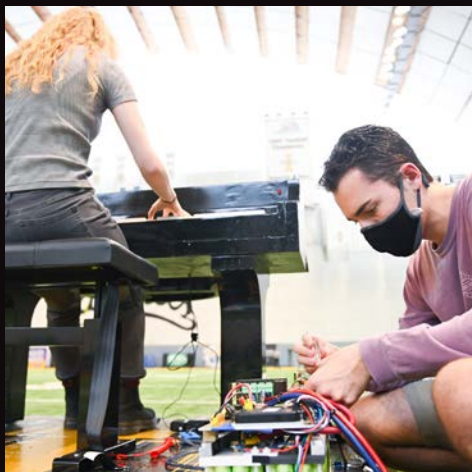




University of Idaho

College of Engineering



*The longest-running
student engineering
innovation showcase in
the Pacific Northwest*

2023 Program Guide

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WELCOME TO EXPO 2023

30 Years of Unstoppable Innovation

Celebrating 30 years of unstoppable innovation, University of Idaho College of Engineering's annual Engineering Design EXPO is the longest-running student engineering and technological innovation showcase in the Pacific Northwest.

For three decades we have listened to our industry partners and business leaders, educating students with skillsets that align with emerging technologies that are reshaping the workplace and job market. You'll see many examples of these skillsets as you browse projects today.

Working in teams, senior engineering students from across disciplines present their projects from our college's Interdisciplinary Capstone Design Program, recognized by the National Academy of Engineering as one of the top seven in the nation for infusing real-world experiences into engineering education. EXPO is the final culminating event before our students graduate and join the workforce.

High school students attend EXPO each year to explore projects that push the boundaries of science and technology through our Engineering the Future program. Students gain

a better sense of what it's like to be an engineering student at U of I by meeting current students and faculty members, and exploring the many hands-on and research opportunities available to undergraduates at U of I.

Industry leaders from across the region attend and help judge the projects presented at EXPO, giving ample opportunity for students to meet and interact with industry leaders who are looking to hire highly-skilled additions to their teams.

Over the years, EXPO has grown in significance, bolstering our educational process and our students' development. But EXPO is not possible without the support of our industry partners and friends of the College of Engineering. We depend on your generous support to produce this quality event.

I want to thank this year's corporate and academic presenting sponsors, Schweitzer Engineering Laboratories and Engineering Outreach at the University of Idaho, for their generosity and commitment to EXPO.

In addition, I want to thank all of the sponsors and partners that support EXPO activities from our Engineering the Future program to providing meals for our capstone students.

Thank you to Idaho National Laboratory, Idaho STEM Action Center, Avista Corp., Geotek, Inc., HP, Inc., Idaho Power, Integra DeLamar, J-U-B Engineers, POWER Foundation/POWER Engineers, Vista Outdoor/CCI Speer, Intermountain Gas Company and KPFF.

As you visit EXPO, please engage with our students and ask them about their projects and designs and the future they hope to create as a Vandal engineer.

What will the next 30 years hold? Time will tell, and our college will continue to develop engineering professionals uniquely equipped to tackle the toughest challenges facing our society.

Sincerely,

Suzanna Long, Ph.D., P.E., CPEM, F.ASEM, F.IISE
Dean, College of Engineering

EXPLORE EXPO ONLINE

uidaho.edu/expo

- Browse capstone projects
- View electronic posters
- Learn more about EXPO: Engineering the Future for Idaho high school students

THANK YOU, EXPO SPONSORS!

The University of Idaho College of Engineering thanks all of our corporate and academic sponsors for their generous support of the annual Engineering Design EXPO. We value and appreciate your participation and continued commitment to engineering education.

**Corporate
Presenting
Sponsor:**



Become a Sponsor

Planning the University of Idaho's Engineering Design EXPO is a yearlong activity.

To explore future opportunities to support EXPO, contact:

**College of Engineering
Development Team
208-885-5888
expo@uidaho.edu**

We look forward to talking with you about how you can help support this event and current and future students.

Innovation Exhibitors



Dynamic Sponsors



Tectonic Sponsors



MEET OUR JUDGES

Judges are a critical part of the Engineering Design EXPO experience for University of Idaho College of Engineering students. Interaction between students and judges creates opportunities for students to gain new insight and learn about engineering career paths and the profession in general.

Thank You for Joining Us!

Jon Adams - Engineered Solar Systems

Jamin Ankney - Gray & Osborne, Inc.
Consulting Engineers

Peter Baran - Design Magnitude Idaho

John Barrutia - DC Engineering

Amanda Battles - Clearwater Paper

Cory Baune - J-U-B ENGINEERS, Inc.

Pat Blount - Moscow High School

Bruce Bouton - Retired

Jim Brennan - MWH/Slayden Constructors

David Buehler - Schweitzer Engineering
Laboratories, Inc.

Sumanth Reddy Chintala - Itron, Inc.

David Christiansen - Retired

Shawna Conery - J-U-B Engineers, Inc.

Nick Crabbs - Vynyl

Mattie Cupps - Micron Technology

Jason Dearien - Schweitzer Engineering
Laboratories, Inc.

Michael Delles - Retired

Chris Dux - Avista Utilities

Chris Dyer - POWER Engineers, Inc.

Holly Eilers - David Evans and Associates

Byron Flynn - GE Renewable Energy (Retired)

Alan Griffiths - Retired

Zara Guzman - Gray & Osborne, Inc.
Consulting Engineers

Gene Hamacher - University of Idaho -
TechHelp

Alexander Hanson - RogueTally

Eric Hasenoeuhl - Keltic Engineering, Inc.

Gary Hermann - Velsicol Chemical Corp and
CH2M Hill

Connor Hill - Element 1 Corp.

David Hollenback - HDT Global

Paul Huber - The Boeing Company

Christopher Hyde - University of Idaho

Lundyn Jared - University of Idaho

Nathaniel Jones - Schweitzer Engineering
Laboratories, Inc.

Victoria Kampfer - PSNS & IMF

Jesse Kappmeyer - Idaho National Lab/
Battelle Energy Alliance

Joseph Keegan - The Boeing Company

Braxton Klas - J-U-B Engineers, Inc.

John Kumm - POWER Engineers, Inc.

Kiersten Lee - MWH

Sergey Lepskiy - J.R. Simplot

Zach Lipple - BorgWarner

Ben Marek - AIRE Whitewater

Tyler Marines - Schweitzer Engineering
Laboratories, Inc.

Ken Mays - The Boeing Company

Andrew McGowan - Integra Resources -
DeLamar Mining Company

Terry McHugh - Evonik

Gary Mecham - BEA

Manan Mehta - Schweitzer Engineering
Laboratories, Inc.

Sally Mei - Schweitzer Engineering
Laboratories, Inc.

Michael Melder - PBS Engineering and
Environmental

Justin Miller - HP Inc.

Brian Miner - Rohinni

Steven Miranda - Retired

Amin Mirkouei - University of Idaho

Macjames Mizer - Ardurra/TO Engineers

Thomas Moore - Self

Nadine Morasci - Astronics AES

Shane Needham - Veloxity Labs

Christian O'Bryan - Schweitzer Engineering
Laboratories, Inc.

Lee Ostrom - University of Idaho

Tom Pfeiffer - Idaho National Lab/ Battelle
Energy Alliance

Christian Pickens - Clearwater Paper

Carol Pochardt - Windval Technologies

Jonathan Richards - Schweitzer Engineering
Laboratories, Inc.

Paul Riebe - Idaho Forest Group

Kierra Russell - Clearwater Paper

Eric Silk - University of Illinois Urbana-
Champaign

Jennifer Simler - Schweitzer Engineering
Laboratories, Inc.

Alex Simon - The Boeing Company

Mark Sipe - Coffman Engineers, Inc.

Jacob Skaug - Schweitzer Engineering
Laboratories, Inc.

Howard Skidmore - POWER Engineers, Inc.

Josh Starkey - The Boeing Company

Tammy St. John-Tesky - University of Idaho

Eric Stubbs - Micron Technology

Scott Sumner - SynTier Engineering, Inc.

Todd Swanstrom - Western Trailer Co.

Nicholas Taylor - AECOM

Arthur Thomas - Jacobs Engineering, Inc.

Steven Wagner - PlayStation

David Watkins - J-U-B Engineers, Inc.

Jan Welch - Stapley Engineering

Michael Williams - Verdis

Jeff Williams - Vista Outdoor

Hattie Zobott - Ardurra

Ryan Zrno - JST





THE COLLEGE OF ENGINEERING CAPSTONE PROGRAM

Recognized by the National Academy of Engineering as one of the top seven in the nation, the University of Idaho College of Engineering Senior Capstone Design Program infuses real-world experiences into undergraduate engineering education.

Engineering students work in interdisciplinary teams on creative projects sponsored by valued industry partners, private individuals or U of I departments. Courses in the program emphasize the design process and the creation of a thoughtfully engineered, tested and validated outcome or prototype.

Our annual Engineering Design EXPO, the longest-running student engineering innovation showcase in the Pacific Northwest, is the culmination of the capstone program. Seniors present their work at EXPO through professional exhibits and technical presentations.

STEM CELL TENDON BIOREACTOR

Cells in our tendons experience stresses when we walk, run, and perform any mechanical movement. The shear stresses these tendon cells experience has the potential to impact their biological response. To study this response, we designed a bioreactor system that can apply well-defined and controlled levels of shear stress to cells in cell culture.

Team Members

Gage Nardi - Computer Science
Rui Bao - Computer Science
Guinevere Richmond - Biological Engineering
David Reetz - Biological Engineering
Nicholas Anderson - Biological Engineering

Client/Sponsor

Nathan Shiele - U of I Department of Chemical and Biological Engineering

Faculty Advisor

Russell Qualls - U of I Department of Chemical and Biological Engineering

EVALUATION OF BIOFILM RESISTANT COATINGS FOR SPACECRAFT WATER SYSTEMS

Biofilm mitigation in spacecraft water systems is crucial for space exploration. The project goal is to create an experimental apparatus to test the viability of polymer coatings that will reduce bacterial adhesion and biofilm formation of two bacteria strains found at concerning levels in the International Space Station. The project will be sent to the ISS so experimentation can occur in microgravity. It will then be sent back to Earth to evaluate the success of biofilm formation resistance.

Team Members

Abraham Brown - Mechanical Engineering
Devan Naes - Chemical Engineering
Gabe Nelson - Materials Science
Lindsey Stachofsky - Biological Engineering
Melissa Phung - Biological Engineering
Sam Kreslins - Mechanical Engineering
Taylor Booker - Biological Engineering

Client/Sponsor

Matthew Bernards - NASA EPSCoR

Faculty Advisor

Russell Qualls - U of I Department of Chemical and Biological

3D PRINTED FLEXIBLE SPINE MODEL FOR DRUG DELIVERY TO THE BRAIN

This project aimed to better understand how drugs injected in the lumbar area of the spine travel through the cerebrospinal fluid via a 3D printed flexible spinal model. By studying the simulated fluid flow, this can assist healthcare workers in understanding and developing safer drug delivery techniques for future procedures.

Team Members

Sydney Inman - Biological Engineering
Bruno Casino Remondo - Biological Engineering
Anne Carper - Biological Engineering

Client/Sponsor

Dev Shrestha - U of I Department of Chemical and Biological Engineering

Faculty Advisor

Russell Qualls - U of I Department of Chemical and Biological Engineering

MEASURING NERVE RESPONSE IN EARTHWORMS FROM MINIMAL ELECTRICAL STIMULUS

Neurobiology has historically been a difficult subject to teach and provide hands-on labs for. Action potentials are the body's way of creating electrical signal through the nerves that acts as the starting point that results in muscle contraction. Live earthworms will be anesthetized and electrically stimulated to generate action potentials. These signals will be live time monitored to evaluate response and system accuracy. We will also be creating a lab simulation based on live results.

Team Members

Honeyville Boiser - Biological Engineering
Lauren Graves - Biological Engineering
Alyssa Hansten - Biological Engineering

Client/Sponsor

Dev Shrestha - U of I Department of Chemical and Biological Engineering

Faculty Advisor

Russell Qualls - U of I Department of Chemical and Biological Engineering



Chemical Engineering

PLASTIC WASTE TO FUEL: RECYCLING IN BALI

Finding a way to recycle used plastic would improve waste and help the environment drastically. Our team was tasked with developing a part of a process that could take recycled plastic and turn it into usable fuel. This process separated and purified incoming treated plastic, finding uses for the by-products. The team also reviewed the recycling collection process for improvements in Indonesia, a country struggling with plastic pollution, to increase recycling involvement among the public.

Team Members

Isaac Blake - Chemical Engineering
Aaron Law - Chemical Engineering
Rahul Bhusal - Chemical Engineering
Juhung Lee - Chemical Engineering

Client/Sponsor

U of I Department of Chemical and Biological Engineering

Faculty Advisor

Matthew Bernards - U of I Department of Chemical and Biological Engineering

PYROLYSIS OIL PURIFICATION DESIGN: CLOSING THE PLASTIC ECONOMY

In this project, improvements to the plastic recycling collection and sorting system for Bali, Indonesia, were recommended to improve throughput, affordability, and quality. Also, a purification unit was simulated and designed to separate fractions of the plastic recycling products for reuse. This system was designed to maximize economic benefit and efficiency to assist Global Petrochemicals in its aim to reduce waste during plastic recycling.

Team Members

Joshua Anderson - Chemical Engineering
Jonathan Bosse - Chemical Engineering
Nick Rowe - Chemical Engineering

Client/Sponsor

U of I Department of Chemical and Biological Engineering

Faculty Advisor

Matthew Bernards - U of I Department of Chemical and Biological Engineering



OPTIMIZATION OF THE MIXSTIX PLATFORM

The Mixstix platform is a product that allows anyone to send a simple science experiment into space. The current Mixstix platform is going through a redesign in order to make it less expensive, easier to use, and to decrease the chances of platform operational errors. New tubing, clamps, end caps, and sealing approaches will undergo testing in order to find the best design to meet the customer needs for the Mixstix experiment platform.

Team Members

Alexis Dunham - Chemical Engineering
Sam Johnson - Chemical Engineering

Client/Sponsor

NanoRacks

Faculty Advisor

Matthew Bernards - U of I Department of Chemical and Biological Engineering

PRESSURE SWING ADSORPTION: SEPARATION OF NITROGEN AND OXYGEN FROM AIR

Pressure Swing Adsorption, PSA, is a common separation technique that is used to produce high-purity gas product streams that can be used in a variety of industrial applications. The PSA design team designed and assembled a fully functional bench-scale PSA that produces streams of oxygen and nitrogen. This bench-scale system will serve as a teaching aid for the future senior chemical engineering laboratories. Our team completed scale up and economic analysis for use at an on-site medical center.

Team Members

Jourdan Allen - Chemical Engineering
Jacob Snow - Chemical Engineering

Client/Sponsor

U of I Department of Chemical and Biological Engineering

Faculty Advisor

Matthew Bernards - U of I Department of Chemical and Biological Engineering

Civil Engineering

NEW OFFICE BUILDING FOR GENERAL CONTRACTOR - KAPOLEI, HAWAII

A California-based general contractor, Tri State General Contractors, is seeking to expand their operations by adding a new office building with attached construction warehouse/shop space in Kapolei, Hawaii. Tri State's new building is planned to be approximately 23,815 square feet, and will consist of finished office space, a storage mezzanine over the offices, and a large open shop area.

Team Members

Austin Emerick - Civil Engineering
John Taylor - Civil Engineering
Devin Steed - Civil Engineering
Parker Watson - Civil Engineering

Client/Sponsor

Garrett Davis - Tamarack Grove Engineering
Derek Peck - Tamarack Grove Engineering

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

NEZPERCE SEWER REUSE SYSTEM

The City of Nezperce will be implementing a sewer reuse system, where treated sewerage from the existing lagoon system treatment plant is pumped via new lift station(s) to new storage pond(s), including any and all control structures, and then applied to fields via irrigation, which will also require lift station(s).

Team Members

Sarah Cordier - Civil Engineering
Kenneth Madsen - Civil Engineering
Nathyn Maller - Civil Engineering
Luke Rutherford - Civil Engineering

Client/Sponsor

Braxton Klas - J-U-B Engineering, Inc.
City of Nezperce

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

SH-3 POTLATCH RIVER BRIDGE REPLACEMENT

The Potlatch Bridge Replacement is important because it expands the number of roads that oversized trucks can use. The original bridge was built in 1955. By increasing the road network, it will allow the transportation of goods to happen more efficiently.

Team Members

Anthony Davis - Civil Engineering
Matthew Thompson - Civil Engineering
Peter Osterberg - Civil Engineering
Zixiang Yu - Civil Engineering

Client/Sponsor

Shanon Murgotio - Idaho Transportation Department

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

OREANA DAM REPLACEMENT

In this project our team is designing a small dam along a creek in Oreana Idaho to create a pond that will be used for irrigation and attracting water fowl.

Team Members

Brenden Jack - Civil Engineering
Mitchell Langland - Civil Engineering
Jacob Smith - Civil Engineering
Jacob Wisshack - Civil Engineering

Client/Sponsor

Luke Landriani - Geotek
HattieZobott - TO Engineers

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

KOOTENAI COUNTY INTEGRATED CLINIC

The project focuses on a new integrated medical clinic near the Spokane River in Post Falls, Idaho. This medical clinic is being designed to support members of the community with primary care medical needs and to provide space for future growth as the city develops. The entire first level of the clinic will be hosting all the examination rooms, nursing stations, and patient care. The second level will be used as future client space and for storage of all the clinic's needs.

Team Members

Anna Young - Civil Engineering
Philip Lohman - Civil Engineering
Xinyi Li - Civil Engineering
Clint Ponozzo - Civil Engineering

Client/Sponsor

Lucas Coutinho - Vista Outdoor
ChaneyWood - KPFF

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

LACROSSE AVE INTERSECTION AND EXPANSION

This project is designing a much needed route to go into the Riverstone Development area, which has been seeing an increase in population and use. The team is also designing an access point for the popular Centennial Trailhead which is located next to the expanded road.

Team Members

Jarod Shannon - Civil Engineering
Ethan Hardt - Civil Engineering
Shaunita Cable - Civil Engineering
Joel Gradin - Civil Engineering

Client/Sponsor

Melissa Cleveland - Welch Comer Engineers
JackGriffing - Welch Comer Engineers

Faculty Advisor

Nielsen Richard - U of I Department of Civil and Environmental Engineering



SOLIDS MANAGEMENT IMPROVEMENT PROJECT – ANAEROBIC DIGESTER SEEDING WITH HYDROLYZED SLUDGE

The Trinity River Authority Central Regional Wastewater System is upgrading their treatment process to thermophilic anaerobic digestion to treat their sludge. This upgrade will allow the plant to generate Class A biosolids and produce methane which can be captured and used to produce energy to offset energy costs for the facility. We will be in charge of transporting the sludge from Blue Plains WWTP in D.C., designing all temporary systems, and properly seeding the new anaerobic digester.

Team Members

Edward Black - Civil Engineering
Brandon Boyd - Civil Engineering
Noah Throm - Civil Engineering
Harrison Bashaw - Civil Engineering

Client/Sponsor

Kiersten Lee - MWH Constructors
EmMinner - MWH Constructors

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

USACE FISH LADDER TEMPERATURE CONTROL DESIGN

The Lower Monumental Dam near Walla Walla, WA, has a fish ladder to allow anadromous fish to return upstream to spawn. These fish are deterred from advancing upriver when they encounter warm water or temperature differences. During summertime conditions, the warm reservoir discourages the fish from exiting the fish ladder, slowing their upriver journey and jeopardizing their opportunity to spawn. We created an engineering solution to encourage fish to exit promptly into the reservoir.

Team Members

Madelynn Gregoire - Civil Engineering
Lauren Moore - Civil Engineering
Jayr Ayala - Civil Engineering
Theodore Ertel - Civil Engineering

Client/Sponsor

Jarrold Milligan - U.S. Army Corps of Engineers
Ryan Laughery - U.S. Army Corps of Engineers

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

POST FALLS APARTMENTS

We are designing the site of a new apartment complex in Post Falls, ID, near the Washington border and with close freeway access. This project will help address the housing shortage in the area.

Team Members

Parker Schwes - Civil Engineering
Aliyana Avalos - Civil Engineering
Noah George - Civil Engineering

Client/Sponsor

Joanna Litalien - TO Engineers

Faculty Advisor

Richard Nielsen - U of I Department of Civil and Environmental Engineering

Computer Science

AUTOMATED VISIO CONSTRUCTION

Software Defined Network (SDN) switches, produced by SEL, are complex systems that control and regulate communications between other devices. These systems are visualized through Microsoft Visio diagrams. Currently, these diagrams are created and exported to a spreadsheet. Our project's goal is to reverse the process by converting the data from a provided spreadsheet into a Visio diagram and implementing a mapping algorithm to place and order Visio shapes to represent the data.

Team Members

Sophia Sivula - Computer Science
Ross Prestwich - Computer Science
Creed Thie - Computer Engineering
Morgan Brockman - Computer Engineering

Client/Sponsor

Jason Dearien - Schweitzer Engineering Laboratories

Faculty Advisor

Bruce Bolden - U of I Department of Computer Science

AUTOCALIBRATION SOFTWARE FOR OPTICAL RECEIVER ARM ALIGNMENT

Our goal is to create software that enables automated calibration for Hansen Photonics' fiber optic launching system, which allows greater access to affordable internet for underserved areas. Because the system works completely over-the-air and by line-of-sight, it avoids the costly and destructive process of laying fiber optic cables. The existing method of calibration done manually was cumbersome. Our system does not require constant human attention and achieves calibration more quickly.

Team Members

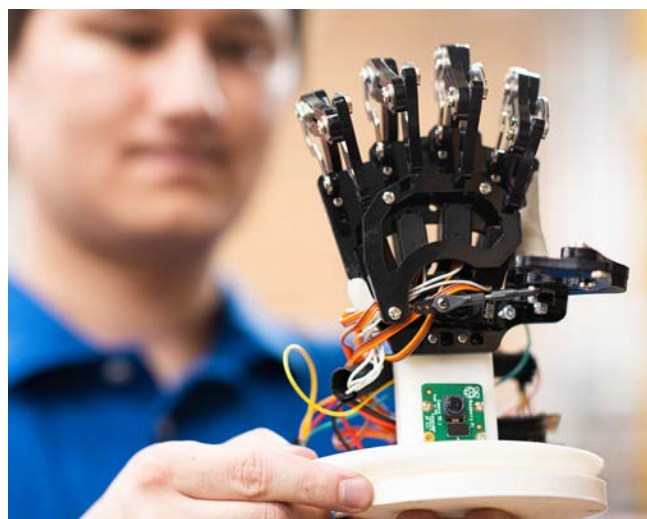
Ethan Corgatelli - Computer Science
Donald Hammer - Computer Science
Hunter Leppek - Computer Science
Joseph Miller - Computer Engineering

Client/Sponsor

JP Hansen - Hansen Photonics, Inc.

Faculty Advisor

Bruce Bolden - U of I Department of Computer Science



AUTOMATED INSTALLATION OF KEYS

Our project is to automate an existing process at Schweitzer Engineering Laboratories. Currently, employees must manually insert plastic keys into molded plugs to ensure they are connected correctly.

In our project, we use resin curing and a six-axis robot to perform this process. This removes strain on employee hands, automates a boring task, and removes the need for small plastic keys.

Team Members

Austin Kugler - Computer Science
John Myers - Mechanical Engineering
Zachariah Preston - Computer Science
Taylor Martin - Computer Science

Client/Sponsor

Levi Gallegos - Schweitzer Engineering Laboratories
TylerMarines - Schweitzer Engineering Laboratories

Faculty Advisor

John Shovic - U of I Department of Computer Science

GAMIFIED VIRTUAL WORLDS AND COMPUTER SIMULATION

Our project aims to create a virtual world within Unreal Engine that allows players to create “computers” within a virtual computer lab. By making a simulated lab, it allows for flexibility and creativity within research and education by not having to worry about increased equipment costs and real world physical constraints and consequences.

Team Members

Feichi Han - Computer Science
Trevor McGeary - Computer Science
Kaleb Browning - Computer Science

Client/Sponsor

Daniel Conte de Leone - U of I Department of Computer Science

Faculty Advisor

Bruce Bolden - U of I Department of Computer Science

BIG DATA ANALYSIS FOR ELLIPTICAL PATTERN IDENTIFICATION

This project could aid in increasing the reliability of climatological models. Current models don't include Atmospheric Gravity Wave's and incorporating them would lead to better models that would aid in improved course of action to protect the environment.

Team Members

Luis Lopez - Computer Science
Riley Doyle - Computer Science
Rodney McCoy - Computer Science

Client/Sponsor

Matthew Bernards - U of I Department of Chemical and Biological Engineering

Faculty Advisor

Bruce Bolden - U of I Department of Computer Science

Electrical Engineering

SECURE HELIOS PROCESSOR DEMONSTRATION

The goal of our project is to demonstrate how Idaho Scientific's Helios processor is resilient to reverse engineering and cyber-attacks. This benefits the industry of critical infrastructure by providing companies with a security hardened computer processor. Our project demonstrates the security features of Helios through a live demo of cyber-attacks conducted on the processor, which is controlling an RC car.

Team Members

Macallyster Edmondson - Electrical Engineering
Chadwick Goodall - Electrical Engineering
Jackie Lee - Electrical Engineering
Robert Walko - Computer Science
Kyle LeDoux - Computer Engineering

Client/Sponsor

Rick Hoover - Idaho Scientific
AndrewWeiler - Idaho Scientific

Faculty Advisor

Yacine Chakhchoukh - U of I Department of Electrical and Computer Engineering

INFRASONIC WILDFIRE DETECTION AND REPORTING DEVICES

Wildfires have become more frequent and continue to threaten the environment and lives across the United States. Past research has found that wildfires can be identified by the sound they create. Our goal is to create a network of low-power, low-cost devices that can identify the sound unique to wildfires and then report an estimated location to First Responders. This technology could help detect and locate wildfires well before current methods, which would save both lives and ecosystems.

Team Members

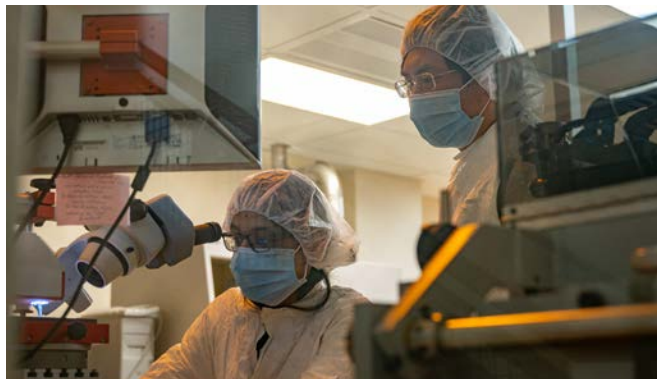
Mairen Chard - Biological Engineering
Jack Lewis - Biological Engineering
Christian Vega - Mechanical Engineering
Kurian Georly Kunnathushery - CS
Jiaqi Shi - Electrical Engineering
Alhajri Abdalrahman - Electrical Engineering
Meshari Alhajeri - Electrical Engineering

Client/Sponsor

Joe Stanley - Stanley Solutions

Faculty Advisor

Herbert Hess - U of I Department of Electrical and Computer Engineering



DETECTING AND LOCATING CANCELLING FAULTS IN SHUNT CAPACITOR BANKS

The objective of our project is to develop an algorithm that can detect symmetric & asymmetric canceling faults in Shunt Capacitor Banks (SCB) to help electrical engineering students in the Power Lab.

Team Members

Mohammad Al Ebedan - Electrical Engineering
Zesheng Guo - Electrical Engineering
PeiCheng Ji - Electrical Engineering
Zeying Chen - Electrical Engineering

Client/Sponsor

Satish Samineni - Schweitzer Engineering Laboratories
JadaHawaz - Schweitzer Engineering Laboratories

Faculty Advisor

Yacine Chakhchoukh - U of I Department of Electrical and Computer Engineering

MARS JAVELIN

We are testing a model payload on Earth for the sake of launching a model on Mars. This model will acquire valuable data for NASA that will allow further progress towards development of other projects relating to the exploration of Mars. Previous work has been done, but for various reasons some of these projects fell through. As a result, "The Spear of Ares", has the objective of designing, building, and testing a model that will survive in a simulated Martian environment.

Team Members

Shujea Aldousari - Electrical Engineering
Owen Blair - Electrical Engineering
Johnathan Kopf - Computer Science
Michael Myers - Mechanical Engineering
Kyle Rast - Mechanical Engineering
Steven Rougeux - Biological Engineering
Tao Wang - Computer Science

Client/Sponsor

Marcus Murbach - NASA Ames Research Center
MalachiMooney-Rivkin - NASA Ames Research Center

Faculty Advisor

Yacine Chakhchoukh - U of I Department of Electrical and Computer Engineering

AI/ML BASED NATURAL LANGUAGE INTERFACES TO DATABASES

Individuals in numerous fields from the sciences to finance regularly work with crucial information stored in electronic databases, the information in which is not easily accessible without learning query languages like Structured Query Language (SQL). Pre-existing Natural Language to SQL solutions allow non-technical users to easily access database information. The team aims to improve upon these systems through increased accuracy and generalization to different databases.

Team Members

Seth Cram - Electrical Engineering
Khoi Nguyen - Electrical Engineering

Client/Sponsor

Hasan Jamil - University of Idaho

Faculty Advisor

Yacine Chakhchoukh - U of I Department of Electrical and Computer Engineering

Mechanical Engineering

LEG EXOSKELETON FOR MULTIPLE SCLEROSIS

Our client has Primary Progressive Multiple Sclerosis and would benefit from assistance on his weaker side. The goal of this capstone is to create an assistive leg exoskeleton that will aid in our client's ability to walk independently. Our solution is a Bowden cable based system that uses linear actuators as a mechanism for ankle motion assistance. An Arduino microcontroller connected to a remote will be used to control the actuators according to our client's gait cycle.

Team Members

Ashley O'Connor - Mechanical Engineering
Trenten Patton - Biological Engineering
Joshua Wilson - Mechanical Engineering
Josie Wicklund - Computer Science

Client/Sponsor

Kevin Rhoades - Dean and Cindy Haagenson Endowment

Faculty Advisor

Steve Beyerlein - U of I Department of Mechanical Engineering

CRYOGENIC TENSILE TESTER

Our team is working on a user-friendly, inexpensive, and accurate way to understand how materials behave at temperatures as low as 100K (-280°F). We're interested in their tensile properties—how they respond to being stretched. We started with a machine that was not fully functional. Our project focuses on improving the data acquisition systems and the user interface.

Team Members

Ryan Sundburg - Mechanical Engineering
Kathryn Reece - Mechanical Engineering
Ethan Hinkle - Computer Engineering
Seth Lunders - Computer Engineering
Chase Gornick - Computer Engineering

Client/Sponsor

NASA Idaho Space Grant Consortium

Faculty Advisor

Michael Maughan - U of I Department of Mechanical Engineering

PRANDTL-D FLYING WING DEMONSTRATION

We designed a powered proof-of-concept flying wing based on the highly efficient Prandtl airfoil patented by NASA. This project serves as the first step in demonstrating the commercial viability of this design in real world UAV applications.

Team Members

Taylor Herndon - Mechanical Engineering
Nicolas Burrows - Mechanical Engineering
Keenan Bryan - Mechanical Engineering
Augustine Almanza - Computer Science
Zach Heimbigner - Computer Science

Client/Sponsor

Brian Boogaard - NASA
Dave Berger - NASA

Faculty Advisor

Vibhav Durgesh - U of I Department of Mechanical Engineering

AIRCRAFT FUEL CRASH SHUTOFF SAFETY VALVE

The objective is to shut off fuel in an aircraft right when a crash happens in an attempt to minimize the severity of post-crash fires to help save lives.

Team Members

Abdulsalam Alghamdi - Mechanical Engineering
Andrea Tomchak - Mechanical Engineering
Dawson Hicks - Mechanical Engineering
Tyler Bendele - Electrical Engineering
Dean Johnson - Electrical Engineering

Client/Sponsor

Jamie Slippy - Kodiak Aircraft

Faculty Advisor

Matthew Swenson - U of I Department of Mechanical Engineering

PENDANT CONTROLLER FOR AUTOMATED FORK TRUCK

Modern self-driving forklifts are designed to operate without human interaction, however there are situations where a human operator will need to take control. The goal of this project is to develop a wired controller that allows a user to take manual control of an automated forklift for maintenance and training purposes. The results of this project will help provide further development of this technology and may be adjusted for application in other, similar automated vehicles.

Team Members

Katelyn Kinson - Mechanical Engineering
Oakley Todd - Mechanical Engineering
Ernesto Orozco - Mechanical Engineering
Ben Bunce - Electrical Engineering
Ross Dunworth - Electrical Engineering

Client/Sponsor

Gabe Riggs - Bastian Solutions

Faculty Advisor

Steve Beyerlein - U of I Department of Mechanical Engineering

DEMONSTRATION OF SMALL-SCALE CONTINUOUS CASTING

Uranium fuel pins, as used in current nuclear reactors, are manufactured using reliable, but wasteful and inefficient methods. Our focus is to demonstrate the feasibility of using continuous casting as a method of producing the fuel pin geometry using a stable, low-melting point alloy. Continuous casting has the potential to drastically reduce hazardous waste, increase production rate of the fuel pins, and allow for previously impractical geometries.

Team Members

Kade Forbes - Materials Science
Timothy Stevens - Mechanical Engineering
Brennen Coulson - Mechanical Engineering
Tristan Denning - Electrical Engineering
Wyatt Knickerbocker - Computer Science

Client/Sponsor

Randall Fielding - Idaho National Laboratory

Faculty Advisor

Michael Maughan - U of I Department of Mechanical Engineering

ROBOTIC ASSEMBLY OF PHOTOVOLTAIC ARRAYS

The current construction of solar arrays is costly, time-consuming, and error-prone due to them being assembled by hand. By developing NASA's patented 4-step process, our project aims to automate the assembly of solar panels for more efficient and precise manufacturing. Our goal is to improve the existing process through the use of two robotic arms. Our proof of concept uses surrogate materials to minimize cost while illustrating production improvements in quantity and size.

Team Members

Tyler Groner - Mechanical Engineering
Holly Keir - Computer Science
Grant Lucke - Mechanical Engineering
Glen Findlay - Mechanical Engineering
Chandler Calkins - Computer Science
David Vorous - Electrical Engineering

Client/Sponsor

Brian Boogaard - NASA Technology Transfer Administrator
John Carr - NASA

Faculty Advisor

Michael Maughan - U of I Department of Mechanical Engineering

RECIPROCATING SAW END-EFFECTOR FOR HOT-CELL ROBOTIC ARM

Idaho National Laboratory utilizes a room called a hot-cell to contain irradiated materials. Due to the nature of the radioactive materials, they must be handled remotely. The future plan is to implement robotic arms which will be inside the hot cell and will be controlled by operators who are outside of the hot-cell. Our team has designed a reciprocating saw end-effector for these robotic arms, enabling operators to cut irradiated materials.

Team Members

Bennett Schlect - Mechanical Engineering
Cameron Summerfield - Mechanical Engineering
Kyle Monaghan - Mechanical Engineering
Blake Hansen - Mechanical Engineering

Client/Sponsor

Jesse Kappmeyer - Idaho National Laboratory

Faculty Advisor

Matthew Swenson - U of I Department of Mechanical Engineering



UNIVERSAL CIRCUIT BOARD PALLET

SEL manufactures circuit boards for each of their products. Validation of these boards requires each one to be individually tested. SEL wishes to optimize the testing process with new automatic testing machines. Each board design requires a unique pallet to move the board through the tester. These pallets must be custom made for each new board design. The goal of this project is to create a pallet that will adapt to many different board designs reducing overall cost, time, and storage space.

Team Members

Tyler Sand - Mechanical Engineering
Stratton Jenks - Mechanical Engineering
Ben Wren - Mechanical Engineering
Michael Cadmus - Mechanical Engineering

Client/Sponsor

Jonathan Richards - Schweitzer Engineering Laboratories
Alex Olson - Schweitzer Engineering Laboratories
Christian O'Bryan - Schweitzer Engineering Laboratories

Faculty Advisor

Matthew Swenson - U of I Department of Mechanical Engineering

MLM ARMREST ADJUSTMENT LOCKING MECHANISM

The Mini-lever Module (MLM) armrest houses all of the controls necessary to operate the Hyster-Yale forklifts. Much like a car steering wheel, each operator needs to adjust the armrest to a position that is comfortable. The current system requires two handle pulls to unlock. The goal of the project is to design a locking mechanism on their forklifts that unlocks with the pull of one handle. The value of the project is to streamline adjustments for operators and keep up with competition.

Team Members

Michael Williams - Mechanical Engineering
Chris Shultz - Mechanical Engineering
Colin Nancarrow - Mechanical Engineering

Client/Sponsor

Samuel Weiss - Hyster-Yale Material Handling
Trevor Harris - Hyster-Yale Material Handling

Faculty Advisor

Matthew Swenson - U of I Department of Mechanical Engineering

OIL FILM INTERFEROMETRY

We are improving the aerodynamics of Kodiak Aircraft. Higher drag forces on the horizontal stabilizer have been noted due to patterned roughness from universal head rivets on the airfoil surface. We will quantify the impact of the rivet heads on performance and decide if the airfoils should have flush-mounted rivets for future aircraft design.

Team Members

Shalom Masango - Mechanical Engineering
Ryan Schaefer - Mechanical Engineering
Brendyn Goodwin - Mechanical Engineering

Client/Sponsor

Brandon Stille - Kodiak Aircraft
Jamie Slippy - Kodiak Aircraft

Faculty Advisor

Vibhav Durgesh - U of I Department of Mechanical Engineering

IMPULSE MEASUREMENT DEVICE: MEASURING FORCES CREATED BY RIMFIRE AMMUNITION

Shooting rimfire firearms is popular due to cost, recoil, and availability. Autoloading rimfires use shot energy to cycle cartridges. Cycling failures costs the shooter time and money. Chamber pressure curves are available, but there is little other information correlated to reliable cycling. Our goal is to build a fixture to quantify the axial and radial forces during firing, to better understand how they correlate to proper cycling in firearms, allowing manufacturers to reduce failure rates.

Team Members

Shane Elmore - Mechanical Engineering
Patrick Chmelik - Mechanical Engineering
Kyle Christopher - Mechanical Engineering

Client/Sponsor

Jeff Williams - Vista Outdoor

Faculty Advisor

Michael Maughan - U of I Department of Mechanical Engineering



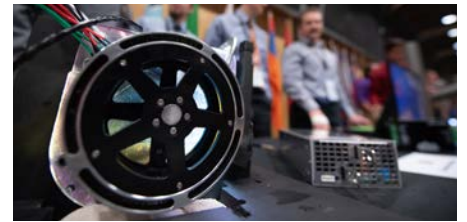
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"The Breezy Night Light"



Allison McCormick
"Apple Iris"



Mia Stroh
"The Viewer"

2023 EXPO ORGANIZING COMMITTEE

For questions related to sponsorship, K-12 outreach and other ways you can get involved, please email expo@uidaho.edu or contact an individual representative below.

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- Maggie Scott, Associate Director
of Development
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Senior Capstone Design Program

- Matt Swenson, Capstone Program Director
Assistant Professor, Mechanical Engineering
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EXPO Extended Experience

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Micron Director of Diversity, Inclusion, and Outreach
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Marketing & Communications

- Alexis Turner, Marketing & Communications Manager
alexisst@uidaho.edu



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A woman with long brown hair, wearing a black jacket and a lanyard with a badge, is smiling and gesturing with both hands while presenting to an audience. The audience members' heads are visible in the foreground, looking towards her. A sign in the background says "100 STORAGE".



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