ENGINEERING DESIGN SHOWCASE 2018

JUNE 7, 2018
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Thank you for attending the 2018 Engineering Design Showcase at UC Davis. This year we have close to 200 design teams presenting at our showcase up from approximately 140 teams last year. The hard work and dedication of our students is evident in their presentations and they look forward to discussing their projects with our guests. The feedback from our public and private sector judges is critical to our effort to improve our undergraduate programs and the experience of the students. I want to thank the judges who have taken time to be here today to evaluate our students’ projects and help celebrate our students’ achievements. The College of Engineering appreciates the close relationships we enjoy with our guests, alumni and friends of the College. On behalf of the entire College of Engineering faculty, I am grateful you have joined us today.

Sincerely,

Jim Schaaf
Associate Dean, Undergraduate Studies
The UC Davis College of Engineering is pleased to share with the campus community the efforts of the senior design teams and engineering clubs. Together, these students and aspiring professionals have endured hours of drafting, modeling, prototyping, testing, and analysis to complete these projects – on top of an already rigorous curriculum. The senior year coursework is the culmination of years of meticulous and precise study and presents students with the opportunity to apply their skills and knowledge in order to engineer solutions to a variety of problems and needs. The faculty and the administration of the College are proud and thrilled to host this event so that members of the public and our partners in industry can see and experience the quality of a UC Davis engineering degree. We thank our guests for their time and attention, and we appreciate our students for their hard work. Please enjoy the showcase!

TEAM #1: SHOE TYING MACHINE

- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Joel Humes (MEC), Gabriela Gomes (MEC), Andrew Choi (MEC), Jacklyn Tran (MEC), Stephanie Thai (MEC)
- **Advisor**: Dr. Jason Moore

**Abstract**: The goal of our project is to design and manufacture an automated shoe tying machine capable of tying someone’s shoelaces into a standard shoe knot. This machine will also compete against the students of Meijo University in three categories: success rate, time of completion, and energy efficiency. Design restrictions placed by our sponsor and stakeholders include the use of a maximum of two motors, power via wall outlet, and no prior placement of the laces.

TEAM #2: AUTOMATED SHOE TYING MACHINE

- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Meijo University, Japan, Team 1
- **Advisor**: Dr. Jason Moore

**Abstract**: This project showcases an automated shoe tying machine capable of tying someone’s shoelaces into a standard shoe knot.

TEAM #3: AUTOMATED SORTING MACHINE

- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Meijo University, Japan, Team 2
- **Advisor**: Dr. Jason Moore

**Abstract**: This project showcases an automated recycling sorter that can sort glass, plastic, steel, and aluminum.

TEAM #4: RECYCLING SORTER

- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Dorian Crutcher (MEC), Roy Gilboa (MEC), Derek Ketchingman (MEC), Ricardo Guilloty (MEC)
- **Advisor**: Dr. Jason Moore

**Abstract**: Sorting recyclable items is one of the most challenging problems to solve in the recycling process. Each item must first be separated and categorized by material before any other stage in the recycling process can begin. This project had us design an automated recycling sorter that can sort glass, plastic, steel, and aluminum in competition with another student engineering team from Meijo University in Nagoya, Japan.

TEAM #5: HARDWARE AND CONTROLS DESIGN FOR A ROBOTIC SAILBOAT

- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Sean Blaevoet (MEC), Jordan Leung (MEC), Michele Shi (MEC), Vivian Tran (MEC), Bryan Zhao (MEC)
- **Advisor**: Dr. Steve Velinsky

**Abstract**: A fleet of autonomous energy ships was proposed in order to harvest wind energy over the ocean. To investigate its feasibility, a sail controller and a rudder controller for a small-scale model sailboat were designed and implemented. The system encompasses two operational modes: a wind conversion optimization mode to maximize boat speed, and a manual mode to allow user control. Sensors and actuators were implemented along with data acquisition and storage for further research and analysis.
TEAM #6: SAILBOAT HYDROFOIL
- Department: Mechanical and Aerospace Engineering
- Team members: Nicole Peacock (MEC), Amanda Braun (MEC), Joseph Buckley (MEC), Andrew Shoats (MEC), Omar Hashem (MEC)
- Advisor: Dr. Steve Velinsky

Abstract: The Energy Ship project proposes to equip a fleet of autonomous sailboats with hydro-kinetic turbines and electrolyzers which will use ocean wind energy to harvest hydrogen. The addition of hydrofoils has the potential to achieve higher speeds, therefore, collecting more energy, by lifting the hull out of the water. A hydrofoil system was designed, manufactured, and installed on a remote-control LASER model sailboat to compare performance during displacement, semi-foil, and full-foil modes.

TEAM #7: U-STEP: A DIABETIC FOOT MONITORING DEVICE
- Department: Biomedical Engineering
- Team members: Elaine Cho (BIM), Shonit Sharma (BIM), Jacqueline Yee (BIM), Marisa Stubbs (BIM)
- Advisor: Dr. Anthony Passerini
- Mentors/Sponsors: Dr. Prasanth Surampudi, Endocrinology

Abstract: U-STEP is a device enabling remote monitoring of diabetic patients feet for uneven pressure distributions and foot injuries, both early signs of ulcer development. Pressure gradient maps and digital images acquired through U-STEP are transmitted wirelessly to a mobile application, allowing changes in plantar pressure and appearance to be monitored over time. U-STEP can be used for both clinic and home use, enabling reliable and consistent foot health monitoring for effective ulcer prevention.

TEAM #8: SOLE SURVIVOR
- Department: Computer Science
- Team members: Andy Tran (CSE), Donald Pinckney (CSE), Kim Dang (CSE), Sally Ly (CSI)
- Advisor: Dr. Xin Liu
- Mentors/Sponsors: Prasanth Surampudi, MD and Professor of Endocrinology, UC Davis Medical Center

Abstract: Recording device/iPhone application that inspects feet and toes of patients with diabetic neuropathy and documents changes over time.

TEAM #9: EZGROW
- Department: Electrical and Computer Engineering
- Team members: Nick Alvarez (EEL), Mark Bourkav (EEL), Issam Abdulrahim (EEL)
- Advisor: Dr. Rajeevan Amirtharajah

Abstract: EzGrow is a control system for vertical hydroponics that automates nutrient and pH levels in a water reservoir for optimal plant growth. The system monitors pH and electrical conductivity and controls 12 volt peristaltic pumps to feed the system the necessary buffers and nutrient solutions. The system is geared towards the consumer market and can fit in someone’s backyard or porch.

TEAM #10: MMO PHONE GAME: PROJECT PANDA
- Department: Computer Science
- Team members: Davey Jay Belliss (CSI), Jessica Hsieh (TCS, CSI), Navid Nadvi (CSE), Alex Derebenskiy (CSE)
- Advisor: Dr. Xin Liu
- Mentors/Sponsors: Travis Heppe, Software Engineer, Google

Abstract: Project Panda is a multiplayer phone game that supports a high number of players with low latency, player customization, and a wide selection of battle skills. The game has two parts to it: The Overlay, and Battle Mode. Players begin the game in The Overlay, which uses their GPS to track their position in real time. If a player finds a boss territory on The Overlay, they can enter Battle Mode. In Battle Mode, players team up to fight enemies and reclaim the boss territory.

TEAM #11: ACTUATED DOUBLE PENDULUM ROBOT
- Department: Mechanical and Aerospace Engineering
- Team members: Erich Baur (MEC), Greg McDonald (MEC), Jiahao Wei (MEC), Todd Sweeney (MEC)
- Advisor: Dr. Jason Moore

Abstract: The goal of this project is to design and construct a double pendulum robot on a moving track that can simulate human balance and serve as a teaching aid for the UC Davis COSMOS program.

TEAM #12: WASTE BUSTERS SEMI AUTOMATED TRASH DISPENSER
- Department: Mechanical and Aerospace Engineering
- Team members: Anna Jiang (MEC), Connor Smith (MEC), Ian de Vries (MEC), Luis Jimenez (MEC), Rex Wong (MEC)
- Advisor: Dr. Jason Moore

Abstract: Waste Busters is a company that aims to reduce, reuse, and recycle all waste. Our mission as their mechanical engineering student team is to assist in designing and building a semi-automated waste system that incorporates a RAGNAR robot, conveyer belt, and garbage sorter all within a trailer.

TEAM #13: LUCID DREAM GENERATOR
- Department: Computer Science
- Team members: George Zhou (COM), Stephen Wang (CSE), Sean Malloy (CSE), Jeffrey Warner (CSI)
- Advisor: Dr. Xin Liu
- Mentors/Sponsors: Tony Galatti, UC Davis Molecular and Cellular Biology

Abstract: An Android app designed to be scientifically practical to affect brainwave patterns. Features of the app include customizable frequency generation, reality checks of varying intervals, and a dream journal. The purpose of this app is to use the customizable frequency generation in order to induce more regular lucid dreaming during sleep. Also, since the feature is customizable we hope that users can utilize this app to perform experiments to better understand how lucid dreaming occurs. Overall, with this app we hope that people can more easily experience the phenomenon of lucid dreaming.
TEAM #14: ABRÁZAME

- Team members: Ke Huang (Ph.D., CMN), Alejandra Amparo (AME, POL), Jeffrey Warner (CSI), Kimmiko James (CSI), Sahil Faruque (COM)
- Mentors/Sponsors: CITRIS and the Banatao Institute at UC Davis, Center for Regional Change, Blum Center for Developing Economies at UC Davis, Institute for Social Sciences

Abstract: The Android-based, mobile phone application Abrázame will document domestic violence events by allowing users to safely share social support messages, receive personalized recommendations, and memorialize their stories in English or Spanish (first release). Users will also have access to a map that marks resources for help. Abrázame will give a voice to victims and survivors of domestic violence and their allies.

TEAM #15: HYPERLOOP: THE SOLUTION TO TRANSPORTATION INFRASTRUCTURE ISSUES WITHIN THE SACRAMENTO VALLEY

- Team members: Aron Sarmasi (ASE, MEC), Austin Gonzalez (ASE, MEC), Daniel Nasr-Church (MEC), Bruno Matsui (ASE, MEC), Riley Schreiner (MEC)
- Mentors/Sponsors: CITRIS and the Banatao Institute at UC Davis, Center for Regional Change, Blum Center for Developing Economies at UC Davis, Institute for Social Sciences

Abstract: Hyperloop is a new mode of transportation developed by Elon Musk that utilizes a pod traveling at subsonic speeds within vacuum tubes between 100 and 1000 miles. In order to develop this idea into working models, Musk started the “SpaceX Hyperloop Competition” in 2014 to have university teams develop pod models to test within SpaceX’s 1-mile long vacuum tube. One loop, the Hyperloop Team at UC Davis, is building a half-scale pod capable of roughly 60 miles per hour to test in SpaceX’s track in August, with a linear induction motor (LIM) to power the pod, eddy current brakes and friction brakes to stop the pod, air bearings to levitate the pod, wheels to move the pod, and controls equipment to connect all of these functionalities to a central power source and to one another. In terms of developing towards track construction in the region, we are also focused on the development of an incubator to fund Hyperloop projects around track development within the next year, with a whitepaper around incubator and track creation released this month and reviewed by the Chancellor of UC Davis and upon review by the Sacramento Council of Governments (SACOG). To summarize our current progress in terms of developing towards track construction in the region, we have brought the technology that makes us unique within the SpaceX competition and the team leaders who are spearheading their development.

TEAM #16: FREEDGE-CHECKER

- Team members: Ernst Bertone Oehninger (Ph.D., ECL), Alexandra Estvan Hill (Ph.D., AME), Madeline Chen (CSI, MAT), Vega Sood (COM, EEL), Dat Nguyen (CSI)
- Mentors/Sponsors: CITRIS and the Banatao Institute at UC Davis, Center for Regional Change, Blum Center for Developing Economies at UC Davis, Institute for Social Sciences

Abstract: Freedge promotes the installation of community fridges that encourage food sharing and reduce food waste. The freedge-checker is an automated monitoring system with sensors and cameras that will help users and cleaning volunteers track the food in each freedge, also building an inventory of all incoming items.

TEAM #17: MACHINE LEARNING FOR CANCER CLASSIFICATION

- Team members: Grayson Cox (CSI), Orli Feuchtwang (CSI)
- Mentors/Sponsors: CITRIS and the Banatao Institute at UC Davis, Center for Regional Change, Blum Center for Developing Economies at UC Davis, Institute for Social Sciences

Abstract: The primary focus of our project is classifying cancer by type automatically. We use convolutional neural networks to classify the type of cancer from histopathological stained slides, thus saving the time of a trained pathologist (or allowing a less well trained pathologist to operate independently) by allowing them to focus on simple approval of our results instead of the actual classification itself.

TEAM #18: STOCHASTIC SIMULATIONS FOR GLOBAL FOOD SECURITY

- Team members: Aleksandra Taranov (Ph.D., BST, IAD), Abhay Manu Sawhney (CSI)
- Mentors/Sponsors: CITRIS and the Banatao Institute at UC Davis, Center for Regional Change, Blum Center for Developing Economies at UC Davis, Institute for Social Sciences

Abstract: Scientists who work on developing higher yielding and drought tolerant crops are often slowed down by the cost and time to run complete field trials. This team is developing an open-source R package implemented in C++ that runs quantitative simulations on whole genome data to speed up the process of developing new crop varieties.

TEAM #19: INCLUSIVE SOCIAL MEDIA FOR OLDER USERS

- Department: Computer Science
- Team members: Kitan Garcia (CSE), Bryan Smiley (CSE), Gwen Hoang (CSE), Kevin Pham (CSE)
- Advisor: Dr. Xin Liu
- Mentors/Sponsors: Chelsea Kim, Graduate Student in Communication, UC Davis

Abstract: This online social media platform will be used to in a client’s research to study the occurrences in reciprocity in social media in older people. The website will be tailored to older users with a high-contrast color scheme, enlarged fonts, a simple and clear, intuitive UX, and voice capabilities, along with the other more common functionalities of other social media platforms.
TEAM #20: SECURING TUBES TO STRAPS
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Cesar Gaytan (MEC), James McDaniel (MEC), Jesse Barnett (MEC), Mae Underwood (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** Helical ground heat exchangers will be instrumental in helping new homes meet California’s Net Zero Energy (NZE) goal by 2020. Partnered with Integrated Comfort Inc., our goal is to reduce the production cost of ICI’s helical ground heat exchanger (GeoHelix) by 30% by focusing on labor time. The design must allow for two or three tensile members to quickly connect to the heat exchanger and help retain its helical coil shape during shipping and installation.

TEAM #21: WHEELCHAIR TO CAR DRIVER’S SEAT TRANSFER ASSIST DEVICE
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Puhan Liu (MEC), Zhiyu Li (MEC), Hung Pham (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** Design of a portable device that allows safe transfer for wheelchair users to get in/out of their vehicles.

TEAM #22: VERTICAL FARMING GROWTH CHAMBER
- **Department:** Biological and Agricultural Engineering
- **Team members:** Alexandra Mora (BSE), Emily Laskin (BSE), Allyson Sandoval (BSE), Cobey Davidson (BSE)
- **Advisor:** Dr. Ken Giles

**Abstract:** Our initiative was to design and build an indoor farming system that senses and controls the growing conditions within the growing chamber. To monitor the conditions within the indoor farm cabinet, applications of instrumentation were required to measure and interpret changes in temperature, relative humidity, and carbon dioxide levels. Unlike other models, the user will be able to input desired growing conditions, and the system will be able to make adjustments to meet these criteria.

TEAM #23: ROWBOT: ALGORITHM FOR ACCURATE ROWING METRICS
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Britt Tarien (MEC), Bryn Cloud (MEC), Ada Liu (MEC), Thomas Shedd (MEC), Li Wang (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** Our team has refined a software model to track the dynamics of a competition rowboat. Our sponsor developed an iPhone app so rowers can track their performance without investing in expensive hardware. Raw iPhone data is uncertain and sampled infrequently. To solve this, we implemented a Bayesian statistics based Kalman filter to merge sensor data into accurate position and velocity, and processed the output at the stroke level. We’ve validated our algorithm against a precision differential GPS.

TEAM #24: HIGH-PRECISION AUTOMATED RAIL ALIGNMENT MACHINE
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Benjamin Bright (MEC), Robert Moore (MEC), Blake Evans (MEC), Andres Prado (MEC), Carlos Soto Rojas (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** Team Davis Micro-Vu developed a method to straighten a guide rail and align it to a backplate. The team utilized precision manufacturing techniques, metrology, automation hardware, and PLC coding. Utilizing a network or servos and actuators, the machine bends a stainless steel rail to be straight within a tolerance of a micron. The rail is aligned to a backplate within +/- 20 microns while a screwdriver bolts them together. Upon completion, the rail will be used to produce consumer electronics.

TEAM #25: RA-VROOM SOLAR BOAT PROPULSION
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Melissa Ng (MEC), Shane Hunter (MEC), David Edgar (MEC), Paul Meranian (MEC), Zhaoning Chen (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** The purpose of the Ra-Vroom senior design team is to design and fabricate a drivetrain system to propel the Davis Solar Boat Team to victory at the 2018 California Solar Regatta. Ra-Vroom has implemented a continuously variable transmission that increases the response and speed of the boat, automatically shifts gear ratios, integrates with the boat design, and complies with competition specifications. To assess the utility of the system, tachometers and a GPS speedometer were used to log data.

TEAM #26: BICYCLE-POWERED MAIZE MILL
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Kiara Breadmore (MEC), Craig Kampen (MEC), Claudio Roman (MEC), Brandon Weaver (MEC), Mohammed Althobaiti (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** The goal of the bicycle-powered maize mill project is to design and build an efficient bicycle-powered maize mill for local entrepreneurs across rural Africa. It is our intention to build a device that will provide a way to produce flour for households and villages to use. This project requires a high production and quality of flour output using a low cost milling system that can be locally repaired with low precision tooling.
TEAM #31: BICYCLE DATA LOGGER
- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Joseph Pickens (MEC), Matt Llanes (MEC), Derrick Lewald (MEC), Eddie Jacobs (MEC)
- **Advisor**: Dr. Jason Moore

Abstract: Our project is an open-source bicycle data logger for use in studying naturalistic cycling behavior on city streets in an effort to improve traffic infrastructure to further reduce cycling accidents around the globe. The system measures speed, steering angle, acceleration, and global position, and its modular design allows for the future addition of many other types of sensors. Our logger’s compact, lightweight, and adaptable nature allow for unobtrusive use on a wide variety of bicycles.

TEAM #32: COMPUTER SCIENCE ARTICULATION WEBSITE
- **Department**: Computer Science
- **Team members**: David Montes (CSI), Giulia Lubet (CSI), Eric Lam (CSE), Jason Dinh (CSE)
- **Advisor**: Dr. Xin Liu
- **Mentors/Sponsors**: Christopher Nitta, Professor of Computer Science, UC Davis

Abstract: The computer science department at UC Davis often needs to articulate courses taken at another institution to those within the department. The goal of this project is to provide a public facing website that students can query to see the articulations for a course they have taken (or plan on taking) at another institution. In addition, a private version of the website will be available to faculty and staff to manage the course articulations.

TEAM #33: CHONCHO LH2
- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Jennifer Tran (ASE), Joseph Araw (MEC, ASE), Ka Lun Fung (ASE), Mario Figueroa (ASE), Aaron Guizar (MEC, ASE)
- **Advisor**: Dr. Case van Dam

Abstract: The purpose of the design was to build an aircraft that met the 2017-2018 NASA Design Challenge. The aircraft must used 60% less energy while maintaining the same flight mission of a 2005 best-in-class baseline. This must be achievable by 2045. The proposed design is a double decker, hydrogen powered airplane called Choncho LH2. This airplane has a seating capacity of roughly 250 passengers, with a range of roughly 3200 nautical mile, while being able to cruise at 35,000 feet at mach 0.8.
TEAM #40: SST-130: AN ULTRA-EFFICIENT COMMERCIAL PASSENGER JET FOR THE FUTURE OF COMMERCIAL AVIATION

- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Brooke Raabe (ASE), Zane Hays (ASE, MEC), Luis Rochin (ASE), Stephen Chally (ASE, MEC)
- **Advisor:** Dr. Case van Dam

**Abstract:** The purpose of this project is to design a subsonic commercial transport aircraft to meet the goal of 60% reduction in energy consumption set by NASA's 2045 objectives, as a submission to NASA's Ultra-Efficient Commercial Transport Challenge. The SST-130 is designed with energy-saving features including unducted turbofan engines powered by liquid hydrogen, wings optimized for maximum laminar flow at high speed, a cambered fuselage, adaptive flaps with trim capability, and anti-ice wing coating.

TEAM #39: FEASIBILITY STUDY OF RENEWABLE TECHNOLOGIES AT YOLO LANDFILL

- **Department:** Civil and Environmental Engineering
- **Team members:** Hannah Lee (CIV), Erica Koopman-Glass (CIV), Jian Liang Chen (CIV), Priyanath Chandrasekhar (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** The Yolo County Central Landfill is committed to the Yolo County's Energy Action Plan to reduce greenhouse gas (GHG) emissions to 1990 levels by 2020. Landfuel Technologies evaluated the feasibility of utilizing two types of renewable energy technologies, solar panels and Power Oxidizers, on the landfill to reduce GHG emissions. The technologies will be compared using a weighted performance matrix that includes GHG emission reduction potential, cost, and approach for implementation.

TEAM #38: ULTRA-EFFICIENT COMMERCIAL TRANSPORT

- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Kevin Li (MEC, ASE), Alfred Pavlik (ASE), Hyunjune Chai (ASE, MEC), Sihong Yu (ASE, MEC)
- **Advisor:** Dr. Case van Dam

**Abstract:** The designed transport aircraft meets the mission specs of reducing the energy consumption by 60% and reducing the noise and immission while maintaining the performance and capabilities of the competing model Boeing 757. The aircraft has a blend-wing-body configuration with a turboelectric and boundary layer injection propulsion system. Its wide seat layout satisfies the passengers and the component weights satisfy the stability.

TEAM #37: LIFT AND CARRY EXOSKELETON

- **Department:** Biomedical Engineering
- **Team members:** Linda Lan Phung (BIM), Cassidy Dzoon (BIM), Michael Brooks (BIM), Hannah Yssels (BIM), Marina Gabriel (BIM)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** David Segal, Professor of Pharmacology, UC Davis

**Abstract:** Our objective is to design a safe, comfortable lower extremity exoskeleton that increases lifting and carrying endurance for shipping and/or warehousing laborers. This is accomplished by increasing users lifting capabilities by 30 pounds without additional metabolic expenditure. Furthermore, our device should not impede work performance and should reduce the risk of long-term injury.

TEAM #36: 193TEES

- **Department:** Computer Science
- **Team members:** Christopher Ta (CSI), Jade MacDonnell (CSI), Rose-Marie Eter (CSE), Phuong Nguyen (CSE)
- **Advisor:** Dr. Xin Liu
- **Mentors/Sponsors:** Travis Heppe, Software Engineer, Google

**Abstract:** This website is an e-commerce platform dedicated to promote the art community here at UC Davis. The website is built with full stack Javascript technology and hosted on Google App Engine—integrated with various API’s, frameworks, and customer analytical tools. Our platform accepts T-shirt designs from Davis art students. The goal is to sell these T-shirts on our platform in order to promote their portfolios and recognition.

TEAM #35: PYXIS

- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Shreya Rastogi (ASE, MEC), Brenna Joe (ASE, MEC), Janine Moses (ASE, MEC), khashchuluun Tamir (ASE, MEC), Pnithan Jantarakolica (ASE, MEC)
- **Advisor:** Dr. Case van Dam

**Abstract:** Team JMSAB designed an innovative aircraft to meet NASA's call for Ultra-Efficient Commercial Transports. Pyxis is an aircraft with gull-boxed wings and zero-emissions liquid hydrogen fuel. It features innovative technological advancements in aerodynamics, structures, materials, and cabin interiors that make this aircraft competitive in the 2045 timeframe. Additionally, Pyxis achieves an energy reduction of more than 60% compared to current mid-range airliners on today’s market.

TEAM #34: ACCUMAGNA

- **Department:** Biomedical Engineering
- **Team members:** Peggy Palsgaard (BIM), Laura Purdy (BIM), Michelle Swedek (BIM), Zhiyu Xiao (BIM)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** David Segal, Professor of Pharmacology, UC Davis

**Abstract:** This project is to design a device that injects into the cisterna magna of mice consistently and safely. Prior to injection, we will use non-invasive tactics to locate our target. Our device will then be able to deliver drug therapies to the CM. Further, the device will be minimally invasive, reducing mice recovery time and improving outcomes of the brain therapy. This way, the study of genetic disease models will be accelerated as less risk and time will be spent on the injection method.
TEAM #41: RAINWATER CATCHMENT SYSTEM FOR BURKINA FASO

- Department: Civil and Environmental Engineering
- Team members: Maria Paola Murillo (CIV), Angela Jazmin Alfaro (CIV), Kyle Edward Doughty (CIV)
- Advisor: Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: Composite Body is proposing to design a portable, adaptable, durable and affordable water catchment system for the village of Thyou and ultimately for use in other rural areas as well. The problem is driven by the inability to access and retain rainwater that can potentially be used for cooking and irrigation. Composite Body will research Burkina Faso and the components of a rainwater catchment system to devise a new system that will relieve the burden of water collection.

TEAM #42: PAVEMENT DESIGN USING LCA

- Department: Civil and Environmental Engineering
- Team members: Raul Tejeda (CIV), Cody Parrott (CIV), Cesar Magallanes (CIV)
- Advisor: Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: Our project is a Life Cycle Assessment (LCA) of pavements that are currently being used in California. Through our investigation we duplicated a mix design that has already been used in industry to see if we achieve similar testing results in the lab. We also suggested an improved mix by changing the ratio of materials used to achieve a lower carbon footprint and a healthier environment for the future.

TEAM #43: FORENSIC ANALYSIS AND REDESIGN OF FOUNDATION SYSTEM SUPPORTING BUILDING IN OAKLAND, CA

- Department: Civil and Environmental Engineering
- Team members: Hamza Shallwan (CIV), Yordan Nikolov (CIV), Jonathan Soohoo (CIV), Christopher Limeisa (CIV)
- Advisor: Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: The purpose of this project is to investigate and determine the cause(s) of failure of a relatively light building supported on shallow foundations and develop performance specifications and a preliminary design solution for design of a new building at the site.

TEAM #44: SKI PARK PROFILER

- Department: Mechanical and Aerospace Engineering
- Team members: Jack Long (MEC), Grant Speckman (MEC), Anad Kannan (MEC), Sher Sher (MEC), Bradley Rainbolt (MEC)
- Advisor: Dr. Jason Moore

Abstract: Professor Mont Hubbard and Professor James McNeil have developed a criteria to analyze the safety of terrain park jumps. The professors have contacted us to create a device that can accurately record the angle of ski slope jumps with respect to a distance from a reference point. Our team has decided to create a snow-tracked device that measures distance with a radial encoder and measures slope angle with the combination of a 9-degree of freedom IMU board and an Arduino microcontroller.

TEAM #45: WATER CATCHMENT DESIGN

- Department: Civil and Environmental Engineering
- Team members: Patrick Spence (CIV), Alexander Haston (CIV), Bryan Palma (CIV)
- Advisor: Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: Burkina Faso is a landlocked country located in West Africa. The driving problem facing Burkina Faso’s communities is a lack of reliable access to safe and clean water. The country needs infrastructure that can capture rainfall and help ease some water collection need. Our goal is to create designs for a rainwater catchment system that will alleviate some burden of water collection for Thyou’s people. We will provide final and alternative designs that will have been tested to meet Thyou’s needs.
#### TEAM #49: RAINFALL CATCHMENT
- **Department:** Civil and Environmental Engineering
- **Team members:** Gurgagn Chand (CIV), Jonathan Gordon (CIV), Cagri Aytekin (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Design a rainfall catchment system as an additional water source for the town of Kissou in Burkina Faso, Africa to be used for schoolchildren.

#### TEAM #50: PROTOTYPING A NEW LIGHTWEIGHT MOBILE CHICKEN COOP
- **Department:** Civil and Environmental Engineering
- **Team members:** Alyssa Lawry (CIV), Austin Cueto (CIV), Betty Yu (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** The project objective was to assess the conditions of the current mobile chicken coop prototype at the UC Davis Pastured Poultry Farm and provide a design for a second-generation chicken coop prototype. The final design is based on the strengths and weaknesses of the current design, with consideration for mobility, sustainability, user-friendliness, cost, and environmental factors.

#### TEAM #51: PARKING STUDY OF DOWNTOWN DAVIS
- **Department:** Civil and Environmental Engineering
- **Team members:** Eunice Oprea (CIV), Aashka Shah (CIV), Olivia Potash (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** The main objective of this project is to characterize the current parking conditions in downtown Davis and compare them with the 2012 UC Davis parking study. The project assesses downtown’s current parking situation by collecting data on total parking available, how much of the parking is used, and how long it is used for. Our second objective is to recommend feasible changes in the current parking infrastructure as well as effective parking management techniques.

#### TEAM #52: MERCURY-RELATED STUDIES OF INDIAN VALLEY RESERVOIR
- **Department:** Civil and Environmental Engineering
- **Team members:** Alexander Monta (CIV), Betanea Leyretana (CIV), Huimin Xin (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** HXB Corporation aims to assist McCord Environmental, Inc. in improving the water quality of mercury-impaired reservoir in California, Indian Valley Reservoir, by examining the possible mercury sources of the reservoir and suggesting potential control studies.

#### TEAM #53: UC DAVIS CAMPUS PARKING STUDY
- **Department:** Civil and Environmental Engineering
- **Team members:** Justin Yuen (CIV), Prajwal Misra (CIV), Zhikun Wu (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Existing parking areas on campus could be better optimized to accommodate a variety of users throughout the day. This study aims to help UC Davis Transportation Services improve campus parking management and transportation planning. The study includes license plate data collection to analyze parking statistics such as occupancy of heavily utilized lots and the number of vehicles a stall serves each day. The project also includes a final report with methods, results, recommendations, and maps.

#### TEAM #54: FEASIBILITY STUDY: REDUCTION OF GHGS AT YOLO COUNTY LANDFILL
- **Department:** Civil and Environmental Engineering
- **Team members:** Alexandra Nicolopoulos (CIV), Haoting Pan (CIV), Raymond Mallari (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Our team will be conducting a feasibility study on two renewable energy technologies, a power oxidizer and solar panels, for use at the Yolo County Central Landfill. We will conduct an economic analysis of the two renewable energy technologies and also calculate reductions in greenhouse gas emissions as a result of implementing the technologies. An ultimate recommendation will be given based on the results of the feasibility study.

#### TEAM #55: A NOVEL METHOD OF SEMI-AUTONOMOUSLY MEASURING, RECORDING, AND TRANSMITTING TEMPERATURE DATA FROM COMPOST PILES TO A HUMAN USER
- **Department:** Biological and Agricultural Engineering
- **Team members:** Peter Chau (BSE), Amber Chou (BSE), Sophia Sturdevant (BSE)
- **Advisor:** Dr. Ken Giles

**Abstract:** Highly Pathogenic Avian Influenza (HPAI) presents a massive problem for the poultry industry. The virus denatures naturally under the high temperatures capable of being produced in a compost pile. The piles also present long-term sources of virus under lower conditions, meaning monitoring of internal temperature is imperative for producers. A semi-autonomous solution was developed to capture data and then transmit the data to a remote user to ideally reduce human hazard factors.

#### TEAM #56: VEHICULAR COLLISION DETECTION SYSTEM
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Adarsh Cherra (MEC), Gurjot Singh (MEC), Lan Ngo (MEC), Ryan Yu (MEC), Nitin Muthusamy (MEC)
- **Advisor:** Dr. Steve Velinsky

**Abstract:** In recent years, vehicles have been used as drivable weapons to spread terror and destruction all over the world. This project aims to explore/develop technologies which will detect a vehicular collision with a pedestrian in which the vehicle’s power train continues to operate and deceleration does not occur. The Vehicular Collision Detection System was developed to prevent secondary and tertiary collisions as well as malicious drivers from causing further pedestrian injury.
TEAM #57: CAMPUS PARKING DEMAND AND MANAGEMENT SOLUTION STUDY
- **Department**: Civil and Environmental Engineering
- **Team members**: Ron Yang (CIV), Morgan Wilson (CIV), Weng Him Choi (CIV)
- **Advisor**: Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract**: The objective of this project is to assist UC Davis Transportation Services (TAPS) in optimizing the utilization of all parking facilities on campus and managing these facilities more efficiently. This case is based on the study of Lot 25.

TEAM #58: THERMAL AUDITING DRONE
- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Melissa Quijada (MEC), Seth Garner (MEC), Regina Lee (MEC), Matthew Campbell (MEC), Tristan Bond (MEC)
- **Advisor**: Dr. Jason Moore

**Abstract**: The Thermal Auditing Drone project has been established to develop a system capable of capturing thermal images of UC Davis building rooftops, in order to determine where excessive amounts of energy are being consumed. The project focuses on optimizing the thermal auditing process through software measures, such as automated flight path mapping, image analysis, and the collection of energy consumption data.

TEAM #59: SUSTAINABLE PAVEMENT DESIGN
- **Department**: Civil and Environmental Engineering
- **Team members**: Patrick Cunningham (CIV), Rebeca Anaya (CIV), Jackson Wise (CIV)
- **Advisor**: Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract**: Pavement construction produces large amounts of greenhouse gas (GHG) emissions. Concrete and asphalt mixtures with reduced associated GHG emissions are needed to reduce the environmental impact. A cradle-to-gate Life Cycle Assessment will be performed on the two mixtures to find the equivalent CO2 emissions. Additionally, the physical properties of both mixture designs will be tested. The findings of this project will be used to provide recommendations for future sustainable pavement design.

TEAM #60: PORTABLE LIFTER DEVICE
- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Joseph Goodwin (MEC), Wing Leong (MEC), Andrew Chen (MEC), Ahmet Arslan (MEC), Aaron Martinez (MEC)
- **Advisor**: Dr. Jason Moore

**Abstract**: Our team was assigned to our sponsor to design a portable lifting device that would solve their problem and satisfy multiple requirements. Currently, the technicians are lifting heavy equipment manually and installing them into network racks, which poses a risk to both personal injury and equipment damages. We designed a device that uses a traditional winch and pulley system to lift up the platform that allows their equipment to slide via rolling platform into the rack and be installed.

TEAM #61: AMMONIUM NITRATE PLANT
- **Department**: Chemical Engineering
- **Team members**: Maya Al Dawoody (CML), Alexia Portillo Rivera (CML), Jose Sanchez (CML), David Maginnis (CML)
- **Advisor**: Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: The project is to design a chemical plant that produces ammonium nitrate from feedstock hydrogen, water, and air. The process is designed to produce ammonia from air and purchased hydrogen. A production process for nitric acid is also designed, and it utilizes half of the produced ammonia in addition to water and air. The nitric acid and ammonia are used to make the ammonium nitrate. The purpose of manufacturing ammonium nitrate is that it has an important use as fertilizer.

TEAM #62: DESIGN OF A NORTHERN CALIFORNIA HYDROGEN (H2) FUELING INFRASTRUCTURE FOR MEDIUM-DUTY AND HEAVY-DUTY VEHICLES
- **Department**: Civil and Environmental Engineering
- **Team members**: Thomas Guo (CIV), Christopher Purdy (CIV), Edison Wu (CIV)
- **Advisor**: Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract**: We will build a conceptual hydrogen fueling stations network to support the early adoption of hydrogen fueling medium- and heavy-duty trucks in SACOG region, so that we can accomplish the goal of zero emission and future hydrogen fueling trucks in the future. The model will provide minimum, medium and maximum service levels based on the demands of SACOG region fleets. We will also determine the location of the hydrogen fueling production facility to better support the demand of the stations.

TEAM #63: PRODUCTION OF OLEFINs FROM SYNGAS
- **Department**: Chemical Engineering
- **Team members**: Alka Paturi (CML), Anjana Jayaraman (CML), Vy Pham (CML), Brandon Dare (CML)
- **Advisor**: Dr. Ahmet Palazoglu
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: The goal of the project is to successfully model a unique production method of lower olefins from syngas in ASPEN.
**TEAM #64: OPTICAL SENSORS**
- **Department:** Biological and Agricultural Engineering
- **Team members:** Jessica Ashkinos (BSE), Katryonna Natividad (BSE), Clarice Roo (BSE)
- **Advisor:** Dr. Ken Giles

**Abstract:** Our senior design project is part of a long-term effort to develop an automated, orchard platform that achieve high fruit harvesting efficiencies. First, a distance sensing system must be integrated with the camera and calibrated, so the pixel speed given from the camera, can be converted into linear ground speeds (m/s). Second, a proper mount will be fabricated to be placed on the orchard platform. Third, creating an accurate perform test in the lab and orchard to assess system performance.

**TEAM #65: CONCRETE AND ASPHALT MIXTURE DESIGNS USING LIFE CYCLE ASSESSMENT**
- **Department:** Civil and Environmental Engineering
- **Team members:** Corinne Canepa (CIV), Kyle Beltran (CIV), Nicole Castillo-Pasquini (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Our team has worked on designing concrete and asphalt mixtures for use in pavement applications with the goal of decreasing greenhouse gas emissions. A Life Cycle Analysis of mixture designs has been used to assess the environmental impact of each mixture.

**TEAM #66: HOUSEHOLD WATER CATCHMENT DESIGN**
- **Department:** Civil and Environmental Engineering
- **Team members:** Matin Amanat (CIV), Mohamed Abdelaziz (CIV), Bryan Rodriguez (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** We are designing a water catchment system with the goal to alleviate the burden of transporting water long distances for the villagers in Thyou, Burkina Faso. The water catchment system will be applied to schools in the area to provide water from the wet season for cooking, cleaning, and growing crops in following months.

**TEAM #67: IV SIMULATOR**
- **Department:** Biomedical Engineering
- **Team members:** Natalya Demchuk (BIM), Phong Huynh (BIM), Brandon Ng (BIM), Nagham Haddad (BIM), Eman Masadeh (BIM)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** Dr. Sage Wexner, Emergency Medicine

**Abstract:** The current methods are not effective for intravenous (IV) catheter insertion practice. Most current methods fail to resembles the human arm and have anatomically correct vein placements. As such, there is a need for a device that can provide an accurate lifelike IV insertion procedure to improve IV insertion skills.

To create a reusable device capable of simulating the intravenous puncture procedure, complete with veins, that can be used to educate students and practice IV placements.

**TEAM #68: CATALYTIC DEHYDRATION OF BIOETHANOL TO DIETHYL ETHER: PLANT DESIGN**
- **Department:** Chemical Engineering
- **Team members:** Rachel Coons (CML), Nicholas DaRosa (CML), Amanda Houston (CML), Michael Ayala (CML)
- **Advisor:** Dr. Spyros Tseregounis
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** Preliminary design for a diethyl ether plant using bioethanol as feed stock was designed using a survey scientific and economic literature for current catalyst technologies. Economic trade offs were explored for proposed use of diethyl ether as a diesel fuel additive. Optimization of proposed plant design was determined from calculated capital and operating costs and reaction kinetic limitations.

**TEAM #69: PROTOTYPING A LIGHTWEIGHT MOBILE CHICKEN COOP**
- **Department:** Civil and Environmental Engineering
- **Team members:** Lj Tullo (CIV), Ruby Chen (CIV), Torynne Dillon (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Design of a prototype of a small, lightweight, and mobile chicken coop for the University of California, Davis Pastured Poultry Farm. This coop cost under $3000, can house 25-50 hens, and can be moved by two to four people.

**TEAM #70: BUFFALO BIKE STAND**
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Ryan Dimick (MEC), Roman Mohammed (MEC), Pablo Vargas (MEC), Adam Wentland (MEC), Bogdan Chepurny (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** The Buffalo Bicycle design is centered around durability, usefulness, repairability, and affordability. This project focuses on the stand that lifts the rear wheel of the bicycle and supports the bike in an upright position when it’s not being ridden. Importantly, the stand is lockable in its deployed position. The stand is sufficiently strong but certain components wear prematurely and are too costly to repair. The project goal is to improve the durability and affordability of this design.

**TEAM #71: LIFE IN THE SYNGAS LANE**
- **Department:** Chemical Engineering
- **Team members:** Hunter Pauker (CML), Brendan Boudreaux (CML), Julio Zamora (CML), Patrick Lavin (CML)
- **Advisor:** Dr. Ahmet Palazoglu
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** The project studies the conversion of carbon monoxide rich syngas to light olefins. The syngas is produced from biomass gasification. We will optimize the process to increase conversion and selectivity of ethylene, the most profitable olefin.
**TEAM #72: AN ECONOMICAL PROCESS OF AMMONIUM NITRATE PRODUCTION IN MBOUDA**

- **Department:** Chemical Engineering
- **Team members:** Panyue Wang (CML), Dingqi Nai (CML), Khanh Tran (CML), Shaotong Jing (CML)
- **Advisor:** Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** The main objective of this project is to design a profitable and low-cost process of ammonium nitrate production in Mbouda, Cameroon in order to sell the product to Middle Africa farms at a competitive price.

**TEAM #73: AMMONIUM NITRATE FROM A BIOMASS DERIVED HYDROGEN**

- **Department:** Chemical Engineering
- **Team members:** Alicia Allen (CML), Samantha Martino (CML), Jenna Williams (CML, MEC), Timothy Wells (CML)
- **Advisor:** Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** We designed an economically profitable and environmentally safe production plant with a yearly yield of 500,000 metric tons of Ammonium Nitrate (NH₄NO₃) at 99% purity by mass. NH₄NO₃ is used as a high-nitrogen fertilizer to increase agricultural yield. From a hydrogen feedstock, we produced ammonia and nitric acid, which are the building blocks to NH₄NO₃. The plant is to be located in Mbouda, Cameroon with the goal of servicing the large agricultural sector in Middle Africa.

**TEAM #74: FORENSIC ANALYSIS AND REDESIGN OF FOUNDATION SYSTEM SUPPORTING BUILDING IN OAKLAND, CA**

- **Department:** Civil and Environmental Engineering
- **Team members:** Hsiang Huang (CIV), Casey Phradichith (CIV), Brad Rousseau (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Geotechnical and structural engineers often encounter situations in which the causes of failure must be forensically examined. The technical forensic investigation requires collection of data, problem characterization, development of failure hypotheses, a realistic back analysis, and not infrequently, observations in situ. The purpose of this project is to provide an opportunity to conduct a forensic engineering analysis.

**TEAM #75: HYBRID ELECTRIC AIRCRAFT PERFORMANCE AND DESIGN**

- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Cody Winn (ASE), Dillan Christensen (ASE), Brodie Eilerman (MEC, ASE), Ryan Johnson (ASE, MEC), Carlos Pagan (MEC, ASE)
- **Advisor:** Dr. Case van Dam

**Abstract:** Details the design of two general aviation aircraft with a four and six seat variation. Both planes are hybrid electric aircraft that utilize batteries and a diesel engine to charge the batteries during flight. The four seater will be able to have range of 1000 nmi with entry into service in 2028. The six seat model will have a range of 750 nmi with entry into service in 2030. Both aircraft will offer noise reduction and more destinations available for customers in addition to fuel savings.

**TEAM #76: UC DAVIS CAMPUS PARKING STUDY - LOT 25**

- **Department:** Civil and Environmental Engineering
- **Team members:** Zaw Win (CIV), Edward Hayden Parker (CIV), Larry Rivera (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** A study directed towards alleviating the preexisting parking issues on campus. Analysis of collected data will be presented, in addition to potential solutions.

**TEAM #77: DEE FROM BIO-E**

- **Department:** Chemical Engineering
- **Team members:** Tiffany Nguyen (CML), Eugene Lee (CML), Aude Gwladys Keubon (CML), Araceli Diaz (CML)
- **Advisor:** Dr. Spyros Tseregounis
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** We are designing a process to produce diethyl ether from bioethanol. This product will be used as an additive in biodiesel fuels to decrease CO and NOx emissions.

**TEAM #78: UC DAVIS CAMPUS PARKING STUDY**

- **Department:** Civil and Environmental Engineering
- **Team members:** Bernard Medina-Brown (CIV), Chenzin Liao (CIV), Cole Hofberg (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** A campus parking study dedicated to providing recent data of campus parking and solutions to alleviate the current parking demand at UC Davis.

**TEAM #79: UC DAVIS CAMPUS PARKING STUDY**

- **Department:** Civil and Environmental Engineering
- **Team members:** Stephen Chiu (CIV), Rain Li (CIV), Gabriela Moreno (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** This project is a parking study that will display the accumulation, duration, and turnover data collected from Parking Lot 25 (Active Recreation Center Parking Lot). There will be a display of analysis of the data and possible suggestions to improve the parking from this study.
TEAM #80: NET LAUNCHING SYSTEM
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Mario Rodriguez (MEC), Ryan De La Cruz-Peterson (MEC), Chad Rice (MEC), Benda Zhu (MEC)
- **Advisor:** Dr. Steve Velinsky

**Abstract:** ARMA USA has the patent NO. 7412975 for a hand held gas propelled missile launcher. The goal of this project is to create a net payload system compatible with the ARMA 100 bean bag gun. The minimum 2’ net is required to launch at least 60’, and have the ability to capture small animals and drones as humanely as possible.

TEAM #81: HYDROGEN FUELING INFRASTRUCTURE FOR MEDIUM- AND HEAVY-DUTY VEHICLES
- **Department:** Civil and Environmental Engineering
- **Team members:** Grant Lee (CIV), Vanessa Leedy (CIV), Alyssa Paluck (CIV), Abigail Wong (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** This project aims to create a conceptual design for a H2 fueling infrastructure map for the Sacramento Area Council of Governments. The map shows a sustainable network to support the Last Mile fleets of County Services.

TEAM #82: UPDATING THE UCD STUDY OF DOWNTOWN PARKING
- **Department:** Civil and Environmental Engineering
- **Team members:** Nora Titus (CIV), Allyson Beem (CIV), Siria Che Wu (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** One of the major issues the City of Davis must address is downtown parking availability. Since the latest 2012 downtown parking study, Davis has witnessed a steady increase in population and newly developed businesses that may impact the current situation. Twenty-five hours of data were collected over a two-week period to analyze the parking occupancy rate, turnover rates, and parking duration to provide a detailed summary of key changes since 2012.

TEAM #83: MOBILITY ASSIST WHEELCHAIR ATTACHMENT
- **Department:** Biomedical Engineering
- **Team members:** Alexandra Dotti (BIM), Victoria Lancey (BIM), Jose Galindo (BIM, MEC), Lucas Burstein (BIM, MEC)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** Emily Reichart, Consultant, Nepal

**Abstract:** Our team’s project is to design a mobility assist wheelchair attachment for disabled individuals in Nepal that eases transport through rugged terrain, while remaining affordable and easy to maintain. We are accomplishing this through a single-wheel motorized attachment that is affixed to the back of the user’s wheelchair. The motorized design ensures the device can both traverse rough terrain and be minimally fatigueing to the user.

TEAM #84: ENVIRONMENTAL JUSTICE ANALYSIS OF POTENTIAL LOCATIONS FOR MDHD HYDROGEN FUELING STATIONS IN SACRAMENTO AREA COUNCIL OF GOVERNMENTS
- **Department:** Civil and Environmental Engineering
- **Team members:** Emily Jasinski (CIV), Valerie Chang (CIV), Gerardine Santiago (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** SACOG census tracts with greatest emissions reduction, closest proximity to distribution centers, and least adverse environmental justice (EJ) effects were ranked and mapped to determine optimal MDHD hydrogen fueling locations. The Caltrans Annual Average Daily Truck count data and Emission Factors Model were used to calculate potential emissions reductions in disadvantaged census tracts. CalEnviroscreen 3.0 was used as a tool to score areas based on EJ impacts of building hydrogen stations.

TEAM #85: DESIGN AND OPTIMIZATION OF A DIETHYL ETHER PLANT
- **Department:** Chemical Engineering
- **Team members:** Benjamin Chang (CML), Pablo Cazares (CML), Randy Xie (CML), Bryan Martinez (CML)
- **Advisor:** Dr. Spyros Tseregounis
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** Diethyl ether (Et2O) is used as an additive to biodiesel fuels for diesel trucks in the northern United States and Canada. The chemical is an oxygenated additive used to reduce the emission of NOx and CO emission, making the fuel more environmentally viable for regulations governed by both the Environmental Protection Agency (EPA) and Environment Canada. This project is focused on producing Et2O by converting ethanol in the gas phase to Et2O and ethylene via catalytic dehydration.

TEAM #86: DYNAMIC POSITIONING SYSTEM FOR BOATS
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Jacob Needels (MEC), Stephen Williams (MEC), David Madey (MEC), Austin Kittrell (MEC), Christopher Antoun (MEC)
- **Advisor:** Dr. Steve Velinsky

**Abstract:** The goal of this project is to design a low-cost, portable dynamic positioning system for small boats. The system consists of four thruster mounts connected to the hull by vacuum cups for easy removability. The system is controlled by a central navigation and power distribution system. The prototype system was produced and tested on a watercraft mirroring the nominal use case.
TEAM #87: WECHAT READER EDUCATION APP
- **Department:** Computer Science
- **Team members:** Haoyu Chen (CSE), Xi Cheng (STA, CSI), Jatin Gaba (CSE), Daljodh Pannu (dj) (CSE)
- **Advisor:** Dr. Xin Liu
- **Mentors/Sponsors:** Sean Hu, WCR Education Group

Abstract: An app for WCR education group members to reader newest education discussions.

TEAM #88: FORENSIC ANALYSIS AND REDESIGN OF FOUNDATION SYSTEM SUPPORTING BUILDING IN OAKLAND, CA
- **Department:** Civil and Environmental Engineering
- **Team members:** Madison Richey (CIV), William Chilcote (CIV), Eric Racadag (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: The problem this project addresses is the settlement of the building located on Edgewater Drive in Oakland, CA. This project aims to determine why the building settled, and to redesign a foundation for a new building at the site. The new design will prevent future settlement and provide a safe, sustainable, and cost-effective building to the user. The final report includes a forensic analysis and redesign, as well as a media release statement for the project.

TEAM #89: “THE” AIRCRAFT
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Kenneth Nguyen (ASE, MEC), Yuriy Honcharuk (ASE), Sam Everett (ASE), Patrick Schaber (ASE)
- **Advisor:** Dr. Case van Dam

Abstract: Our senior design team will be showcasing our aircraft concept for the NASA’s Ultra-Efficient Commercial Transport Challenge. Titled as “THE Aircraft,” our aircraft will feature a turbo-electric hybrid hydrogen electrical propulsion system in order to meet NASA’s goal of reducing energy consumption of commercial transport aircrafts by 60% by year 2045. The project will encompass our design process, aerodynamics, system configurations, stability analysis, costs, and design optimizations.

TEAM #90: SMART HORSE BOOT
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Ciera Knolle (MEC), Carla Medlin (MEC), Trent Storm (MEC), Jonathan Pepper (MEC)
- **Advisor:** Dr. Jason Moore

Abstract: The smart horse boot is a device that detects horse lameness by wirelessly monitoring force measurements from a horse’s hoof and displaying the data on a portable device. It consists of an aluminum plate inside a horse boot with nine force sensors in a 3x3 matrix. An electronics box is on the outside of the boot containing the circuitry, battery, and microcontroller. The sensors provide data for practitioners and horse owners to locate abnormalities in a horse’s gait and diagnose lameness.

TEAM #91: FUSION ENTHALPIES OF TM2O3, YB2O3, AND LU2O3 FROM DROP AND CATCH CALORIMETRY AND FIRST PRINCIPLES CALCULATIONS
- **Department:** Materials Science and Engineering
- **Team members:** Matthew Fyhrie (MSE)
- **Advisor:** Dr. Ricardo Castro

Abstract: The enthalpies of 2-3mm beads of Tm2O3, Yb2O3, and Lu2O3 were measured using drop and catch (DnC) calorimetry and first principles calculations from density functional theory (DFT). Close corroboration between calculations and empirical measurements, as well as prior results from the DnC system with DFT indicate that the empirical values gathered are accurate and can be used for calculations in place of current values extrapolated from the enthalpy of fusion of Y2O3 by Shpilrain.

TEAM #92: FINGER PROSTHETIC
- **Department:** Biomedical Engineering
- **Team members:** Kendall Ng (BIM), Aditi Shastry (BIM), Sanjana Naik (BIM), Chanju Park (BIM), Valerie Cote (BIM)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** Dr. Jaron Ross

Abstract: Digyx is a finger prosthesis created for partial finger amputees who have lost their 3rd, 4th, and 5th fingers. This device is a mechanical solution that restores hand function by providing grip strength. Digyx is operated solely by the affected hand, improving on current finger prosthesis designs.

TEAM #93: DIETHYL ETHER PRODUCTION VIA THE CATALYZED DEHYDRATION OF ETHANOL
- **Department:** Chemical Engineering
- **Team members:** Nathan Wu (CML), Kevin Xia (CML), Huy Tran (CML), Christopher Ho (CML)
- **Advisor:** Dr. Spyros Tseregounis
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

Abstract: This project is interested in developing an efficient chemical process for the production of diethyl ether, which can then be scaled up for industrial applications. This project will review several potential catalysts and processes, and determine the best method for optimizing the yield of diethyl ether from the catalyzed dehydration of ethanol and its competing reaction, which produces ethylene. The project will include a figure of our finalized chemical process, with kinetic data available.

TEAM #94: PAVEMENT LCA
- **Department:** Civil and Environmental Engineering
- **Team members:** Isaac Mai (CIV), Eric Lang (CIV), Adam Julander (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: We are creating concrete and asphalt mix design designed to reduce the environmental impact based on a cradle to gate life cycle.
TEAM #95: LPE GROWTH OF GAP PHOTOCATHODES
- Department: Materials Science and Engineering
- Team members: Ryan Bunk (MSE, EEL)
- Advisor: Dr. Ricardo Castro

Abstract: Efficient generation of hydrogen fuel is crucial to a sustainable future. One method of accomplishing this is by splitting water into hydrogen and oxygen using light and a photocatalyst, such as GaP. Commercial GaP substrates typically have short minority carrier lifetimes, which limits efficiency of photocathodes. By growing GaP layers by LPE, long minority carrier lifetimes are possible, increasing the efficiency of a GaP-based photocathode.

TEAM #96: CHARACTERIZATION OF GOLD-GOLD BONDS IN FLIP CHIP COMPONENTS
- Department: Materials Science and Engineering
- Team members: Thomas Schultz (MSE), Garrett Zambrano (MSE), Quynh Ha (MSE), Ying Qian (MSE), Nigel Mencias (MSE)
- Advisor: Dr. Ricardo Castro

Abstract: Partnered with Keysight Technologies Inc. to provide characterization of Gold-Gold bonds in Flip Chip components through use of shear testing, optical microscopy and scanning electron microscopy. Testing methods were used to identify the failure mechanisms and the quality of diffusion between gold surfaces.

TEAM #97: CANINE HINGE JOINT PROTECTION
- Department: Biomedical Engineering
- Team members: Emmery Leighton (BIM), Nicolette Sarmiento (BIM), Jasmeet Kaur (BIM), Lintong Yu (BIM, CMN), Kevan Bruce (BIM)
- Advisor: Dr. Anthony Passerini
- Mentors/Sponsors: Denis Marcellin-Little, Professor of Surgical and Radiological Sciences, UC Davis, SVM

Abstract: In canines, joints often need extra protection and stability after undergoing major surgery because without proper stabilization, full and complete healing of the joint and retention of joint motion are compromised. Our device incrementally introduces canine joint motion, depending on the joint and the severity of the injury. It is attached to a Breathe-o-prone garment via Velcro and also allows for an adjustment of joint range of motion.

TEAM #98: METALLURGICAL CHARACTERIZATION OF GOLD MESH BONDING
- Department: Materials Science and Engineering
- Team members: Angel De La Torre (MSE), Vincent Sciuto (MSE), Johann De Silva (MSE), Scott Cohen (MSE), Jinbai Lu (CML)
- Advisor: Dr. Ricardo Castro

Abstract: UC Davis Materials Science and Engineering students were given the task of characterizing the gold to gold mesh bond method used within Keysight’s interconnect packaging. Gold mesh is an alternative solution to using gold ribbon bonding to connect circuit components within microelectronics packages. The gold mesh bonding was characterized via SEM imaging to examine microstructure changes in the gold mesh along with probe testing to analyze electrical properties between varying gold mesh samples.

TEAM #99: DESIGN OF A NORTHERN CALIFORNIA HYDROGEN FUELING INFRASTRUCTURE FOR MEDIUM-DUTY AND HEAVY-DUTY VEHICLES
- Department: Civil and Environmental Engineering
- Team members: Haley MacGowan (CIV), Alex Huynh (CIV)
- Advisor: Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: Medium and Heavy Duty Vehicles are large contributors to greenhouse gas levels while being a small fraction of on road traffic. In order to address this our team will provide a hydrogen fueling infrastructure map for the SACOG region that will assist in the transition to hydrogen as an alternative fuel. By focusing on large distribution centers, considering zoning/land use, and manipulating the projected penetration rates of hydrogen fuel, our team will find the best suited station locations.

TEAM #100: AMMONIUM NITRATE FERTILIZER PRODUCTION
- Department: Chemical Engineering
- Team members: Troy Sharp (CML), Hunaid Shakoor (CML), Krishan Gandhi (CML), Matthew Siqueiros (CML)
- Advisor: Dr. Roland Faller, Dr. Jason White
- Mentors/Sponsors: Andy Towarnicky, Process Development Group, Andeavor

Abstract: A design concept for a plant capable of producing 500,000 metric per year tons of solid ammonium nitrate is proposed.

TEAM #101: MERCURY IN CALIFORNIA LAKES
- Department: Civil and Environmental Engineering
- Team members: Alyysen Calalang (CIV), Josh Bernd (CIV), Victor Ventura (CIV)
- Advisor: Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: Reservoirs throughout the state of California are mercury-impaired due to elevated levels of methylmercury in fish. The project goal is to provide the tools necessary to perform further research into mercury-impaired reservoirs. This will be accomplished by proposing cost effective and feasible control studies that will reduce mercury levels and methylmercury bioaccumulation in reservoirs.
TEAM #102: AN APPROACH TO CHARACTERIZING GOLD RIBBON WEDGE BONDS

• Department: Materials Science and Engineering
• Team members: Alex Ma (MSE), Karina Rasmussen (MSE), Shaheer Siddiqui (MSE), Mohammed Mahdi Safar (MSE), Bofang Li (MSE)
• Advisor: Dr. Ricardo Castro

Abstract: As the development of communications technology is rapidly changing, so are the challenges for packaging integrated circuits that are becoming more embedded with active circuits. The ever-shrinking wire bond pad has proven to favor ribbon bonding over round wire bonding, due to its rectangular shape that has shown to improve both process and performance. Our group has worked with Keysight to develop a set of criteria that can reliably produce quality ribbon bonds with an automated bonder.

TEAM #103: PIXIS - REST API CODE GENERATOR

• Department: Computer Science
• Team members: Kelly Su (CSE), James ChenDylon Dickinson (CSE), Andrew Ni (CSI)
• Advisor: Dr. Xin Liu
• Mentors/Sponsors: Robert Hodges, Senior Staff Engineer, VMware

Abstract: Our project is a code generation tool written in Python that parses an OpenApi 3.0 specification file and outputs working server and client code for several frameworks (Flask, Angular, Node.js, Java). Developers can use our application to quickly generate skeleton code. They then only need to fill in the API functionality to have a fully operational API.

TEAM #104: WEBSCRAPING AND WORD2VEC

• Department: Computer Science
• Team members: Alex Whelan (CSE), Kai Yan (CSI), Rhys Li (CSE)
• Advisor: Dr. Xin Liu
• Mentors/Sponsors: Martin Hilbert, Professor of Communication, UC Davis

Abstract: The idea of this project is to use Deep Neural Nets that implement Word2Vector analysis solutions in order to make sense of text formulated in natural language. For example, public policy reforms like in health care and taxes consist of a large variety of issues and opinions. The idea is to explore how deep neural nets can be used to analyze written text to map out the qualitative opinion landscape of the different issues involved in these issues.

TEAM #105: MYSTERIOUS THEREMIN

• Department: Electrical and Computer Engineering
• Team members: Max Nedorezov (CSE), Alan Qin (EEL), Matthew Lo (EEL), Cathy Hsieh (CSE), Andrea Hsieh (EEL)
• Advisor: Dr. Andre Knoesen
• Mentors/Sponsors: Texas Instruments

Abstract: A vacuum tube theremin with an infinity mirror display. The theremin is the first electronic instrument invented in the 1920s that is played without ever touching it. The infinity display is part of bringing the player to awe of this magnificent creation.

TEAM #106: SOLARTRIKE

• Department: Mechanical and Aerospace Engineering
• Team members: Brian Munoz (MEC), Austin Page (MEC), Alexander Sulyman (MEC), Alex Chew (MEC)
• Advisor: Dr. Jason Moore

Abstract: As people become older, activities such as riding a bicycle become more difficult. The Solar-trike team was formed to help develop an innovative electric-assisted tricycle drive train for its client.

TEAM #107: AMMONIUM NITRATE SYNTHESIS PLANT

• Department: Chemical Engineering
• Team members: Mitchell Rotter-Sieren (CML), Yibo Zhu (CML), Chaorui Duan (CML), Tong Qin (CML)
• Advisor: Dr. Roland Faller, Dr. Jason White
• Mentors/Sponsors: Andy Towarnicky, Process Development Group, Andeavor

Abstract: This project is an investigation on the potential for the production of ammonium nitrate in Mboda, Cameroon to service farms in Middle Africa. We have prepared a conceptual design package of the plant as well as an economic analysis using rigorous profitability measures, while also considering other key issues including such as process safety and environmental considerations. We want to find out if we can make a profit by selling our ammonium nitrate at $400 per metric ton.

TEAM #108: FEASIBILITY STUDY FOR THE REDUCTION OF GHGS FROM THE YOLO COUNTY CENTRAL LANDFILL

• Department: Civil and Environmental Engineering
• Team members: Sukhjeaven Sahota (CIV), Vivian Le (CIV), Danielle Charleston (CIV)
• Advisor: Dr. Colleen Bronner, Dr. Deb Niemeier

Abstract: This project assesses the feasibility of implementing solar panels on top of closed landfill cells while also using power oxidation to convert emissions from closed cells to renewable energy at the Yolo County Central Landfill. These systems have the potential to support current and future power loads for the facilities at the landfill. A basic design was developed and the feasibility was evaluated based on the estimated reduction in greenhouse gas emissions and projected cost.

TEAM #109: DESIGN PROJECT OF DIETHYL ETHER

• Department: Chemical Engineering
• Team members: Weilin Zhang (CML), Yu Chen (CML), Zi Wang (CML)
• Advisor: Dr. Spyros Tseregounis
• Mentors/Sponsors: Andy Towarnicky, Process Development Group, Andeavor

Abstract: Our project is investigating the use of Diethyl Ether (DEE) as an additive to Diesel. According to the dynamic of catalyst used, plant location, cost consideration and economic...
benefits for producing DEE, we are going to design, build, and operate of a plant to produce DEE.

**TEAM #110: UPDATING ORCHARD LIFE CYCLE ASSESSMENT MODELS**
- **Department:** Civil and Environmental Engineering
- **Team members:** Christopher Hamilton (CIV), Siyu Jia (CIV), Ysela Larios (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** This project is part of ongoing research to conduct a life cycle-based analysis of California’s orchard production landscape undertaken by Dr. Alissa Kendall and Dr. Elias Marvinney, mainly focused on almonds but also considering other perennial crops. The project focuses on the irrigation energy requirements, such as the energy required to pump groundwater. Future trends in groundwater use and irrigation energy requirements will be discussed in relation to climate change predictions.

**TEAM #111: LIGHT OLEFIN PRODUCTION FROM SYNTHESIS GAS**
- **Department:** Chemical Engineering
- **Team members:** Rachel Schonwit (CML), Everett Moiseff (CML), Rodrigo Posada (CML), Jason Macnaughton (CML)
- **Advisor:** Dr. Ahmet Palazoglu
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** Catalyzed production of light olefins from synthesis gas involving a recycle stream, multiple-stage reactor design, adsorption and distillation columns.

**TEAM #112: DIRECT PRODUCTION OF LIGHT OLEFINS FROM SYNGAS**
- **Department:** Chemical Engineering
- **Team members:** Heather Liu (CML), Kelvin Mai (CML), Alexander Chen (CML), Yan-shun Mung (CML)
- **Advisor:** Dr. Ahmet Palazoglu
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** Olefins are necessary for the chemical industry that are highly versatile building blocks used to synthesize polymers and organic chemicals. Traditionally, olefins are produced from cracking non-renewable, crude oil feedstocks. This project explores olefin production using renewable sources of CO-rich syngas produced as a result of biomass gasification. Using Aspen simulations and kinetic data, we propose a direct syngas-to-olefin process to maximize olefin production and economic opportunity.

**TEAM #113: LIGHT OLEFIN PRODUCTION FROM SYNGAS**
- **Department:** Chemical Engineering
- **Team members:** Aram Balaian (CML), Hailey Yoon (CML), Isaac Alvarez (CML), Grace Jung (CML)
- **Advisor:** Dr. Ahmet Palazoglu
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** The light olefin production from syngas using catalyst was studied. Cr/Zn and SAPO34 zeolite were used in this process. The microscale production design was built using Aspen Plus and the results were compared with those from DOW. The scale-up process was designed and its economic analysis and profitability were investigated.

**TEAM #114: LFF-100**
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Christopher Schuldt (ASE), Jonathan Rose (ASE), William Britten (ASE, MEC), Juan Marin (ASE)
- **Advisor:** Dr. Case van Dam

**Abstract:** Design for an ultra efficient mid-range single aisle passenger transport aircraft, intended to compete against the Boeing 737-800. Innovative features include; forward swept wings to promote laminar flow, turbo-electric distributed propulsion to increase propulsive efficiency, and a staggered three lifting surface design reducing wing area and induced drag. This is for the NASA design competition with the aim of reducing energy consumption by 60% and emissions 80% by the year 2045.

**TEAM #115: NERVO: FINGER-ASSIST**
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Andrew Louie (MEC), Ty Farkas (MEC), Abraham Arellano (MEC), Xuyi Long (MEC), Shogo Suzuki (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** The mission of this project is to design a device to assist our client’s limited grip strength. After a diving accident, our client Gerry, was left paralyzed from the chest down. Gerry has fairly good upper arm strength, but lacks dexterity and strength in his fingers, which provides challenges in his daily life. Our design utilizes a glove that is driven by cables which are attached to servo motors. The servo motors are controlled by a joystick to achieve multiple gripping motions.

**TEAM #116: ROCKET IMAGING PAYLOAD: IDENTIFICATION OF GROUND-BASED TARGETS USING CONTOUR DETECTION AND NEURAL NETWORKS WITH BLUETOOTH-ENABLED INERTIAL MEASUREMENT UNIT**
- **Department:** Electrical and Computer Engineering
- **Team members:** Alysia Iglesias (EEL), Eden Tessema (EEL, COM), Jonathan Wapman (EEL), Daniel Ji (EEL), Abha Pandey (EEL)
- **Advisor:** Dr. Rajeevan Amirtharajah

**Abstract:** The Rocket Imaging Payload system provides a fast, accurate, and reliable method to identify ground-level targets while onboard a rocket. A continuous stream of images can be captured and analyzed in real-time using the NVIDIA Jetson TX1 and advanced imaging algorithms within a completely self-contained system. Onboard telemetry sensors report flight data via Bluetooth for real-time flight monitoring.
TEAM #117: MICROBIOME CULTIVATOR: SMALL-SCALE, HIGH-THROUGHPUT GUT SIMULATOR
- **Department**: Biological and Agricultural Engineering
- **Team members**: Nashea Awais (BSE), Kyle Cheung (BSE), Adam Poltorak (BSE)
- **Advisor**: Dr. Ken Giles

**Abstract**: The gut simulator supports research into the impact of diet on the animal and human gut microbiomes. Recent research suggests that gut microbiome plays a key role in health and sustainability. The system improves upon existing simulators by using peristaltic motion to cause mixing in experimental samples. Additionally, multiple parallel experiments (up to 24) can be conducted, decreasing the time needed to gather large data sets necessary for screening and diagnostic purposes.

TEAM #118: FANTASTIC FLOOR
- **Department**: Electrical and Computer Engineering
- **Team members**: Neil Arakkal (COM), Feng Cai (EEL), Daniel Vallejo (COM), Rohit Dhamankar (CSE), James Sun (CSI)
- **Advisor**: Dr. Andre Knoesen
- **Mentors/Sponsors**: Texas Instruments

**Abstract**: An interactive floor that lights up with random colors when stepped on.

TEAM #119: QUESTSHIN
- **Department**: Biological and Agricultural Engineering
- **Team members**: Amy Young (BSE), Corrinna Lee (BSE), Julia Tse (BSE), Mark Anthony Parungao (BSE), Yangcheng Liu (BSE)
- **Advisor**: Dr. Ken Giles

**Abstract**: In a world drowning in plastics, efforts to produce bio-based versions of plastic products are key in reducing plastic’s negative impact on our planet. To help with this cause, we focused on the sports industry, where plastic is often used because it is flexible, ergonomic, and lightweight. Using various everyday products, such as meat trays, eggshells, and clothing fibers, we’ve constructed and tested various environmentally friendly composite materials for use in shin guards.

TEAM #120: AUTOMATIC SCREW FEEDER
- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Jieh Meinhold (MEC), Solon Yiu (MEC), Hong Truong (MEC), Riyaz Merchant (MEC), Felix Le (MEC, CSI)
- **Advisor**: Dr. Steve Velinsky

**Abstract**: This project consists of the design and manufacturing of a prototype adjustable automatic screw feeder for assembly automation. Screws can be poured into a hopper where a they will be aligned and sent down a track. Upon reaching the end of the track, they can be picked up manually, or loaded into a standard blow-feeding mechanism and sent to a screwdriver head. The design is built to accommodate multiple screw diameters with minimal adjustment.

TEAM #121: PLASMA WATER CONTENT
- **Department**: Biomedical Engineering
- **Team members**: Joseph Pouratibib (BIM), John Madsen (BIM), Johnny Phan (BIM), Shahab Chizari (BIM)
- **Advisor**: Dr. Anthony Passerini
- **Mentors/Sponsors**: Dr. Nam Tran, Pathology and Laboratory Medicine

**Abstract**: Many medical tests are inaccurate because they assume the amount of water in the blood is the same (which is not true for patients with pathological conditions, e.g. High Cholesterol). Therefore, there is a need for a laboratory method for measuring the water in the blood plasma. This will help clinicians correctly diagnose patients. To address that need, we are trying to use NMR to measure the T2 relaxation time of blood plasma samples and correlate the relaxation time with water content.

TEAM #122: DRAWBACK
- **Department**: Computer Science
- **Team members**: Lena Tan (CSE), Hong Truong (MEC), Yunwon Tae (CSE), Richard Gao (CSI)
- **Advisor**: Dr. Xin Liu
- **Mentors/Sponsors**: Travis Heppe, Software Engineer, Google

**Abstract**: Our project is an online collaborative whiteboard application that allows multiple users to draw on a shared canvas in real time.

TEAM #123: WATER CATCHMENT DESIGN
- **Department**: Civil and Environmental Engineering
- **Team members**: Oriana Hone (CIV), Elisa Heida (CIV), Nicolas Dante Dilliott (CIV)
- **Advisor**: Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract**: Team E.O.N. is designing a household water catchment system for the Secondary School of Yargho in Burkina Faso, West Africa. Burkina Faso is a landlocked country located just below the Sahara Desert. Rainfall is scarce and irregular in this area, which worsens poverty experienced by the community. Team E.O.N. is designing a system that can potentially relieve the burden of water collection for students and teachers at the Secondary School.

TEAM #124: HIGH TEMPERATURE ADHESION OF SAPPHIRE TO ALUMINA HOUSING WITH CERAMIC INTERLAYER
- **Department**: Materials Science and Engineering
- **Team members**: Morris Yang (MSE), Sean Killilea (MSE), Zachary Whittles (MSE), Jiarong Kang (MSE)
- **Advisor**: Dr. Ricardo Castro

**Abstract**: Create alumina-based cladding for sapphire fiber for applications in high temperature and high stress sensing applications. Blends of ceramic powders are sintered with optimizing ratios of optical, thermal, mechanical properties to withstand heat of 1600 C for 4 Hours. The adhesive material possesses refractive index lower than that of the fiber to prevent signal loss. With the information gathered, high temperature sensing enables improved efficiency in the aerospace and energy sectors.
TEAM #125: A FEASIBILITY STUDY FOR MERCURY REMEDIATION IN LAKE SOLANO

- **Department:** Civil and Environmental Engineering
- **Team members:** Lauren Graves (CIV), Kahui Lim (CIV), Brooke Ahmed (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Methylmercury contamination is a nationwide issue and poses a risk to both people and wildlife. Lake Solano is a small reservoir downstream of Lake Berryessa in the California Coast Range in Solano County, California. In the Cache Creek Watershed and other watersheds surrounding Lake Solano, cinnabar mining serves as a major source of inorganic mercury. Lake Solano is a small, shallow lake that has a large build-up of vegetation and sediment, which can facilitate anoxic zones and other conditions.

TEAM #126: MERCURY BIOACCUMULATION

- **Department:** Civil and Environmental Engineering
- **Team members:** Melvin Aquino (CIV), Adrian Cristobal (CIV), Truc Le (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Mercury bioaccumulation poses a high-level threat due to its impact on the surrounding ecosystem and human health. California aquatic resources are especially susceptible to mercury contamination of from both natural and anthropogenic sources. Our project will hone in on Lake Berryessa. The purpose of this study is to research and recommend potential control studies for this reservoir.

TEAM #127: SAPPHIRE DIRECT BONDING USING SPARK PLASMA SINTERING

- **Department:** Materials Science and Engineering
- **Team members:** Christian Patino (MSE), Calvin Tan (MSE), Benjamin Tanyongkul (MSE), Teera Yong (MSE), Leslie Park (MSE)
- **Advisor:** Dr. Ricardo Castro

**Abstract:** Our group is implementing a method for ultra-high temperature bonding for a 0.4 mm thick sapphire fiber to an MTI 10x10x0.5 mm alumina substrate. Spark Plasma Sintering (SPS) at 1200 C for approximately 150 minutes is utilized to direct bond the two materials. Scanning electron microscopy (SEM) images were taken to examine the bonding interface of the two materials. Transmission vs. wavelength and optical light leakage measurements are recorded through the use of a laser at varied wavelengths.

TEAM #128: UNIVERSAL FIXATOR HINGE

- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Richard Kokolosos (MEC), Aidan Delplanque (MEC), Alexa Monserret (MEC), Kulvir Jandir (MEC)
- **Advisor:** Dr. Jason Moore

**Abstract:** We have worked with Dr. Denis J. Marcellin-Little to design, manufacture, and test a novel circular external fixator hinge. The purpose of this project is to enhance the capabilities of the current Small Bone Fixator (SBF) systems being used by orthopedic surgeons at the UC Davis School of Veterinary Medicine. Our hinge is helping to further research into canine limb deformity correction via distraction osteogenesis.

TEAM #129: RUNCAST

- **Department:** Biomedical Engineering
- **Team members:** Samir Akre (BIM), Angela Tolwani (BIM), Krishna Basude (BIM, MEC)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** Dave Hawkins, Professor of Neurobiology, Physiology, and Behavior, UC Davis

**Abstract:** Our device will be capable of predicting lower-body overuse injuries so that athletes and active people can take action to prevent them. To do this, we want to characterize lower body musculoskeletal loading profiles from the Achilles tendon and the surrounding foot region. We have identified several key biomechanical factors that are markers of these loading profiles, and we are building a wearable device to monitor and analyze them.

TEAM #130: THE CATALYTIC FORMATION OF DIETHYL ETHER FROM BIO-ETHANOL

- **Department:** Chemical Engineering
- **Team members:** Eric Taurone (CML), Sami Long (CML), Janet Li (CML), Alex Patch (CML)
- **Advisor:** Dr. Spyros Tseregounis
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** We propose a method for the production of diethyl ether from the dehydration of bio-ethanol, a renewable resource derived from corn stalk, for use in diesel engines, enabling cold-starting and reducing emissions. This process will utilize a packed-bed reactor and Tungstophosphoric Acid (TPA) as the catalyst.

TEAM #131: PRODUCTION OF AMMONIA NITRATE AS FERTILIZER

- **Department:** Chemical Engineering
- **Team members:** Manling Tan (CML), Alejandra Ayala (CML), Heqing Huang (CML), Zekun Chen (CML)
- **Advisor:** Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** The project proposes a potential ammonium nitrate production process from biomass derived hydrogen. It shows a detailed description of the unit operating processes modeled in the Aspen Plus software. Environmental impact considerations and existing regulations are taken into account, as well as a complete economic analysis in order to evaluate the profitability of the design. The proposed design will be located in Mbouda, Cameroon, where it will service farms in Middle Africa.
TEAM #132: CHESS ENGINE
- **Department**: Electrical and Computer Engineering
- **Team members**: Kenneth Surdyk (EEL), Alexander Strakhov (EEL, COM), Nicholas Phillips (COM)
- **Advisor**: Dr. Terry O’Neil

**Abstract**: We have designed a chess-playing computer engine. Most of the implementation is done in software using the C programming language, and part of the calculation is done using the Verilog Hardware Description Language programmed on an FPGA chip. Games are played on a free chess application called Xboard.

TEAM #133: DEEP LEARNING FOR CANCER THERAPY
- **Department**: Computer Science
- **Team members**: Suraj Jena (CSE), Valeria Brewer (CSE), Kumud Ravisankaran (CSI), Ninad Mehta (CSE)
- **Advisor**: Dr. Xin Liu
- **Mentors/Sponsors**: Gerald Quon, Professor of Molecular and Cellular Biology, UC Davis

**Abstract**: Our project is a tumor classification automaton, hosted through a web service. It is designed to accept data through the same interface, classify using the chosen type of Neural Network, and display the results on the same page.

TEAM #134: ULTRA EFFICIENT COMMERCIAL TRANSPORT CHALLENGE: JAG-XP1
- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Bruno Matsui (MEC, ASE), Kilian Ginnell (ASE, MEC), Mengsu Yang (ASE, MEC), Adriana Henriquez (ASE), Robert Woo (ASE)
- **Advisor**: Dr. Case van Dam

**Abstract**: The JAG-XP1 is a subsonic, middle-of-market wide-body passenger transport concept designed for the 2045 time frame. The XP-1 aircraft leverages advancements in composite structures, transonic aerodynamics, and hybrid-electric propulsion technology combined with an advanced dynamic active control system. This design will meet or exceed the goals set forth by the Ultra-Efficient Commercial Aircraft thrust of the NASA Aeronautics Research Mission Directorate.

TEAM #135: PRIMEROFLOW: BREASTMILK MONITORING DEVICE
- **Department**: Biomedical Engineering
- **Team members**: Melissa Onak (BIM), Aurelia Montoya (BIM), Rosanna Resendiz (BIM), Tiffany Ngoc My Huynh (BIM)
- **Advisor**: Dr. Anthony Passerini
- **Mentors/Sponsors**: Dr. Laura Kair & Adara Blake, Pediatrics

**Abstract**: Our objective is to create a device that can measure, in real time, the volume of breast milk an infant consumes during breastfeeding that is accurate, cost effective, and portable to be used in a clinical setting. The device will allow for lactation consultants and other clinicians to measure breast milk consumption directly from the breast to aid in the treatment of infants that are not gaining adequate weight.

TEAM #136: LIGHT OLEFIN PRODUCTION FROM HIGHLY CONCENTRATED CO SYNTHESIS GAS
- **Department**: Chemical Engineering
- **Team members**: Matthew Coats (CML), Marilyn Mc Bryan (CML), Bunra Av (CML), Alex Collazo-Zavalza (CML)
- **Advisor**: Dr. Ahmet Palazoglu
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: Light olefins, such as ethylene and propylene, are key components in industrial grade polymers and plastics. The current Fischer-Tropsch methods are inefficient at producing these light olefins. An alternative and more selective method is proposed requiring novel reaction kinetics. The production platform was optimized to be an economic competitor in the olefin market. The process model was developed in Aspen Plus V9/V10.

TEAM #137: SYNTHESIS OF AMMONIUM NITRATE FERTILIZER
- **Department**: Chemical Engineering
- **Team members**: Tongxia Li (CML), Jiexin Liang (CML), Alex McGillivary (CML), Jialin Zhu (CML)
- **Advisor**: Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: The goal of our senior design is to produce 500,000 metric tons of ammonium nitrate fertilizer per year at a minimum purity of 99% by mass. The production will go through a series of processes including air separation, ammonia synthesis, oxidation of ammonia, nitric acid synthesis, ammonium nitrate production and granulation. Along with the application of sensitivity analyses and heat exchanger networks to our project, we also include assessment of the economic feasibility of our design.

TEAM #138: AMMONIUM NITRATE PRODUCTION IN MBOUDA, CAMEROON
- **Department**: Chemical Engineering
- **Team members**: Samuel Calvert (CML), Jorge Cervantes (CML), Cheryl Fichter (CML), Samantha Hugo (CML, FRE)
- **Advisor**: Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: The production of ammonium nitrate fertilizer in Mbouda, Cameroon is investigated from chemical, economical, and social perspectives. Hydrogen derived from biomass is used to synthesize ammonia and nitric acid, which are then combined to produce ammonium nitrate, an environmentally and economically superior fertilizer. The project has been found to be economically feasible in addition to providing a cheap fertilizer source for the agriculturally dependent populations.
TEAM #139: DIETHYL ETHER PRODUCTION BY DEHYDRATION OF ETHANOL
- **Department**: Chemical Engineering
- **Team members**: Nathaniel Hopper (CML), Peter Shevtchenko (CML), Bashar Ammari (CML), Claire Ajideh (CML)
- **Advisor**: Dr. Spyros Tseregounis
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: Diethyl ether (DEE) is a promising oxygenated additive to diesel fuel that has been shown to reduce NOx and CO emissions as well as improve engine life. Our team has been hired by an international shipping company, LEIS, to design a plant to produce DEE from bioethanol, in order to ensure a future supply for their fleet of trucks. Process simulations were performed using Aspen Plus software, and additional economic factors related to plant location, transportation, and safety were considered.

TEAM #140: FORENSIC ANALYSIS AND NEW DESIGN OF A FOUNDATION FOR A TWO-STORY BUILDING IN OAKLAND
- **Department**: Civil and Environmental Engineering
- **Team members**: Rheanna Ostrea (CIV), Brian Morales (CIV), Hussain Alshawaf (CIV)
- **Advisor**: Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract**: The project will be an approach to the forensic analysis and new design of a foundation for a two-story building in Oakland. The previous foundation experienced settlement between one and a half and three feet on opposite sides. To prevent future failure, this project’s goal is to develop a safe foundation design. The team proposes to achieve the goal by completing two main objectives: understanding the cause of settlement and developing a new foundation design.

TEAM #141: ENTEROVIRUS D68: DIAGNOSIS OF AN EMERGING POLIO-LIKE DISEASE
- **Department**: Biomedical Engineering
- **Team members**: Richard Phouasalith (BIM), Katherine Erickson (BIM), Su Hyun Lyu (BIM), Shruthi Aravindan (BIM)
- **Advisor**: Dr. Anthony Passerini
- **Mentors/Sponsors**: Marintha Heil and Walter Koch

**Abstract**: Enterovirus D68 is a global emerging infectious disease, which causes paralysis and polio-like symptoms in small children, and diagnosis of this disease is particularly challenging. We present a fast, novel qPCR diagnostic that differentiates Enterovirus D68 clusters from each other and from non-D68 viruses on a platform available at most large hospitals and medical centers. This will enable the CDC to better track the disease, and give physicians information to predict paralysis in patients.

TEAM #142: DIETHYL ETHER PRODUCTION FOR BIOFUEL
- **Department**: Chemical Engineering
- **Team members**: Kevin Arata (CML), Chase Kidd-Kadlubek (CML), Charlotte Swaney (CML), Yek Yong Kong (CML)
- **Advisor**: Dr. Spyros Tseregounis
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: As people push for greener fuel alternatives, governments have reacted by creating legislation that encourages biofuel usage. In this project, we convert ethanol from biomass into diethyl ether, a biofuel additive for diesel that has been shown to increase fuel efficiency, improve emissions, and increase engine life in cold climates. We explore reaction catalysts, process designs, facility locations, and other factors to create a competitive, large-scale diethyl ether production plant.

TEAM #143: DESIGN OF A NORTHERN CALIFORNIA HYDROGEN (H2) FUELING INFRASTRUCTURE FOR MEDIUM-DUTY AND HEAVY-DUTY VEHICLES
- **Department**: Civil and Environmental Engineering
- **Team members**: Fayue Lin (CIV)
- **Advisor**: Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract**: The purpose of this project is to develop a proposed Northern California H2 fueling infrastructure map focused on supporting medium-duty and heavy-duty zero-emission vehicles in the Sacramento Area Council of Governments (SACOG) region fleets.

TEAM #144: HEAT (HIGHLY EFFICIENT AIR TRANSPORTATION)
- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Katherine Robertson (ASE, MEC), Christian Zavala (ASE, MEC), Kyle Eggen (ASE, MEC), Salim Hasin (ASE, MEC), Lucas Ang (ASE)
- **Advisor**: Dr. Case van Dam

**Abstract**: NASA has called for innovative ways to achieve ultra-efficient commercial transports. In response to this, HEAT, or Highly Efficient Air Transportation, was developed to meet and exceed these expectations for the large twin aisle family. The design is a hybrid wing body configuration powered by a turboelectric propulsion system. This configuration was designed to meet the mission requirements of the B777, while reducing noise, fuel burn, and NOx emissions by 40.3 dB, 72%, and 79% respectively.
TEAM #145: PRODUCTION OF LIGHT OLEFINS FROM SYNGAS THROUGH DIRECT SYNTHESIS METHODS
- Department: Chemical Engineering
- Team members: Sanjana Gehlot (CML), Audrey Ballentine (CML), Elliot Ng (CML), Jarren Suzuki (CML)
- Advisor: Dr. Ahmet Palazoglu
- Mentors/Sponsors: Andy Towarnicky, Process Development Group, Andeavor

Abstract: Direct catalyzed processes utilized in the production of light olefins from syngas are analyzed and modeled using ASPEN-Plus. The economic potential of the process is assessed along with its level of efficiency in terms of light olefin and by-product production.

TEAM #146: AUTOMATED ORGANIC WASTE PROCESSING AND RECYCLING OF PLA COMPOSTABLE PLASTIC
- Department: Computer Science
- Team members: Benjamin Hough (CSE), Eden Bernabe (CSI), Seza Habibi (CSE), Allen Speers (CSE)
- Advisor: Dr. Xin Liu
- Mentors/Sponsors: Michael Siminitus, Principal Consultant, Waste Busters

Abstract: Sort trash moving on a conveyor belt using machine learning vision techniques to classify items and a delta robot to remove select items from the belt.

We are not bringing a model per se, instead we want to have a camera mounted on a tripod facing downwards in order to demonstrate our vision system. Ideally, it would be on a table but setting it on the floor would be okay as well.

TEAM #147: CLESES (STERILIZE)
- Department: Mechanical and Aerospace Engineering
- Team members: Austin Harris (MEC), Nahom Embaye (MEC), Ryan Kunzman (MEC), Tohid Moradi (MEC)
- Advisor: Dr. Jason Moore

Abstract: A medical device sterilization contraption that is to be used in Kabango, Uganda in the efforts to reduce malaria and other contagious diseases. Designed around the concept of an autoclave with retrofits to be able to run on dirty water and without electricity.

TEAM #148: NATCAR
- Department: Electrical and Computer Engineering
- Team members: Nicholas Tribble (EEL)
- Advisor: Dr. Lance Halsted

Abstract: We are not bringing a model per se, instead we want to have a camera mounted on a tripod facing downwards in order to demonstrate our vision system. Ideally, it would be on a table but setting it on the floor would be okay as well.

TEAM #149: EEC 195: LINE FOLLOWING AUTONOMOUS CAR
- Department: Electrical and Computer Engineering
- Team members: Nicholas Tribble (EEL)
- Advisor: Dr. Lance Halsted

Abstract: The goal of this project was to create a car that can follow a line autonomously at the fastest speed possible using a 2d camera, a microcontroller, and a custom designed motor control PCB. The car uses image feature detection and PID steering and speed control to detect and accurately follow the line.

TEAM #150: NATCAR
- Department: Electrical and Computer Engineering
- Team members: Andrew Vu (EEL)
- Advisor: Dr. Lance Halsted

Abstract: Autonomous Vehicle

TEAM #151: NATCAR 2018
- Department: Electrical and Computer Engineering
- Team members: Gracie Vargas-Roque (COM), Hannah Camille Craig (EEL), Jose Higareda (EEL), My Le (EEL)
- Advisor: Dr. Lance Halsted

Abstract: The goal of the project was to design and construct an autonomous vehicle that is capable of navigating a course marked by a 1-inch wide scotch tape on a dark colored carpet. The car must be able to navigate the course through turns with a minimum radius of 3 feet and drive over crossings at angles greater than sixty degrees, navigating “pretzels” and “6-inch steps.” The finish line will be marked with two 4 inches of tape, parallel to the track tape, in which the car must automatically stop. The overall goal of the race is to achieve the fastest speed possible.

TEAM #152: AUTONOMOUS VEHICLE
- Department: Electrical and Computer Engineering
- Team members: Garrett Carlson (EEL), Philippe Arino (EEL), Terry Richards (EEL)
- Advisor: Dr. Lance Halsted

Abstract: An autonomous vehicle capable which utilizes a 2d camera and microcontroller in order to control a 1/12 scale vehicle using a DC motor and steering servo.

TEAM #153: COENGAGE
- Department: Computer Science
- Team members: Akanksha Gupta (CSE), Richard Hou (CSE), Karishma Harry (CSE), Devon Johnson (CSE)
- Advisor: Dr. Xin Liu
- Mentors/Sponsors: Jennifer Quynn, Learning, Assessment and Technology Specialist, UC Davis College of Engineering

Abstract: An alternative in-class assessment tool with enhanced customizability.
TEAM #154: VIRTUAL REALITY GAME FOR DEPRESSION THERAPY

- **Department:** Computer Science
- **Team members:** Jonathan Hoeck (CSE), Jonathan Jiang, Susie Chac (CSI), Melody Chang (CSE)
- **Advisor:** Dr. Xin Liu
- **Mentors/Sponsors:** Subuhi Khan, Graduate Student in Communication

**Abstract:** The Virtual Reality Game for Depression Therapy is a game based on cognitive task analysis designed to help players overcome the symptoms of depression.

TEAM #155: SEND-A-SONG

- **Department:** Computer Science
- **Team members:** Soo Hyung Kim (CSE), Ho Lun Sin (CSE), Zeyu Zengli (CSE), Xuanyu Chen (CSE)
- **Advisor:** Dr. Xin Liu
- **Mentors/Sponsors:** Dr. Petr Janata, Meamer, Inc.

**Abstract:** We are building an iOS app that allows our users to share messages related to their favorite songs.

TEAM #156: MOBILE CHICKEN COOP

- **Department:** Civil and Environmental Engineering
- **Team members:** Kip Larroque (CIV), Haotai Huong (CIV), Xepeng Li (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** We will be presenting two designs for a lightweight mobile chicken coop. One design will focus on being lightweight and low cost while the other will focus on structural integrity and mobility. Structural and cost analysis will be performed to determine which design is optimal.

TEAM #157: KABINGO EMERGENCY TRANSPORT

- **Department:** Biomedical Engineering
- **Team members:** Kevin Ekins (BIM), Kendra Moore (BIM), Katie Rivara (BIM), Hannah Sander (BIM), Emily Schmitt (BIM)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** Samantha Tucci, UC Davis

**Abstract:** Kabingo is a rural village in Uganda where getting treatment during medical emergencies is difficult. Currently, villagers will ride on the back of a motorcycle for hours to receive care, which is unsafe and uncomfortable. A device is needed to safely transport a pregnant, injured or ill patient across rugged terrain. Therefore, we are working with the non-profit Hope for Kabingo to design a motorcycle trailer to more effectively transport patients from Kabingo to an urban medical facility.

TEAM #158: POULTRY COOP REDESIGN

- **Department:** Civil and Environmental Engineering
- **Team members:** Zachary Clark (CIV), Paola Perez (CIV), Jiaqi Xu (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** The purpose of this project is to improve the initial poultry coop design that was tested and built last year by other UC Davis civil and mechanical undergraduate students. We will present two alternative designs to meet the needs of the UC Davis Pasture Poultry Farm and pasture poultry farming industry. The performance and functionality of last year’s design will be enhanced by improving several features, such as the structural integrity, mobility, and ease of maintenance.

TEAM #159: FEASIBILITY REPORT OF ADHESIVE CLADDING FOR OPTICAL BRAGG GRATED SAPPHIRE FIBER FOR TEMPERATURE AND PRESSURE SENSORS IN ULTRA HIGH TEMPERATURE ENVIRONMENTS

- **Department:** Materials Science and Engineering
- **Team members:** Youcheng Hong (MSE), Christopher Kohne (MSE), Haonan Qi (MSE), Luke Yoshida (MSE), Lacey Trinh (MSE)
- **Advisor:** Dr. Ricardo Castro

**Abstract:** The ultra-high temperature environment of jet turbines necessitate a cladding around fiber optic sensors to protect the fiber’s signal intensity. We are working to create a cladding of porous alumina that can withstand temperatures of 1600°C and pressures of 700 psi for a duration of 4000 hours. Introduction of pores, through starch consolidation casting, into an alumina body serves to lower the index of refraction of alumina to serve as a successful cladding that meets the stated requirements.

TEAM #160: FLOODBUDS: FLOOD CONTROL SYSTEM FOR RICE FARMS IN THAILAND

- **Department:** Biological and Agricultural Engineering
- **Team members:** Nisha Marwaha (BSE), Sam Hornstein (BSE), Jennifer Medina (BSE), Janaye Porter (BSE)
- **Advisor:** Dr. Ken Giles

**Abstract:** Raitong Organics Farm is a patchwork of wet-paddy rice fields cultivated by local farmers in Sisaket, Thailand. In the region, monsoon flooding causes excessive damage to rice crops, severely reducing yields. Our team is developing a flood control system for the farm, with the idea that this technology can be easily disseminated. This system integrates manual sluice gates with water depth sensors that provide real-time alerts about paddy conditions to safely and efficiently control flooding.

TEAM #161: UPDATING LCA OF ALMOND ORCHARD

- **Department:** Civil and Environmental Engineering
- **Team members:** Alfredo Gutierrez (CIV), Justine Lue (CIV), Sammy Edan (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** We are updating the current LCA of almond orchards. We are focusing on the almond orchard water pumping.
TEAM #162: A NOVEL METHOD OF SEMI-AUTONOMOUSLY MEASURING, RECORDING, AND TRANSMITTING TEMPERATURE DATA FROM COMPOST PILES TO A HUMAN USER

- Department: Biological and Agricultural Engineering
- Team members: Peter Chau (BSE), Amber Chou (BSE), Sophia Sturdevant (BSE)
- Advisor: Dr. Ken Giles

Abstract: Highly Pathogenic Avian Influenza (HPAI) presents a massive problem for the poultry industry. The virus denatures naturally under the high temperatures capable of being produced in a compost pile. The piles also present long-term sources of virus under lower conditions, meaning monitoring of internal temperature is imperative for producers. A semi-autonomous solution was developed to capture data and then transmit the data to a remote user to ideally reduce human hazard factors.

TEAM #163: OLEFIN PRODUCTION FROM SYNGAS USING CR-ZN AND SAPO-34 BIFUNCTIONAL CATALYST

- Department: Chemical Engineering
- Team members: Denise Monahan (CML), Ashleigh Falasco (CML), Imren Mashiana (CML), Reema Abdelrahman (CML)
- Advisor: Dr. Ahmet Palazoglu
- Mentors/Sponsors: Andy Towarnicky, Process Development Group, Andeavor

Abstract: Recently, the light olefin market has grown immensely, resulting in the need to improve the production of light olefins. Currently, the processes used produce a wide distribution of hydrocarbons. To combat this, Flawless Design Corporation has explored using a Cr-Zn and SAPO-34 bifunctional catalyst for light olefin production because of its control of carbon-carbon coupling. Our design includes an optimized packed-bed reactor and a separation system to isolate olefins from the byproducts.

TEAM #164: DESIGN AND OPTIMIZATION OF A CHEMICAL PLANT PRODUCING LIGHT OLEFINS FROM SYNGAS USING CR-ZN AND SAPO-34

- Department: Chemical Engineering
- Team members: Daniela Ivey (CML), Samantha Kwan (CML), Rodrigo Almanza (CML), Kevin Zhang (CML)
- Advisor: Dr. Ahmet Palazoglu
- Mentors/Sponsors: Andy Towarnicky, Process Development Group, Andeavor

Abstract: In this project, a new process for the production of light olefins developed by DOW Chemicals was modeled using a bifunctional catalytic mixture of Cr-Zn and SAPO-34. This process is more favorable compared to the currently used Fischer Tropsch process due to its higher selectivity for desired light olefins. ASPEN was used to model a proposed plant design that maximized profitability and safety while minimizing environmental impact in order to determine the desirability of this new process.

TEAM #165: DESIGN AND TECHNO-ECONOMIC ANALYSIS OF A BIOMANUFACTURING FACILITY FOR CANNABINOID-BASED THERAPEUTICS

- Department: Chemical Engineering
- Team members: Hasan Mohammad (BCL), Eric Chen (BCL), William Deng (BCL), Ines Perez-Vargas (BCL)
- Advisor: Dr. Karen McDonald, Dr. Somen Nandi
- Mentors/Sponsors: Dr. Brandon Zipp, Director of R&D, Scientific CoFounder, Vitality Biopharma

Abstract: Studies have shown that adding sugars to a tetrahydrocannabinol (THC) molecule can remove its psychoactive properties. Vitality Biopharma, Inc. has been exploring the use of THC-glycosides as a prodrug for Crohn’s disease. We have designed a biomanufacturing facility capable of producing 200 kg of THC-glycosides annually using two different recombinant proteins produced in Escherichia coli using SuperPro Designer®. The techno-economic analysis for the designed facility will be presented.

TEAM #166: DESIGN AND ECONOMIC EVALUATION OF RECOMBINANT SILK FERMENTATIVE PRODUCTION FACILITY

- Department: Chemical Engineering
- Team members: Jonathan Provost (BCL), Batchimeg Baker (BCL), Shawn Kayhan (BCL)
- Advisor: Dr. Karen McDonald, Dr. Somen Nandi
- Mentors/Sponsors: Dr. Jennifer Fung, Lead Scientist, Fermentation, Bolt Threads

Abstract: Recombinant protein synthesis is being employed to produce synthetic silk proteins for clothing. In this project, we designed alternative facilities comprised of a 72-hour fed batch and 48-hour semi-continuous process utilizing stirred-tank and bubble column reactors for the production of 1000 metric tons of silk protein per year. Design results, economic analysis and environmental, and an environmental, health and safety impact assessment for the facility will be presented and discussed.

TEAM #167: DESIGN AND TECHNO-ECONOMIC ANALYSIS OF A SEMICONTINUOUS TRANSGENIC RICE CELL CULTURE FACILITY FOR PRODUCTION OF BUTYRYLCHOLINESTERASE

- Department: Chemical Engineering
- Team members: Min Du (BCL), Shuhao Cai (BCL), Kuljinder Dhami (BCL)
- Advisor: Dr. Karen McDonald, Dr. Somen Nandi
- Mentors/Sponsors: Jasmine Corbin, Ph.D. Candidate Chemical Engineering and Designated Emphasis in Biotechnology, UC Davis

Abstract: Butyrylcholinesterase (BChE) was found to be a post exposure treatment to various organophosphorus nerve agents for national defense on international terrorism. We designed a facility to manufacture BChE at a production level of 25 kg/year under semicontinuous operation. Results will be presented for the total capital investment, operating cost, environmental, health, and safety impact analysis, as well as the sensitivity analysis on all raw materials, and the scheduling impact on labor cost.
TEAM #168: PLANT PAL (AUTONOMOUS PLANT MONITORING SYSTEM)

- **Department:** Electrical and Computer Engineering
- **Team members:** Daniel Arday (COM), Rasul Silva (COM), Faris Alsaad (COM)
- **Advisor:** Dr. Rajeevan Amirtharajah

**Abstract:** PlantPal is a simple IoT solution for your home gardening needs. PlantPal collects data on the amount of water, sunlight, temperature, and humidity your plants are experiencing. It then sends all this data back to you wirelessly to let you know how your plants are doing. PlantPal is an essential addition to any plant enthusiast or home gardener’s toolbox.

TEAM #169: DESIGN AND TECHNO-ECONOMIC ANALYSIS OF A LARGE SCALE CELL-FREE ANTIBODY PRODUCTION FACILITY

- **Department:** Chemical Engineering
- **Team members:** Florence Rusly (BCL), Bilal Kudaimi (BCL), Patrick Doherty (BCL)
- **Advisor:** Dr. Karen McDonald, Dr. Somen Nandi
- **Mentors/Sponsors:** Dr. Alexander Steiner, Senior Director – Business Operations and Strategy, Dr. Bob Kiss, VP, Process and Analytical Development, Sutro Biopharma

**Abstract:** Sutro BioPharma has developed a cell-free protein synthesis (CFPS) platform which requires only 2 days to produce industrial scale antibodies. Our goal is to design a large scale E. coli cell extract facility and a CFPS facility for manufacturing 200 kg/yr of antibodies based on three antibody titer scenarios. We present our process design scheme along with estimates of the total capital investment and annual production cost as well as assessments of the environmental, health, and safety impact.

TEAM #170: COMPUTER-SIMULATED DESIGN OF AN AMMONIUM NITRATE PRODUCTION PLANT VIA HABER-BOSCH AND OSTWALD PROCESSES

- **Department:** Chemical Engineering
- **Team members:** Austin Bons (CML), Eva Rewinski (CML), Diego Docto (CML)
- **Advisor:** Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** Growing food demands worldwide require more sustainable farm practices, such as use of a more efficient fertilizer. One such fertilizer is ammonium nitrate. Because sub-Saharan Africa highly depends on fertilizer imports, we believe an ammonium nitrate production plant in Mbouda, Cameroon will be both profitable and also beneficial. Our plant, simulated in Aspen Plus, will produce 500 thousand metric tons of 99% ammonium nitrate using the Haber-Bosch and Ostwald processes.

TEAM #171: DESIGN AND TECHNO-ECONOMIC ANALYSIS OF A BIOTECH FACILITY PRODUCING ENDOLYSINS: A PRODUCT FOR INCREASED EFFECTIVENESS AND SUSTAINABILITY IN FOOD SAFETY

- **Department:** Chemical Engineering
- **Team members:** Melissa Mariscal (BCL), Chong-Wei Huang (BCL), Micah Marmorstein (BCL)
- **Advisor:** Dr. Karen McDonald, Dr. Somen Nandi
- **Mentors/Sponsors:** Matt McNulty, Ph.D. Candidate Chemical Engineering and Designated Emphasis in Biotechnology, UC Davis

**Abstract:** Endolysins are a class of enzymes that bind selectively to specific species of bacteria and cause rapid cell lysis, making them a suitable candidate for food safety applications. The facility designed will produce 500 kg/year of endolysin product through fermentation of E. coli. The base case assumed 1 g/L product titer and 65% product recovery. The total capital investment of this facility, cost of operation, and evaluation of health and safety will be discussed during the presentation.

TEAM #172: THE POWER OF TRASH: A FEASIBILITY STUDY FOR IMPLEMENTATION OF RENEWABLE ENERGY TECHNOLOGIES AT YOLO COUNTY LANDFILL

- **Department:** Civil and Environmental Engineering
- **Team members:** Laila Hassen (CIV), Tristan Schubert (CIV)
- **Advisor:** Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract:** Landfills are the third largest source of methane production, a potent greenhouse gas, in the United States. This project explores harnessing methane and implementing solar panels as renewable energy sources for Yolo County Landfill. This is completed through preliminary gas composition and flow analyses, landfill site surveys, and solar company collaboration. Recommendations to the landfill are in the form of a cost-benefit analysis and GHG reduction plan and integration to the existing system.

TEAM #173: CONVERTING SYNGAS TO LIGHT OLEFINS VIA MTO PROCESS AND CR-ZN/SAPO-34 CATALYST?

- **Department:** Chemical Engineering
- **Team members:** Lambert Tran (CML), Kim Dang (CML), Manesha Thiyagarajan (CML), Sheenum Asija (CML)
- **Advisor:** Dr. Ahmet Palazoglu
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** Ethylene and propylene are important petrochemical derivatives and are key components used in the plastic, packaging and textile industry. The volatile crude oil market has prompted chemical manufacturers to use alternative feedstocks, such as synthesis gas (syngas), to produce olefins. This project is an industrial scale simulation of the Methanol to Olefins (MTO) process used to convert syngas into olefins. This simulation exhibits high olefin selectivity compared to the Fischer-Tropsch method used in industry, and is therefore a reliable alternative process for light olefin production.
TEAM #174: AMMONIUM NITRATE PRODUCTION PLANT VIA OSTWALD AND HABER PROCESSES

- **Department**: Chemical Engineering
- **Team members**: Anna Pischer (CML), Daniel Laino (CML), James Baker (CML), Michael Shun (CML)
- **Advisor**: Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: This project simulates an ammonium nitrate production plant using Aspen Plus to produce 500,000 metric tons of 99% by mass granules per year. In addition to ammonium nitrate, a nitric acid production process based on the Ostwald process and an ammonia production process based on the Haber process were designed. These processes require acquisition of only nitrogen and hydrogen. The plant simulation has optimized operating conditions, equipment sizing, and heat integration, all while meeting environmental and safety regulations. A detailed economic analysis of the process was deemed profitable.

TEAM #175: UCD CS WEB TUTORING APP

- **Department**: Computer Science
- **Team members**: Beatrice Zhu (CSI), Marco Gomez (CSI), David Tomassi (CSE), Parker Hampson (CSI)
- **Advisor**: Dr. Xin Liu
- **Mentors/Sponsors**: Zhang Liu, Alumni, UC Davis

**Abstract**: Finding a tutor who is both available and knowledgeable is a common problem. The process of finding a tutor for Computer Science at Davis is plagued with this problem we hope to remedy. The current situation is to go into the basement of Kemper and look at a board and shout a name of a tutor and hope they are there. Our project provides students an easy to use search feature that shows tutors who are ready to tutor right now and have taken the exact course that they need help in.

TEAM #176: DSI: SEMANTIC WEB QUERY VISUALIZATION

- **Department**: Computer Science
- **Team members**: Sailesh Patnala (CSE), Wonhee Park (CSE), Nishant Chandrashekar (CSE), Mithun Vijayasekar (CSE)
- **Advisor**: Dr. Xin Liu
- **Mentors/Sponsors**: Carl G. Stahmer, Directory of Digital Scholarship, UC Davis Library

**Abstract**: UC Davis is involved in a pilot program with Cornell University and Harvard College to be the first academic libraries in the world to change their library catalog to a linked-data universe by end of the year.

Our project is a web application that visualizes relationships between input information and information coming from UCD’s library dataset and other endpoints of the semantic web. Leveraging the UCD library dataset will not only give the user the ability to see the meta information regarding a topic but also query other sources on the web to return more substantive information.

TEAM #177: INDUSTRIAL-SCALE PRODUCTION OF STABLE AND ECOLOGICALLY SUSTAINABLE AMMONIUM NITRATE FERTILIZER

- **Department**: Chemical Engineering
- **Team members**: Wyatt Liao (CML), Stanford Atmadja (CML), Vic Xuan (CML), Wynona Cagas (CML)
- **Advisor**: Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors**: Andy Towarnicky, Process Development Group, Andeavor

**Abstract**: This project aims to develop a process to produce ammonium nitrate granules at a minimum purity of 99% by mass for use as an economically viable fertilizer source for farmers in Mboda, Cameroon. Specifically, processes for the production of reactants nitric acid and ammonia were first designed on the Aspen Plus simulation to obtain process conditions for the production of 500,000 MT of ammonia nitrate per year. Energy considerations as well as sensitivity analyses were done on major unit operations and stream conditions to obtain required product yields at the most optimal costs.

TEAM #178: FORENSIC ANALYSIS AND REDESIGN OF FOUNDATION SYSTEM SUPPORTING BUILDING IN OAKLAND, CA

- **Department**: Civil and Environmental Engineering
- **Team members**: Asia Pitzer (CIV), Omar Ragabo (CIV), Edgar Torres (CIV)
- **Advisor**: Dr. Colleen Bronner, Dr. Deb Niemeier

**Abstract**: Optimum Engineering has conducted a forensic analysis and proposed a foundation redesign for a failed building in Oakland, California. The forensic analysis includes a geologic site investigation, stratigraphic characterization, and settlement analysis. Results from said analysis were used to determine the failure conditions. A foundation redesign was recommended for the future construction of a two-story building at the site. The recommendation includes fill compaction specifications, a cradle-to-use life cycle assessment, and the predicted amount of settlement over the design’s lifetime.

TEAM #179: AUTOMATED SPECIFIC GRAVITY MEASUREMENT DEVICE

- **Department**: Mechanical and Aerospace Engineering
- **Team members**: Kyle Howser (MEC), Daniel Melvin (MEC), Gabriel Simmons (MEC), Peter Son-Bell (MEC)
- **Advisor**: Dr. Steve Velinsky

**Abstract**: Specific gravity of beer correlates to alcohol content. Brewers measure it to track fermentation. Most commercial brewers do this manually: automatic systems are too costly and/or only work for home brew. True Symmetry Brewing requested a low-cost device to continuously measure specific gravity at their small-scale brewery. Our system accomplishes this with a differential pressure sensor. It calculates a hydrostatic pressure difference between two points in the fermenting beer and sends the measurements to a raspberry pi. The pi converts them to specific gravity and outputs them to a computer.
Abstract: We have developed an android application for a gamified learning e-tool designed to develop nutrition literacy in an accessible and captivating way. The application provides 1) conceptual information, 2) practice applying concepts through gamified tasks, and 3) testing to reinforce learning and track progress. The gaming side of this application is inspired by current popular mobile games. We used Android Studio and Ruby on Rails for the development of the app and the backend respectively.

Abstract: Our goal is to improve on the first prototype of the mobile chicken coop utilized by the UC Davis Poultry Team. Our design will be light enough for 2-4 people to move around and large enough to house from 20-50 chickens. It will be structurally safe and will provide security for the chickens.

Abstract: The production of light olefins from syngas using the OX-ZEO process uses a bifunctional catalyst to directly produce ethylene, propylene, and butylene from carbon monoxide and hydrogen. Light olefins are produced in a jacketed packed bed reactor that utilizes the heat generated from the exothermic reactions to heat the inlet stream to the reactor operating conditions. At a flow rate of 10,000 cubic feet/min and $8/1000 cubic feet/min, our input would be $80/min. The output is predicted to be worth $236.31/min, resulting in a profit of $156.31/min before considering energy and labor costs.

Abstract: There is a need for an affordable, durable, lightweight prosthetic knee for children in Nepal that allows physiologically normal gait and the ability to walk up or down hills. Specifically, there are a large number of child amputees in Nepal that need a prosthetic allowing mobility in hilly terrain. Our main focus is to redesign state-of-the-art features implemented in top of the line prosthetics to develop an affordable, high quality knee that can be manufactured and assembled for under $80.

Abstract: A major part of monitoring a patient’s health is measuring their heart rate using an electrocardiogram (ECG). However, ECG electrodes cannot adhere to burnt skin, and contact with said skin can increase risk of infection. We present a portable device that uses remote photoplethysmography (rPPG), incorporating an RGB camera to accurately monitor the heart rate of burn patients in real-time and prevent the spread of disease.

Abstract: Our project involved designing a clinical lab samples containment device is transported via a drone. Detachment onto and off the drone will be smooth to enhance ease of use. The clinical lab samples will consist of patient blood samples in standard Vacutainers. The container will maintain appropriate environment for the samples en route. The containment device is transported via a drone. Detachment onto and off the drone will be smooth to enhance ease of use. The clinical lab samples will consist of patient blood samples in standard Vacutainers. The container will maintain appropriate environment for the samples en route. The container will protect specimens during the flight and protect from unwanted tampering. The container will also be able to be tracked separately from the drone in case it is separated from the drone.

Abstract: This senior design team is part of the UC Davis Hyperloop Team’s propulsion subsystem group. Our purpose is to design, test, and implement a mounting and stability system for the linear induction motor (LIM) that powers the pod by the summer of 2018, in anticipation of the annual Hyperloop Pod Competition hosted by SpaceX.
TEAM #187: TECHNICAL ANALYSIS OF CCD FOR LSST PROJECT
- **Department:** Materials Science and Engineering
- **Team members:** Kristy Jorgensen (MSE)
- **Advisor:** Dr. Ricardo Castro

**Abstract:** For my project, I am doing research with Professor Craig Lage on his Large Synoptic Survey Telescope. My research will culminate into a technical report of the architecture of a STA3800 CCD which has been tested in LSST simulations previously. The report will contain information on how this CCD functions along with cross-section images, elemental analysis, topography, and dimensional analysis.

TEAM #188: QUICK RELEASE BRACKET FOR THALES SVDUS
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Lauren Campbell (MEC), Alexander (AJ) Douglass (MEC), Evan Barnell (MEC), Katie Wikler (MEC), Nicholas (Nick) Maharaj (MEC)
- **Advisor:** Dr. Steve Velinsky

**Abstract:** This University of California Senior Design Team has developed and tested a design of a quick-release bracket for the convenient, safe, and cost-effective mounting and removal of Thales’ in flight entertainment systems on airplanes worldwide.

TEAM #189: PRODUCTION OF AMMONIUM NITRATE
- **Department:** Chemical Engineering
- **Team members:** Silvy Pang (CML), Oscar Santamaria (CML), Evan Martin (CML), Hannah Wong (CML)
- **Advisor:** Dr. Roland Faller, Dr. Jason White
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** The project’s purpose is to model ammonium nitrate fertilizer production in Mbouda, Cameroon and to evaluate its profitability. This process was simulated in an Aspen Plus simulation, and a profitability analysis was performed to determine project viability using BTROR, NPV, DCFROR, and MIRR calculations. Ammonia was produced via the Haber process, and nitric acid was produced via the Ostwald process. These products were then used to produce ammonium nitrate. Safety concerns were considered as well; the ammonium nitrate will be properly transported in accordance with general regulations.

TEAM #190: DIETHYL ETHER PRODUCTION PLANT DESIGN
- **Department:** Chemical Engineering
- **Team members:** MK Chan (CML), Ashley Templeton (CML), Antonin Thulliere (CML), Niraj Vora (CML)
- **Advisor:** Dr. Spyros Tseregounis
- **Mentors/Sponsors:** Andy Towarnicky, Process Development Group, Andeavor

**Abstract:** We are showcasing our design of a diethyl ether production plant. We will provide the problem statement, our ASPEN flow sheet design, our economic analysis, and other design factors that we considered.

TEAM #191: TRANSGENIC EXPRESSION OF TYPE II COLLAGEN FOR CARTILAGE ENGINEERING
- **Department:** Biomedical Engineering
- **Team members:** Joy Doong (BIM), Fredric James Murolo (BIM), Leland Woodward Choi Howard (BIM)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** Marc Facciotti, Professor of Biomedical Engineering, UC Davis

**Abstract:** Engineered cartilage is a potential treatment for damaged cartilage. However, cultured cartilage has low collagen II content, which compromises the structural and mechanical properties of the tissue. Unfortunately, no combination of existing methods has yet produced a material where collagen II content reaches levels found in natural tissue. Hence, we designed and built a transgenic system to increase collagen II production in chondrocytes with graded user-control. We envision that such method could ultimately be used along with existing methods to culture clinically viable cartilage tissue.

TEAM #192: DRIVING SIMULATOR FOR STEERING DEVELOPMENT
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Abdulmalek M. Alkabsh (MEC), Shubhankar P. Patankar (MEC), Elijah B. Kitchel (MEC), Jason Spaargaren (MEC), Scott S. Paniccia (MEC)
- **Advisor:** Dr. Steve Velinsky

**Abstract:** Traditionally, designing for good handling in automobiles has been a gray area because of analytical subjectivity. To develop objective metrics, the Hyundai Center of Excellence has been building a hardware-in-the-loop (HIL) system, which allows for the complexity of the steering column, the power steering motor, and the rack and pinion of an actual Hyundai Sonata to be incorporated into a simulator test bed. The objectives of our project are to modify and complete the test bed design, and assemble its components. A secondary goal is to perform system identification for controller design.

TEAM #193: MANTA L-15
- **Department:** Mechanical and Aerospace Engineering
- **Team members:** Christophe Hildebrandt-McIntosh (ASE, MEC), Vincent Ng (ASE, MEC), Francisco De-La Cruz (ASE, MEC), Cathy Le (ASE), Robert Spharler (ASE)
- **Advisor:** Dr. Case van Dam

**Abstract:** The Manta L-15 is the next generation in aircraft design. Utilizing natural laminar flow with a hybrid blended body and modern engine design, the Manta L-15 aims to increase the fuel efficiency and reduce the cost and emissions for commercial air travel.
TEAM #194: WOMEN SAFETY APP
- **Department:** Computer Science
- **Team members:** Bryan Gayaban (CSE), Jerry Moran (CSE), Shayan Daneshvar (CSE), Sushil Ravoori (CSE)
- **Advisor:** Dr. Xin Liu
- **Mentors/Sponsors:** Nicholas Hosein, Graduate Student in Electrical and Computer Engineering, UC Davis

**Abstract:** We developed the mobile companion app for the Kabrya Tease, a fitness tracker targeted at high-end women’s fashion designed by Kabrya Fashion. We employed the usage of barcode technology to pair the Tease with the application initially. And then use Bluetooth LE for further communication between the two. The companion application contains Tiles that contain the different functions of the application. It also employs AWS for storage of user generated data and communication.

TEAM #195: NON-INVASIVE BLADDER VOLUME AWARENESS FOR SCI PATIENTS
- **Department:** Computer Science
- **Team members:** Irvin Low (CSE), Felix Le (MEC, CSI), Nicholas Ng (CSE), Wenzhe Huang (CSI)
- **Advisor:** Dr. Xin Liu
- **Mentors/Sponsors:** Dan Fong, Graduate Student in Electrical and Computer Engineering, UC Davis

**Abstract:** Our team was tasked to design software to complement an in-production embedded software designed to measure bladder volume levels. The goal was to build a working cloud database for securely storing private health information, a desktop application to assist medical professional with managing patients, and a mobile application. The mobile application would work in tandem with the device for the users which would be connected to the patch via Blue tooth.

TEAM #196: CARDIOMYOCYTE ANALYZER: A SINGLE CELL ISOLATOR AND ELECTROPHYSIOLOGY PLATFORM
- **Department:** Biomedical Engineering
- **Team members:** Mike Meller (BIM), Paolo Disano (BIM), Ryan Collins (BIM), Niket Karode (BIM)
- **Advisor:** Dr. Anthony Passerini
- **Mentors/Sponsors:** Dr. Javier Lopez, Internal Medicine

**Abstract:** Although scientific research is increasingly concerned with studying biological systems on a single cell level, there are few affordable technologies that are capable of handling live and electrically sensitive cells of unusual shape and size such as cardiomyocytes. Many laboratories, including that of our client, a cardiovascular research at UC Davis, are forced to manually isolate and transfer cells for analysis in a laborious, inefficient, and inaccurate manner. Our device provides a fast, high-throughput, and accurate method to conduct single cell analysis. The first part of our system is a low cost microfluidic impact printer capable of producing cell-containing droplets of picoliter to microliter magnitudes. The second component is a custom electrode-containing imaging well plate for use in electrophysiology experiments. Together, our system allows for experimental protocols which are able to statistically correlate the pathological behavior of diseased cells to their genotypes. In turn, through an understanding of cardiac diseases at the single cell level, novel therapies can be developed.

TEAM #197: HARDWARE ABSTRACTION LAYER
- **Department:** Computer Science
- **Team members:** Jacob Rodriguez (CSE), Pranav Gupta (CSE), Andrew Shephard (CSE)
- **Advisor:** Dr. Xin Liu
- **Mentors/Sponsors:** Marco Pritoni, Research Scientist, LBNL

**Abstract:** Develop a hardware abstraction layer to access and move metadata from HVAC smart devices to cloud database storage for users to view data from buildings around lab.

TEAM #198: HEALTHAI
- **Team members:** Arbit Chen (MS, CS), Dian Yu (PhD, CS), Sam Cheng (CSI, MAT), Terry Yang (CSI)
- **Mentors/Sponsors:** CITRIS and the Banatao Institute at UC Davis, Center for Regional Change, Blum Center for Developing Economies at UC Davis Institute for Social Sciences

**Abstract:** Advances in conversational agents leveraging state-of-the-art artificial intelligence has the potential to address many health issues faced by our society today. For example, some problems that can be tackled include depression, elderly care, and health education. We are developing a conversational agent that can provide health care advice, offer companionship, and monitor personal well-being. Our agent can be deployed on the Amazon Alexa platform to reach the large userbase that already exists and is only growing bigger.
Students

4,690 Undergraduate Students
30% Women
4.2 Years – mean time to degree
LEADR Student Support Center
Engineering Design & Startup Centers

1,112 Graduate Students
422 Masters
690 Ph.D.

Faculty

228 Total Faculty
45 hired, 2015-17 to meet student growth

17 Members of the National Academies
National Academy of Engineering: 15
National Academy of Medicine: 1
National Academy of Sciences: 1

Departments

• Biological & Agricultural
• Biomedical
• Chemical
• Civil & Environmental
• Computer Science
• Electrical & Computer
• Materials Science
• Mechanical & Aerospace

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#1 Percent of Women Faculty Among Top 50 U.S. News and World Report Ranked Engineering Programs
– American Society for Engineering Education

#1 Multidisciplinary University Coffee Research and Education Center in the U.S.

#1 Full-Body PET Scanner in the World

#6 Best Public U.S. University
– Wall Street Journal

#9 Contributions to the “Public Good”
– Washington Monthly

#1 Best Value College for Women in STEM (U.S.)
– Forbes

Campus Sustainability
– UI GreenMetric World Ranking

Chancellor Gary S. May
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