñez Giraldo

Chemistry



Purdue Advisor
Rodolfo Pinal

Colombia Advisor
Ruby Lizeth Perez

Effect of polarity on protein liquid formulations

During my research internship at Purdue, I participated in innovative pharmaceutical research projects by working in Dr. Pinal's laboratory at the Industrial and Molecular Pharmaceutics Department. Our aim was to demonstrate how excipients present at typical concentrations in protein solutions produce changes in solvent polarity and can affect the structure and functionality of proteins.

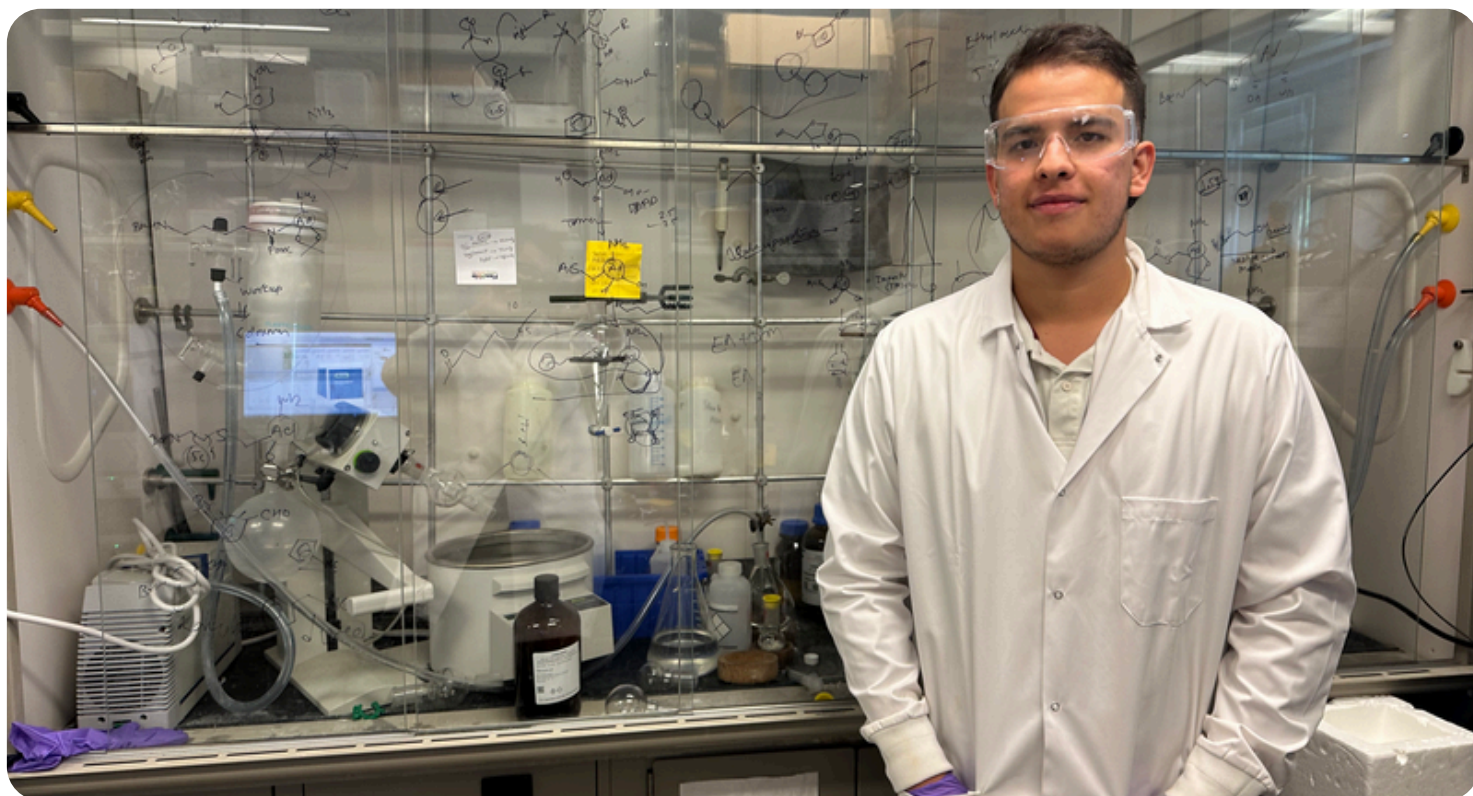
Furthermore, electrostatic effects on polarity are hypothesized to be important for protein stability and functionality due to their long-action range. In this study, enzymes were used as model proteins with enzymatic activity as a measure of protein stability and their functionality. We used a dye-based solvatochromic method to compare polarity effects exerted by an excipient assessing the (de)stabilization of the protein in the presence and absence of a long-range electrostatic effect.

I also worked in collaboration with PhD Karen Gutierrez to investigate the effect of electrostatic spray drying on catalase activity, using cutting edge technology to characterize the spray dried powders.

I am profoundly grateful to the UREP-C and the Purdue Partnership Colombia program for providing me with a golden opportunity to work alongside recognized researchers. This experience has been transformative for my professional journey, empowering me to stand as an independent researcher capable of leading progress in my field. But the benefits go beyond the professional side.

The program also enriched me personally, fostering my cross-cultural skills through interactions with individuals from diverse backgrounds. It allowed me to form bonds and share experiences with new people, adding a depth of understanding and empathy to my persona that is as invaluable as it is intangible. This journey has been nothing but a blessing, and for that, I am eternally thankful.





Simón Ángel Henao Toro

Chemical Engineering

Purdue Advisor

Rong Huang

Colombia Advisor

Diego Luis Durango Restrepo
Ángela Adriana Ruiz Colorado

Synthesis of a series of benzylamines as inhibitors of PRMTs

Protein arginine methyltransferases are a group of proteins responsible for the methylation of histone tails. X-ray crystallography has revealed that the protein has two main binding pockets: the substrate pocket and the cofactor pocket (SAM), which becomes SAH after methylation is completed (SAM without the methyl group). Overexpression of PRMTs has been linked to many diseases, including diabetes, neurological disorders, and, most notably, various types of cancer.

Therefore, developing a molecule capable of fitting into the SAM binding pocket could inhibit enzyme overexpression and reduce disease progression. So, what molecule could achieve this better than SAH? That's why we are focused on synthesizing analogs of SAH that could mimic its behavior. We have successfully synthesized benzylamines that have the potential to bind in the SAM binding pocket.

This experience has changed me profoundly in terms of the perspective through which I see things; it will never be the same. Purdue has provided me

with the opportunity to learn many new things, starting with the diverse cultures I have encountered here, the potential that every individual possesses, and the potential that I have within myself.

I worked directly in the Huang Lab with Dr. Akshay Kulkarni under the guidance of Dr. Rong Huang. I am very grateful for all the knowledge they imparted to me, their patience, and the confidence they instilled in me. The Huang Lab is a place full of values and multicultural diversity, where everyone feels comfortable and welcome. Everybody's ideas hold great value and are carefully considered, and I am thankful for the experience I had with all of them.

I am also very thankful to the people of the Colombia Purdue Partnership and Universidad Nacional de Colombia - Sede Medellín for believing in me and bringing me this one lifetime opportunity.

“Tell your son to stop trying to fill your head with science, for to fill your heart with love is enough.”

- Richard Feynman



Mitchell E. Daniels, Jr. School of Business

**Kely Johanna
Monroy Malagon**
Business Management



Purdue Advisor
Steven Dunlop

Colombia Advisor
Sandra Rojas Berrio &
Gustavo Acuña Corredor

**Purdue Center for Regional Development
& Natural National Parks of Colombia App**

This opportunity has been a commemorative time. I have worked in the DCMME and GSCMI giving me tools for the rest of my life. The opportunity to work with partners from all over the world in a second language on different projects has been an enriching experience.

The PCRD project has the goal to increase purchases by Indiana companies locally to improve the Indiana economy, encouraging companies to find other local manufacturers to partner with to produce enhanced products with added value, promoting Indiana's manufacturing supply base. At the beginning, I helped to research information, subsequently as a team, we create a dashboard with relevant information from 92 counties. This dashboard will be displayed

in the Supply Chain Marketplace, making it easier for companies to search for intrastate partnership.

As a Colombian who loves the different ecosystems of Colombian geography, I created an app of the Natural National Parks of Colombia implementing Appsheet, the app offers information about the parks: location, how to arrive, activities for park, best seasons to visit, access times and cost. Making the information more accessible for national and international visitors.

I will be forever grateful for being part of this life-changing experience. Without the guidance from: Dutt Jagdish Thakkar and Steve Dunlop from the DCMME and Juan Diego Velasquez de Bedout and Luz Ines Tascon Villa from the Colombia Purdue Partnership, they were crucial in my personal and professional growth. For the love and support of my amorous husband and finally, I must honor my family who gave me so much more than they had and encouraged me to fly far away.



*"The question isn't who is going to let me;
it's who is going to stop me"*

- Ayn Rand

Andrea Lorena Sánchez Taborda

Agricultural Business Management

Contribution of community gardens to the health and economic wellbeing of households in the North Central region in USA

As part of my internship at Purdue University, I investigated the relationship between community gardens and household health and economic status in the North Central region of the United States. I used the NCR-Stat: Baseline Survey, conducted by the North Central Regional Center for Rural Development (NCRCRD) in 2022, which included a total of 4,669 respondents from NCR states, encompassing Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.

My experience at Purdue University has been transformative both personally and professionally. During my time at this institution, I acquired a knowledge base that has had a positive and significant impact on my perception of the world and my pursuit of new experiences. I also had the opportunity to visit cities such as Chicago, New York and Las Vegas that will remain in my heart.



Purdue Advisor

Maria I. Marshall

Colombia Advisor

Jhon Delgado Arias

I'm especially grateful to my advisor, Dr. Maria I. Marshall, for being my mentor during these six months and for sharing her great knowledge with me. I would also like to thank Juan Diego Velásquez, Luz Inés Tascon, Mateo Acosta and Carolina Zamorano for going along with me in this experience. Likewise, I thank the Universidad de Caldas for contributing to enriching my experience in the rewarding path of research.

Finally, I want to express my deep gratitude to my mother Edit Taborda for opening the doors to me as her youngest daughter helping towards the pursuit of my dreams, to my sister Hellen Taborda for being an unconditional support, to my boyfriend Jose Osorio for being my amulet at all times, to my grandparents Luis Taborda and Ruby Guevara for being my angels in this process, and to all my maternal family for trusting me.

"Opportunities don't happen, you create them."

-Chris Grosser

Laura Alejandra
Córdoba Trillos
Economics



Purdue Advisor **Colombia Advisor**
Mohammad Rahman Carlos Osorio Ramírez

The impact of financial investment in technology on the growth and competitiveness of United States companies

During my time at Purdue, I had the opportunity to learn more about digital transformation and technological innovation. I researched the importance and the impact of technological investment on the growth and competitiveness of companies in the U.S. financial and retail sector, which is significantly influenced by this trend. My contribution to this project was to develop a web scraping code to automate downloading specific and valuable information from each of these companies over the past 30 years.

The above allowed me to find information in an efficient and fast way to identify and analyze the technologies that the companies adopted and how the investment value was. The above enabled me to find information efficiently and quickly, to identify the technologies adopted by these companies and assess the amount of their investment. This information will be useful for understanding the growth factors, industry

competitive dynamics and the technological landscape of their operational environment.

My Purdue experience was not only academically but also in my personal and cultural growth. It pushed me beyond my comfort zone, teaching me to adapt more readily, embrace change and strengthen my resilience. I met incredible people from diverse backgrounds, broadening my perspectives and worldview and I forged friendships that made my time at Purdue more meaningful. Also, I engaged in academic, cultural events, and workshops offered by the university, cherishing these enriching experiences. I also had the opportunity to explore new places, witness a solar eclipse, and attend a concert. These enriching experiences made my time at Purdue truly remarkable

I am grateful to Universidad Nacional de Colombia for providing us with this opportunity, to Juan Diego Velásquez and Luz Tascón for opening doors and making this experience possible, and to my advisors as well. I am deeply thankful to my friends and family for their unwavering support, encouraging me to keep going, and believing in me every step of the way.



“It’s not about what you should have done to become who you want to be; it’s about what you can still do and change to become that person.”

Daniel Camilo Puentes Rodríguez

Public Accounting & Business Management

Exploring Economic Structures and Cultural Perspectives

Understanding a society requires analyzing various elements that constantly interact. Through the DCMME and the PCRD, I have gained insights into the structure of the state of Indiana by studying its database of companies. I created several dashboards that facilitate the interpretation of this data, enabling companies to identify local suppliers within the state, thereby reducing the need to seek suppliers from outside Indiana.

Additionally, I worked with AppSheet, where I developed two applications. The first application, inspired by my passion for cycling, focuses on cycling routes in Colombia and provides all the necessary information to start a route. The second application is designed for new international students at Purdue University, offering information about transportation, stores, libraries, health services, and more. The knowledge acquired from using AppSheet, which enables app creation without coding, is invaluable for my professional development.



Purdue Advisor
Steven Dunlop

Colombia Advisor
Gloria Isabel Rodríguez

Furthermore, I visited three companies in Indiana: Amazon Fulfillment, Subaru, and NHK. These visits provided me with valuable insights into the business dynamics of the state and the vehicle sector, a field I am deeply passionate about. This work allowed me to gain a comprehensive understanding of the economic dynamics of the state.

This experience has been extraordinary, as it allowed me to explore not only academic concepts but also different cultures, cities, languages, and places. This exposure has enabled me to understand the world from a broader perspective. It was a profound immersion where I encountered diverse perspectives on life, which I found both enriching and enlightening. As a student of economic sciences, I aspire to understand the behavior of individuals, governments, and companies, and this experience has significantly contributed to that understanding. Finally, I would like to express my gratitude to the DCMME, under the leadership of Dr. Steve Dunlop, the UREP-C program, and everyone who was part of this remarkable experience.

“From data analysis to cultural immersion, a journey of professional and personal growth.”



María del Mar Torres Araújo

Administrative Engineering



Purdue Advisor
Steven Dunlop

Colombia Advisor
Luz Montoya Restrepo

Electric Vehicle Product Commition & Newboiler App

During my time at Purdue University, I worked on a research project under the supervision of Steve Dunlop and Dutt Thakkar focused on the electric vehicle industry. We identified current investments, analyzed government funding to facilitate the transition, evaluated neighboring states' situations, and compared sector growth from 2017 to 2022, including a risk analysis for businesses. I developed a plan to strengthen the ecosystem and workforce of electric vehicles, along with case studies on EV manufacturing.

Additionally, I actively participated in the development of NewBoiler, an application designed for Purdue University students living outside Lafayette. This tool aims to ease the university transition by providing valuable and practical information for students.

Furthermore, thanks to my experience with Purdue, I was able to visit and learn from companies such as Subaru, NHK, and Amazon Fulfillment.

This research experience has not only enriched my academic background but also profoundly impacted my personal development. Through UREP-C, I had the opportunity to meet people from different cultures, explore new cities like Chicago and New York, and live experiences that broadened my perspective and enriched my life in invaluable ways.

I want to express my sincere gratitude to Steve Dunlop and Dutt Thakkar for believing in my potential and providing me with the opportunity to develop my research skills. I also deeply appreciate my family and the friends I have made during this experience, who have been invaluable support throughout this journey.



"In life, you don't have to give so many explanations; what you have to do is have faith and take leaps into the void."

- Gabriel García Márquez

Ana María Peláez Álvarez

Industrial Engineering

Electric Vehicle Product Commission (EVPC) & Newboiler App

During my time at Purdue University, I participated in two significant projects under the direction of Dutt Thakar and the supervision of Steve Dunlop. I contributed significantly to categorizing companies and assessing risks for the transition from internal combustion engine (ICE) vehicles to electric vehicles (EV). This project, in collaboration with the Indiana Electric Vehicle Product Commission (EVPC), involved analyzing the supply chain for EV battery cell manufacturing in Kokomo and New Carlisle, Indiana, and benchmarking with Kentucky. These insights were crucial for positioning Indiana in the EV ecosystem.

I created two applications using AppSheet: first, a mental health app enabling users to track their well-being and access mindfulness tools and resources; second, NewBoiler, a collaborative project helping international Purdue students adjust with essential information. These experiences enriched my skills in programming,



Purdue Advisor
Steven Dunlop

Colombia Advisor
Eva Cristina Manotas

mobile app design, teamwork, and interdisciplinary collaboration. During these projects, I developed strong analytical and project management skills, gaining a deeper understanding of the EV industry.

Beyond academics, I immersed myself in American culture, connecting with people from various countries and exploring cities like New York and Chicago with my UREP-C cohort. These experiences are cherished memories of my time at Purdue.

I want to express my deep gratitude to my professor in Colombia, Eva Manotas. I thank Dutt Thakar and Steve Dunlop for believing in my talent and equipping me to contribute. Grateful to my parents for encouraging me to learn, explore, and help others. Finally, I want to thank the Colombia Purdue Partnership program for making this possible. This experience at Purdue has been fundamental for my development and has influenced my future plans.

“Within me, I possess everything needed to navigate in any direction, thank you universe.”

María Doris, My Mommy.



STANLEY COULTER HALL



College of Liberal Arts

Luis Enrique Pardo Granados

English Philology



Purdue Advisor

Alejandro Cuza-Blanco

Colombia Advisor

Rodolfo Suárez Ortega

Processes undergoing in language acquisition

While at Purdue, I had the opportunity to work with grad students in different stages of likewise different projects of the Second Language Acquisition and Bilingualism Research Lab (SLABLAB) led by Dr. Alejandro Cuza.

From literature reviews to in-situ data collection and analysis, examining the deviations and degree of optionality found in child heritage speakers of Spanish in the future perfect, present perfect, adverb distribution etc.; looking at the acquisition of the verbs *ser* & *estar* by L2 learners in Spain; and studying the preference and production of forms of address of Colombian Spanish by native English speakers.

These are but a few examples of the cornucopia of topics concerning generative grammar, crosslinguistic interference and language acquisition that are within the scope of the lab

whose results help understand how the mind creates thinking via the essential human tool (language), and how such tool undergoes morphosyntactic readjustments in an otherwise monolingual environment.

Some of the non-epiphenomenal activities that I did and will be etched on my memory are being the Italian Monitor in the Italian Studies Program and doing music at Exalt (music ministry) at St. Thom's, getting off the beaten path insofar as I reaped the benefits of building riveting friendships with such verve.

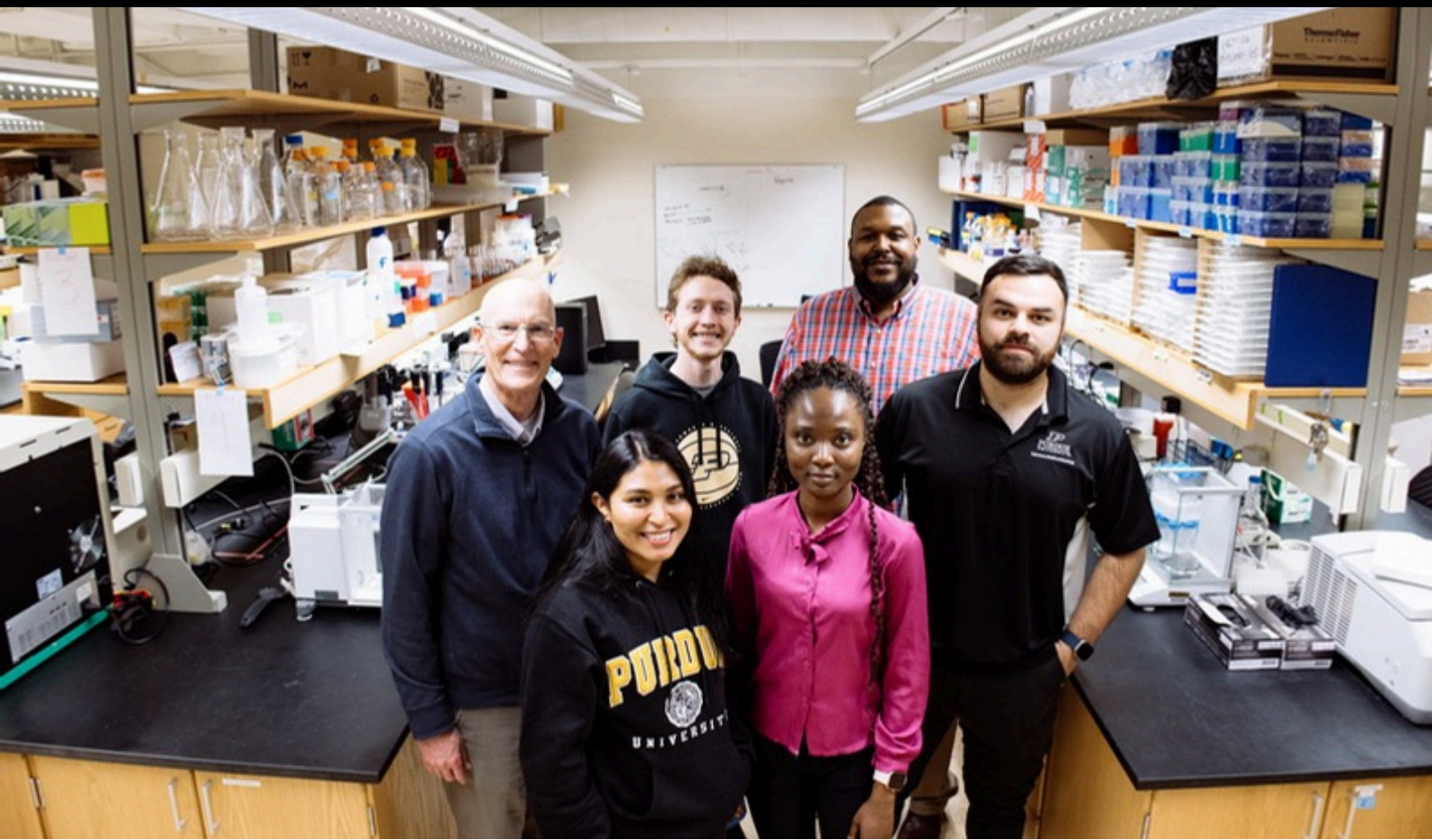
How delightful to be part of UREP-C by becoming the first student in getting the "espacios plurilingües" grant, en route to meeting the needs of language research; apropos of which, I would dearly like to thank Melba Cárdenas, that served as a liaison between the universities. Substantive partnerships, such as the aforementioned, provide a benchmark for fostering undergraduate research, for they elucidate career paths with pinpoint accuracy. Ergo, a fortiori, it is germane to thank Dr. Cuza in this process, my family and God Almighty.



"lacta Alea Est; The die is cast"



College of Health and Human Sciences





Valery Andrea Suarez Reinel

Physiotherapy

Purdue Advisor
Tim Gavin

Colombia Advisor
Edgar Cortés Reyes

Impact of a Single High-Fat Meal on Microvascular Function in Young Healthy Adults: A Near-Infrared Spectroscopy Study

This research project examines the impact of a high-fat meal on microvascular function in young, healthy adults without coronary risk factors. Such meals are typically high in saturated and trans fats, found in fried foods, fatty meats, processed snacks, and certain dairy products like cheese and butter. High-fat meals can elevate cholesterol and triglyceride levels, increasing the risk of cardiovascular diseases over time.

We will use near-infrared spectroscopy (NIRS) to measure vascular occlusion time in the tibial anterior muscle before and 5 hours after consuming the meal. We anticipate observing a significant change in microvascular function, indicated by a prolonged vascular occlusion time. This suggests that even young, healthy individuals may experience reduced microvascular perfusion following a high-fat meal, emphasizing the importance of dietary choices for cardiovascular health.

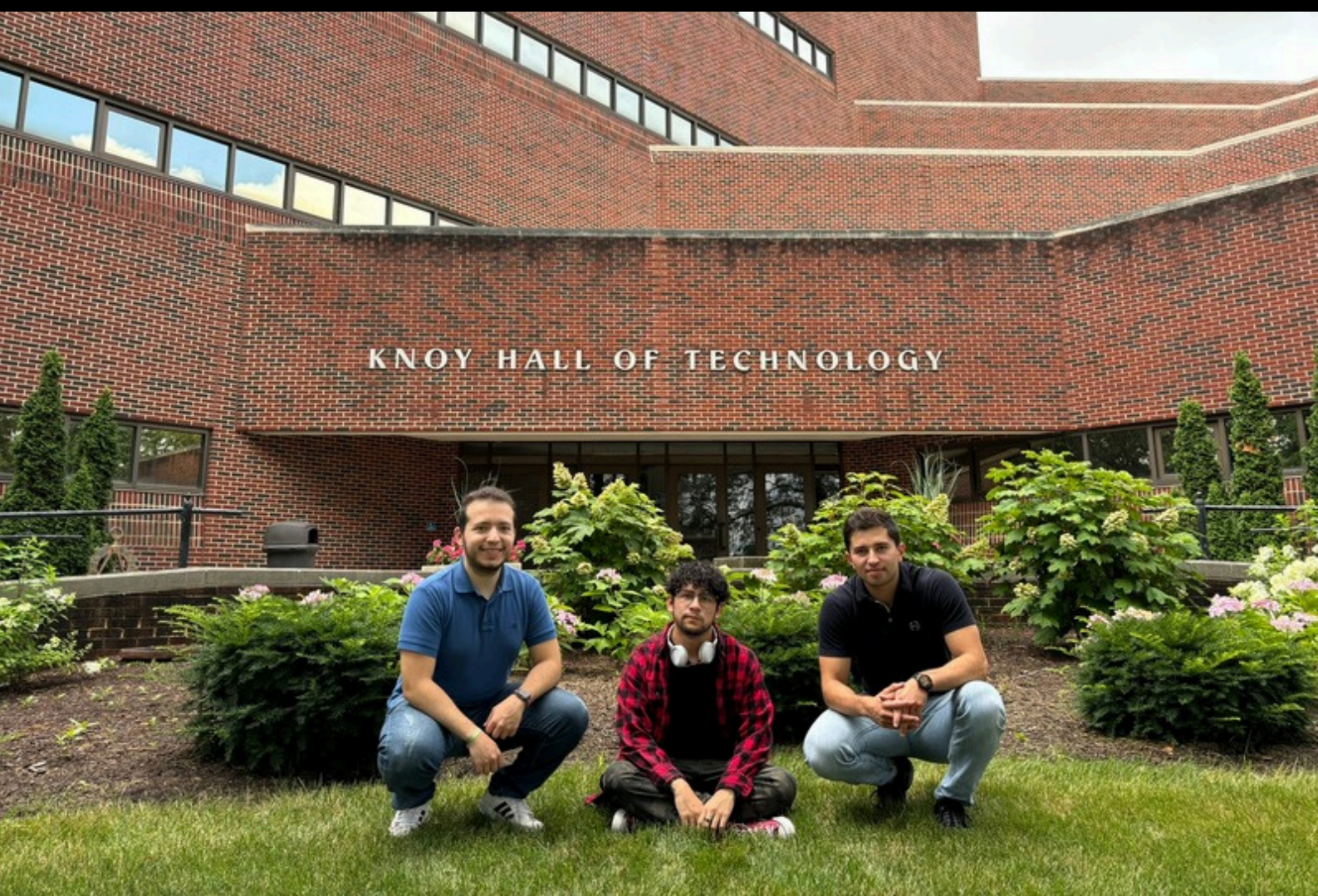
The study highlights the immediate negative effects of a single high-fat meal on microvascular function, regardless of conventional coronary risk factors. These findings underscore the need for dietary interventions to address early vascular dysfunction and suggest further investigation into the mechanisms and long-term cardiovascular impacts. This could lead to innovative strategies in managing cardiovascular health.

I would like to express my gratitude to the Purdue-Colombia Partnership, especially to Juan Diego Velasquez and Lucy, for being instrumental in fulfilling the dreams we, as students, work towards every day in our pursuit of research internships. Additionally, I extend my heartfelt thanks to Dr. Tim Gavin for welcoming me into his lab and sharing his knowledge, which has significantly contributed to my professional, academic, and personal growth. Lastly, I am profoundly grateful to my partner of four years, who became my fiancé during this exchange, for personally inspiring me to dream big by his side.

“Be proud of your progress”



Polytechnic Institute





Jonny Fabian Bernal Camacho

Industrial Design & Graphic Design

Purdue Advisor

Paul Parsons

Colombia Advisor

Karen Lange

User experience design for extraterrestrial environment controllers

Being a visiting scholar at Purdue University was an incredible journey that pushed me to grow in many ways. As an industrial and graphic designer passionate about UX, I got the chance to experience some pretty advanced research. I worked with the RETH Institute, a NASA research lab based at Purdue, focusing on Human-Computer Interaction (HCI) for extraterrestrial environment controllers. Basically, I designed interfaces for astronauts to use in ISS missions. It was a unique and interdisciplinary challenge that made me grow as a designer and as a researcher.

One thing that stood out was being the only student from the faculty of arts at Purdue. It set me apart but also showed me the value of interdisciplinary work. I got to collaborate with people from various fields, which broadened my perspective and enriched my research.

Meeting and working with new people from different careers and nationalities was incredibly challenging, something I never thought I could experience until now.

Living in another country without my family was a big adjustment. I had to become self-reliant and figure out how to handle things on my own.

Sharing a place with roommates was not an easy task for me, but it taught me a lot about cooperation and understanding different lifestyles. It was also a great experience to learn from people with different backgrounds; in my case, I lived with a geologist, a mathematician, and an engineer. Engaging in midnight conversations with them is something I will never forget from this experience.

“Design is not just what it looks like and feels like. Design is how it works”

- Esteban Trabajos

Nicolás Rendón Arias

Systems & Telecommunications Engineering



Purdue Advisor

Walter Daniel
Leon-Salas

Colombia Advisor

José Fernando
Mejía Correa

Land Management and Compost Bin Monitoring Through IoT

This project takes advantage of recent advances in IoT (Internet of Things) and off-the-shelf sensors to enhance agricultural land management and composting practices. By integrating real-time data collection, analysis, and automation, the project aims to improve sustainable agricultural practices, optimize resource utilization, and reduce waste. Key parameters such as temperature and composting conditions (CO₂, ammonia, and pH) are continuously monitored using LoRaWAN radio technology and electronic sensors, enabling precise decision-making and enhanced compost quality.

The implementation of the LoRaWAN network is a key aspect of the development process of our system as it allows sensor monitoring over long distances. Our system also includes a web-based dashboard that is easy to use, facilitating access to users of different backgrounds. The project

contributes to a greener future where sustainable land management and waste reduction are prioritized. Furthermore, this project underscores the significant social impact. By deploying these modern technologies in rural areas of Peru, we want to improve the quality of life for local communities, providing them with the tools to adopt sustainable practices, enhance their productivity, and measure their practices in a precise way that can help them make decisions for their land management.

I want to thank my mom for being my emotional and rational support all these years, giving me love and understanding every step I took in my career.

I want to thank my advisors Dr. Leon-Salas and Dr. Mejía, who shared their knowledge and expertise with me during this experience. I am also grateful to Valeria, director of international affairs at my home institution, for taking care of all the details through my internship process at my university and for allowing me to be the first student representing my Universidad de Manizales in the UREP-C program.

Thanks to all my relatives, friends, and the Colombia-Purdue Partnership for believing in me and sending positive thoughts and good vibes from day one.



"Let your joy be in your journey - not in some distant goal"

- Tim Cook

Julián Darío Romero Romero

Industrial Engineering

Evaluating the Performance of Topic Modeling Techniques with Human Validation in the Context of Engineering Design

At Purdue University, I worked on this project under the guidance of my advisor, Nanda Gaurav. I would like to express my deepest gratitude to my labmate, Miguel Feeijo, for his invaluable support throughout this project. Together, we focused on developing methods to evaluate engineering design using machine learning techniques, particularly natural language processing. Our main goal was to produce a scientific paper, which we co-authored and will be presented to a journal.

During my time at Purdue, I participated in several events that significantly boosted my imagination and motivated me to delve deeper into research. Learning from my peers' projects allowed me to engage with the research community and gain various perspectives. The challenge of presenting technical terms in English also strengthened my confidence.



Purdue Advisor
Nanda Gaurav

Colombia Advisor
Oscar Barrera Ferro &
Gabriel Zambrano Rey

Outside of academics, I thoroughly enjoyed the vibrant community at Purdue. Interacting with people from diverse cultures fostered both personal and professional growth. I participated in activities such as workshops, swimming, playing tennis, spending time with friends, and other activities. My program partners became like family during these six months, and we formed friendships that will last a lifetime. Together, we attended significant events such as the solar eclipse, the Indianapolis 500, the 4th of July celebrations, and trips.

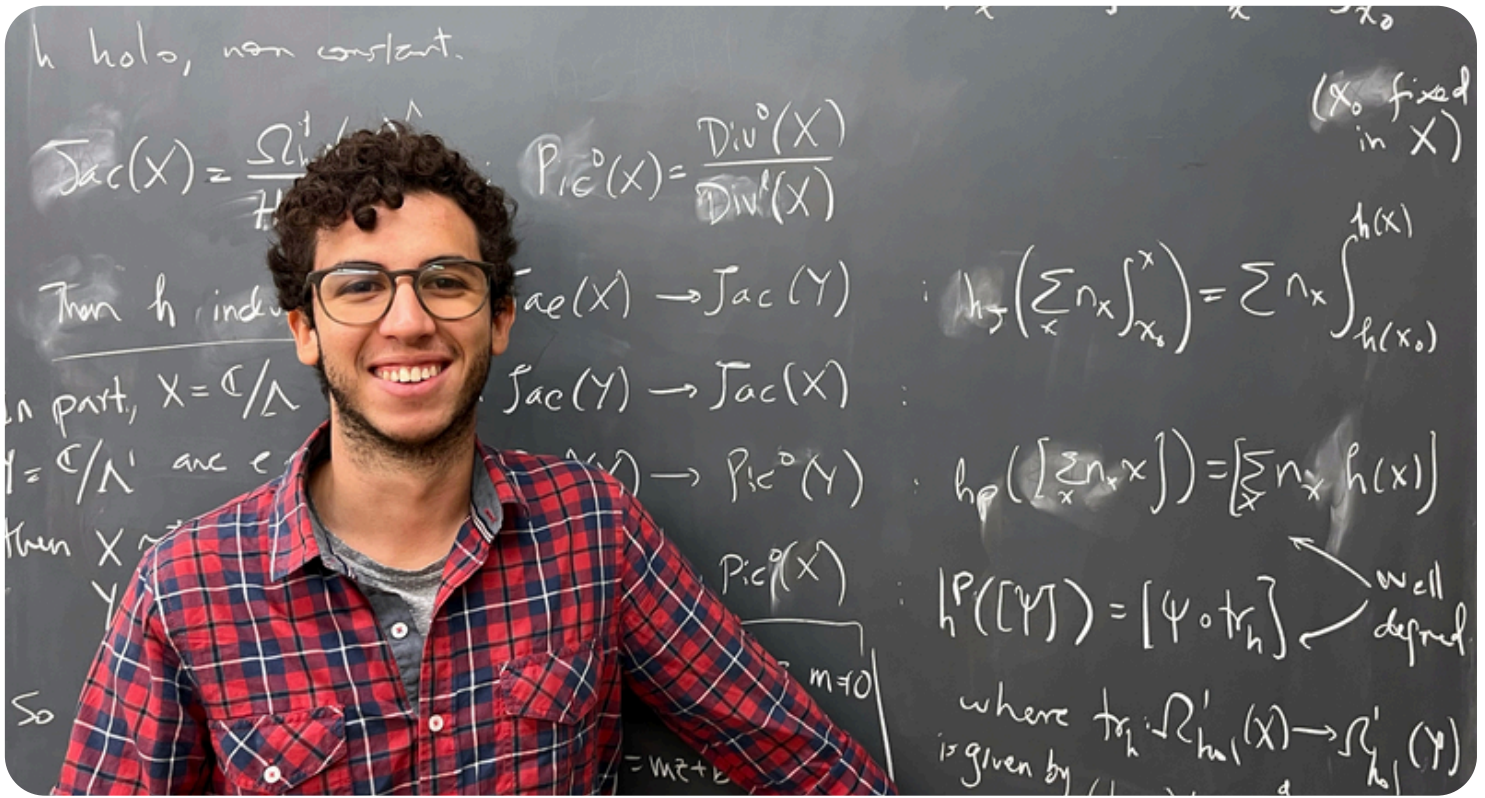
Attending Purdue, one of the world's most prestigious engineering institutions, was an invaluable experience that has greatly propelled my career. I am confident that attending such a renowned institution will have a significant impact on my professional future.

I would also like to extend my gratitude to Juan Diego V. and his team for making this program possible. Special thanks to my parents for their unwavering support and to my mates, who were always there to help.

“The small changes in our daily lives make the difference in the long term”



College of Science



Esteban Saldarriga-Marín

Mathematics

Purdue Advisor

Daniel Le

Colombia Advisor

Guillermo Mantilla-Soler

On Eichler-Shimura's Construction

Elliptic curves are objects of particular interest in Number Theory. They are widely used in cryptography due to the difficulty of solving some problems in the group of points of an elliptic curve defined over a finite field F_p . This poses the challenge of understanding such groups. A cross-cutting issue consists in counting the number of points of an elliptic curve E over F_p .

We study elliptic curves over C , where we gain a rich analytic and geometric structure. Modular curves and modular forms arise naturally, the former as moduli spaces of elliptic curves with “additional data,” and the latter as a special sort of functions somehow compatible with the modular curves. These functions form a finite dimensional C -vector space, and some special endomorphisms, the Hecke operators, act on them in a nice way. Eigenvectors of these operators, the Hecke eigenforms, carry an important property: their L-function satisfies a functional equation and has an Euler product. This gives a Fourier-analytic flavor to the theory.

A version of Modularity Theorem is that rational elliptic curves arise from abelian varieties, an object directly linked to an eigenform f . When we bring the discussion to the field Q (which is the bridge to the F_p ambient), all versions of Modularity rephrase in algebraic parlance. Here, Eichler-Shimura's relation plays a fundamental role: it relates Hecke operators modulo a prime p with the Frobenius element on the elliptic curve E over F_p , and it is crucial in the proof of a version of Modularity that says that $a_p(f) = a_p(E)$ for all p . Here, $a_p(f)$ is the p -th Fourier coefficient of f , and $a_p(E)$ is $p - \#(\text{points in } E)$. This takes us back to the counting problem.

On this trip I have learned about many areas that I never thought I would have learned. I want to thank Professor Daniel for his patience and guidance; I am marveled every single time we talk about Mathematics. I thank Professor Guillermo for his faith in me. I thank Juan Diego and Lucy for making this project possible. I thank my friends for being my constant companionship. And, finally but most importantly, I thank my family, who have loved and supported me unconditionally from afar. This work is dedicated to them.

Alejandro Franco García

Geology & Computer Science



Purdue Advisor **Colombia Advisor**
Yunyue Elita Li Germán Andrés Prieto Gómez

Monitoring seismic attenuation by sparse rural road traffic detection in noisy environments

During my academic exchange at Purdue University, I had the opportunity to work in the Sustainability Geophysics Project group led by Professor Yunyue Elita Li. My research was part of a project that aims to conduct a spatiotemporal study of seismic attenuation changes in a rural area located within a wind farm in the northern United States, and its relationship with various climatic variables with seasonal changes. To achieve this, I made improvements to the algorithm for identifying seismic signals produced by vehicular traffic on a road monitored by a seismometer. I used the amplitudes of these signals as indicators of daily seismic energy attenuation in the first few meters of the subsoil and its variation over time.

Throughout my stay in the laboratory, I strengthened my programming and signal

processing skills, and I improved my knowledge of applied seismology in urban areas, a field of surface geophysics with great growth potential in the coming decades. Additionally, I actively participated with contributions and comments in seminars where my lab mates shared their latest research progress. I presented my research at the 2024 Purdue Computational and Applied Geophysics Workshop, and I learned how to install seismometers to acquire data for new research.

I am deeply grateful to Purdue University for providing its excellent facilities for my academic and personal development. I am immensely thankful to Professor Yunyue Elita Li, who motivated and guided me daily with my research and even joined me in sports activities on many occasions. I am also very grateful to my UREP-C and NEXO colleagues for their friendship and for making this experience unforgettable. Finally, I extend my gratitude to my parents, the Universidad Nacional, Juan Diego, Lucy, and all those who made it possible for me to fulfill this dream.



“Do differently, think differently, and sit back and watch your whole world change.”

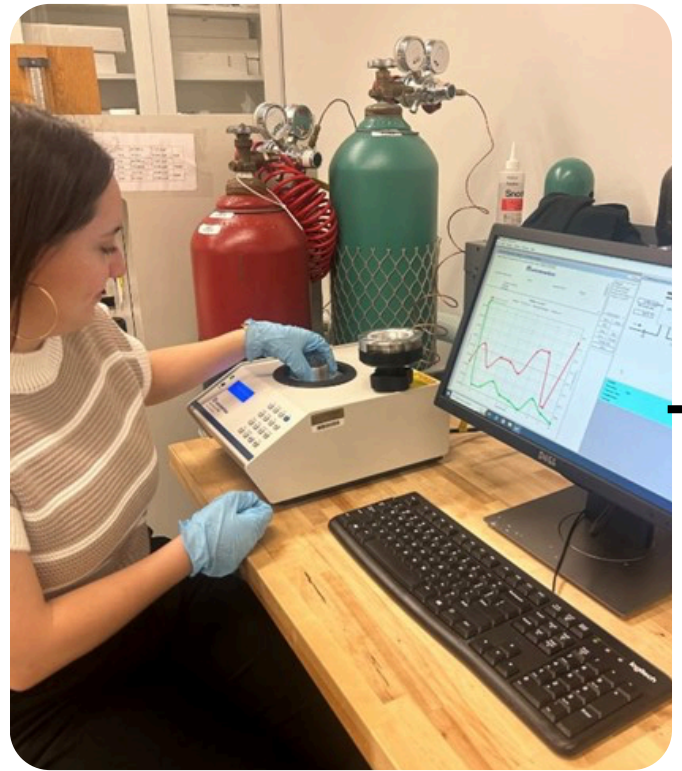
Angee Lopera Restrepo

Geological Engineering

Constraining stresses in the scandinavian Caledonides

My journey to Purdue as a UREP-C participant has been nothing short of an exhilarating adventure. It's been a melting pot of challenges and enriching experiences that have shaped me profoundly. Along the way, I've met mentors whose guidance has been pivotal in my professional growth. Equally memorable are the friendships forged with roommates who've reminded me of life's beauty and the importance of savoring every moment.

Since my arrival, I've undergone significant personal growth, mastering essential skills like independence—lessons that feel overdue, but as they say, "30s are the new 20s." Under the expert guidance of Douglas Schmitt, my project delved into the physical properties of 25 samples from diverse lithologies sourced from Sweden.



Purdue Advisor
Douglas Schmitt

Colombia Advisor
Oscar Jaime Restrepo

These samples were critical to the COSC-2 investigation, a collaborative effort among multiple institutions unraveling the mysteries of the Scandinavian Caledonides.

My journey began humbly in the lab, learning the basics of coring and equipment operation. I owe a debt of gratitude to Wayne Kottkamp, my patient co-worker turned friend, with whom I battled daily lab challenges that added a few gray hairs to our heads.

I'm deeply thankful for my advisor, who not only welcomed me into his lab but also into his life, fostering an environment where I felt truly at home. To the entire UREP-C team, especially Juan and Lucy, your dedication in opening doors for Colombians like me is truly commendable, turning dreams into reality for countless young individuals.

Above all, my heartfelt appreciation goes to my family whose unwavering support has been my anchor throughout this incredible journey.



"If not us, then who? If not now, then when?"

- John Lewis



Juan Sebastian Aguiar Castrillon

Applied Physics & Chemical Engineering

Purdue Advisor

Yulia Pushkar

Colombia Advisor

Claudia Palacio

Raman resonance characterization of materials and proteins for artificial photosynthesis

Infinity Energy – yes... ?. Solar panels currently harness less than 20% of solar energy, whereas plants achieve nearly 60% efficiency through photosynthesis. Addressing climate change and rising energy demands, artificial photosynthesis aims to replicate this natural process to improve energy generation. Key to this is mastering the challenging task of splitting hydrogen by oxidizing water, as plants do efficiently. Success in this area could lead to a substantial and sustainable energy source, since the Sun's lifespan for at least the next 2K-years.

In Professor Pushkar's group, I conducted measurements on materials and proteins, mainly iron (Fe) and manganese (Mn), to assess their potential for hydrogen splitting through molecular features and light interaction. I learned various optical characterization methods, including Raman spectroscopy with different setups (442 nm, 532 nm, and 830 nm laser excitation), and theoretical

spectrum calculations using density functional theory and Gaussian. These efforts were complemented by techniques such as Fourier Transform Infrared (FTIR) and UV-Vis Spectroscopy.

This experience was challenging as it was my first time away from home, dealing with a new culture and language. Despite initial frustrations, I managed well and realized that scientists are like curious children collaborating with others who share their questions. I am deeply grateful to Olga, Dileep, Jully, Gabriel, and all group members for their support and patience. I also appreciate Yulia for believing in me, my roommate Juan Manuel Duarte for his support, and Sam Wadas for making me feel at home and becoming a cherished friend.

"Life is not what one has lived, but rather what one remembers, and how one remembers it to recount it."

- Gabriel Garcia Marquez



Juan Manuel Duarte Quiros

Physics

Purdue Advisor

Andreas Jung

Quantum Correlations between top and anti-tops within the LHC.

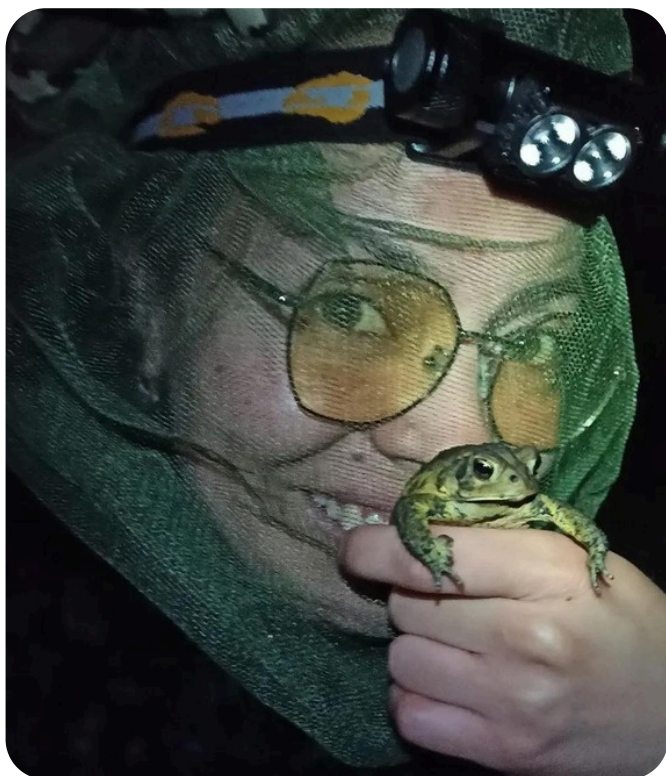
During my time at Purdue, I worked with Professor Andreas Jung and join his research group in the daily data analysis activities for top quark studies with data collected by the CMS particle physics experiment at the Large Hadron Collider (CERN, Switzerland). After learning the basic analysis tools, I focused on studying quantum correlations (such as entanglement, bell-inequality violation, and others) between top and anti-top quarks as a two-qubit system in final dilepton states.

This opportunity has allowed me to experience real research within my fields of interest, make contacts within these that will allow me to continue my way in academia, and enhance my research and communication skills. For such wonderful experience, I must thank Juan Diego Velasquez, Lucy Tascon both from Colombian Purdue Partnership Office and Professor Andreas Jung for allowing me to be part of the program, also I am thankful to everyone from Jung Research Group that showed me the way around and especially to Andrew Wildridge that was my principal advisor during the program.

"Thou shall follow the path of the greats."

- Anonymous

**Laura Jineth
Pardo Castro**
Biology & Sanitary Engineering



Purdue Advisor
Dr. Daniel Park

Colombia Advisor
Lauren Raz

**Phenological Patterns in *Dioscorea*:
Species and Sex Responses to Climate**

During my time at The Park Lab, I have worked on two projects involving plants of the genus *Dioscorea* (the yam family). Firstly, I am interested in applying computer vision to determine the sex of herbarium specimens. To achieve this, I have constructed a database with annotations for herbarium specimens of all *Dioscorea* plants in Colombia, downloaded from the GBIF website and the National Colombian Herbarium (HNC). I have also annotated specimens for *Dioscorea villosa* (native to the USA and Ontario) and *Dioscorea polygonoides* (native to the Neotropics) sourced from GBIF. William Weaver, creator of the LeafMachine tool, will collaborate on training the model. Secondly, using the same dataset but adding annotations from human observation images sourced from GBIF for *Dioscorea* in Colombia, *D. villosa*, and *D. polygonoides*, we aim to evaluate the

phenological response of males and females to precipitation patterns over the years in which biological records have been collected.

This experience leaves me feeling fulfilled. I have grown and learned a lot by immersing myself in another country and working in a research environment, which reinforces my desire to pursue this path and begin my graduate studies. However, what I cherish the most are the special people I met and the opportunity to learn from other cultures. One thing I will always remember are the almost daily conversations until 1 am with my roommates, we laughed, cried, grew, and learned so much from each other. I don't know how we managed to have so much to talk about!

I will be forever grateful to Juan Diego and Lucy for facilitating this opportunity, to Dan for giving me the chance, and to my family for their support and motivation.



"A bird sitting on a tree is never afraid of the branch breaking, because its trust is not on the branch but on its own wings."

- Charlie Wardle

Naim Sebastián Vargas Martínez

Mathematics

Profinite completions and groups

Coming to Purdue, I was mostly interested in algebraic topology and Galois theory. During my first encounters with Dr. Ben McReynolds, among many other subjects, we talked about the Krull topology. This topology allows us to generalize the fundamental theorem of Galois theory for infinite degree extensions. It turns out that Galois groups with the Krull topology are just the first example of a profinite group, so I ended up studying these groups during my research experience to understand their behavior and properties, also focusing on studying profinite completions of groups and different levels of rigidity.

Being part of a research experience early in my mathematical career allowed me to learn the research process. I frequently collaborated with my advisors and peers, discussing my questions and progress, learning about their work, and writing a detailed document of my findings. This experience helped me understand how math is done and provided valuable insights for my future research career.



Purdue Advisor

Ben McReynolds

Colombia Advisor

Carolina Neira Jiménez

Attending math workshops, I interacted with other students and professors, learning about their interests and journeys, which helped shape my own future aspirations.

Living in a different country and working with people from diverse backgrounds was both challenging and rewarding. I learned to resolve problems, maintain a healthy environment, and avoid conflicts. Along the way, I made great friends, shared new experiences, and had a wonderful time. We explored new places together, creating unforgettable memories and strengthening our bonds. Whether visiting local spots or traveling to distant locations, their company made every moment more enjoyable and enriching.

For all of this, I will always be grateful to Juan Diego and Lucy for creating this opportunity for all of us, to my advisors and the professors who were always willing to answer my questions at any moment, and of course, to my family and friends for always being there, no matter what.

"Young man, in mathematics you don't understand things. You just get used to them."

-John Von Neumann.



Sebastián Yepes Garcia

Systems and Engineering & Computer Science

Purdue Advisor
Jeremiah Blocki

Colombia Advisor
Juan Carlos Mendivelso

Sensitivity of Compression Algorithms

During my time at Purdue University, I had the privilege of delving into the intricate world of data compression under the guidance of Dr. Jeremiah Blocki. My research focused on the "Sensitivity Analysis of LZ77, LZ78, LZW, and Burrows Wheeler Transform Algorithms," a project aimed at unraveling the complexities and efficiencies of these foundational methods in computing theory.

This project allowed me to construct and prepare a paper for conference presentation, fostering both personal and professional growth. Through this endeavor, I gained unique research skills by learning to navigate and master a topic that was initially foreign to me. This process taught me the value of persistence and dedication in the pursuit of knowledge.

Life on campus was enriched by diversity, participating in multicultural spaces and linguistic exchange that broadened my global perspective and strengthened my language skills.

I am deeply grateful to Dr. Blocki and Seunghoon Lee for his continuous guidance and support, as well as to the programs and sponsors associated with UREP-C, who made this transformative experience possible. My family and friends also deserve special thanks for their essential support throughout this academic journey.

This experience has reaffirmed my belief in setting clear objectives and pursuing them with determination, a philosophy I will continue to apply in my future academic and professional endeavors.

"A goal is a dream with a deadline."

-Napoleon Hill



College of Veterinary Medicine



Alejandro Daza Gallo

Veterinary Medicine



Purdue Advisor
Hinayah Rojas de
Oliveira

Colombia Advisor
Sandra Marin

Genomic imputation and prediction analysis: Unraveling genetic variability in dairy cattle

Along this time here, I work in interesting project that was about looking at the phenotype of the Purdue Dairy Cattle but is not only the phenotype is extend the all the genomic data that we have after processing samples and complete little missing spaces. As an economic way to contribute with the genomic investigation, the imputation is a method to include related data in different populations, these ones need to have a common ancestor, in this case, working with Holstein, has very strongly relation and means with a good accuracy about this information. On the other hand, working on another important project about the methane production in beef cattle, work here was a wonderful experience, taking care of and handling the cattle was a thing that I wanted. Present in the Summer Research Symposium was an honor for me.

I started my undergraduate and at the beginning of this one I said I like to work with genetic, I had had a long time without work in that, now with this experience I feel so happy after doing that and the field work. Another thing of my experience here was my first time in an NBA game, taking this internship let me have that and enjoy a particularly good basketball game.

I want to say thanks to Dr. Hinayah Rojas for the opportunity to be here, work in my project, help her with another important project and her lab that are amazing people, who teach me everything to work in my project, that people stay with me along six months and made very grateful memories here, a lot of laughs and very special moments. Special thanks to Nexo Global Program, Juan Diego Velasquez, and Luz Ines for their support throughout these months.



“Shame of nothing, we are here to enjoy”

Sebastian Franco Gallego

Biology

Genetic manipulation of the parasite *Sarcocystis Neurona*

During my time at Purdue I had the opportunity to carry out my research stay in a research group focused on the area of parasitology, which seeks to identify the function of some genes that are expressed through different stages of parasite development in order to understand how some cellular organelles interact with the cells hosts that they infect.

Sarcocystis neurona is a protozoan commonly known as the cause of equine protozoal myeloencephalitis (EMP), which has caused numerous losses to the equine industry in North America. Therefore, it is essential to understand the biology of this parasite by knowing how the infection process occurs.

According to this context, it's necessary to establish tools that allow us to know the importance of some organelles involved in the infection mechanism, for this reason, the objective of my project was to generate parasites with Ty-tagged proteases using gene editing methods such as the CRISPR/Cas9 technique.



Purdue Advisor

Sriveny Dangoudoubiyam

Colombia Advisor

Fredy Rivera Páez

The creation of these mutant parasites will allow us to establish their function with respect to dense granules, a relationship that has been previously documented in parasites close to this group.

I am immensely grateful to Dr. Dangoudoubiyam and each of the lab members, Annapoorani, Madhuri, Vishnu, thank you for the patience, commitment, time spent teaching me every part of the project, gratitude for making this research experience enriching. Coming to Purdue has been an unimaginable adventure, full of challenges, laughter, knowledge, beautiful places with postcards, people say there is a before and after coming to Purdue, it really transforms you. My deepest thanks to Juan Diego Velasquez, Lucy Tascon, other people and entities that made this dream possible and thanks each of the people I met, I will always remember them.

Special thanks to my family, mother and father for always trusting me even at times when I do not believe in myself. Gratitude to my mentors at the University of Caldas Dr. Fredy Rivera and Dr. Paula Ossa for showing me this beautiful world of research.

*Never give up on a dream. Just try to see
the signs that lead you to it*

- Paulo Coelho



Vanessa Alejandra Valencia Palacios

Veterinary Medicine



Purdue Advisor

Andrea Pires dos Santos

Genetic Expression of miRNAs Related to Lymphoma in Pleural Effusion in Domestic Felines, and Case Report: Liver Disease by Hammondia Heydorni

My research at Purdue University has been conducted in the Clinical and Molecular Research Laboratory, I investigated the genetic expression of molecules called microRNAs (miRNAs), which regulate normal genetic expression. My first project analyzed the overexpression of miRNAs related to lymphoma in pleural effusion samples from domestic felines. Using molecular techniques such as qPCR, this study aimed to correlate miRNA expression with lymphatic diseases and cancer.

My second project focused on a case report detailing two rare cases of Hammondia Heydorni infection in 2016, along with a recent case from June 2024. This article describes the clinical presentation and processes applied, and I expect to publish it in July 2024 in the Veterinary Clinical Pathology Journal.

My time at Purdue University has been transformative both personally and professionally. The experience expanded my understanding of laboratory diagnostic processes and reinforced my belief that I can achieve great things, even if I initially don't know how to do it. The trips to New York City, Indiana Dunes, and Chicago allowed me to meet incredible people and enjoy new landscapes and cuisine. Participating in campus activities and making new friends enriched my stay.

I am especially grateful to Dr. Andrea Pires dos Santos for her mentorship and to Laura Ribas Machado, my laboratory mentor, for teaching me molecular techniques and guiding me through laboratory life. I also thank my family, especially my mother for her unwavering support, and my dog Morgana for always making me happy, even from afar.

I extend my gratitude to the Nexo Caldas program, the Caldas government, the Coffee Growers Association, and the Colombia-Purdue partnership, as well as Carolina Zamorano, Mateo Acosta, and Juan Diego Velásquez for their support.



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**Nicolás
Rendón Arias**



**Ana Milena
Espinosa Jimenez**



**Ana María
Medina**



**Lauren Sofia
Yepes**



Happy
BIRTHDAY





Oh! FUN FACTS



Ana Orjuela

I have 10 alarms every 15 minutes in the mornings, I wake up my roommates with this but I don't hear any alarm



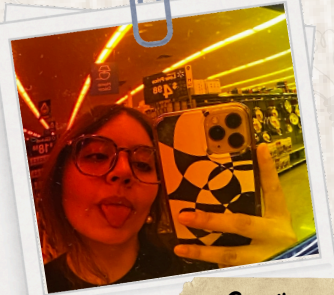
Carlos

I learned to ride a bike! I really enjoy going out to see the outdoors.



Valentina

I am still sleeping with thermal sleepwear :v



Camila

I don't have fun facts, just facts.



William

I am allergic to loratadine (allergy medication)



Stephanie

One day I was late to the lab because there was a spider in my bathroom



Daniel Puentes

We were in Indianapolis lost and not knowing what to do in the middle of the night



Laura Cordoba

In the sushi restaurant at Purdue, I ordered an "O.M.G. roll", and being playful, I said: "Can I have an 'Oh My God' roll, please?" instead of pronouncing each letter. My friends and the staff burst into laughter



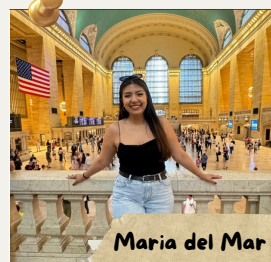
Kely

I wasn't there on the weekends, but when I was, we had the best parties!



Andrea

I was running through one of the tunnels and one of my legs failed me and I fell



Maria del Mar

My real thanks go to the Pantry and the Gas Station



Ana Pelaez

With my last breath I curse Spirit Airlines



Oscar

Urepcitos took me as their gym trainer



Linda

Being here gives me so much excitement and energy that I don't want to sleep because of all the new things I'd like to try.



Simón Gonzales

I am deeply addicted to sugar



Steven

I like to go everywhere in sandals



Mariana

Our trip began on Thursday from Medellín. Mateo's suitcase was marked with a red tag, and it was searched. We had a layover in Miami but missed our connecting flight, so we had to spend the night at the airport. When we finally arrived in Indianapolis, there was a snowstorm and we got diverted to Chicago. (Part I)



Mateo

(Part 2) Luckily, we met our mom in the USA and she helped us out (Love U Amna). On Saturday, we finally made it to Indianapolis, but our suitcases were missing. They found Mateo's eventually, but mine was still missing when I arrived in West Lafayette. Fortunately, they sent it to me later.



Luis Morales

And there I was after they said the last goal wins and my knee said NO.



Douglas

Every time I forget a word in Spanish my brain reproduces that scene of modern family that goes like: "I cannot deny it anymore, I'm turning into a white woman"



Ana Milena

While volunteering, I had to write down birth dates. My listening skills were poor, and I accidentally wrote that an older lady was born in 1867. Imagine her face when she saw I'd turned her into a 150-year-old!



Camilo Delgado

The long daylight gave me the sensation of having a whole day ahead, even though it's closer to midnight



Vivian

Over the course of one day, I drove through five states including Indiana, Ohio, West Virginia (of course jamming out to Take Me Home, Country Roads), Pennsylvania and Maryland.



Dan Avila

Now I have more microplastics in my testicles.



Julian Cruz

Simón is the only reason I still believe in the Antioquia department



Annie

I hit my leg on my bed frame on my first day, then I got eaten alive by mosquitoes until I had bites the size of mountains, sprained my ankle going down the stairs, and messed up my knee while dancing... but hey! we're still standing.



Lina

One day a person asked me a question and I didn't understand what he said, so I just answered "okay." Immediately after, the person looked at me very confused and said "it is a question"



Juan Camilo

One day my advisor told me that if I wanted her to introduce me to someone who worked in my area, I understood that she meant if she had already introduced me to that person I said no, and her worried expression made me realize I had said something wrong



Pablo

On my second day riding my bike, my bag broke and I lost the arequipe I had been looking for for two months.



Luis Pardo

People from the program refer to me as either Traducciones or Gatto Pardo. Some of them still don't know my name.



Valery

May began, and I was barely getting any sleep because every morning, I'd wake up with one eye smaller than the other. That's when it hit me—after a lifetime of being allergy-free, I discovered I'm allergic to pollen!



Simón Henao

1731 brought Perro Negro from Provenza to West Lafayette



Sebas Franco

On the trip to New York, we almost woke up in a subway station because we missed the last bus to New Jersey.



Isabella

In the first week I waited for the buses to stop automatically at the bus stop and several times they just passed me by because I didn't think I had to wave my hand for the bus to stop.



Jonny

I made some terrible financial decisions in Mango Mango



Nico

I learned how to ride a bike in with my UREP-C roomies



Julian Romero

Somehow I ended up sleeping without a quilt during winter, but with one during summer.



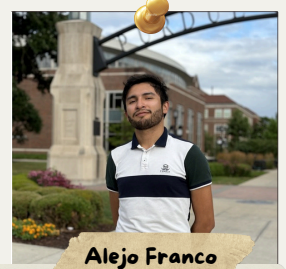
Vane

Be cautious when speaking in another language! Once, I told my Brazilian mentor "I JL per CU," only to remember later that "CU" has a very different meaning in Portuguese.



Sebas Yepes

I landed an all-expenses-paid trip to Pennsylvania just by responding "I want" to a casual invitation in a WhatsApp group!



Alejo Franco

I biked more than 2000 km in these six months. I recommend not skipping this stage.



Esteban

After an almost-48-hours long trip to Indianapolis I took the wrong shuttle at the airport, which dropped me off at midnight in Bloomington—two hours away from West Lafayette—, alone.



Naim

The sunsets at 9:00 PM really ruined my sleep cycle and meal schedules.



Laura Pardo

I used the kitchen sink to wash my underwear once. Days later, I thought I found a rag in the garbage disposal, only to discover it was my panties!



Angee

For some reason during all the process to get here and start the program I thought I was gonna live in Indianapolis so I checked all the possible activities to do there, it was until I arrived that I realized I wasn't.



Juan Manuel

My washing machine malfunctioned and most of the apartment got flooded, then since I was in the bathroom before, when the service people came in, they saw me on my knees trying to dry the floor with a towel, and I was in my underwear.



Alejo Daza

One day my advisor sent me to an event to look how works the presentation and to eat, she said, 'You can eat whatever you want Alejandro, go there' and I listened to her.



