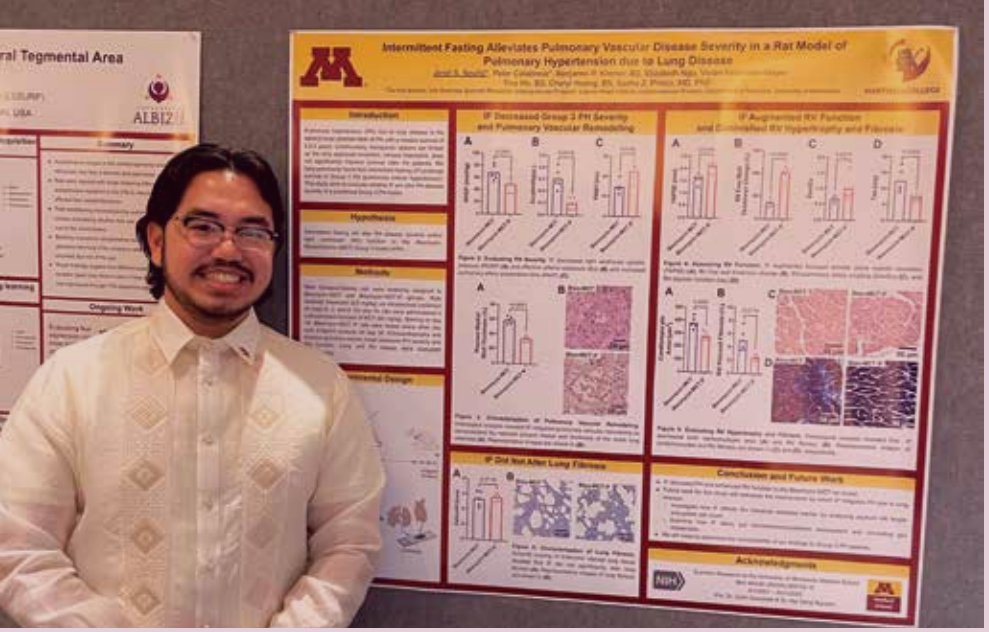
HARTNELL COLLEGE

19TH ANNUAL

STEM INTERNSHIP SYMPOSIUM

SCIENCE • TECHNOLOGY • ENGINEERING • MATH

September 20th, 2025


ral Tegmental Area
ALBI2
Intermittent Fasting Alleviates Pulmonary Vascular Disease Severity in a Rat Model of Pulmonary Hypertension due to Lung Disease
Introduction
Hypothesis
Methods
Ongoing Work
If Decreased Group 3 PH Severity and Pulmonary Vascular Remodeling
If Augmented RV Function
If Did Not Alter Lung Fibrosis
Conclusion and Future Work
Acknowledgments


PLC
Culture
Resources
high levels
ALL means ALL
students first
data driven

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THE PROGRAM

Hartnell STEM Internship Program

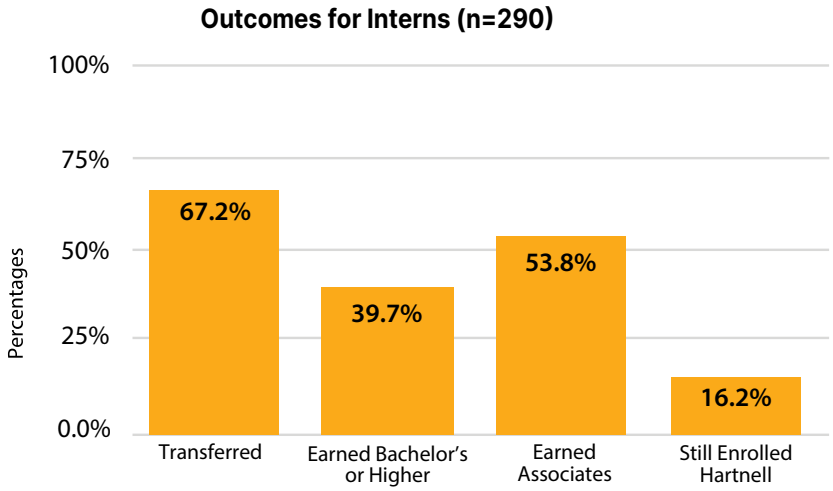
The STEM (Science, Technology, Engineering and Math) Internship Program at Hartnell Colleges supports and engages students in undergraduate academic research and/or professional internship experiences. Internships include relevant and innovative projects with regional research institutions, local partners, and national REU (Research Experiences for Undergraduates) programs. Internships are guided by experienced mentors who provide authentic professionalism and transfer preparation for upper-division and graduate studies. Students are provided the opportunity to share their work with academic and professional communities through presentations and publications.

Hartnell STEM Micro Internship Program

Hartnell College received a National Science Foundation Hispanic Serving Institution grant, with a goal of extending the reach of the Internship program. When students were polled regarding why they were not participating in internships, they stated that they did not feel ready academically or that they could not fulfill the time commitment. To bridge these gaps, we developed the STEM Micro Internship Program, in which students participate in faculty-led, 25-hour applied learning experiences.

Hartnell is strengthening diversity in STEM while taking on the challenge of meeting our nation's skilled workforce needs. The program is creating a new legacy of opportunity for the families of the Salinas Valley by producing future generations of bright young scientists through innovative and comprehensive STEM programs and initiatives. For the past 19 years, our unique STEM Internship Program has achieved unprecedented success, matching hundreds of community college students with university researchers and industry experts in prestigious laboratories throughout the Central Coast and beyond.

The STEM Internship Program began in 2006 with the placement of six student interns. Since then, the program has placed more than 1,400 students in undergraduate research and professional internship opportunities. In addition to its growth over the 19-year period, the program has demonstrated higher academic success rates for participating students when compared with their peers. For example, degree attainment for Hartnell interns is dramatically higher than that of non-participants. Of the 290 interns from cohorts 2016 through 2023, **67.2% have transferred, 53.8% earned their Associate of Science, 16.2% still enrolled at Hartnell College.** Of the interns who have transferred, **39.7% have earned their bachelor's degree**. Evidence shows that STEM internships have been a valuable resource not only for skill-building, but also for overall student success and degree completion.



FUNDING SOURCES

- Hartnell College
- Hispanic Serving Institutions STEM Title IV Grants
- Hartnell College Foundation
- National Science Foundation

Thank you!

HARTNELL COLLEGE

STEM INTERNSHIP PROGRAM TEAM

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Director of Academic Affairs, Hispanic Serving Institution Initiatives

Richard Morales
Director of Communications and Marketing

Joel Thompson
Director of Academic Affairs, Science and Math Institute

Belen Gonzales
Director Career Hub

Anely Meneses
SMI Program Specialist

Dina Nieto Uribe
Coordinator of Job & Internship Placement - Career & Transfer Hub

Edlin Hernández
Coordinator of Job & Internship Placement - Career & Transfer Hub

Leda Polio
HSI Program Assistant

Micro-Internship Mentors

Dr. Adrea Gonzalez-Karlsson

Dr. Jeffrey Hughey

Mohammad (Tarek) Hussain

Dr. Rosser Panggat

Dr. Ver Marie Myr Panggat

Tito Polo

Dr. Mohammed Yahdi

Hartnell Community College District Governing Board

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HARTNELL COLLEGE

MISSION

We advance social and economic justice
through the transformative power of education.

At Hartnell College, we know that post-secondary education is the lever that can propel the economic and social mobility of our community, and we understand how critical it is for us to reverse these educational and economic inequities. Our commitment is to provide high-value baccalaureate degrees, associate degrees, certificates, and transfer opportunities for our students, so they can achieve their career and academic goals, contribute to the economic and social vibrancy of our community, and become the leaders and changemakers of tomorrow.

HARTNELL VISION

If you could imagine the most perfect Hartnell College,
what would that look like?

- A place where students receive the message every day that they belong, their ideas matter, and they bring worth to the community.
- A place where students build relationships and build their future.
- A place where students can give their all to their education and future without worry that something will stop their educational journey.
- A place where we dismantle self-imposed and societal barriers.
- A place of transformation, growing the thoughtful leaders of tomorrow.
- A place where dreams become possibilities.

Vision statements reflect the voices of
Hartnell College students, faculty, and staff.

WELCOME

Welcome to the 2025 Hartnell STEM Internship Symposium.

Today, we are gathered to celebrate the work of our student interns who spent their summer immersed in the world of science, technology, engineering, and mathematics. They have taken on the creative challenge of research, asked meaningful questions, and gained skills that will stay with them long after this experience.

Each year, the Hartnell College STEM Internship Program offers students the opportunity to see what it truly means to be part of the scientific community, work alongside mentors, learn the process of inquiry, and grow more confident in their ability to solve problems. This growth is what we are honoring today. It is much more than data and results, but a story of curiosity and discovery.

When the program began in 2006, just six interns participated. From those humble beginnings, it has grown into a life-changing experience that has now supported hundreds of students in our region. Year after year, our interns are exposed to professional experiences in universities, research centers, and industries, creating partnerships that open doors and possibilities.

The success of this program is possible because of a strong community. Faculty, mentors, and industry partners dedicate their time and expertise to teaching our students while making a lasting impression on their lives. Their commitment ensures that every intern receives the support, encouragement, and guidance needed to excel. We are deeply grateful for their generosity.

In many ways, the Hartnell College STEM Internship Program is a launchpad that helps students see their potential and equips them with the tools to pursue it. It builds the confidence that, through hard work, tomorrow's challenges can be met.

Thank you for joining us in this celebration. Your presence today confirms the value of this program and the achievements of our students.

Michael Gutierrez
Superintendent/President, Hartnell College

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STEM PARTNERSHIPS & MENTORS

California State, Monterey Bay
Dr. Arunkumar Sharma

California Space Grant Consortium
Dr. John Kosmatka
Amy Arkwright
Tito Polo

Hartnell College
Dr. Adrea Gonzales-Karlsson
Dr. Jeffrey Hughey
Mohammad Hussain
Dr. Ver Marie Myr Panggat
Dr. Rosser Panggat
Tito Polo
Mary Rayappan
Dr. Mohammed Yahdi

Joby Aviation
Omar Perez-Sandoval
Miguel Maldonado
Maurico Romero
Ken Burleigh
Cody Cleverly
Eric Dungan
Tedd Michel
Audrey Shanks

Monterey County Health Department
Donna Ferguson
Rawni Lunsford

Naval Postgraduate School
Dr. Alan Van Nevel
Dr. Jennifer Carson
Dr. Mary Sims
Dr. Leonardo Herrera
Dr. Brij Agrawal
Dr. Christopher Curran
Dr. Branden Naylor
Dr. Kevin Jones
Dr. Seth Gray
Dr. Chad Machiela
Dr. Robert Schroeder
Dr. Kristen Tsolis
Dr. Branden Naylor

Nurbli
Noe Lomeli

Science Voices
Dr. Lev Horodysky

United States Department of Agriculture
Dr. Juan Alvarez (OPPE)
Dr. Greg Simmons (APHIS)
Dr. Ruth Henderson
Dr. Jean Auth
Dr. Chan Heu
Dr. Peishih Liang
Dr. Angelita Acebes-Dora

University of California, Los Angeles (Dentistry School)
Dr. David Geffen

University of California, Santa Cruz (LAMAT)
Dr. Andrea Antoni
Dr. Enrico Ramirez-Ruiz

University of California, Santa Cruz (SUPERDAR)
Dr. Michael Loik

University of Minnesota Life Sciences Summer Undergraduate Research Program (LSSURP)
Dr. Sasha Prisco
Benjamin Kremer

SPECIAL THANK YOU

to our

Andy Newton STEM Internship Partner

Award Winner

JOBY AVIATION

Joby

AVIATION

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THANK YOU TO

the human Chevron energy company™

for supporting this year's STEM Internships and the

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SYMPOSIUM AGENDA

Welcome

Michael Gutierrez
Superintendant/President

Presentation of the Andy Newton STEM Internship Partner Award

Presented by Dr. Joel Thompson
Director of the Science and Math Institute

Student Panel Discussion

Presented by Anely Meneses
Program Specialist

Javin Niar - Joby Aviation
Anevay Castro - County of Monterey Health Department
Jeriel Sevilla - LSSURP University of Minnesota
Denise Regalado Ramos - Naval Postgraduate School
Alondra Bejarano Garcia - USDA ARS
Pacific Basin Agriculture Research Center in Hawai'i

Walkthrough of Posters

Chevron

MESA Math · Engineering · Science Achievement


'Imiloa Astronomy Center of Hawai'i
University of Hawai'i at Hilo

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STUDENT INTERNS

Layla Alvarez
Jasmin Angeles Mora
Aaron Arvizu Rivera
Ashley Avino
Alondra Bejarano
Gabriel Bello
Sofia Beltran Espino
Esteban Berelleza
Isai Cabrera
Anevay Castro
Ramon Castro
Mario Chris
Jennifer Cruz
Israel Crystalinas
Braden Diaz De Leon
Jonathan Dominguez
Allen Escolta
Abigail Ferrales
Brisa Flores
Ismael Galaz
Andy Garcia Ruiz
Hezekiah Gonzalez
Ramon Hernandez
Kayla Kennamore
Juliah Kuepfer
Keily Lepiz
Rebecca Linares
Fernando Lopez
Ana Manzo
Juan Madrigal
Angela Madrigal
Mariah Marquez
Brianna Martinez
Cindy Martinez
Luis Mendoza
Kajal Naidu
Victoria Nava
Javin Niar
Daniel Orta
David Orta
Jesse Pineda
Denise Regalado
Christopher Rodriguez
Felipe Rodriguez
Kevin Ruiz Hernandez
Hector Sanchez
Jeriel Sevilla
Cristian Soto
Emiliano Tavarez
Xavier Taylor
Kristoffer Valdehueza
Alexander Valenzuela
Diego Villegas Cano
Lesly Villanueva
Marina Villareal
Isaac Virgen
Aurora Webeck

Survey of Wild Host Plants for Drosophila Suzukii

Intern: Layla Alvarez

Mentor: Dr. Simmons

Opportunity: United States Department of Agriculture (USDA)

Drosophila Suzukii (Matsumura), or spotted wing drosophila (SWD), is an invasive crop pest that distinguishes itself from similar species by its preference for ripe, thin skinned fruits (i.e., berries), made possible because of its serrated ovipositor. In an effort to stunt the rapid reproduction of *D. suzukii*, classical biological control methods have been utilized across California, all of which require extensive knowledge of *D. suzukii's* habitat, host suitability, natural enemies and surrounding ecosystem for optimal results. This project will assess the compatibility of local, wild host plants with *D. suzukii*, providing new data for USDA, APHIS, to improve ongoing *D. suzukii* biological control methods. Selected hosts were Nightshade (American & black), rose hips, Phalsa, Firethorn, wild plums (American & Chickasaw), blackberries, Madrone, and Cotoneaster, all of which shared *D. suzukii's* ideal host characteristics. Cherry Laurel, Fig, Crabapple, & Black plums were then subbed in for unripe & dry hosts (i.e., Madrone) in trial 2. Collected hosts were sorted into 350 mL deli cups. *D. suzukii* were then released in groups of 20, an even ratio of Females & Males. The cups were placed in an incubator at around 20 °C for 96 hours initially, where *D. suzukii* were recounted, and cross examined with our initial numbers. The cups were put back into the incubator for 2 weeks to allow for any new *D. suzukiii* emergence, where only blackberries, Chickasaw & Black plums, cherry Laurel, Nightshade, and Phalsa produced a successful 2nd generation.

Layla Alvarez

Major: Natural/Environmental Science

Designing a Lunar Rover

Intern: Jasmin Angeles Mora

Team Members: Christopher Rodriguez, Isaac Virgen

Mentor: Mentor: Tito Polo

Opportunity: California Space Grant Consortium

As we know, current data collection tools on lunar rovers are often extremely expensive and are sometimes even limited in the range of measurements or activities that they can perform. To overcome these challenges, we designed and developed a multifunctional drill arm that combines sensors for measuring, recording, and displaying distance, temperature, soil properties, gas levels, and audio. Our purpose is for it to be able to operate through rough terrains, so almost like a 4×4 vehicle. While doing its job we hope it'll collect important data and display it back to us as promoted. The goal is for it to be used in future explorations/ missions to the moon or other planetary bodies. The methods we have decided to use are the ESP32 and Arduino which will each have their role in this project. A custom-built controller will also be developed to be able to manually operate not only the rover but the drill arm as well. We also plan on building a web page which will display data gathered from sensors and it'll also work as the remote control of the soil sensor zipper. We wanted to create something modern but at the same time very useful in the real world. Our project will demonstrate the development of a sensor-equipped rover capable of simulating key functions required for exploration as well as some fun distractions for the mental health of our scientists.

Jasmin Angeles Mora

Major: Engineering

Project Legion

Intern: Aaron Arvizu Rivera

Team Members: Alexander Valenzuela, Cristian Soto

Mentors: Seth Gray, Chad Machiela, Robert Schroeder

Opportunity: Naval Postgraduate School

Project Legion is a drone built to use Reinforcement Learning to perform the same functions as a regular drone while also carrying out set orders for a mission. To ensure this is possible, the drone has a 3D-printed frame large enough to fit all the components of a drone, along with a Jetson Nano Developer Kit Board, which is used to deploy and run a trained AI model in reinforcement learning. The flight controller (found on every drone) and the Jetson are connected through a UART bridge to allow both hardware to communicate with one another. The AI model will be trained on a desktop or laptop with a virtual simulator, such as Isacc Sim or Nvidia's Omniverse. Project Legion is the base for a future project that will attempt to create a swarm of drones for Special Operations applications.

Aaron Arvizu Rivera

Major: Civil Engineering

Integrating Raspberry Pi for Avocado Leaf Image Collection

Intern: Alondra Garcia Bejarano

Mentors: Dr. Angelita Acebes-Dora, Dr. Peishih Liang, Michael Boshe

Opportunity: United States Department of Agriculture (Pacific Basin Agriculture Research Center)

Location: Hilo, Hawai'i

In Hilo, Hawai'i the avocado industry has been facing economic decline due to a decrease in production yield caused by Pseudacysta Persea, also known as Avocado Lace Bug (ALB). This pest, invasive to the United States, arrived in Hawai'i in 2019 and is present in California as well. ALB does not feed on the actual crop but feeds on the underside of leaves, causing chlorosis, and necrosis, that could lead to potential leaf tissue death. To monitor the damage on avocado lace bug leaves, I developed a low-cost, portable imaging field tool. The imaging system is designed to capture high quality images of avocado leaves under standardized conditions. The python programmed field tool integrates a Raspberry Pi, NoIR camera, ST7789 IPS TFT display, fan, and a button. I tested various camera angles, cameras, heights, materials and lighting setups to optimize the imaging system. The field tool captures images with a button press, saves them with timestamps into a file, and displays the images immediately for in-field verification. To withstand environmental factors, I designed a 3D printed custom enclosure in Fusion 360 to protect components from outdoor conditions. Designed to work under heat and also lightweight enough for in field use, the tool provides efficient field image collection. Using Python in VSCode I processed the collected leaf images to analyze the damage. Terminal executions were made to calculate the percentage of no damage, chlorosis and necrosis of the leaf area affected by ALB damage. The data gathered will be vital towards knowing plant health and creating ways to improve plant growth that will help scientists approach a sustainable solution for farmers facing ALB damage.

Alondra Bejarano

Major: Mechanical Engineering

Clinical Skill Development and Career Path Confirmation at City Dental

Intern: Ashley Christine Avina

Mentor: Dr. Youngjoo Kim, D.S.S

Opportunity: City Dental

High quality-dental care is a dedication of City Dental, located in Salinas, California. A wide range of services are offered to strengthen confidence and ensure that patients leave comfortably with a brighter, enhanced smile. The Panther Connect Nano-Internship of Summer 2025 allowed me to contribute 161 hours of service. Throughout this time, I provided valuable assistance in various areas of the clinic. Under the guidance of my supervisor, Dr. Youngjoo Kim, D.S.S, and association with dental assistants, I was trained to help maintain a safe and efficient environment for all patients. My responsibilities included observing procedures, sterilizing instruments, and preparing and breaking down operatories. This experience exposed me to the inner workings of a practice and strengthened my readiness for a career centered on patient care. Beyond clinical skills, I was also introduced to the difficult realities of a healthcare setting, including overbooked schedules and unexpected absences. During this time, I faced a personal hardship after sustaining a concussion and being diagnosed with post concussion syndrome. With the support of my mentor and colleagues, I was able to adapt and continue learning in the field of dentistry. These challenges strengthened our teamwork. Midway through this internship, I was offered a full time position as a dental assistant. Throughout the program, I developed a foundational understanding of dental materials and tooth anatomy, along with knowledge of emergency and routine patient examinations. I've also gained hands-on experience assisting with the high volume evacuator and saliva ejector during prophylaxis and restorative procedures for patients of all ages. Additionally, I shadowed extractions, crown deliveries, root canals, bone grafts, implant placements, and scaling and root planing. Most importantly, this internship confirmed my passion for dentistry and my commitment to this career path.

Ashley Christine Avino

Major: Biology

Innovation for Crop Growth in Controlled Environmental Agriculture

Intern: Gabriel Bello

Mentor: Dr. Michael Loik

Opportunity: UCSC - SUPERDAR

This internship placed me on an interdisciplinary project bridging civil engineering with environmental research to develop innovative methods for monitoring crop growth. I collected plant physiological data using a spectrometer, chlorophyll meter, gas-exchange analyzer, and water-potential setup (including measurements on Joshua trees). I cultivated, potted, and maintained multiple species, including coffeeberry, radish, Artemisia, and others, while tracking temperatures and organizing plants into “wet” and “dry” groups to control water availability. A major responsibility was engineering a track-mounted drone system installed above bench tables and anchored to wall supports. I soldered wiring and voltage lines, stabilized the frame, and programmed ultrasonic-based motion controls so the cart paused at set intervals and traversed back and forth for systematic imaging. The payload integrated infrared and ultraviolet sensors along with a multispectral, 8-lens camera to assess plant health in preparation for powdery-mildew challenge trials. In parallel, I programmed a crawler robot to support monitoring tasks and ensured that all equipment, carts, and plant systems remained operational throughout the project. Beyond the lab, I assisted graduate students with their research. This included visiting crop fields to collect soil samples for laboratory analysis and joining surveys that required documenting plants within 3×3 m quadrats to record species abundance and evaluate how environmental factors, including wildfire, affected populations. To better contribute to these efforts, I also spent time independently reading research articles related to the project, which helped me connect my engineering work to the broader scientific context. Although the mildew trials were not completed, I documented plant stress responses—such as bolting—and gained a deeper understanding of homeostasis and environmental adaptation. The experience strengthened my skills in coding, circuitry, hardware integration, and data collection while also giving me practical exposure to fieldwork and interdisciplinary collaboration. It demonstrated how civil-engineering tools can be applied to environmental and agricultural innovation, while reinforcing my adaptability, initiative, and ability to contribute across disciplines.

Gabriel Bello

Major: Civil Engineering

Wearable Environment and Health Monitoring System

Intern: Sofia Beltran Espino

Team Members: Aurora Webeck, Diego Villegas

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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NASA

CALIFORNIA SPACE GRANT CONSORTIUM

Human missions to Mars face major challenges including space radiation, isolation, and hazardous environments (NASA, 2024). These conditions pose serious physical and mental health risks such as radiation-induced cancer, muscle atrophy, and bone loss (NASA, 2025). Current NASA suits monitor biometric data, but what if they also tracked environmental conditions in real time? This project explores a wearable health monitoring system built with Arduino Uno Wifi, designed to collect both biometric and environmental data for use in spaceflight and hazardous Earth environments. The system aims to support data-driven safety decisions and early detection of risks. We developed a portable prototype jacket integrating seven sensors: UV, fine particle, blood oxygen, pulse, and two that measure atmospheric components. Using an engineering design approach, we selected open-source components and refined sensor code. Once validated, data was transmitted wirelessly both to a monitoring device and directly to a small display. This system demonstrates potential for real-time astronaut monitoring and occupational safety on Earth. With further development, it could improve situational awareness and long-term health tracking in extreme environments.

Sofia Beltran Espino

Major: Engineering

NSF Rise Physics Curriculum

Intern: Esteban Berelleza

Team Member: Alexander Valenzuela

Mentor: Sagayamary Rayappan

Opportunity: NSF - Rise Teaching Internship

Building a curriculum centered around teamwork and inclusion is crucial for students to not only learn but also thrive. Through daily group activities, students are exposed to the value of teamwork, and our goal is to encourage students to help each other truly grasp the new material. With the week 1 example overview, students were taught measurement, SI units, and the implementation of Scientific Notation. With each day building upon the next, repetition and overfamiliarity with the concepts help students attain a strong foundation within the Physics curriculum. This week 1 example gives insight into what the entire year-long curriculum would be like, and includes a quiz on day five. Day 5 features a five-minute meditation at the start of the class to help regulate and ease the nerves of students. Far too often, the “grind culture” within STEM leads to students putting their personal needs aside to prioritize good grades. Our mission is to teach students the importance of including both. Throughout the internship, there were many new and unfamiliar concepts we learned. One of which was the California NGSS teaching structure. By far the most challenging aspect of the project was learning how to create a curriculum that fit those standards. Fortunately, it felt familiar to the structure we, as high school students, experienced. Our prior exposure to this class helped tremendously when it came to homework and exam formatting. Through the usage of past projects, Khan Academy, and the NGSS teaching structure, we were able to cultivate assignments with questions that built upon each other. This was done intentionally to help prepare the high school students for what they should expect to come across in college.

We want to thank Dr. Rayappan and MESA for giving us the opportunity to delve into the world of education. This was a truly fulfilling experience and has motivated us to continue our path in engineering to help inspire and educate the future.

Esteban Berelleza

Major: Electrical Engineering

A.S.E.R (Agricultural Space Exploration Rover)

Intern: Esteban Berelleza

Team Members: Angela Madrigal, Keily Lepiz

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

The rover is focused on planetary space research with an emphasis towards exploring and

collecting data on the environment that responds to the possibility of establishing agriculture on a planet. The rover will encompass key sensors, a solar panel to track the sun, and a robotic arm that will measure the natural components of the celestial body. Some of the sensors that the rover will be equipped with will include a camera, a temperature and humidity sensor, a soil moisture sensor, an air quality sensor, ultrasonic, and an NPK sensor. The sensors and features will work together to analyze and collect data in order to determine if the environmental conditions will be sufficient in establishing agriculture. In addition to the sensors and solar panel, the rover will be controlled via joystick through the usage of antennas. Reliable movement and ease of use is the product of only needing two motors to power the entire ground vehicle. The "tank-like" wheels consisting of a large surface area and grooves, provides our rover with the ability to maneuver over and around space debris. The final end goal of the rover is to find areas within different nearby planets that provide a terrain suitable for plant life and agriculture. This information will be key to one day pave the way for humans to establish settlements beyond Earth.

Esteban Berelleza

Major: Electrical Engineering

O.A.S.I.S (Observation And Analysis System In Search)

Intern: Isai Cabrera Gallegos

Team Members: Israel Crystalinas and Jennifer Cruz-Marquez

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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NASA

CALIFORNIA SPACE GRANT CONSORTIUM

The development of low-cost, functional rovers is essential for future planetary exploration missions. This project, named O.A.S.I.S. (Observation and Analysis System In Search), addresses this challenge by designing a rover for simulated lunar exploration. The primary objective was to create a functional prototype capable of mapping the lunar surface, examining terrain, and collecting and transmitting critical environmental data back to a user.

Throughout the internship, I was mainly responsible for the electrical, testing the sensors, and some of the code for the microcontrollers. My work involved wiring sensors that included LiDAR, GPS, Soil Moisture, MQ-2 Gas, MQ-135 Gas, and BME 680 Environment to two ESP-32 microcontrollers and 3 Arduino Unos. Most of the code was written in C++. I used the Arduino IDE to upload and manage the microcontroller's functions. A significant portion of my time was dedicated to testing and troubleshooting sensors to ensure all components functioned together reliably and the wiring of the rover.

The final project was a functional rover prototype that demonstrated key capabilities for lunar exploration. A joystick successfully controls the rover and is able to wirelessly transmit collected data. I successfully integrated and programmed the LiDAR sensor to display real-time distance measurements on an LCD screen. Furthermore, one ESP-32 was dedicated to controlling two arm servos and transmitting soil moisture data, while the other was programmed to send data from the GPS and gas/environment sensors.

This project provided valuable, hands-on experience in robotics and embedded systems. I strengthened my skills in problem-solving, sensor integration, troubleshooting, and microcontroller programming, while contributing to the successful development of a functional lunar rover prototype.

Isai Cabrera

Major: Engineering

County of Monterey — Public Health Lab Internship

Intern: Anevay Castro

Mentor: Rawni Lunsford

Opportunity: County of Monterey Public Health Lab, Salinas

During my internship with the public health lab I was able to be part of a team dedicated to safeguarding community health through laboratory analysis and operational support. This experience provided me with an inside view of the lab's workflow.

A significant portion of my time was spent on hands-on tasks within the lab's core functions. I performed weekly subcultures for both the bacteriology and mycology sections, which was an essential step for isolating and identifying microorganisms in both clinical and environmental samples. I also contributed directly to the pre-analytical phase of the lab's work by preparing collection kits which ensured that field staff had the necessary materials for accurate and timely sample collection.

My role also focused on quality assurance and administrative efficiency. I assisted with the calibration of pipettes, centrifuges, and temperature monitors which helped to ensure that all equipment met strict standards for accuracy and reliability. I managed crucial records through careful data entry, scanning, and filing, and I was responsible for performing assigned inventory, which maintained a consistent supply of lab reagents and materials. Finally, I was tasked with properly receiving routine water samples. This involved following a precise protocol for logging and processing samples upon arrival.

This wide range of responsibilities allowed me to develop an in-depth understanding of the attention to detail, organization, and teamwork required to run a high-functioning public health laboratory.

Anevay Castro
Major: Biology

A.R.E.S.
(AI Rover Exploration Scout)

Intern: Ramon Castro Hernandez

Team Members: Ismael Galaz, Brisa Flores Balderas

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

Vehicles used for space exploration can often be expensive and limited to specific applications. This NASA-sponsored internship project develops a small-scale, AI-powered rover designed to simulate planetary exploration. The rover is a six-wheel, all-terrain buggy equipped with Raspberry Pi and Arduino microcontrollers to control navigation, sensing, and communications. It operates autonomously, using computer vision and machine learning to map terrain through image and video capture while detecting and classifying materials such as iron. Integrated ultrasonic sensors and AI-driven obstacle avoidance allow it to traverse diverse surfaces without manual intervention. Material identification results are transmitted to the user for further analysis, demonstrating potential applications in the detection of extraterrestrial resources. The project showcases how low-cost, modular platforms can be adapted for advanced autonomous navigation, environmental mapping, and material recognition in simulated space environments. By combining AI, robotics, and sensor integration, this work provides a scalable framework for future planetary exploration rovers.

Ramon Castro Hernandez

Major: Electrical Engineering

NSF RISE Curriculum Project

Intern: Mario Chris

Team Member: Aurora Webeck

Mentor: Sagayamary Rayappan

Opportunity: NSF Rise - Teaching Internship

This STEM based curriculum development project aims to lay the foundational ideas of visual data analysis and comprehension for middle schoolers. It emphasizes a conceptual understanding of the three most common graph types—bar graphs, pie charts, and line graphs. The curriculum uses active hands-on learning methods through class-teacher discussion on presented graphs and the application of concepts through worksheets. It culminates in a final project where students demonstrate their knowledge through in-class data collection based on a research question and presentation of graphs they created in teams.

Throughout the course of the project's development I have developed skills and overcome challenges that made this internship experience all the more rewarding. In tandem with gaining proficiency in project development, I gained a valuable perspective on how educators and academics approach sharing knowledge. This internship pushed me to think about how knowledge builds upon itself and how to encourage connection between ideas to demonstrate critical thinking.

I am deeply grateful for this internship opportunity and look forward to the future opportunities it may open. Thank you to the internship coordinator, my mentor, and other individuals who gave me advice through this internship.

Note from the mentor, Mario Chris:
In my years as an educator, this is my first experience teaching someone how to teach a class. I enjoyed helping the intern tackle the challenges of designing a curriculum. I learned to articulate the pedagogical practices that I have used as a teacher, and it was rewarding to help someone bring their ideas to fruition.

Mario Chris

Major: Engineering

O.A.S.I.S (Observation And Analysis System In Search)

Intern: Jennifer Cruz Marquez

Team Members: Israel Crystalinas, Isai Cabrera Gallegos

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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The upcoming lunar mission presents a significant opportunity for scientists and experts to gain a deeper understanding of the lunar surface. The name of my rover is O.A.S.I.S., which stands for Observation and Analysis In Search. O.A.S.I.S. carries 7 sensors and aims to analyze the moon's environment by collecting sample data. It uses cameras to map and lidar to scan the area of the moon, and to transmit its GPS location. O.A.S.I.S. provides considerable findings for scientists and experts to learn more about the moon and its surface.

Jennifer Cruz Marquez

Major: Computer Science

O.A.S.I.S (Observation Analysis System In Search)

Intern: Israel Crystalinas

Team Members: Jennifer Cruz-Marquez, Isai Cabrera Gallegos

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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NASA is currently preparing for future lunar exploration through the Artemis program, a mission aimed at not only returning people to the Moon but establishing a sustainable lunar base. Our team was inspired to contribute to this vision by designing and building a functional planetary rover. We created O.A.S.I.S, a rover specifically engineered to assist in the search for water on the Moon and other celestial bodies by detecting and mapping potential water sources. Equipped with a range of environmental sensors, O.A.S.I.S can map terrain, track surface changes, and gather data essential for evaluating planetary habitability. O.A.S.I.S was developed using the ESP32s microcontroller to efficiently manage motor functions and wirelessly process data from its GPS, LiDAR, moisture sensor, and more. To fully accommodate the mounting of its sensors, motors, and microcontrollers, we designed and 3D-printed a custom chassis tailored entirely to the mission's demands. O.A.S.I.S has proven its ability to traverse varied surfaces and effectively map its surroundings using its suite of seven sensors. With NASA's Artemis mission approaching, our team's rover, O.A.S.I.S, demonstrates that student-led innovations can support sustainable exploration and resource discovery, not only on the Moon but in future space missions as well.

Israel Crystalinas

Major: Mechanical Engineering

Joby Training Management Internship

Intern: Braden Diaz De Leon

Mentor: Ken Burleigh

Opportunity: Joby Aviation

During the summer of 2025, I interned at Joby Aviation, a leading company in the development of commercially used electric vertical take-off and landing (eVTOL) aircraft. I was part of the Manufacturing Training team, where I contributed to ongoing training development initiatives. My responsibilities included data input and transfer, assisting with data analysis, course development, and optimizing learning processes. I worked with tools such as Excel, Google Docs, PowerPoint, JavaScript, Moodle, and Totara. Through this role, I enhanced my skills in project coordination, deepened my proficiency in JavaScript, and gained a stronger understanding of data management in a training and development context. I also supported the transition to a new learning management system, which improved learning efficiency, data accuracy, analytics, and record-keeping. This internship provided valuable hands-on experience in a professional, cross-functional environment.

Braden Diaz

Major: Computer Science

Battery Education Training Catalog (BETC)

Intern: Jonathan Dominguez

Mentors: Mary Sims and Thatcher Banh

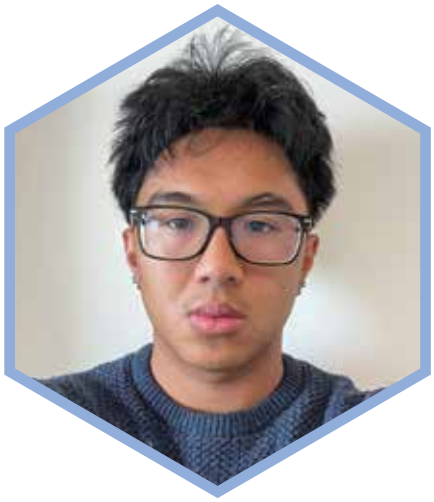
Opportunity: Naval Postgraduate School

The U.S. ranks fourth-place in the world in battery manufacturing. However, the U.S. does not want to rely on other countries for sake of battery related trade materials so it started to build upon a new database known as the Battery Education and Training Catalog (BETC). The BETC provides clear educational pathways in battery careers and will support U.S. battery workforce growth by consolidating accredited academic courses, certificates, and CEUs nationwide.

Manual and automated web scraping methods identified 456 programs at high school, college, and postgraduate levels, overcoming technical challenges such as rate-limiting. The data, structured in Excel, is publicly available via a conversational chatbot interface. Future work will combine automated scraping and institutional self-reporting to improve scalability, accuracy, and sustainability.

Jonathan Dominguez

Major: Engineering

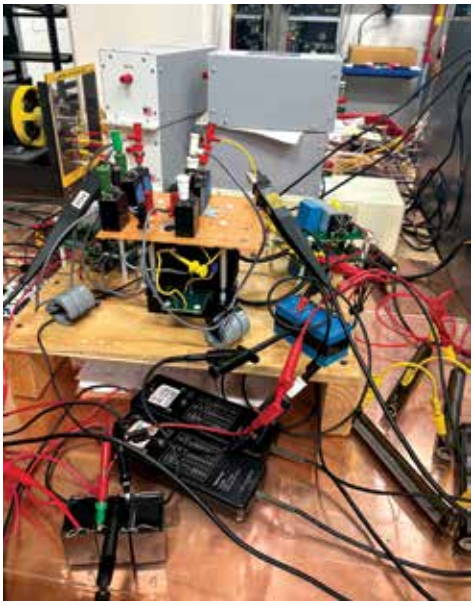


Microgrid Project

Intern: Allen Escolta

Mentor: Branden Naylor

Opportunity: Naval Postgraduate School



During our NPS internship, we were tasked with improving access to a more detailed version of energy data, which will consist of heating and cooling data through any type of building using a Microgrid Tool. Initially, I faced challenges due to the unreliable sources of the tool we used since there were many unstable versions of it, as well as outdated .idf files that came with the online tool. We got over these barriers by finding the right versions all over the internet and learned how to convert these .idf files so it is compatible with our online tool we used. Also, through intensive collaboration, we developed a user interface to address the problem, while learning new programming languages such as Python and Julia. We also became familiar with EnergyPlus, an open-source building energy simulation tool, which allowed us to analyze energy flows within buildings based on location. By integrating preloaded data from EnergyPlus into our interface, we enhanced the tool's functionality by enabling it to generate graphs and simple data charts directly on the website. Upon completion, we plan that this will help NPS and other Navy bases to contribute to the resilience of each building and hope to keep the buildings electricity strong and uninterrupted continuing through any type of weather storm or even during blackouts as well.

Allen Escolta

Major: Mechanical Engineering

STEAM Educational Programming for the Bezos Learning Center

Intern: Abigail Ferrales

Mentor: Dr. Christina N. Menendez

Opportunity: Smithsonian Leadership for Change

Smithsonian Institution

Building the educational programming for the upcoming Bezos Learning Center, located in Washington D.C. adjacent to the Smithsonian's National Air and Space Museum, the BLC will serve as a STEAM-focused facility that encourages problem-solving and immersive learning whilst encouraging creativity. The central component of the BLC's programming is the Bezos Science and Technology Innovation Challenges (BeST). Its purpose is to engage middle and high school learners in finding responses and solutions that are relevant to them and their community.

Tasked with creating multiple challenges and questions that are hands-on activations and are grounded in solving real world problems; participating students have the opportunity to find potential solutions for real world community-based problems. For example, students could answer the question, "How can we design homes and neighborhoods that integrate green infrastructure to address specific needs?" Then students are tasked to design their own model for what future homes could look like that address issues in their community. These activations will occur primarily outside of school and at the BLC or across the nation (as these challenges will be available online). This gives learners the opportunity to work in distinct roles on teams and will have access to a myriad of physical and digital tools and collections. The center will serve as a place of possibility and engagement for all!

Abigail Ferrales

Major: Environmental Science

A.R.E.S.
(AI Rover Exploration Scout)

Intern: Brisa Flores

Team Members: Ismael Galaz, Ramon Hernandez Castro

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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Autonomous robotic systems are playing an increasingly vital role in planetary exploration, enabling safe and efficient geological surveys in environments that are hazardous or inaccessible to humans. Integrating artificial intelligence (AI), robotics, and sensor technologies allows these systems to analyze terrain and materials in real time, simulating capabilities needed for future space missions. This project, sponsored by NASA through the California Space Grant Consortium (CaSGC), aimed to design and develop a small-scale, AI-powered rover—named A.R.E.S. (AI Rover Exploration Scout)—that demonstrates the potential for autonomous navigation, environmental mapping, and material classification for planetary exploration. A.R.E.S. is a six-wheeled, all-terrain rover powered by a Raspberry Pi 4 Model B and two Arduino Mega boards. It features a night vision camera, ultrasonic sensors, and a solar-powered system. The rover navigates autonomously using AI-driven obstacle avoidance and computer vision techniques. A TensorFlow-based machine learning model was trained on thousands of labeled rock images, then optimized using TensorFlow Lite for real-time inference on the onboard Raspberry Pi. The model identifies and classifies rocks such as basalt and granite in live video streams, which are accessible via smartphone over Wi-Fi. The current model demonstrates moderate accuracy in real-time rock classification and autonomous navigation across varied surfaces. The system also transmits identification data for further analysis, highlighting its potential for field deployment. A.R.E.S. provides a scalable framework for integrating AI, robotics, and computer vision into planetary exploration systems, with future work focused on improving classification accuracy, arm precision, and full autonomous pathfinding.

Brisa Flores Balderas

Major: Aerospace Engineering

A.R.E.S.
(AI Rover Exploration Scout)

Intern: Ismael Galaz

Team Members: Brisa Flores Balderas, Ramon Hernandez Castro

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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The A.R.E.S. (AI Rover Exploration Scout) project is a NASA-sponsored initiative developed through the California Space Grant Consortium (CaSGC) aimed at designing and constructing a semi-autonomous bogie rover capable of simulating planetary exploration missions. This rover is a six-wheeled, all-terrain ground vehicle that employs a Raspberry Pi 4 Model B along with one Arduino Mega board for control, data processing, and navigation. It features a night vision camera and ultrasonic sensors for obstacle detection, for better operational sustainability in uneven terrains, a temperature sensor, and GPS to know the location of the rover at all times. A.R.E.S. also incorporates computer vision and machine learning techniques to identify and classify rock types commonly found on Earth and Mars, such as basalt and granite. A custom-trained TensorFlow model, converted to TensorFlow Lite for real-time operation, processes live video footage to detect and label rocks with bounding boxes. Additionally, the system can stream data wirelessly to a smartphone interface, facilitating remote observation. Currently, A.R.E.S. demonstrates moderate accuracy in real-time rock detection and autonomous navigation over uneven surfaces. Future enhancements are planned, including expanding the training dataset for improved classification accuracy, advancing autonomous pathfinding capabilities, and potentially adding a robotic arm. A.R.E.S. represents a scalable, AI-integrated robotic solution for future Mars exploration efforts and serves as an educational tool for outreach in space science and robotics.

Ismael Galaz

Major: Aerospace Engineering

Joby Aviation
Facilities Maintenance Intern

Intern: Andy Garcia Ortiz

Mentors: Miguel Maldonado and Mauricio Romero

Opportunity: Joby Aviation

Over the course of a 10-week summer internship with Joby Aviation in Marina, California, I served as a Facilities Maintenance Intern through a partnership with Hartnell College. This internship provided me with real-world, hands-on experience that extended beyond the classroom and offered professional-level training employers value highly.

I worked in a role equivalent to a Maintenance Technician 1 while also shadowing supervisors and managers to gain insight into leadership, planning, and coordination within an aerospace operations environment. Additionally, I collaborated with highly skilled tradespeople, including Maintenance Technicians (levels 3–5), a plumber, an electrician, a fabricator, and a welder.

My responsibilities included advanced technical projects such as sheet metal fabrication for air duct exhaust vents and assisting with irrigation system installation. I learned how to connect to main water lines, operate shut-off valves, repair industrial backflow systems, and perform preventive maintenance. I also learned to unclog urinals and toilets and install support fixtures for new bathroom plumbing.

One of the most challenging and rewarding projects involved working with my team and direct supervisor to install and program motor-operated, remote-controlled roll-up blinds. This task had been declined by subcontractors due to the technical difficulty, but I was given the time, tools, and autonomy to successfully complete it.

Additional skills I developed included ethernet cable fabrication, low-voltage time clock installation, conduit bending, high-voltage electrical safety, and voltage measurement. I also learned proper adhesive bonding techniques for metal-to-tile installations, participated in safety walk audits, and completed various fixture installations, including shelving, signage, and TV stands. I received training in invoice documentation and processing as well.

This internship enhanced my technical knowledge, improved my confidence, and strengthened my readiness for a career in facilities maintenance or construction management.

Andy Garcia Ortiz
Major: Construction Management / Welding

NSF RISE STEM Curriculum

Intern: Hezekiah Gonzalez

Team Member: Rebecca Linares

Mentor: Dr. Sagayamary Rayappan

Opportunity: NSF Rise Teaching

STEM (Science, Technology, Engineering, Mathematics) education provides a chassis for understanding how the world functions around us, or how we revolve around its scientific principles and fathom the cosmos we inhabit. Such disciplines require basic mathematical foundations that include, for example, trigonometry.

Having this in mind, the purpose of this Noyce NSF RISE project was to help create a math/science curriculum from anything between 3rd and 12th grade levels. The development of our one-week accelerated trigonometric curriculum focused on revising key concepts and learning skills that will help high school students prepare for future opportunities.

This curriculum was created to present new material, define and explain the “why” and “how” behind it, show step-by-step examples, and allow students to attempt on their own or brainstorm in a group setting. With this, our desired impact is for the students to truly understand new and familiar ideas.

Our curriculum was developed with much inspiration of previous mentors before us who genuinely gave it their best for their students.

Thank you Dr. Sagayamary Rayappan.

Hezekiah Gonzalez

Major: Engineering

From Clinic to Community: UCLA SHPEP Experience and Maternal Health Proposal

Intern: Kayla Kennamore

Mentor: Dr. David Geffen

Opportunity: Summer Health Professions Education Program (SHPEP) at UCLA

SUMMER HEALTH PROFESSIONS EDUCATION PROGRAM

Shaping Careers. Changing Lives.

During my time in the UCLA Summer Health Professions Education Program (SHPEP), where I was accepted into the dental track, I gained valuable academic, clinical, and professional experiences. In the dental track, I worked alongside dental students to create teeth molds and place fillings on simulated teeth, strengthening my technical skills. I participated in seminars with important dental leaders at UCLA and dentists with their own practices, where I was able to ask questions about clinical practice, specialization, and career development. I also received personalized guidance on preparing a competitive dental school application from leaders in admissions and equity within the institution. These experiences deepened my understanding of the dental profession and reinforced my commitment to pursuing dentistry.

Separately, as part of SHPEP's interdisciplinary component, I collaborated with peers to develop a proposal for a healthcare intervention addressing racial disparities in maternal health. Our plan focuses on reducing the disproportionately high maternal mortality rates among African American women in Los Angeles County. In the United States, Black women face maternal mortality rates three to four times higher than White women, even when accounting for income and education, with more than 80 percent of these deaths considered preventable. The proposed intervention, designed for future implementation at Martin Luther King Jr. Community Hospital would involve 1,000 pregnant African American women randomly assigned to receive either standard maternal care or standard care supplemented with culturally matched community-based doula support and midwifery-led services. Doulas would provide emotional, physical, and informational support from mid-pregnancy through six weeks postpartum, while midwifery care would aim to reduce unnecessary medical interventions. Outcomes would be measured quantitatively through maternal mortality ratios, cesarean rates, preterm births, and qualitatively through patient satisfaction, provider trust, and reported care experiences. This proposal seeks to demonstrate that equity-centered, culturally congruent care delivered by practitioners who share the cultural background of their patients can help reduce racial disparities in maternal health.

Kayla Kennamore

Major: Biology

CRISPER/Cas9-mediated Sterilization in Tephritids: A Genetic Approach to Population Control

Intern: Juliah Elisa Kuepfer

Mentors: Jean Auth and Chan Heu

Opportunity: USDA Pacific Basin Agriculture Research Center

Location: Hilo, Hawai'i

Fruit fly outbreaks are an increasing threat to U.S. agriculture. In California they are responsible for causing severe crop losses when larvae hatch and feed inside fruits and vegetables. At the USDA-ARS Pacific Basin Agricultural Research Center in Hilo, Hawaii, we used CRISPR/Cas9 to target the beta tubulin 2 (btub2) gene in male Ceratitis capitata (Mediterranean fruit fly), Bactrocera cucurbitae (Melon fruit fly), and Bactrocera dorsalis (Oriental fruit fly). Knockout of btub2 produced sterile males that could still mate but produced no offspring, achieving gene editing efficiencies greater than 70% in all three species. Studies with females were conducted only to better understand how this gene functions in both sexes, rather than as part of the control strategy. These results support btub2 as a promising target for Sterile Insect Technique. By sterilizing fruit flies we will provide a solution towards agricultural farmer's fruit fly outbreaks. This species-specific approach could offer a safer, more sustainable alternative to chemical pesticides. Next steps include developing ways to produce sterile males on a larger scale and testing the method in more realistic, outdoor settings.

Juliah Kuepfer

Major: Biochemistry

A.S.E.R (Agricultural Space Exploration Rover)

Intern: Keily Lepiz

Team Members: Esteban Berrelleza, Angela Madrigal

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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With space exploration rapidly advancing, humanity is not yet fully prepared to send people to explore distant planets. However, we can deploy robotic rovers equipped with specialized instruments to investigate and assess possible planetary environments. These missions provide valuable data to determine whether a planet could support future human exploration and habitation. My research focuses on designing and developing a rover capable of collecting comprehensive environmental data to evaluate planetary conditions for potential human settlement.The rover is controlled via a bluetooth joystick and integrates multiple sensors, including air quality, temperature, humidity, gas, pressure, ultrasonic distance, soil moisture, and NPK (nitrogen, phosphorus, potassium) sensors, to assess both atmospheric and soil characteristics. It also features a custom 3D-printed robotic arm designed to to assist with soil composition analysis. It is powered by a combination of solar panels and batteries for sustained operation. Data is collected through Arduino and ESP32 microcontrollers and transmitted to a web server via Wi-Fi for remote monitoring and analysis. The rover successfully collected and transmitted environmental and soil composition data in real time to a remote web server. This research demonstrates the feasibility of using a compact, sensor-equipped rover for autonomous planetary environment assessment. Such rovers could serve as cost-effective, remotely operated platforms to evaluate the habitability of extraterrestrial environments before undertaking human exploration.

Keily Lepiz

Major: Mechanical Engineering

NSF RISE STEM Curriculum

Intern: Rebecca Linares

Team Member: Hezekiah Gonzalez

Mentor: Sagayamary Rayappan

Opportunity: NSF Rise - Teaching Internship

NSF RISE Abstract/Reflection

Ever since California implemented AB705 and AB1705, unprepared high school students have managed to trickle into transfer-level math courses. Some students, such as Hezekiah, manage to get through many math courses without understanding the fundamentals of Trigonometry.

Having this in mind, the purpose of this Noyce NSF RISE project was to create a one-week accelerated Trigonometry math/science curriculum which aims to help high school students revise key concepts necessary for expanding into more advanced concepts, and learn skills that will prepare them for future opportunities.

Students will be familiarized early with Angles, Triangles, Quadrants, etc. through Definitions, Examples, and a worksheet that can be taken home. This curriculum was created to present new material, define and explain the “why” and “how” behind it, show step-by-step examples, and allow students to attempt on their own or brainstorm in a group setting. With this, our desired impact is for the students to truly understand new and familiar ideas.

The project has room to grow with more diverse worksheets and perhaps quizzes to add a grade-based goal. The project could also cover additional topics such as algebra to have a broader impact in later College-level Math courses.

Our curriculum was developed with much inspiration of previous mentors before us who genuinely gave it their best for their students. Thank you, Dr. Sagayamary Rayappan, for providing us with this opportunity.

Rebecca Linares

Major: Mathematics

Photogrammetry Meets Machine Learning

Intern: Fernando Lopez Vasquez

Mentors: Dr. Brij Agrawal and Dr. Leonardo Herrera

Opportunity: Naval Postgraduate School

This project focuses on reconstructing 3D models of UAVs and a small satellite model using low-quality visual and infrared imagery. The objective is to generate realistic synthetic data to train AI algorithms, reducing the need for costly real-world data collection. MATLAB was used to enhance image quality, improving feature visibility for photogrammetric processing. Open-source tools like COLMAP and Meshroom were then used to generate preliminary 3D models. Although the modeling process is ongoing, early results show that even degraded imagery can yield usable reconstructions. This work supports future efforts to create labeled synthetic data with real-world features for remote sensing and defense applications

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Fernando Lopez

Major: Engineering

Flying Ad Hoc Network Coverage

Intern: Juan Madrigal

Mentors: Joseph Lukefahr, Steve Mullins, Dr. Alexander Bordetsky

Opportunity: Naval Research Enterprise Internship Program

Reliable UAV communication is essential for mission success, especially in environments where traditional networks fail. This study examines the impact of varying frequencies (2.4 GHz to 5.8 GHz) and transmit power (0 to 10 dBm) on key performance metrics, including throughput, latency, slant range, and voltage, using Rajant Cardinal radios for communication between a drone and a ground control station. Eight ground tests were conducted, exploring different configurations to assess network performance. The findings offer critical insights into optimizing UAV communication systems for demanding military and maritime missions, where reliable and efficient data transfer is vital. This research enhances the understanding of UAV communications in dynamic environments.

Juan Madrigal

Major: Mechanical Engineering

A.S.E.R (Agricultural Space Exploration Rover)

Intern: Angela Madrigal

Team Members: Esteban Berrelleza, Keily Lepiz

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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NASA

CALIFORNIA SPACE GRANT CONSORTIUM

The Agricultural Space Exploration Rover (A.S.E.R) aims to evaluate and gather environmental data through key sensors that will assess the potential of developing agriculture on celestial bodies. The rover will be equipped with multiple sensors that will share an ESP32 board, including an MQ135 gas sensor, a capacitive soil moisture sensor, a BME680 sensor, an NPK sensor, and two HC-SRO4 ultrasonic sensors. Specifically, the BME680 sensor measures the humidity and temperature of the air, along with the atmospheric pressure. The NPK sensor analyzes the amount of nitrogen, phosphorus, and potassium in the soil that is important to understanding the viability of the soil for plant growth. The ultrasonic sensors will be implemented on the back and the front of the rover in order to respond to object detection. A 3d printed arm for the NPK and soil moisture sensor will be implemented in order for the rover to readily access and retrieve environmental data. The 3d arm and rover will be controlled utilizing a joystick module with buttons to move the robotic arm and rover through antennas for wireless communication. The data will be collected through a web server that will display key information collected from the sensors via WiFi.

Angela Madrigal

Major: Civil Engineering

Cosmic Fireworks: Simulating the Red Nova Eruption in Andromeda

Intern: Ana Manzo

Mentors: Dr. Andrea Antoni, Dr. Enrico Ramirez-Ruiz, Naunet Leonhardes-Barboza, Angela Twum

Opportunity: UCSC LAMAT

The universe is vast and filled with incredible phenomena, one example of such are explosive transients known as Luminous Red Novae. These events typically unfold over timescales of tens to hundreds of days and are believed to arise from binary star interactions, where mass transfer occurs between a donor star and its companion. One particular LRN of interest occurred in the Andromeda Galaxy in 2015. Observations of this event gave us an opportunity to investigate how the role of binary star interactions trigger such outbursts. Fortunately, a pre-outburst image of the donor star is available, allowing us to constrain its mass and evolutionary state. In addition, light curves produced from this observation, helps us estimate the total ejected mass from the event. The goal of my project is to infer the nature of the companion star by employing 1D hydrodynamic simulations to model the binary system interaction and compare the results with the observed data. I conducted three simulations with varying mass ratios (companion mass to donor mass) to examine how changes in the companion mass affect the amount of mass ejected. The simulations indicate that the closest match to observations occurs at a mass ratio of 0.2, which produces an ejected mass of 0.44 solar masses. While this is slightly larger than the observed value of 0.3 solar masses, it still provides valuable insight into the possible masses capable of reproducing the event. For future work, I plan to extend these simulations by not only varying the companion mass further but also exploring a range of donor star masses, given a range of such.

Ana Manzo

Major: Astronomy

The Importance of Hartnell's ITR

Intern: Mariah Marquez-Gonzalez

Mentor: Paul Chen

Opportunity: Hartnell Information Technology Department

HARTNELLCOLLEGE

The IT department is tasked with keeping everything running smoothly, from student labs to faculty equipment. IT works daily at assessing situations and using problem solving skills to repair campus equipment. I was able to intern with our Hartnell College IT Department for two months and learned a lot in that time.

This was a great opportunity for me as this experience allowed me to problem solve and develop my organizational skills. I had a variety of tasks assigned to me that I had to assess individually. One ticket could be completely different from the next. Being able to look at different tickets expanded my skillset. I primarily worked with paperwork and computer lab upgrades during my time interning. I was able to take charge and manage our spreadsheets to ensure our records were up to date and avoid future conflicts and allow my colleagues to focus on other tasks and keep our department running smoothly.

Taking the time to organize our records helped me reach my goal of improving my organization skills which will apply to any future stem careers and throughout my education.

I was able to gain knowledge on how computer software worked hand in hand with the hardware and about what policies our school has in place. I worked on imaging computers and installing software and programs needed for faculty work. I also aided in phone assignments and installation projects along with installing a switch which entailed more work than one might assume. This internship expanded my knowledge on how computers and devices work behind the scenes. As there were a variety of issues sometimes I would find myself unable to find a solution. This is where I turned to my supervisors for guidance. I was able to ask questions and gain insight into how to solve new types of issues. This insight

will continue to be valuable as I move forward in my career. As a Marine Biology major we use a lot of different technology when in labs and we are faced with many obstacles that require perseverance and outside of the box thinking. Coming away from this internship, I now have new knowledge to be able to troubleshoot any future issues as well as the assurance to know that asking questions is always a good learning opportunity.

Mariah Marquez-Gonzalez

Major: Biology

Developing an Engaging Biology Curriculum for 5th Grade Students

Intern: Brianna Martinez

Team Member: Abrianna Ruano

Mentor: Sagayamary Rayappan

Opportunity: NSF Rise Teaching Internship

This summer, I worked under the guidance of my mentor, Abrianna Ruano, to address a common challenge faced by new STEM teachers. Overwhelmed with the challenges of starting their new career, they may find it difficult to develop an effective, age-appropriate science curriculum. To support new educators and enhance student learning, we developed a comprehensive 5th-grade biology curriculum designed to be both engaging and easy to implement.

We developed a full-year curriculum covering plant biology for 6 weeks, animal biology for 6 weeks, and human biology for 12 weeks. Each unit includes clearly defined learning objectives and outcomes, along with hands-on activities, worksheets, visual aids, projects, slides, and videos. We prioritized interactive and memorable experiences, such as building models and delivering student presentations, to encourage creativity, critical thinking, and collaboration.

By breaking down complex biological topics into accessible lessons, our curriculum helps teachers deliver high-quality instruction with confidence. The materials are organized in an easy-to-navigate format, allowing any STEM teacher to pick up and begin teaching immediately. Our work not only supports classroom engagement but also contributes to long-term student interest in science. We hope this project empowers educators and inspires the next generation of STEM learners.

Brianna Martinez

Major: Biology

Microgrid Project

Intern: Cindy Martinez

Mentor: Brandon Naylor

Opportunity: Naval Postgraduate School

This internship focused on developing a Microgrid simulation tool—a digital platform used to model and analyze small-scale energy systems that can operate independently or alongside the main power grid for the Energy Academics Group. A central part of the work involved hands-on experience with EnergyPlus, an open-source building energy performance simulation engine developed by the U.S. Department of Energy, which models heating, cooling, lighting, ventilation, and other energy flows within buildings. The main project involved creating an interactive user interface that integrates specific input data, such as building geometry, occupancy schedules, weather conditions, and energy usage profiles, to model detailed energy use scenarios. A key component of the project included developing user guides for both the Microgrid tool and EnergyPlus to enhance accessibility and usability for future users. Throughout the internship, we worked collaboratively as a team, focusing on project coordination while also learning to program in C++, Julia, and Python. In addition to the core project, we engaged in smaller technical initiatives such as 3D printing, programming a weather station with a Raspberry Pi for NPS research, and designing a protective shed for a generator. This experience provided a broad foundation in coding, modeling, and design, and helped build essential skills for future work in engineering and energy systems.

Cindy Martinez

Major: Computer Science

Monterey County Public Health Laboratory Internship

Intern: Luis Mendoza

Mentor: Rawni Lunsford

Opportunity: Monterey County Public Health Department

The Monterey County Public Health Laboratory provides essential testing services to safeguard the community, including communicable disease surveillance, environmental monitoring, and water quality testing to ensure public safety. Working in this professional laboratory setting has given me exposure to the high standards, precision, and teamwork required in a laboratory setting. At the Monterey Public Health Laboratory, my days began around 0800. I would come in, don my lab coat, and report to my assigned decontamination area. With PPE and approved disinfectants, I prepared biosafety cabinets, benchtops, and shared workspaces to ensure safe daily operations. Once decontamination was complete, I reported to the Bacteriology section, where I assisted with quality control (QC) subcultures by transferring organisms to fresh slants and verifying the performance of new media batches. I supported the microbiologists throughout the day as needed. I also rotated through the Environmental section, where I conducted routine water testing for coliform and other contaminants. In addition, I trained in Media Preparation, where I learned to prepare culture media, calibrate pH, and maintain essential supplies for daily laboratory work. Every day offered new learning opportunities. Although I have yet to experience everything the Monterey Public Health Laboratory has to offer, it has been an honor to serve Public Health and the people of Monterey County. This experience has not only allowed me to contribute meaningfully, but has also benefited my own journey in higher education.

Luis Mendoza

Major: Health Science & Biology

Computational Analysis of Pyruvate–Cation Interactions in Atmospheric Conditions

Intern: Kajal P. Naidu

Mentor: Arun K. Sharma, Ph.D.

Opportunity: Research at California State Monterey Bay

Pyruvic acid is a simple alpha-keto acid that plays a vital role in biological metabolism and atmospheric chemistry. It can form through photochemical oxidation of volatile organic compounds (VOCs) like isoprene or be directly emitted from decomposing plant and animal matter. Once in the atmosphere, pyruvic acid and its conjugate base, pyruvate, can partition into aqueous aerosol particles, fog, and cloud droplets where further reactions occur. In aqueous environments, these molecules exist in equilibrium between ketone and geminal diol forms and interact with atmospheric cations, influencing their vibrational properties and chemical speciation.

In this study, density functional theory (DFT) calculations using the RωB97XD functional and 6-311++G(2d,2p) basis set in Gaussian were used to investigate the vibrational properties of pyruvic acid and pyruvate in the presence of atmospheric cations under aqueous conditions. Complexes were modeled in both ketone and geminal diol forms for pyruvic acid–$MgCl_2$ and pyruvate–MgCl systems. Additionally, the ketone form of pyruvate was examined with Na^+, K^+, Ca^{2+}, and Mg^{2+}. Carbonyl stretching frequencies decreased as the Mg–C1 distance increased, eventually reaching a plateau for the pyruvate-MgCl and pyruvic acid-$MgCl_2$ systems. Among the interactions between pyruvate and the cations, Mg2+ induced the largest downward shift in both symmetric and asymmetric stretches due to its high charge density and small ionic radius. This increases its ability to polarize and weaken the carbonyl bonds. These results highlight the importance of cation charge density and ionic size in modulating carbonyl vibrations and provide insight into pyruvate's chemical behavior in aqueous atmospheric environments. Such insights could inform the design of aerosol-phase chemical reactions relevant to atmospheric aging, secondary organic aerosol formation, and climate-relevant processes.

Kajal Naidu

Major: Biology & Pre Med

Environmental Impacts to California's Ocean Ecosystem: Sea Surface Temperature Effects on Coastal Communities

Intern: Victoria Nava

Mentors: Marina Lesse and Kellen Jones

Opportunity: Naval Postgraduate School

Ongoing environmental changes and rising atmospheric temperatures are triggering serious consequences that threaten to weaken the economic foundations of our coastal communities. Monterey Bay is an example of a region experiencing the effects of climate change. One of the major issues I address is: *How can an increase in sea surface temperatures (SST) impact the marine ecosystems in Monterey Bay?* A major concern is the effect on fish populations, which play vital roles in the ecosystem. If sea temperatures continue to rise, the food web will be disrupted, leading to environmental damage. Overall, rising sea temperatures will impact on our community's income, food supply, and tourism.

Victoria Nava

Major: Computer Science

Reconstructing Flight Test Training

Intern: Javin Niar

Mentor: Cody Cleverly

Opportunity: Joby Aviation

As a Flight Test Training Intern at Joby Aviation, I supported the development and implementation of a new Learning Management System (LMS) to enhance the efficiency, traceability, and communication of flight test training. The previous training framework lacked centralized learning records, consistent documentation of on-the-job training (OJT), and structured mentorship processes such as shadowing and reverse shadowing.

To address these challenges, a custom LMS plugin was introduced to log OJT directly into individual training records. I redesigned flight test training courses to be more accessible and learner-driven, working closely with qualification owners to align content with role-specific needs. This included integrating a core competency framework, which is being standardized across all flight test roles to establish end-to-end traceability.

In addition to what this project has already achieved, additional exciting developments are coming up. To ensure alignment with real-world operations, I trained alongside flight test teams to gain direct insight into their workflows, communication styles, and training limitations. Based on my observations, I am developing an advanced OJT activity that supports the dynamic scheduling of flight tests and shifts administrative tracking responsibilities to the learners. These adjustments will lead to even greater improvements in accuracy and efficiency.

Javin Niar

Major: Aerospace Engineering

Global Collaboration in STEM: Expanding the Greenworks in Greenfield Model

Intern: Daniel Orta

Team Members: David Orta, Isael Estrada

Mentor: Dr. Lev Horodyskyj

Opportunity: Science Voices

Building on the inaugural launch of the "Greenworks in Greenfield" program, my objective this summer was to expand a student-driven STEM training model focused on measurable skill development and participation outcomes. Partnering with Science Voices and collaborators at the University of Campinas (Brazil), I co-facilitated project design workshops, supported student prototyping, and coordinated nine hybrid sessions blending in-person and virtual engagement.

During the planning phase, I contributed to the conceptual rollout of the program by engaging in schedule design, slide deck planning, and practicum goals. I also initiated contact with Greenfield Unified School District (GUSD) to secure a host site. Once the program launched, my primary responsibility was managing the computer lab environment—preparing, setting up, and equipment management; refreshing MacBook Pro systems with updated OS/software environments; ensuring reliable network connectivity for collaboration with Brazil; and coordinating with STEM faculty to secure Arduino kits. Our team supplemented these resources with additional hardware, broadening student access to circuitry and microcontroller exercises. Together, we also helped ensure session continuity by providing light refreshments—an often overlooked but essential factor in keeping participants engaged and focused.

Beyond technical execution, I collaborated in post-session reviews that functioned like mini-think tank sessions, where our team assessed outcomes and adapted instruction to student aptitude and available resources. This nimble approach kept sessions productive and relevant across two sites, GUSD and Hartnell's King City Campus

Exit surveys confirmed impact: 100% of participants indicated they would return for a follow-up internship (GiG Part 2) to complete project design, implementation, and evaluation. This experience strengthened my leadership, facilitation, and technical operations skills while reinforcing my commitment to advancing STEM access, hands-on training, and measurable student outcomes at the community college level.

Daniel Orta

Major: Computer Science

Bridging the STEM Equity Gap: Launching and Evaluating the Greenworks in Greenfield Summer Internship

Intern: David Orta

Team Members: Daniel Orta, Isael Estrada

Mentor: Dr. Lev Horodyskyj

Opportunity: Science Voices

To address the STEM opportunity gap for Hartnell students in South Monterey County, my primary objective for this summer internship was to co-develop, launch, and evaluate the "Greenworks in Greenfield" (GiG) program. This four-week, paid internship, conducted in collaboration with the international science equity organization Science Voices, was designed to provide a hands-on, project-based learning experience. The program taught scientific project design and offered hands-on access to drone piloting, virtual reality exploration, 3D modeling/printing, & circuit simulation/building.

As a Program Coordinator, my responsibilities included adapting a project design curriculum, securing lab facilities, recruiting a student cohort, and co-facilitating nine sessions where students learned project design, explored prototypes, and collaborated virtually with international partners in Brazil (Science Voices & University of Campinas). A critical part of my role involved implementing the program and executing a data science workflow to evaluate its impact, which included collecting periodic surveys and quiz results, and structuring 19 session transcripts for analysis.

A major accomplishment was the successful launch of the pilot program with a full cohort of four Hartnell interns and two international students from Brazil. We overcame challenges such as a condensed timeline, overcoming knowledge gaps, and accommodating varied student schedules. I conducted quantitative analyses of gamified assessments which showed significant learning, with 100% of the Hartnell cohort participants scoring 90% or higher on the final gamified assessment exam. Qualitative analysis of surveys confirmed a measurable increase in technical confidence (e.g., participant comfort with building circuits rose from an average of 3.25 to 4.5 out of 5.0). The surveys also illustrate unanimous student interest in participating again & the program's value in meeting their needs.

This experience provided me with critical skills in project management, co-teaching, facilitation, public speaking, data analysis, and student mentorship. The key takeaway was the profound impact of our "students helping students" model. The Hartnell STEM Club funded 4 South County participants and led the way for directly meeting students' needs. Dr. Horodyskyj's mentorship was invaluable in guiding our strategic decisions and curriculum adaptation, while Melvin Jimenez in the Office of Student Life provided additional support and resources for participants.

This internship has solidified my passion for creating accessible, data-driven, gamified STEM education pathways. We successfully demonstrated that a student-led, multi-modal model can effectively bridge opportunity gaps at the community college level in Monterey County. The foundation we've built will be crucial for the program's future growth and my own career goals in science and community leadership.

David Orta

Major: Computer Science

Preserving Ulu Through Radiation and Cold Treatment

Intern: Jesse Pineda

Mentor: Dr. Peishih Liang

Opportunity: United States Department of Agriculture (Pacific Basin Agriculture Research Center)

Location: Hilo, Hawai'i

Bread fruit (Artocarpus altilis) is a perennial fruit native to the South Pacific. It is not only a culturally important fruit, known to Hawaiians as Ulu, but also an important food crop that is highly nutritious and versatile. However, Ulu spoils within just 24 hours after harvesting, causing major food waste and economic losses for local farmers. The goal of this study is to identify effective, low-cost preservation methods that can help Hawaiian farmers extend Ulu shelf life from hours to a week while maintaining fruit quality. Hawaii's hot, humid climate makes preservation difficult, and cold storage, depending on the temperature, can also damage the fruit, preventing farmers from transporting their fruit. As a student intern, I assisted in conducting research to investigate practical preservation solutions for fresh market Ulu in order to help reduce food waste, increase profitability for local farmers, and strengthen Hawaii's food security. This study tested two preservation methods to extend Ulu's shelf life. The first method we applied was storing the fruit in a controlled cold environment with and without an edible wax coating at 8 to 13 degrees, to find the optimal temperatures that didn't damage the fruit. Finally, we tested between 200 Gy through 800 Gy radiation treatment to slow down the ripening processes. The data shows that this specific wax in conjunction with radiation increases shelf life more than radiation alone or cold storage alone. This research provides Hawaiian farmers with promising, cost-effective solutions that can help farmers extend their produce shelf life and strengthen local food security.

Jesse Pineda

Major: Plant Science & Business Agriculture

Advancing Naval Operations with AR, Multi-Sensor Integration, and AI-Based Detection

Intern: Denise Regalado Ramos

Mentors: Christopher C. Curran, Ying Zhao, Maximillian Leutermann and Patrik Liljegard

Opportunity: Naval Postgraduate School

This summer I worked on three projects to improve Navy operations using different technologies. The first focused on augmented reality (AR) training for additive manufacturing, creating step-by-step modules with Taqtile Manifest and AR headsets to help sailors learn 3D printer operations and maintenance with minimal prior training, reducing downtime and costs. The second developed and tested a passive, multi-sensor unmanned aerial system (UAS) detection setup for maritime special operations platforms, integrating EO/IR, RF, acoustic, and radar sensors without active RF emissions, along with Python tools for data processing and field testing. The third, Night Vision Drone Detection, tested over 24 deep learning-based image restoration models for low-light object detection, finding that SRMDx2 'dn' plus DarkIR preprocessing significantly improved YOLOv11's accuracy over original images. Together, these projects highlight how technology can address real challenges in Navy environments, completed as part of the STEM internship program at NPS.

Denise Regalado Ramos

Major: Computer Science

Project: C.O.R.E (Collecting Observations via Rover Exploration)

Intern: Christopher Rodriguez

Teams Members: Jasmin Angeles, Isaac Virgen

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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As we know, current data collection tools on lunar rovers are often extremely expensive and are sometimes even limited in the range of measurements or activities that they can perform. To overcome these challenges, we designed and developed a multifunctional drill arm that combines sensors for measuring, recording, and displaying distance, temperature, soil properties, gas levels, and audio which will all sit over our ground vehicle. Our purpose is for it to be able to operate through rough terrains, so almost like a 4×4 ground vehicle. While doing its job we expect it'll collect important data and display it back to us as promoted. The goal is for it to be used in future explorations/missions to the moon or other planetary bodies. The methods we have decided to use are the ESP32 and Arduino which will each have their own roles in this project. A custom-built controller will also be developed to be able to manually operate not only the rover but the drill arm as well. We also plan on building a web page which will display data gathered from sensors and it'll also work as the remote control of the soil sensor zipper. We wanted to create something modern but at the same time very useful in the real world and that's where our ground vehicle came in. Our project will demonstrate the development of a sensor-equipped rover capable of simulating key functions required for exploration as well as some fun distractions for the mental health of our scientists.

Christopher Rodriguez

Major: Aerospace Engineering

Evaluating Blueberry-Based Diet Treatments to Influence Spotted Wing Drosophila Oviposition

Intern: Felipe Rodriguez

Mentors: Dr. Gregory Simmons and Dr. Ruth Henderson

Opportunity: USDA-APHIS Salinas, CA

The Spotted Wing Drosophila (SWD) or, Drosophila suzukii, was first observed by T. Kanzawa in 1916 then later described by Matsumura in 1931 who considered SWD to be native to Eastern and Southeastern Asia. Before long SWD came to the United States, it was later introduced as an invasive pest. Narrowing it down to the state of California in the county of Monterey where berry growers are struggling because SWD prefers hosts that have soft skin layers where it begins to oviposition, infest and damage the crop. The problematic issue with SWD is there is no predatorial enemy in the wild that will leave crops protected from SWD. To eliminate the complication is to conduct a biocontrol method with a parasitoid wasp of SWD larvae, the Ginasapis kimorum formerly known as Ganaspis brasiliensis G1. To refine the process, the internship focuses on sterilizing frozen blueberries, then carefully modifying and infesting them to maximize the production of SWD. This strategic method offers several benefits, including reduced costs, minimized mold growth, and improved time efficiency. Inconveniencies relate to having SWD larvae genetically immune to the G. kimorum parasitic sting, precise control to ensure a considerable amount of G. kimorum, and post-harvesting G. kimorum handling. Making sure the G. kimorum are properly taken care of otherwise it would all have been for naught.

Felipe Rodriguez

Major: Plant Science

Developing an Engaging Biology Curriculum for 5th Grade Students

Intern: Abrianna Ruano

Team Member: Brianna Martinez

Mentor: Sagayamary Rayappan

Opportunity: NSF Rise Teaching Internship

This summer, I worked under the guidance of my mentor, Abrianna Ruano, to address a common challenge faced by new STEM teachers. Overwhelmed with the challenges of starting their new career, they may find it difficult to develop an effective, age-appropriate science curriculum. To support new educators and enhance student learning, we developed a comprehensive 5th-grade biology curriculum designed to be both engaging and easy to implement.

We developed a full-year curriculum covering plant biology for 6 weeks, animal biology for 6 weeks, and human biology for 12 weeks. Each unit includes clearly defined learning objectives and outcomes, along with hands-on activities, worksheets, visual aids, projects, slides, and videos. We prioritized interactive and memorable experiences, such as building models and delivering student presentations, to encourage creativity, critical thinking, and collaboration.

By breaking down complex biological topics into accessible lessons, our curriculum helps teachers deliver high-quality instruction with confidence. The materials are organized in an easy-to-navigate format, allowing any STEM teacher to pick up and begin teaching immediately. Our work not only supports classroom engagement but also contributes to long-term student interest in science. We hope this project empowers educators and inspires the next generation of STEM learners.

Abrianna Ruano

Major: Biology

Airframe Assembly Intern

Intern: Kevin Ruiz Hernandez

Mentor: Eric Dungan, Tedd Michel

Opportunity: Joby Aviation

This summer I had the amazing opportunity to intern at Joby Aviation once again, and I was able to develop hands-on experience by working with the Manufacturing and Mechanical Engineering teams as well as the Airframe Assembly Supervisor Team. My work was centered on improving operational efficiency, standardizing production processes, and ensuring quality assurance across critical manufacturing workflows. A core component of my role involved developing and implementing detailed workflow charts to optimize manufacturing procedures. By collaborating with engineers, I helped to visualize and streamline complex production steps, which was instrumental in reducing potential errors and improving overall production. At the same time, I applied my skills in advanced design software, including SolidWorks and CATIA, to support various projects, such as creating visual aids for assembly processes, designing fixtures for prototyping, and 3D-printing components for testing and functional use. A significant collaborative project with another intern focused on establishing Quality Assurance templates for crucial bonding and drilling operations. We worked to create comprehensive documentation, including checklists, visual guides, and specific process parameters, with the goal of ensuring consistency and reducing defects in these high-precision tasks. This project provided valuable insight into the importance of meticulous technical documentation and quality control in aerospace manufacturing. The internship offered a comprehensive experience in a fast-paced engineering environment. It provided me with practical skills in project management, technical documentation, cross-functional collaboration, and advanced proficiency in design and manufacturing software, including a developed understanding of Microsoft Excel for data analysis and reporting. Through my direct contributions to process optimization and quality control, I gained a foundational understanding of the challenges and requirements of modern aerospace production.

Kevin Ruiz Hernandez

Major: Mechanical Engineering

Efficiency and Strength in Additive Manufacturing Techniques for Applications in the Navy

Intern: Hector Enrique Sedano Sánchez

Mentors: Christopher Curran and Ethan Brown

Opportunity: Naval Postgraduate School

3D metal printing is the cutting edge of additive manufacturing and allows for rapid prototyping and development. Traditionally ,a solid block of material would be cut down into a viable machine part with no concerns besides dimension tolerance. However, additive manufacturing has major problems: void appearance, tolerances, and production speed. My project aims to tackle these issues using the various additive techniques available at the NPS (Naval Postgraduate School), namely wire laser systems, direct energy deposition, and cold spray techniques. Void appearance would be one of the most important factors to investigate because voids affect the longevity, strength, and overall quality of a machine part. We can achieve a porosity of 1-6% with the HAAS UMC 1250ss Phillips Hybrid wire laser system, 0.5-2% with DED (directed energy deposition), and less than 1% with the Xspee3d cold spray.

These values are affected by a number of different variables, including of course the deposition type, but also material type, shielding gas, and other parameters. Unfortunately, I was unable to conduct my own test as the CT Scanner used for this analysis was inoperable during my internship. However, production speed was something I could quantify easily for a 1×1×1 in both the Haas, wire laser system, and the cold spray system. The cold spray system is one of the fastest additive manufacturing techniques with the block specified above taking ~10 minutes from start to finish, whereas the HAAS takes ~38 minutes. There are ongoing efforts to implement this type of technology into the Navy. For future research I would hope to aid in this process and research the feasibility, efficiency, and production method for these applications.

Hector Sedano Sánchez

Major: Aerospace Engineering

Intermittent Fasting Alleviates Pulmonary Vascular Disease Severity in a Rat Model of Pulmonary Hypertension due to Lung Disease

Intern: Jeriel S. Sevilla

Mentors: Peter Calabrese, Benjamin P. Kremer, BS, Elizabeth Ngo, Vivian Krocheski-Meyer, Truc Ho, BS, Cheryl Huang, BS, Sasha Z. Prisco, MD, PhD

Location: Minneapolis, Minnesota

Opportunity: LSSURP - Minnesota

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Introduction: Pulmonary hypertension (PH) due to lung disease is the second most common type of PH with a median survival of 2.5-3 years and has limited therapeutic options. As we previously demonstrated that intermittent fasting (IF) prolongs survival in another category of PH, pulmonary arterial hypertension, this study aims to investigate whether IF alters PH severity and/or right ventricular (RV) function in PH due to lung disease.

Methods: Male Sprague-Dawley rats were randomly assigned to Control, Bleomycin-monocrotaline (MCT), and Bleomycin-MCT-IF groups. Rats received bleomycin (2.5 mg/kg) or PBS (1 mL/kg) via intratracheal instillation on days 0, 3, and 6. On day 14, rats were administered a subcutaneous injection of MCT (60 mg/kg) or PBS. The day after MCT injection, Bleomycin-MCT-IF rats were fasted every other day until endpoint analysis on day 38. Echocardiography and invasive pressure-volume loops assessed PH severity and RV function. Lung and RV tissues were evaluated histologically.

Results: IF reduced PH disease severity and augmented RV function without altering pulmonary fi brosis.

Conclusion: IF alleviated PH and enhanced RV function in the Bleomycin-MCT rat model. Future studies will delineate the mechanisms by which IF mitigates PH due to lung disease.

Jeriel Sevilla

Major: Chemistry

Project Legion

Intern: Cristian Soto

Team Members: Alexander Valenzuela, Aaron Arvizu Rivera

Mentor: Seth Gray, Chad Machiela, Robert Schroeder

Opportunity: Naval Postgraduate School

Autonomous drones can provide special operations forces with rapid, covert reconnaissance and mission support in dangerous or inaccessible environments. To that end, this project involved designing and assembling a custom 3D-printed drone with stable flight and advanced onboard processing. The frame was printed in sections to fit the build volume and reassembled with 3-inch and 1-inch standoffs for optimal component spacing. A custom shock-absorbing flight controller mount was developed to protect sensitive electronics. The power distribution board connects the ESCs, motors, capacitors, and a 5V regulator powering the Nvidia Jetson Orin Nano for AI-based navigation. The fully assembled drone passed initial power and control tests. Next steps include autonomous flight programming, computer vision integration, and field trials in simulated missions to demonstrate its real-time intelligence capabilities.

Cristian Soto

Major: Computer Science

Classifying Deep Atmospheric Turbulence Using Neural Networks

Intern: Emilano Tavarez

Mentors: Dr. Brij Agrawal and Dr. Leonardo Herrera

Opportunity: Naval Postgraduate School

The propagation of wavefronts emitted by observation satellites or earth-based systems is severely disrupted by atmospheric turbulence and can cause distortion in long-range image capture. While corrective methods like adaptive optics exist, these are often too complex to implement. Previous research at NPS proposed a faster alternative: using deep learning to classify atmospheric turbulence, described by the Fried Parameter (r_0), directly from images. Initially, a ResNet-18 convolutional neural network (CNN) from MATLAB's Deep Network Designer Toolbox was used. While effective for weaker turbulence (higher r_0), it struggled with stronger turbulence (r_0 < 3 cm). To address this limitation, a Vision Transformer (ViT) architecture was suggested and ultimately proved to be more accurate. The successful implementation of a ViT-based system could potentially replace the complex sensor arrays used today for detecting and correcting atmospheric turbulence, thereby enhancing wave transmission.

Emiliano Taverez

Major: Mechanical Engineering

Microscopy at Joby Materials and Process Lab

Intern: Xavier Taylor

Mentor: Audrey Shanks

Opportunity: Joby Aviation

Throughout the summer, I have been working as a Materials and Process (M&P) Intern for Joby Aviation. Joby Aviation is developing an electric vertical takeoff and landing aircraft (eVOTL) to pave the way for future air transportation. The M&P lab at Joby does most of the research and development for Joby. They test different materials and different types of bonds, as well as many other things, to determine what works best for the Joby aircraft for safety, cost, and efficiency. During my time working at Joby, I have learned and accomplished many tasks, including machining, cleaning and dimensioning test specimens, testing, bonding, laying up panels, and more. However, one of the things that I enjoyed doing the most was Microscopy. My goal for this project was to prep (machine, clean, polish) a test sample so that I could analyze it under a microscope and measure any gaps between the silver gauge and the actual specimen. Some results were that some of the specimens had very large gaps between the silver gauge and the actual specimen. We concluded that this was probably a result of the machining process, as in some of the specimens, when we were cutting, the silver gauge would come loose. Overall, I enjoyed my time at Joby, and I especially liked working on this project. I was able to learn so many new skills and experience lots of new things at Joby.

Xavier Taylor

Major: Engineering

Environmental Controls on the Adhesive Bonding Process

Intern: Kristoffer Valdehueza

Mentor: Audrey Shanks

Opportunity: Joby Aviation

The electric vertical takeoff and landing (eVTOL) aircraft represents a leap in urban air mobility, providing an efficient alternative to traditional transportation. In the manufacture of the eVTOL aircraft, traditional fasteners are minimized, and in their place is structural adhesive bonding, the method of joining two materials using a strong adhesive, thereby allowing a reduction in weight and improving load distribution. One of the main projects that I worked on this summer as a Materials and Process Intern at Joby, a company whose core focus is the development of eVTOL aircraft, was surveying the effects of the environmental controls temperature and humidity on the structural adhesive bonding process. These factors can significantly influence the strength of the bond, the cure quality, and the production of amine blush, a surface defect that can weaken adhesion. My work primarily focused on composite materials testing and evaluation, failure analysis, and composite lamination. Moreover, I regularly sat in meetings and project discussions with a team project manager, which gave me insight into the workflow in this type of environment, including documentation, budgeting, and coordination. The lab I supported specialized in carbon fiber composite and structural paste adhesive incoming and receiving material. After bonding two carbon fiber panels together with mixed adhesive in a controlled environment and putting them through hand cure and post cure, we machined them into individual notched coupons and labeled and dimensioned them so they were ready for testing. Specimens were tested to ASTM D3165 using a double-notched lap shear method. Our testing machine, the Shimadzu 100kN Mechanical Test Frame, produced stress v. strain curves, which we analyzed to evaluate the bond performance, alongside visual inspection of the failure surfaces. It was found that the environmental differences during the manufacturing process, such as temperature and humidity, resulted in discrepancies between the strength values returned during testing, proving that environmental factors play a part in the adhesion quality. This research has direct implications for the development of lightweight, high-strength bonded joints in eVTOL structures, and the optimization of their environmental durability and conditions.

Kristoffer Valdehueza

Major: Engineering

Project Legion

Intern: Alexander Valenzuela

Team Members: Aaron Arvizu Rivera, Cristian Soto

Mentors: Seth Gray, Chad Machiela, Kristen Tsolis, and Kevin Jones

Opportunity: Naval Postgraduate School

Project Legion is intended to support its allied special forces with a fleet of interlinked drones powered by a trained LLM. The project shows the methodologies behind its assembly, soldering and software. Prototype I consist of a 20-inch 3D printed tough blue PLA frame with soldered 45 amp. electronic speed controllers (ESCs), 3.14-inch standoffs, power distribution board, LiPo 6s battery and a Nvidia Jetson Nano to support autonomous flying. Prototype I describes the background behind the larger assembly, its prioritized soldering points, and which software suits best to ensure safe operability during flight. Project Legion is focused on providing the least amount of surface area on the design itself aimed to enhance agility and protection of each physical component. Static components such as the Nvidia's Jetson Nano will be adjusted in position for every new design. Upon each rendition cycle, the drones will become more suitable for operatives that take place in environments unsuitable for larger, more robust drones, providing a strategic advantage to our adversaries. Capabilities of autonomous flying and swarm management will remain dynamic amongst each new design.

Alexander Valenzuela

Major: Aerospace Engineering

NSF Rise Physics Curriculum

Intern: Alexander Valenzuela

Team Member: Esteban Berelleza

Mentor: Sagayamary Rayappan

Opportunity: NSF - Rise Teaching Internship

Building a curriculum centered around teamwork and inclusion is crucial for students to not only learn but also thrive. Through daily group activities, students are exposed to the value of teamwork, and our goal is to encourage students to help each other truly grasp the new material. With the week 1 example overview, students were taught measurement, SI units, and the implementation of Scientific Notation. With each day building upon the next, repetition and overfamiliarity with the concepts help students attain a strong foundation within the Physics curriculum. This week 1 example gives insight into what the entire year-long curriculum would be like, and includes a quiz on day five. Day 5 features a five-minute meditation at the start of the class to help regulate and ease the nerves of students. Far too often, the “grind culture” within STEM leads to students putting their personal needs aside to prioritize good grades. Our mission is to teach students the importance of including both. Throughout the internship, there were many new and unfamiliar concepts we learned. One of which was the California NGSS teaching structure. By far the most challenging aspect of the project was learning how to create a curriculum that fit those standards. Fortunately, it felt familiar to the structure we, as high school students, experienced. Our prior exposure to this class helped tremendously when it came to homework and exam formatting. Through the usage of past projects, Khan Academy, and the NGSS teaching structure, we were able to cultivate assignments with questions that built upon each other. This was done intentionally to help prepare the high school students for what they should expect to come across in college.

We want to thank Dr. Rayappan and MESA for giving us the opportunity to delve into the world of education. This was a truly fulfilling experience and has motivated us to continue our path in engineering to help inspire and educate the future.

Alexander Valenzuela

Major: Engineering

Design and Implementation of Web-Based Features for Enhancing Multilingual School Communication

Intern: Lesly Alexia Villanueva Mayoral

Mentor: Noe Lomeli

Opportunity: Nurbli

Nurbli is a platform designed to bridge communication gaps between schools and families. By providing multilingual translations for school and community-related information, the company ensures that parents and residents remain informed and engaged in local events and school activities. My objective for the internship was to expand my knowledge of how AI can be applied in real-world projects while gaining experience as a software engineer. During my time at Nurbli, I contributed to this mission by enhancing the website's communication, usability, and inclusivity.

My responsibilities ranged from front-end design to backend development. I redesigned webpages such as the Contact Us and Pricing pages to be more visually appealing, easier to navigate, and responsive across multiple devices. I also improved the website's footer with interactive links and buttons, ensuring functionality in both English and Spanish. Additionally, I developed a dynamic FAQ page that incorporated search, voice-enabled input, and AI integration to provide curated responses tailored to guest and liaison users.

I encountered challenges such as integrating real-time audio with server-side processing and maintaining consistent layouts across devices. Through iterative testing and debugging, I delivered reliable, user-friendly features that enhanced both accessibility and user experience.

This internship allowed me to strengthen my skills in Flask, JavaScript, HTML, CSS, and Bootstrap, while also deepening my understanding of responsive design, localization, and user-centered design principles. My mentor, Noe, played a significant role in my learning by giving presentations on Git and HTTP methods and designing mini projects, such as a "taqueria" app, to help me apply these concepts.

Overall, this full-stack software engineering internship provided me with technical growth and insight into the importance of inclusive communication in software development. It also affirmed my interest in pursuing a career in computer science, particularly in applying machine learning to support community needs.

Lesly Alexia Villanueva Mayoral

Major: Computer Science

C.O.R.E (Collecting Observations via Rover Exploration)

Intern: Isaac Virgen

Team Members: Jasmin Angeles, Christopher Rodriguez

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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As we know, current data collection tools on space rovers are often extremely expensive and are sometimes even limited in the range of measurements or activities that they can perform. Anyone knows that a rover is supposed to be very versatile and collect data and information from wherever it is stationed at, for instance the moon and mars, but mars has not had any humans step foot on it so the data is limited. The purpose of the rover is to be able to examine as much data as possible with also a new data taker being attached on it, that being a drill arm. We know that Mars is a mysterious planet and who knows what lies underneath it. With the implementation of the drill arm we hope to find more data and uncover more about Mars. I've been hands on with designing the actual body of the rover. The rover's name is C.O.R.E. I've been tasked with also implementing and coding the rover. The rover is attached with a temperature,humidity, altitude sensor, a soil moisture sensor, and a speaker to have room for music or some form of communication. The C.O.R.E. The rover is powered by an arduino for the moving mechanical parts of the rover and the sensors powered by the implementation of the esp-32. The overall chassis of the rover is the multifunctional rocker Boogie system to overcome rough terrain through its unique suspension. The rover has the implementation of two arms, one for the drill and one arm for the soil moisture sensor. The arm for the drill, the drill, and motor controls will be controlled by a microcontroller called the funduino controlled with an antenna to the arduino. I also plan and help to develop a webpage that displays all the Info for the sensors. The rover is also implemented with a speaker for communication or music. Overall this project showed how little we need to make some practical that can be used for data analysis on a planet we do not fully understand yet. Our results are to be able to analyze the soil of mars after drilling into it while being sturdy and cost effective. The experience made me realize how precise you have to be especially with working with electronics and coding.

Isaac Virgen

Major: Mechanical Engineering

Wearable Environment and Health Monitoring System

Intern: Diego Villegas Cano

Team Members: Sofia Beltran Espino and Aurora Webeck

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

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CALIFORNIA SPACE GRANT CONSORTIUM

Human missions to Mars face major challenges including space radiation, isolation, and hazardous environments (NASA, 2024). These conditions pose serious physical and mental health risks such as radiation-induced cancer, muscle atrophy, and bone loss (NASA, 2025). Current NASA suits monitor biometric data, but what if they also tracked environmental conditions in real time? This project explores a wearable health monitoring system built with Arduino Uno Wifi, designed to collect both biometric and environmental data for use in spaceflight and hazardous Earth environments. The system aims to support data-driven safety decisions and early detection of risks. We developed a portable prototype jacket integrating seven sensors: UV, fine particle, blood oxygen, pulse, and two that measure atmospheric components. Using an engineering design approach, we selected open-source components and refined sensor code. Once validated, data was transmitted wirelessly both to a monitoring device and directly to a small display. This system demonstrates potential for real-time astronaut monitoring and occupational safety on Earth. With further development, it could improve situational awareness and long-term health tracking in extreme environments.

Diego Villegas Cano

Major: Mechanical Engineering

NSF RISE Curriculum Project

Intern: Aurora Webeck

Mentor: Sagayamary Rayappan

Opportunity: NSF Rise - Teaching Internship

This STEM based curriculum development project aims to lay the foundational ideas of visual data analysis and comprehension for middle schoolers. It emphasizes a conceptual understanding of the three most common graph types—bar graphs, pie charts, and line graphs. The curriculum uses active hands-on learning methods through class-teacher discussion on presented graphs and the application of concepts through worksheets. It culminates in a final project where students demonstrate their knowledge through in-class data collection based on a research question and presentation of graphs they created in teams.

Throughout the course of the project's development I have developed skills and overcome challenges that made this internship experience all the more rewarding. In tandem with gaining proficiency in project development, I gained a valuable perspective on how educators and academics approach sharing knowledge. This internship pushed me to think about how knowledge builds upon itself and how to encourage connection between ideas to demonstrate critical thinking.

I am deeply grateful for this internship opportunity and look forward to the future opportunities it may open. Thank you to the internship coordinator, my mentor, and other individuals who gave me advice through this internship.

Note from the mentor, Mario Chris:
In my years as an educator, this is my first experience teaching someone how to teach a class. I enjoyed helping the intern tackle the challenges of designing a curriculum. I learned to articulate the pedagogical practices that I have used as a teacher, and it was rewarding to help someone bring their ideas to fruition.

Aurora Webeck

Major: Mathematics

Wearable Environment and Health Monitoring System

Intern: Aurora Webeck

Team Members: Diego Villegas and Sofia Beltran Espino

Mentor: Tito Polo

Opportunity: California Space Grant Consortium

HARTNELL COLLEGE

NASA

CALIFORNIA SPACE GRANT CONSORTIUM

Human missions to Mars face major challenges including space radiation, isolation, and hazardous environments (NASA, 2024). These conditions pose serious physical and mental health risks such as radiation-induced cancer, muscle atrophy, and bone loss (NASA, 2025). Current NASA suits monitor biometric data, but what if they also tracked environmental conditions in real time? This project explores a wearable health monitoring system built with Arduino Uno Wifi, designed to collect both biometric and environmental data for use in spaceflight and hazardous Earth environments. The system aims to support data-driven safety decisions and early detection of risks. We developed a portable prototype jacket integrating seven sensors: UV, fine particle, blood oxygen, pulse, and two that measure atmospheric components. Using an engineering design approach, we selected open-source components and refined sensor code. Once validated, data was transmitted wirelessly both to a monitoring device and directly to a small display. This system demonstrates potential for real-time astronaut monitoring and occupational safety on Earth. With further development, it could improve situational awareness and long-term health tracking in extreme environments.

Aurora Webeck

Major: Mathematics

Nurbli Platform: Breaking Language Barriers

Intern: Marina Iris Villareal

Mentor: Noé Lomelí

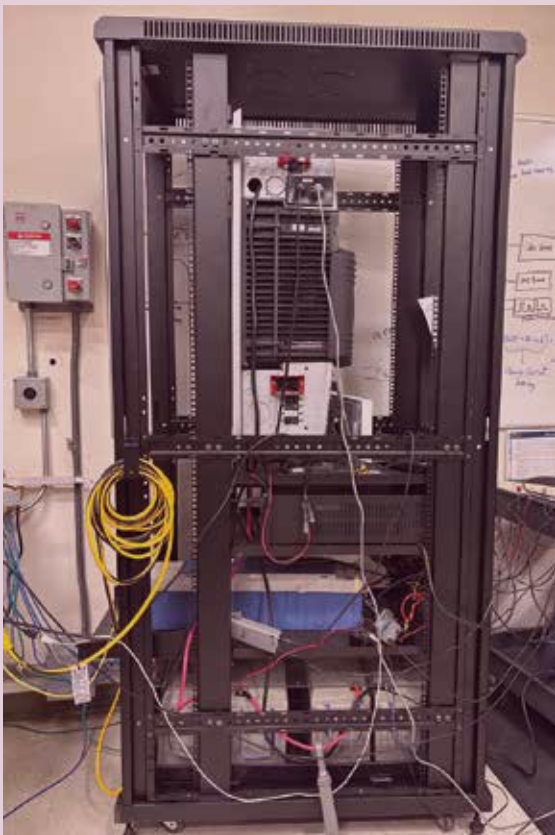
Opportunity: Nurbli

Nurbli is a platform that offers tools and services such as interpretation and audio translations. Currently, the supported languages available are Triqui Bajo, Mixteco de San Jose Las Flores, Spanish and English. Nurbli developed a website that allows users to access translated event flyers that are displayed based on their zipcode and preferred language to help keep them engaged within their community. During my internship, I was assigned to a variety of tasks such as fixing bugs, updating page designs, and adding new features to enhance the user's experience.The primary tech stack Nurbli uses is Flask, Python, and MongoDB. Flask allows us to use website programming languages such as HTML, CSS, and Javascript, Python is used as the main programming language to create API endpoints and MongoDB is used as the database to help store, maintain and access data across the platform. Throughout my summer internship, as I worked on each task, the challenges also increased. While this felt daunting at first, with the support and guidance from my mentor as well as working as a team, I successfully demonstrated my abilities to complete each task all while learning how to use the new tech stack. My engagement with the engineering team was by participating in stand-up meetings twice a week, this allowed us to update each other about our accomplishments and share feedback. Working as a software developer has taught me how to communicate and work as a team as well as learn how to make the most of my time when working independently.

The final task was to add a new feature to the FAQs page. The new feature was to create a search engine that allows users to ask questions by using text or microphone. This feature required teamwork, a new design layout, AI integration, and an efficient way to dynamically retrieve the set of FAQs from the database. The task was completed in two phases, phase one is currently deployed and phase two has some minor fixes and will be tested before it gets deployed.

Marina Iris Villareal

Major: Computer Science



HARTNELL COLLEGE

19TH ANNUAL

STEM INTERNSHIP SYMPOSIUM

SCIENCE • TECHNOLOGY • ENGINEERING • MATH

MICRO-INTERNSHIP MENTORS

Dr. Jeffery R. Hughey

Mario Chris

Tito Polo

Adrea Gonzalez-Karlsson

Mohammad (Tarek) Hussain

Victoria Hutchins

Dr. Ver Marie Myr Panggat

Dr. Rosser Panggat

*Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation. This material is based upon work supported by the National Science Foundation under Grant No. 1832446.

HARTNELL STEM MICRO-INTERNSHIP

Genome analysis of the psammophilic fungus Mallocybe sp. (Inocybaceae, Basidiomycota) from Cambodia reveals the shortest published Agaricales complete mitochondrial genome

Advisor: Dr. Jeffery R. Hughey

STUDENTS:

Amal F. Alsaqaf
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Lupita Avila
Caedence Barclay
Azucena D. Bautista
Yenethsy Bernal
Joshua D. Bett
Jacob D. Cain
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Yuvia Francisco
Timothy L. Fuller
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Jade Gonzalez Cruz
Jesus Gonzalez
Angel Gutierrez
Virgilio Hernandez Cruz
Julissa M. Hernandez
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Sandy Huynh
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Alvaro E. Sanchez Lopez
Maria Suarez
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Shea Valenzuela
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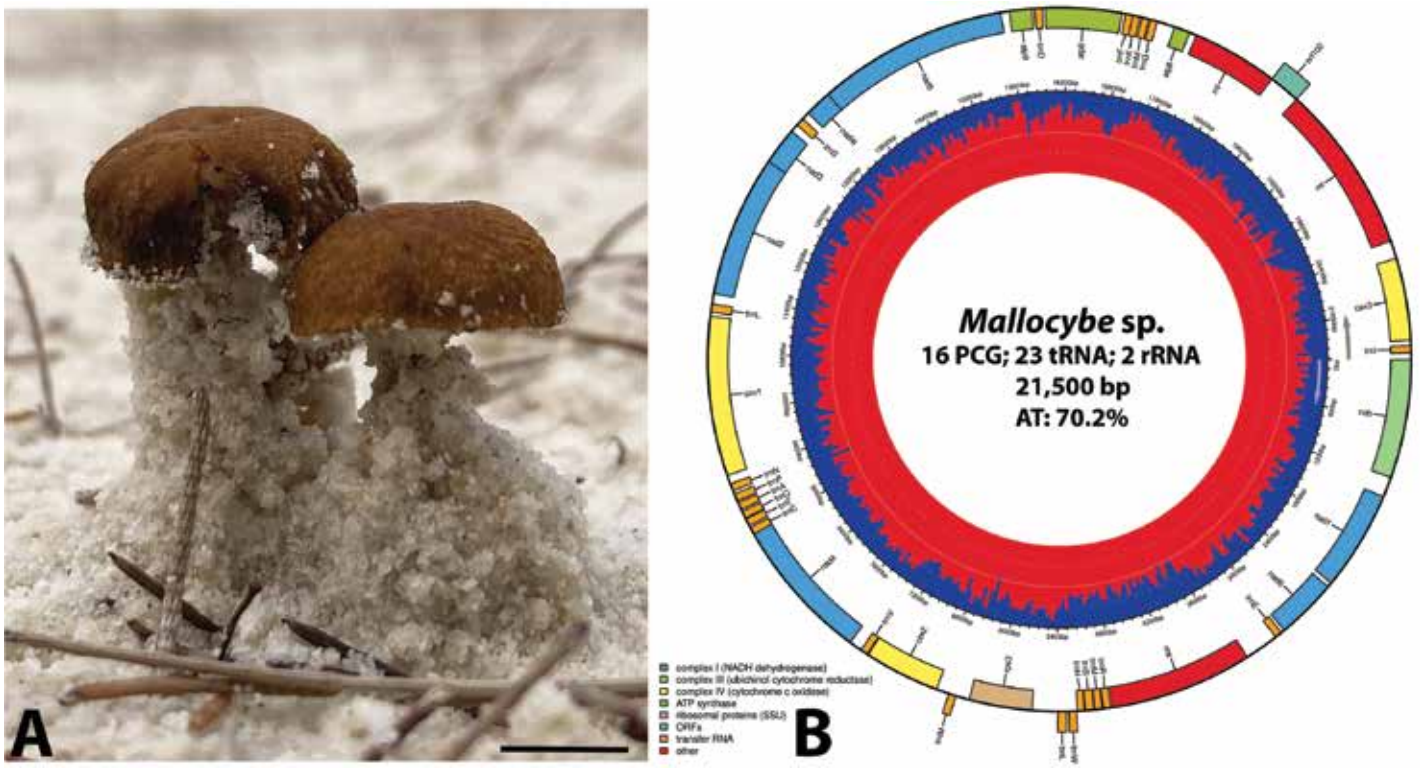

Mallocybe is an basidioma forming fungal genus with widespread global distribution and eighty-one legitimate species names. To date, there are many published phylogenetic investigations on species of *Mallocybe* based on nuclear markers, however no mitochondrial genomes have been deciphered. To contribute to the bioinformatics and systematics of the Inocybaceae, we present the complete mitochondrial genome of a psammophilic *Mallocybe* sp. from Koh Rong Sanloem, Cambodia. The mitochondrial genome of *Mallocybe* sp. is circular, AT skewed (70.2%), and 21,500 bp in length. It contains the standard conserved fungal gene package, including 16 protein-coding, 23 transfer RNA, and 2 ribosomal RNA genes. The genome represents the shortest published mitochondrial genome of a gilled mushroom classified in the Agaricales.

†All authors contributed equally to the analysis and writing of this paper. Author order was determined alphabetically. – Research mentor, Jeffery R. Hughey.

Complete chloroplast genome of the marine eelgrass Zostera pacifica (Zosteraceae, Plantae) from Monterey, California

Advisor: Dr. Jeffery R. Hughey

STUDENTS:

Sosan Abdulrahman
Adilene Aguirre
Eliana Arriaga
Ashley C. Avina
Angeles Badajos
Yureni A. Badillo
Alexis M. Bañuelos
Javier Pulido
Bet-sua Bucio Valdovinos
Taliyah Champaco
Rodrigo Chavez
Gregorio Chavez-Felix
Melaina Cruz
Melissa Distancia
Kingsley Dzubay
Andres Espinoza
Julie Estrada
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Jimena Hernandez-Tejeda
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Hanna Khanaka
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Julia Lewis
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Ana Martinez
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Cesar M. Ramirez
Fatima Mendez
Ashley Mendoza-Torralba
Kajal Naidu
Abraham Nolasco
Lupita Nuñez
Vivian Paredes
Jesse P. Anaya
Sreenivas Rajesh
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Jeriel S. Sevilla
Jennifer G. Tijero
Aaron Tinoco Viorato
Heaven Valdez

Zostera is a genus of seagrass with worldwide distribution and great ecological importance. Five species are currently recognized in the genus, including *Zostera pacifica*, a wide leafed subtidal species originally described from Puget Sound, Washington, Santa Barbara and Monterey, California. Although there have been numerous investigations of the nuclear and organellar genomes of other *Zostera* species,

no genomes of *Z. pacifica* have been published. Here, we present the complete chloroplast genome of the eelgrass *Zostera pacifica* from Monterey, California. The genome is circular and 144,675 bp in length. It consists of 82 protein-coding, 31 transfer RNA, 8 ribosomal RNA genes, and is 99.44%-99.42% similar in nucleotide pairwise identity to the closely related species *Zostera marina*.

†All authors contributed equally to the analysis and writing of this paper. Author order was determined alphabetically. – Research mentor, Jeffery R. Hughey.

Designing and analyzing aerodynamic structures using DIY wind tunnels

Advisor: Mario Chris

STUDENTS:
Isai Cabrera Gallegos
Juan Madrigal
Alonso Gutierrez
Cristian Flores
Angel Avila
Ismael Galaz
Juan Martinez
Xavier Taylor
Isaac Virgen
Larry Gonzalez
Brandon Ortiz
Joaquin Ramirez
Dylan Nieves
Jonathan Dominguez
Julio Moreno
Esteban Berrelleza
Robert Cruz
Alondra Garcia
Azucena Bautista
Karolina Rodriguez
Jessica Lopez

The use of air travel and other major modes of transportation has grown rapidly over the last several decades and is only projected to continue increasing in prevalence. Such large-scale burning of fossil fuels takes its toll on the environment, to say nothing of the hundreds shelled out at gas stations and airports.

In this micro-internship, students will learn and apply engineering design principles to develop solutions to the problem of fuel consumption and greenhouse gas emissions. There will be room in every team for students interested in research, design, dynamics, and more. Projects will be scaffolded—from conceptual designs to tangible results, from two- to three-dimensional analyses, from simple to more complex cross-sectional geometries—and all skill levels will be accommodated.

There is opportunity for formative assessment regarding not only the aerodynamic efficiency of students' final designs, but also their creativity in identifying problems and generating solutions, as well as their sensitivity to adjacent fields of study, such as materials science and production engineering.

Arduino, 3D Printing, Electrical Soldering, and Oscilloscope Micro-Internship

Advisor: Tito Polo

STUDENTS:
Angela Madrigal
Yoali Cid Solis
Cristian Soto
Angel Guerrero
Christopher Talavera
Esteban Berrelleza
Leo Guizar
Kelen Flores
Hezekiah Gonzalez
Isai Cabrera Gallegos
Salma Rodriguez
Ivan Altamirano
Isaac Virgen
Israel Crystalinas
Christopher Rodriguez
Ismael Galaz
Cindy Martinez
Andrea Diaz
Ethina Mencias
Javin Niar
Uriel Cardenas
Denise Regalado Ramos
Alexander Valenzuela
Keily Lepiz-Rangel
Joshua Torres
Ramon Hernandez Castro

Arduino design has been at the front of user-friendly software and hardware development, especially to solve real-world problems. Students will work on Arduino projects such as, programming a blinking LED, creating a temperature and humidity sensor circuit, working on a water level detection device, controlling DC motors using Arduino via Bluetooth, wire up and use an alphanumeric LCD display, analog Joystick module and several other sensors. Students will also learn the concepts of and how to implement different electronic components, Digital and Analog circuits, and Arduino boards. Also, students will learn soldering electronic components, and the use of electrical measuring equipment: voltmeter, ammeter, function generator and oscilloscope.

Inter and Intraspecific Competition in Lichen in Pinnacles National Park

Advisor: Adrea Gonzalez-Karlsson

STUDENTS:
Alex Diaz
Alexander W. Vallenzuela
Hezekiah Gonzalez
Angel Guerrero
Julieta Castillo
Lupita Olvera
Andrew Robles
Leilani Arroyo
Paulina Magallon

We studied lichen diversity and distribution at the Pinnacles National Park. Measuring the size and species of nearest neighbors to assess competition in lichen in Pinnacles National Park.

Students identified lichen species, using a guide as well as iNaturalist which is an application that helps you identify wildlife around you.

Students learned about experimental design and how to carry out data collection in Pinnacles National Park. Lichens are super cool and have beautiful colors and growth forms and the Pinnacles is a local natural wonder.

HARTNELL STEM MICRO-INTERNSHIP

Artificial Intelligence Demystified - Math in Machine

Advisor: Mohammad (Tarek) Hussain

STUDENTS:
Isai Cabrera Gallegos
Montserrat Mata Vargas
Erwyn Hernandez
Sergio Diaz
Esteban Berrelleza
Frances Wong
Pedro Avalos
David Nunez Garcia
Juan Esaaumamaro
Emiliano Tavarez
Cindy Martinez
Fernando Lopez
Denise Regalado Ramos
Enrique Lopez
Pedro Bairez Gonzalez
Allyson Ocampo
Rodrigo Hernandez Martinez
Victoria Nava
Roberto Ruelas Guevara
Liliana Zavaleta
Rigoberto Avalos
Nery Dolor
Lilith Larson
Jaime Andrade
Jonathan Dominguez
Angel Vega
Samantha Batson
Anthony Gonzalez
Shanezel Rollin
Maram Gasmelseed
Alexander Valenzuela
Maritza Garcia-Perez
Allen Escolta
Isaak Castro
Yaire Rosales
Braden Diaz de Leon
Valentino Corona-Hernandez
Christopher Rodriguez
Salma Bautista Rodriguez
Nathan Clark
Gustavo Cortes
Rodolfo Palacios
Jonas Yahdi
Andany Sanchez
Kristoffer Valdehueza
Aaron Flores

This micro-internship introduced the basic concepts of Artificial Intelligence (AI)/Machine Learning (ML). Students learned about the fundamentals of AI/ML such as, learning to design and implement neural networks using very simple linear mathematical function ReLU (Rectified Linear Unit), along with exponential and logarithmic functions, and matrices; concepts that a student who has taken intermediate algebra should be able to grasp.

Students learned how to take publicly available datasets and analyze them using AI/ML models. Particularly, they learned how to use ML models to solve the two most important problems that ML addresses: regression and classification.

The students applied these newly learned tools, neural nets, to solve real world problems using advanced concepts in ML:

1) Neural Style Transfer (NST) to transform an image into the style of another image.

2) Generative Adversarial Networks (GAN) to create images.

3) ChatGPT-4 architecture transformer and how it works.

The participants took a journey through advanced computer science topics such as, computer vision and its applications. They learned about LLM (Large Language Models) using transformers and popular applications of computer vision in object detection and self-driving cars.

Investigations of Tidepool Organisms in Monterey Bay

Advisor: Victoria Hutchins

STUDENTS:

Amal Alsaqaf
Andrea Fernandez
Aniyah Chambers
Anthony Gonzalez
Claudia Dominguez-Trejo
Evelyn Gonzalez
Heaven Valdez
Jennifer Tijero
Julissa Hernandez
Kajal Naidu
Paz Ramirez
Pest Gonzalez Aguirre
Reema Mubarz
Samuel Ochoa
Sandy Huynh
Sarah Takemura
Stephanie Cervantes-Azpilcueta
Tiffany Croley
Vidal Chavez
Yared Espinoza
Zimri Sims

Examining patterns in the rocky intertidal by conducting quadrat, swath, and point contact transects in Point Pinos tide pools. Students learned about species that live in the intertidal and conducted surveys to collect data for their individual projects. They investigated organism populations, zonal variation, and the abundance of cover algae to prevent desiccation of intertidal organisms. These relationships show the adaptation of organisms to live in these stressful environments.

The Most Common Vision Screening Findings and Vision-Related Symptoms among Hartnell Students

Advisor: Dr. Ver Marie Myr Panggat

STUDENTS:
LIZBETH GALVEZ
CHANTAL RAMOS-VERDIN
BONITA SILVA
ADRIANA GARCIA
ASHGAN MOTHANA
CRYSTAL MALDONADO
MICHELE HERNANDEZ
JOESEPH SUAREZ
MIA FLETES
RUTH MEZA
SHAYLYNN MONTEON
ENRIQUE MUNOZ
LAUREN WILEY
KARLA MARTINEZ
DESIREE CARDONA
MARGRET LUNKUSE
LOGAN GONZALEZ
ANYELI MARTINEZ VAZQUEZ
IVAN RUVALCABA
KAJAL NAIDU
GENESIS GUERRERO
CHRISTOPHER DOLAN
JENNIFER RAMIREZ
DANIEL DUONG
ALMA DE JESUS
ARIANNA VILLAGOMEZ
STARLENE MORALES-CARDINALLI
RODRIGO CHAVEZ
JESSICA HUANTE
ARIANNA CARDENAS
JENNIFER SERRA
TRINITY ARIAS
MARIA V. SANCHEZ
ZIHAN GENG
MARIA MURILLO-CHAVEZ
BRIANNA LIMON
NADDYIA LOPEZ
ALICIA VACA
MARIA CORTES
NERY ANN DOLOR

Eighty percent of all learning comes through visual pathways (Optometrist. org, 2021).

Due to the effects of impaired vision in learning, the California Department of Education created a guide for vision screening in California Public Schools with the main objective of identifying potential vision deficits and encouraging professional comprehensive eye and vision evaluations (www.cde.ca.gov, 2019). Vision screening is recommended to start in the newborn period and continued in every well-child visit (American Academy of Pediatrics and American Academy of Ophthalmology). According to studies, a college student's ability to access and understand course materials could be directly affected by one's vision (Abraham Eye Associates, 2024) and ultimately affects student success. It is therefore important to note that vision screening examinations remain an essential part of a college student's regular doctor's check-up.

Students at Hartnell College are introduced to the anatomy and physiology of the eye in their classes, however, there is no in-depth learning of the subject. This project will enable 25 Hartnell College students to get in-depth hands-on learning by training them with the following skills: skill in taking detailed ophthalmologic medical history, vision screening examination skills and skills on creating eye health digital educational pamphlets. The training will involve reading the medical information, medical interviews, performing vision screening examinations, managing and analyzing data and creating a short and simple eye health digital educational pamphlet.

HARTNELL STEM MICRO-INTERNSHIP

The Effectiveness of Anatomage Virtual Dissecting Table on Learning Anatomy

Advisor: Dr. Rosser Panggat

STUDENTS:
Kasandra Leon Garcia
Lizbeth Salcido- Huizar
Aileen Lopez
Barbara Ramirez Martinez
Leyla Garcia Mojica
Timothy Allen
Anthony De Jesus Merino
Karen Jimenez
Abrianna Ruano
Yessica Almaraz
Andres Espinoza
Natalie Hall
Isabella Marinelli
Maria Perez-Hernandez
Jaqueline Camargo
Belinda Dominguez
Janelle Hankemeier
Alysson Tanglao
Brenda Loya-Alvarado
Veronica Arellanes-Garcia
Jennifer Cruz-Garcia
Brielle Nabor
Alondra Ramirez Aguilera
Christofer Gonzalez
Ashley Serrano
Guadalupe Venegas

Technology has been part of the U.S. education system for over fifty years. The main goals of technology in education include the following - to improve how lessons are delivered while enhancing the student learning experience, to increase student engagement and encourage student collaboration, to prepare the students for the digital future and overall to promote better quality education.

Teaching human anatomy has continuously been evolving. Several advanced technologies have been developed solely for this purpose. One of these advanced technologies is the Anatomage which is a virtual dissection table. It is a touch screen computer the size of an operating table that uses real cadaveric images. Students learn the anatomy of the human body without the mess, the smell and the cost of real cadavers. However, with all these advancements, there are still debates on the effectiveness of technology in education.

This proposal aims to enable 20 Hartnell College Biology students to get in-depth and hands-on learning by training them in the following skills: Anatomage virtual dissection table skills and skills as in creating Anatomage interactive games for students. The project will involve live hands-on training with an Anatomage Table user, taking assessments and evaluation surveys, managing and analyzing data and creating Anatomage interactive games for students.

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For more information about the
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or visit: www.hartnellstem.org

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