2021
SENIOR DESIGN SHOWCASE

GONZAGA UNIVERSITY | School of Engineering & Applied Science

CENTER FOR ENGINEERING DESIGN & ENTREPRENEURSHIP

Message from the Dean, Dr. Karlene Hoo

Welcome to the Gonzaga University's School of Engineering and Applied Science 2021 Virtual Design Exposition Day.

We are here to celebrate an important milestone in our engineering and computer science students' program of study – that of completing their two-semester sequence of senior design. This daunting feat required input and support from our faculty, industry sponsors, supervising faculty, and numerous community members to help transform innovative ideas into proof-of-concept and prototypes. Along the way, our students learned about project planning, teamwork and communications, report writing and technical drawings, and budgeting and resource management.

I am especially grateful to the faculty and staff of the School of Engineering and Applied Science that have assisted our students despite the numerous technical challenges, which were exacerbated by the pandemic. Academic Director, Toni Boggan, and the SEAS Capstone Committee members also deserve major praise for their tireless efforts in bringing this day to a successful fulfillment.

To our senior SEAS students, I want to congratulate you on achieving this milestone in your capstone project. Since the start of your senior year, you worked with your design team to take the project from ideation to the physical realization we see and hear about today. Thank you for your dedication and commitment to excel in this demanding but gratifying pursuit.

Finally, I wish the graduating seniors much success in all your future endeavors. Go Zags.

Dr. Karlene Hoo, PhD
Dean, School of Engineering and Applied Science

Message from the Academic Director

Congratulations to our Senior Design graduates!

You exhibited perseverance and determination under challenging circumstances. Teams working remotely and in person have shown us stories of success and growth through trials. These adaptations taught lessons of flexibility and the importance of finding new ways to be a team which will serve everyone well in future challenges. We are saddened by the loss of rites of passage that our seniors have endured but we remain hopeful that our strong students will find new methods of leading all of us to a future full of promise.

Thank you to everyone for a strong dedication to find the new finish line for senior design. Special thanks to our sponsors and Design Advisory Board members who continue to support our program and our students. Thank you to the Capstone Committee for guidance and expertise. Thank you to Megan Weed for organizational wizardry and thank you to everyone from the Manufacturing Technology Center and the Dean's office.

Seniors, please keep in touch with us and send us word of your challenges and successes. We believe in you and your future! I wish you all health and strength!

Toni Boggan
Academic Director
Center for Engineering Design and Entrepreneurship

Welcome to Senior Design Showcase 2021

Gonzaga University's Center for Engineering Design & Entrepreneurship was established in 1992 to enhance the design experience for senior engineering and computer science students. The Center organizes projects for the academic year and many are commissioned by sponsors in the private and public sectors. Prospective sponsors are sought throughout the year for projects involving all engineering, computer science, and computational thinking programs. Many projects are interdisciplinary.

Participating sponsors provide a definition, resources, and funding for the projects. They also commit a liaison from the sponsoring company to guide and support the students throughout the academic year. Sponsors receive several benefits from the Senior Design Program including a project completed by students and faculty members. Additionally, the sponsoring company has the opportunity to work with bright and enthusiastic individuals with innovative ideas. This team experience is an opportunity to evaluate senior students as prospective employees.

Recently, another type of project developed which is the student proposed project. During their junior year, engineering and computer science students research and refine potential projects which are then reviewed by a faculty committee. If a project is accepted, the students who proposed it work on the project. In the 2020-2021 school year, 14 of our projects were developed by student teams.

All projects are periodically reviewed by faculty and the Center's Design Advisory Board (DAB). The DAB is comprised of engineering and computer science professionals in both the private and public sectors. They are instrumental constituents for the Center and a major factor in guiding the students. The review process brings an outside perspective to the teams and is a component required to meet design guidelines established by the Accreditation Board for Engineering and Technology (ABET).

Design Advisory Board Members

Adam Miles	DOWL
Adam Nekimken	Apple
Alek Marinos	Keytronic
Andrew Asper	ACI Mech. & HVAC
Andrew Matsumoto	Civil West Svcs
Art Miller	NIOSH
Ben Bladow	Boeing
Berry Ellison	City of Spokane
Bethany Alcamo	Vera Water and Power
Bill Galle	Spokane County
Bob Turner	City of Spokane
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Brennan Dunlap	Boeing
Brent Barr	f5
Chris Sharman	Soft Dev Systems
Colleen Little	Spokane County
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Fred Reinel	FR & Associates LLC
Gary Holmesmith	Kaiser Aluminum
Henry Loehner	WSDOT
Jacob Koopmans	Boeing
Jasmine Jans	Next It / Verint

We are so grateful for the invaluable relationships forged with our students and the Design Advisory Board. If you or someone you know would be interested in serving on the Design Advisory Board, please contact Toni Boggan, boggan@gonzaga.edu, 509-313-3913, or visit us on the web at www.gonzaga.edu/cede.

Pictured left: ENSC 22 on-site of the trail down to the bridge they designed for their Senior Design project sponsored by the City of Spokane.

The Center for Engineering Design & Entrepreneurship is supported by a dedicated group of volunteers from the engineering community who lend their expertise to our students and our program **by reviewing our student's presentations and reports.** Thank you, Design Advisory Board!!

Jeff Barnhart	Boeing
Jeff Owen	SEL Inc.
Jennifer Emerson-Martin	Iteris, Inc.
Jesse Tarr	MW Engineers
Joel Lee	Metro Engineering
John Gibson	AVISTA
Josh Comfort	DCI Engineers
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Katy Allen	City of Liberty Lake
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Sam Shoemaker	MW Consulting
Sean Stadelman	SEL Inc.
Stu Barton	Jacobs
Terra Donley	HDR Inc
TJ Bolser	DCI Engineers

Civil Engineering Projects

ENSC 20—Bicycle Safety Stop

Alex James
Gabby Kinney
Bowen Spellman
Aidan Feehan

Advisor: Dr. Rhonda Young
Sponsor: Oregon State University
Liaison: Dr. David Hurwitz

The goal of this project is to analyze vehicle and cyclist interactions in the Pacific Northwest to determine the safety and feasibility of implementing the "Idaho Stop" law. The "Idaho Stop" law allows cyclists to legally yield at stop signs instead of coming to a complete stop. Our team performed data collection and analysis, expert interviews, and literature reviews to determine the characteristics of these vehicle-bicycle interactions. From there, we developed procedures for future analysis, information to better inform expert surveys, and the proper theories to apply to intersection characteristics. These deliverables ultimately contributed to the first half of a comprehensive, two-year project that will be continued through the 2021-2022 year. We worked with the PacTrans organization in conjunction with teams from Oregon State University and the University of Idaho to contribute to this multiyear, multi-institutional project.

ENSC 21—Biochar Filtration for Stormwater

Veronica Piechowski
Grace Rogers
Milo Rolland

Advisor: Dr. Kyle Shimabuku
Sponsor: Ron Seubert

Freshwater scarcity is a growing challenge requiring nontraditional water resources, such as stormwater and wastewater, to be harvested. Identification of low-cost treatment techniques is a key step to creating a feasible system for treating stormwater. Our project evaluated biochar, or pyrolyzed biomass, as a treatment technology because of its high pollutant adsorption capacity and low-cost. Our analysis involved lab testing biochar's ability to adsorb phosphorus and other dissolved pollutants from stormwater as well as an extensive literature review comparing alternative adsorbents and current stormwater harvesting techniques. The knowledge gained was used for the foundation for a business, StormChar Solutions, which manufactures and sells optimized biochar production systems to advance biochar usage while producing multiple economic, environmental, and social benefits for the consumer and community. The completion of this project allows stormwater dischargers and water providers to more sustainably manage water resources.

Civil Engineering Projects

ENSC 22—Centennial Trail Connector & Bridge

Right—Hydraulics Team
Joseph Fountaine, Lindsey Evers
Advisor: Dr. Sue Niezgoda
Bottom Left—Structures Team
Suhib Hammad, Bernard Olewski, Maxwell Duke
Advisor: Emily Sackmann
Bottom Right—Transportation Team
Madelyn Cayton, Oliver Crawford
Advisor: Dr. Rhonda Young

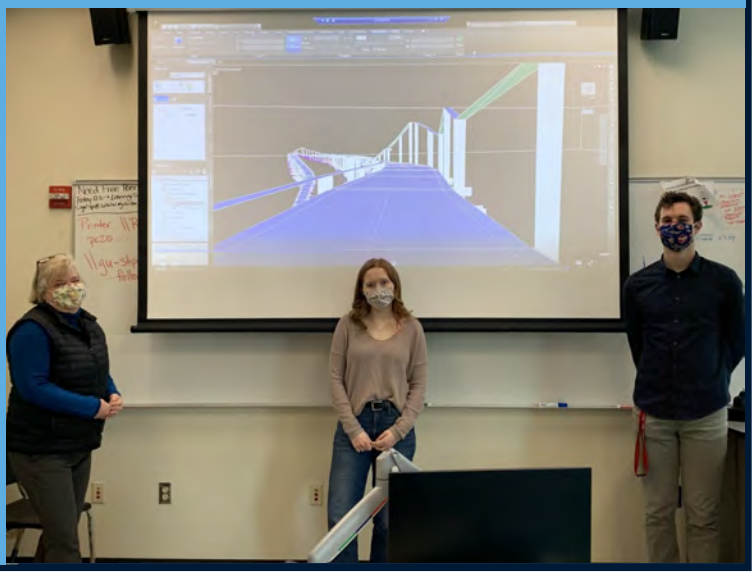
Sponsor: City of Spokane
Liaison: Colin Quinn-Hurst

The Centennial Trail, a regional multi-use path, has a few gaps that present challenges to users. One is the area around Summit Boulevard west of Downtown Spokane where the trail utilizes neighborhood streets before heading to Pettit Drive (Doomsday Hill) and crossing the T.J. Meenach Bridge. A former streetcar alignment and river crossing area was considered a possible alignment to keep the trail separated from traffic. Our team determined the design of the trail's alignment and bridge location, including site terrain modeling, optimizing the trail's alignment, river hydraulic modeling, and material research, dictating the best option for the bridge design. This solution will provide access for all users to continue to use the Centennial Trail as a significant and major transportation route in the Inland Northwest.

The Team is split up into three groups, Structures, Transportation, and Hydraulics. The Hydraulics Team analyzed the Spokane River to determine the feasibility of emplacing a bridge at our project location. This included the development of a HEC-RAS model of the existing hydraulic conditions of the river and a proposed model that analyzed the effect the bridge will have on the waterway. The Hydraulics Team also worked with the Transportation Team to help design stormwater management options in and around the trail to reduce stormwater runoff and erosion.

The Structures Team's goal was to design a pedestrian bridge that connects the new trail segments on either side of the Spokane river. The Structures Team did this by developing structural drawings and a calculation package for the bridge. Providing the client with a feasible design, the team investigated different materials, determine applicable loading (Dead, Live, Wind, Vehicle, etc.), and deemed the optimal bridge type to be a steel parker style truss. A computerized model was then developed to analyze the superstructures behavior under the various load combinations. The structural drawings include designs for the superstructure, deck, foundation, and piers. The calculation package includes a compilation of hand calculation and computer model outputs to support how each component was designed.

The Transportation Team for the Centennial Trail Connector and Bridge project is responsible for the transportation elements of the design of the Centennial Trail segment. This included designing the horizontal and vertical alignment of the trail to meet accessibility requirements, reduce cost, promote user comfort, and handle the challenging topography of the project area. The Transportation Team worked hand in hand with the Structures Team to ensure that the trail connects into the bridge design and worked with the Hydraulics Team to design stormwater management facilities along the trail. Multiple designs of the trail were considered but the final design was chosen based on design cost and feasibility, the feedback of the client, and the feedback of other stakeholders.



Civil Engineering Projects

ENSC 23—Civic Building Structural Design

Moment Engineering consists of four Gonzaga Civil Engineering seniors tasked with the production of design-development level structural drawings and calculations for a civic building project in Spokane, Washington. While each member of our team has unique knowledge in the field of Civil Engineering, our team has a strong shared interest in, and passion for, structural engineering. Our group has brought individual and relevant experience to this project through academic research, structural engineering internships, and construction related background knowledge. This project will leverage our education and expertise in providing more than just drawings and calculations; we foster positive relationships with our client, Spokane's Conservation District, and strive to provide them with solutions that benefit them and society as a whole.

Mitchell Borseth, Benny Cope, Ryan Dunne, Levi Arnold

Advisor: Aaron Zwanzig
Sponsor: Integrus Architecture

ENSC 24—Design and Evaluation of a Beaver Dam Analog Complex

Nick Whittlesey
Connor Denning
Advisor: Dr. Sue Niezgoda
Sponsor: Spokane County Public Works; The Lands Council
Liaisons: Dawson Matthews, Colleen Little, Kat Hall

Thompson Creek, a tributary to Newman Lake in Northeast Spokane County, is an incised stream which is unable to trap sediment and nutrients flowing into Newman Lake. In particular, the phosphorus loading causes eutrophication and algae blooms in the lake which is undesirable to the Newman Lake community. Design and implementation of a Beaver Dam Analog (BDA) complex on Thompson Creek will cause flows to slow down and allow sediment and nutrients to settle out, while also promoting stream health, bank stabilization, and riparian growth along the stream banks. The Best Dam Team (TBDT) has developed a design plan set and instructions for BDA complex implementation and monitoring. Research, hydraulic analysis, and past BDA projects have provided TBDT with the confidence that the designed BDA complex for Thompson Creek will have the aforementioned positive impacts on Thompson Creek and Newman Lake.

Civil Engineering Projects

ENSC 25— Mixed Use Pilot

Laura Baddeley
Hanna Herzog
Tyce Konkle
Lindsey Pavletich

Advisor: Adam Miles
Sponsor: DOWL

Our project is to assist Northtown Square in planning a mixed-use facility, a development with both residential and commercial space. Our specific task was to analyze the traffic patterns around the current site and to predict what they will look like with the new facility. We developed a traffic impact analysis report that addresses four main points: zoning requirements, trip generation, or how many people enter and leave the site and what routes and methods they use, efficiency of traffic operations in the surrounding area, and safety. This report will help our client to determine how the proposed development will impact the area, and how to configure elements such as parking to meet regulations and minimize traffic conflicts.

ENSC 26—Geo-Structural Deep Foundation

Callen Scaroni
Isha Singh
Joshua Madison
Nathaniel Cockbain

Advisor: Dan Parshall
Sponsor: Quanta Subsurface

The goal of our project is to design a deep foundation for a replacement transmission pole structure outside of Helena, CA. The team designed a micropile foundation, as the small diameter piles offer easy installation into the rocky site with no significant site modification. The final design and drawing package includes calculations and drawing sets for the micropile foundation, pile cap, and connective elements. With an integration of geotechnical and structural design, our team has learned how to design innovative deep foundation solutions to meet all criteria and constraints of our project site.

Civil Engineering Projects

ENSC 27— Ice Age Floods

Taylor Lenderman
Anthony Valerius
Advisor: Taylor Hoffman-Ballard
Sponsor: Osborn Consulting Inc.

The City of Spokane intends to feature the Missoula Ice Age Floods as the theme of a regional park in the North Bank area; the park will feature a stream channel which demonstrates how the ice age floods created the region's landscape. The goal of the proposed project is to design and model a stream play feature, aimed specifically at K-12 grades, that mimics the hydraulic features which created the Eastern Washington landscape.

ENSC 28— Precast Concrete Legacy Structure II

Sarah McClennan
Davis Wright
Allison Kelly
Pavel Germanovich
Advisor: Melissa Verwest
Sponsor: Knife River

Precast concrete is a material being used increasingly in infrastructure, and our team saw this project as an opportunity for the Civil Engineering department to strengthen their teaching on precast concrete, better preparing students for their future design. Our project was to design a structure made of precast concrete which could be displayed on Gonzaga's campus. The structure was designed to be an educational piece and includes many educational concepts, for example, we added plexiglass windows on two of the pieces to show the rebar, ties, insulation, and concrete on the inside of the piece. A model of our design has been 3D printed to illustrate the potential structure. Overall, the goal of the structure was for anyone who walks past, a civil engineering student or not, to be intrigued and walk away with new knowledge of precast concrete.

Civil Engineering Projects

ENSC 29— Wastewater Lift Station Intertie

Taylor Berry-Maraist
Tomas Nergaard
Kayla Schunzel
Advisor: Dave Moss
Sponsor: City of Spokane

The wastewater force main from the North Pointe Lift Station produces a large amount of hydrogen sulfide gas when it connects to the City of Spokane's sewer system near Nevada Street and Lyons Avenue. The wastewater is corrosive and is causing odor issues, safety concerns, and pipe damage. The goal of our project was to analyze, plan, and design a gravity intertie pipe to Spokane County's Marion Haye sewer system, eliminating the City's North Pointe Lift Station. Over the course of the year, the team analyzed three potential gravity sewer routes, identified the best route, and advanced the design of the selected option. Our evaluation and design has developed a greater understanding of the challenges of various options under consideration by the City and has presented a potential solution.

Electrical and Computer Engineering Projects

ENSC 40— Helical Antenna Array

Travis Spicer
Aaron Weber
Advisor: Bob Conley
Sponsor: Smart Antenna & Radio Lab
Liaison: Dr. Steve Schennum

The goal of our project was to design and fabricate a helical antenna array that can be configured to produce any polarization. This is accomplished by using both right-hand polarized and left-hand polarized elements in the array so that any desired polarization can be produced with a vector sum of the two. As a continuation of the work of previous design teams, we have taken the exiting HFSS simulations of the antenna elements, made adjustments, and designed a feed network to connect them to a signal cable. The antenna elements were fabricated using chemical etching and heat transfer lithography, and the feed network was fabricated using a PCB mill. The antenna elements and feed network were connected and tests were run to verify the simulation results.

Electrical & Computer Engineering Projects

ENSC 42—Gyroscopic Microphone

The goal of our project was to reduce turbulence caused by high wind speeds interacting with a microphone diaphragm. These turbulent forces cause distortion within the recording and interfere with the quality of sound. Our project is testing a new concept to mechanically reduce turbulence by moving small microphones at the same speed as the wind, nullifying the airflow causing the turbulence. The initial prototype moves microphones which record and store data locally. By proving this concept is a viable method of wind noise reduction, more development can take place to market a microphone product to Hollywood or communication companies that operate in high wind environments.

Bailey Tran, Matthew Kleyn, Hunter Ward, Lyssa Blood
Advisor: Dr. Claudio Talarico
Sponsor: CEDE, KREM 2
Liaison: Brenna Greene

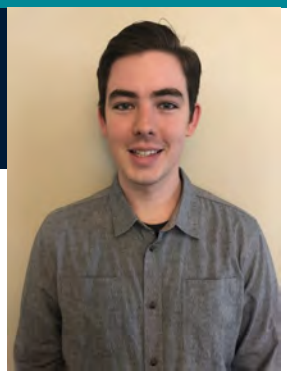
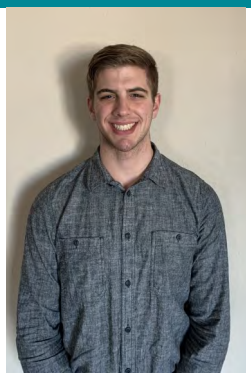
ENSC 43—MySleeve

Gretchen Rudel
Loren Anderson
Brandon Takahashi
Graham Laird
Advisor: Dr. Yanqing Ji
Sponsor: Gonzaga Basketball
Liaison: Travis Knight

In the age of sports analytics, professional teams are using new training methods and technology to get an edge. These methods range from extensive video analysis to “smart” analytics. However, there is a large gap in terms of individual player analytics. Most data and analysis pertains to the team as a whole, not the individual. To fill this need of individual smart analytics, we have created MySleeve. MySleeve is a shooting sleeve with built-in motion sensors that analyze a player’s shooting form, and provides feedback to improve the player’s shot. Analysis results are given to the player in the associated desktop application. MySleeve includes a basketball shooting sleeve with motion trackers, a desktop application to provide feedback, and a backend server to store the data and analyze the shooting form. All components work together to provide individual player “smart” analytics.

Mechanical Engineering Projects

ENSC 50—A Better Fin


Aidan Murray
Richard Zukowski
Max Leung-Wagner
Advisor: Dr. Marc Baumgardner
Sponsor: CEDE

Power steering systems under heavy use conditions will suffer performance losses and even fail if not properly cooled. Our project seeks to compare four different styles of annular fins (circular, teardrop, and then adding bars to the front of each) to see which style can be the most efficient and effective at cooling a working fluid. To achieve this, the team mathematically modeled a circular fin case to aid in the design of both primary shapes from the ground up, then produced a test rig in which hot water can be passed through a finned section of pipe in cross flow to test the cooling capability of each fin shape. Fin shapes could then be compared to determine if the teardrop shape was more effective than the circular shape, and if adding protuberances to either shape improved performance overall.




ENSC 51—Automatic Pill Dispenser

Grace Lilje, Catherine Parra, Jake Gammon, Ryan Hunt

Advisor: Debra Offill Sponsor: CEDE, Assured Independence Liaison: Dave Hunt

Telehealth and Medication Management is an emerging industry with a massive market of senior patients. It is a solution that greatly reduces the cost of caregiving, as daily visits can be cut to monthly visits with the help of a medication dispenser. Pill dispensers currently on the market are capable of dispensing numerous types of pills on different schedules, however, they come at a large price tag and involve complicated technology. Our goal is to design and build a medication dispenser with the functionality of those on the market, but for a fraction of the price while simplifying the user interface. The final product will be a functional and consistent pill-dispensing device capable of holding three medications on three customized dispensing schedules, while minimizing cost to the user.

Mechanical Engineering Projects

ENSC 52—Baja Car Suspension and Steering

William Long
Samuel Wilson
Alexander Orovitz
Alex Blau
Advisor: Jim Weston
Sponsor: SAE Baja Club
Liaison: Andy Gothro

ENSC 52's goal was to design and manufacture the frost suspension and steering of a Baja Race vehicle. Working in conjunction with Gonzaga's SAE Baja Club, ENSC 52 has helped design and build a Baja car in order to compete in the Society of Automotive Engineers' annual Baja competition. Due to recent rule changes to the Baja Competition, all vehicles are required to include four-wheel drive components. Needing to design multiple parts from the ground up, ENSC produced the frost suspension and steering components for the manufacturing of HR5, Gonzaga's first four-wheel drive Baja vehicle.

ENSC 53—Bearing Press & Chock Manipulator

Aidan Peck
James Knight
Nathan Lewis
Patrick Osborne
Advisor: Christopher Nicol
Sponsor: Kaiser Aluminum
Liaison: Kellen Appoldt

Our sponsor, Kaiser Aluminum, tasked us with the project of designing a system and process to help in the maintenance of their bearing and chock assembly system that operates in their aluminum rolling mills. The current process at Kaiser aluminum is a manual process that is time consuming and places the Kaiser technicians at unnecessary risk. To achieve this task, our team visited the Kaiser facility and conducted interviews with Kaiser technicians to understand the complete problem. Through an iterative design process, our team worked with Kaiser engineers and Axle NW designers to design a solution that met all of Kaisers requirements. Our final product contained final design drawings and operating procedure for a bearing removal and manipulator device that would allow Kaiser technicians to safely and quickly carry out the maintenance process. Now Kaiser Aluminum will use our report and work to manufacture our design for use in their Trentwood facility.

Mechanical Engineering Projects

ENSC 54— Blade Material 420HC Properties

Colin Helgeson
Matthew Vermeer
Michael Baer
Advisor: Mike McDonald
Sponsor: Buck Knives
Liaison: Justen Bock

Buck Knives wishes to improve the knife blade performance of its 420HC steel blades and tasks us to probe the current heat-treatment process for adjustments leading to an overall better blade. The project workload is distributed into three distinct phases starting with a baseline testing of 420HC steel for its material properties, subsequently adjusting the heat-treatment process, and re-testing the 420HC steel parts that conform to our revamped heat-treat. This will then be followed by a comparison of our resultant data to the baseline data for noticeable improvements. An in-depth analysis of the 420HC steel material properties will allow our team to further refine the heat-treatment process to produce a knife blade with greater reliability while still retaining a low cost.

ENSC 55— Commissioning of a TLUD Stove

Molly Fackelman
Seth Kelley
Rachel Yamamoto
Advisor: Dr. Marc Baumgardner
Sponsor: Mechanical Engineering Department

The goals of ENSC 55 were to install and commission a new, full-size combustion hood, and an experimental Top-Lit Updraft Gasifier (TLUD) Stove for the purpose of investigating bio-char production. Inefficient burning of biomass from solid fuel cookstoves is a significant contributor to indoor air pollution and climate change; the Top-Lit Updraft Gasifier is an innovative cooking apparatus designed to be more efficient and safer than traditional solid-fuel stoves, meaning it could be a replacement for more traditional solid fuel cookstoves. Over the course of the first semester, we designed a custom total-capture combustion hood for the GU Combustion Lab. This hood will safely exhaust all fumes produced during solid fuel combustion experiments with the TLUD. During the second semester, we focused on installing the combustion hood and writing a data acquisition program in LabVIEW to read and record changes in temperature and mass during experimentation.

Mechanical Engineering Projects

ENSC 56— Compact Intravenous Warmer

Shelby Taketa
Declan Flanagan
Nicholas Cunningham
Erik Ratchford
Advisor: Gabe Achenbach
Sponsor: CEDE
Liaison: Dr. Marsha Pactol, Keely Jenkins

Patient comfort is at the forefront of the medical profession, but the injection of cold fluids intravenously can cause discomfort and even hypothermic shock. Current solutions are too expensive, require extra training, or are too bulky. To combat this issue our team strived to create an intravenous fluid warmer that is inexpensive, easy to use, and compact. The ideal design utilized a continuous heating element to heat any fluid in the IV tube, a series of sensors to monitor the fluid temperature, and is in a compact case. Special consideration was taken to ensure the device could become FDA Certified. Prototypes were designed to be 3-D printed and common parts were used for all the internals, however, with further research and additional time custom parts could be manufactured to reduce device cost. This would allow the device to be mass-produced and distributed to hospitals and care facilities around the world.

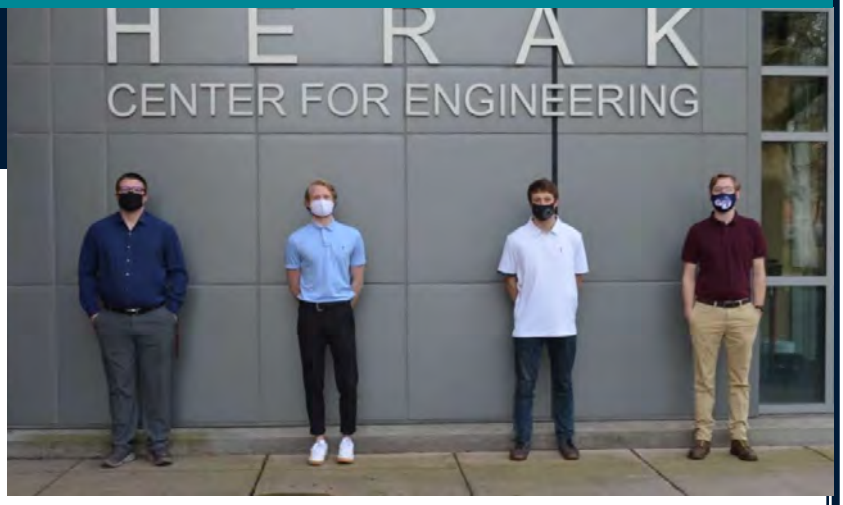
ENSC 57—Composite Handling Equipment

Brett Wilson, Trey Reohr, Efren Chavez Cardona,
Callie Brewster, Alec Wilson
Advisor: Sam Shoemaker
Sponsor: The Boeing Company
Liaisons: Jacob Koopmans, Nick Questad,
Brenna Doll, Conor Garand

The goal of our project was to create a suction cup system to help lift and maneuver composite materials in the aerospace and other applicable industries. Our design utilizes SMA or shape memory alloy to be able to acuate and control our suction design. Over the course of the semester the team has worked toward creating a prototype to replace the high energy overhead moving equipment used by industry today. Working alongside Boeing, the team has troubleshooted and designed a proof of concept to be able to pick up a sheet of composite material due to SMA actuation, for a brief period of time.

Mechanical Engineering Projects

ENSC 58—Coolant Heating System Solution



Jared Boswell
Carter Garcea
Jake Hansel
Collin Murray
Advisor: Chris Nicol
Sponsor: Kaiser Aluminum
Liaison: Laura Frank

Kaiser aluminum currently heats the coolant for their 80” mill using steam from two boilers installed decades ago. ENSC 58 proposed that the tanks used to hold the coolant be insulated and that the steam necessary to heat the coolant be produced using a new, more efficient, package boiler. The team began the project by mathematically modeling the heat loss through the tank walls, the pipes, and due to the milling process. Possible solutions were evaluated using a decision matrix, and P&ID drawings and ROI analysis for the specified solution were produced, which can be used to propose the solution for funding.

ENSC 59—Continuous Fiber 3D Printer

Michael Zell
Patrick Kunz
Drew Oakes
Gary Heberling
Advisor: Rudy Lauth
Sponsor: CEDE
Liaison: Jeremy Smith, Continuous Composites

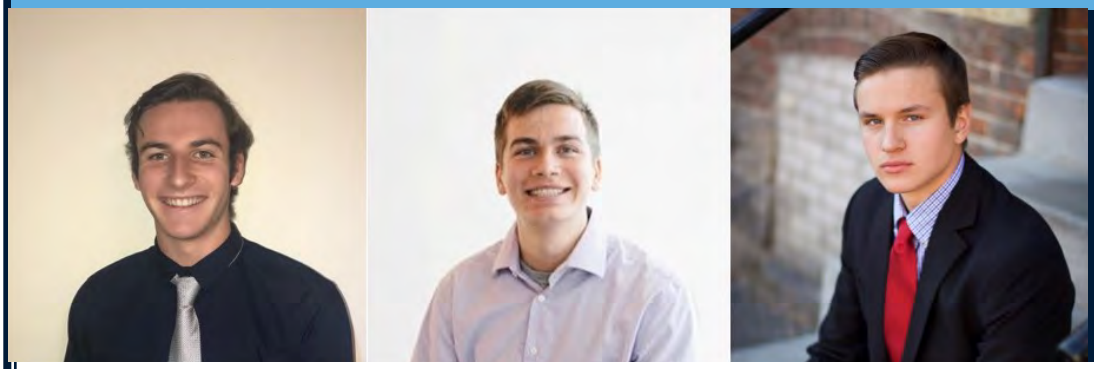
Ever since the commercialization of 3D-printers, the plastic prints have always struggled to have substantial structural integrity. With the addition of a second motor and a continuous carbon fiber throughout the print, we look to find an affordable way to increase the strength of the printed object without busting the bank. Our team has taken a basic, affordable 3D printer, the Ender 3 Pro, and created modifications to the hardware and software to allow it to print with a strand of carbon fiber within the filament. With the affordable modifications of a secondary motor, a cutting mechanism for the carbon fiber, and some electronic upgrades, we hope to reinforce the products of the printer that would otherwise be quite delicate and impractical in most situations.

Mechanical Engineering Projects

ENSC 60—Deep Venous Thrombosis Prevention

Will Yuponce
Carlee Burnett
Maureen Barrett
Lindsey Young
Advisor: Shane Pacini
Sponsor: Lung Technologies LLC
Liaison: Kerry Curran

Post-orthopedic surgery patients are at a high risk for developing Deep Venous Thrombosis (DVT), which can be fatal and difficult to diagnose. Current prevention methods are overly complicated or have negative side effects. The focus of our project is to create a portable and more effective sequential compression device. Our simple design will offer ease of use for hospital staff and patients by eliminating external components. With our innovative product, users are guaranteed a hassle-free, highly effective DVT prevention device.



ENSC 61—Dispenser Production Design Challenge

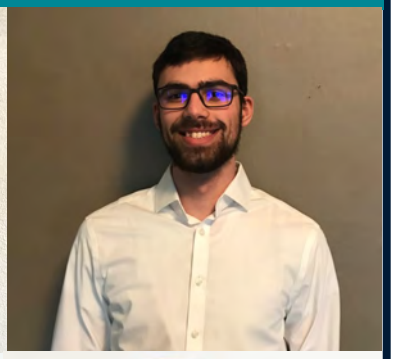
Michele Brianti, Gabriel Carbajal, Ryan Moore
Advisor: Andy Johnston

Sponsor: Skils'kin
Liaison: Steve McBride

Skils'kin is a nonprofit in Spokane that provides job opportunities for people with disabilities. They were struggling to make the assembly of a soap dispenser product more accessible to employees with diverse disabilities. This project focused on this problem by improving the steps of the assembly process associated with epoxy being dispensed onto a polyethylene terephthalate window as well as the same window being bonded to the inside surface of the soap dispenser. Key aspects of the solution included creating devices for Skils'kin that automated the process so more employees could participate, but not automating it too much that the job was no longer needed. We designed an automatic epoxy dispenser and a window adhesion device prototype that opened the opportunity for more employees to contribute. Additionally, our team commissioned a 3D printer for Skils'kin which allowed them to internalize workflow and train their employees in 3D printing skills.

Mechanical Engineering Projects

ENSC 62— Electric Boat Motor Conversion

Electric boat motors can be relatively expensive when compared to gasoline options with the same power and the market offers no option to preserve existing components of gasoline motors. The team has created and tested a do-it-yourself (DIY) kit to convert an existing gas-powered outboard motor to an electric motor. The conversion kit allows for reuse of the casing, driveshaft, mount, and propeller from the original motor. This kit consists of an off the shelf electric motor- controller package chosen specifically for this application and a custom mount and coupling to combine the motor with the original components. This provides the means to better access electric motor technology in an environmentally conscious manner.

Daniel Smart, Andrew Feucht, Matthew Gasper, Wyatt May
Advisor: Jeff Nolting
Sponsor: CEDE, Suhag Patel

ENSC 63— Eyeris Light Controller

Chance Schachle
Carson Lewis
Jared Alano-Gray
Tarik Alauddin
Advisor: Dan Harmon
Sponsor: CEDE

The Eyeris Light Controller (ELC) is the bridge between modern lighting technologies and allows automatic light adjustment based on a user preset. Our team has designed a controller prototype that interfaces current lighting technology (light sensors, dimming bulbs, etc.) to allow a consistent and desirable level of light to be maintained throughout a set period. This controller automatically dims the light sources in the room based on the presence of natural light. Using light sensors, the ELC takes in data regarding the levels of light at different positions in a space and adjust the corresponding light source to alter the overall light level to a user-set level. Paired with motion sensors and low-power transceivers, the ELC promotes an energy conservative approach to automation in lighting for commercial spaces.

Mechanical Engineering Projects

ENSC 64—Hythane Pipeline Materials Optimization

Cameron Oen
Nicklaus Vogt
Mathew Morgan
Advisor: Dr. Pat Ferro
Sponsor: CEDE
Liaison: Blake Casagranda

According to a 2018 EPA estimate, 1802.79 million metric tons of Carbon Dioxide were emitted from electricity produced from burning fossil fuels such as natural gas and coal. The Hythane Pipeline Materials Optimization Project is testing the hybrid of natural gas and renewably produced Hydrogen within a pipeline system created by the ENSC 64 Team. The hybrid gaseous mixture within the pipeline system will offset the amount of CO2 produced through the burning of natural gas and the mixing of Hydrogen into the abundant natural gas pipeline network will provide the possibility for end uses of Hydrogen in fuel cells, further combating environmental risk. With the overall goal of acting as a Consultant to Renewable Energy companies, Team ENSC 64 produced a complex pipeline system to measure the leakage rate of the smaller Hydrogen-natural gas (hythane) molecular mixture through susceptible pipe fittings.

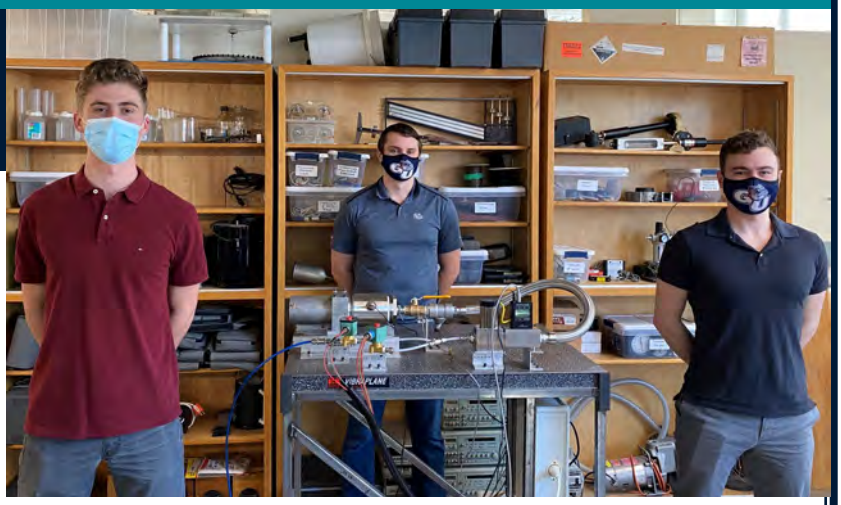
ENSC 65—Air Monitor/ Spectrometer

Alex Walde
Kristine Johnson
Thomas Noone
Advisor: Dr. Art Miller
Sponsor: NIOSH
Liaison: David Parks

Miners are often exposed to diesel particulate matter (DPM) from the machinery in mines. DPM is a carcinogen and overexposure can lead to a variety of negative health effects. The goal of our project is to design a real-time air monitor that can measure the amount of DPM in the air with an infrared spectrometer and notify miners if the level of DPM is hazardous. Our team created and tested a benchtop design using handpicked components that is effectively able to quantify the level of DPM in the air. Our work serves as a proof of concept for future designs that would be optimized for protecting miners in real world scenarios.

Mechanical Engineering Projects

ENSC 66—Measurement Lab



Albert White
Thomas Standiford
Cody Meyer
Advisor: Dr. Tim Fitzgerald
Sponsor: GU Mechanical Engineering Department

To aid in the development and continued innovation of Gonzaga's Mechanical Engineering Department, the goal of our project was to complete the design and construction of multiple instruments within the measurement lab. This included work on a hybrid rocket test stand, an inertia measurement device, and the lab's wind tunnel. We've built upon the progress of previous teams to work towards completing these projects, resulting in operational lab instruments. The rocket test stand was modified and packaged with an updated data acquisition program for use in lab, allowing future students to experiment with different fuel configurations. Additionally, research was conducted on the inertia device and a design package was created to provide future teams with the tools necessary to bring it to an operational standard.

ENSC 67—Microgravity Rocket Lab

Mark Jankovic
Joseph Curran
Joshua Margraf
Evan Melnick
Advisor: James Weston
Sponsor: CEDE

As space becomes more and more accessible, it is crucial to increase our ability to perform experimentation within a microgravity environment. To create another more rapid and cost-effective way of carrying out these experiments, we have developed a model rocket with a controls package that can perform a microgravity maneuver. While we had to rescope our project at the beginning of the year and remove the payload section, we have kept and developed the controls package that is ultimately responsible for creating a microgravity environment. We feel that the work we have completed will lay the groundwork for future expansions and studies upon this concept, as well as further interest in making space more accessible.

Mechanical Engineering Projects

ENSC 68—Motorized Pivot Disk

Our team was tasked with designing and developing a working prototype of a motorized pivot disk. Pivot disks are medical devices used to assist mobility impaired people navigate their surroundings. The pivot disks currently on the market are not motorized. The addition of a motor will improve the effectiveness, autonomy, and safety of the currently available products. The successful completion of our project addresses many of the most expressed concerns by both mobility impaired people and their care givers.

Lauren Johnston, Seth Frings
Mathew Mueller, Eric Possa
Advisor: Colleen Nolting
Sponsor: Walter Jakubowski

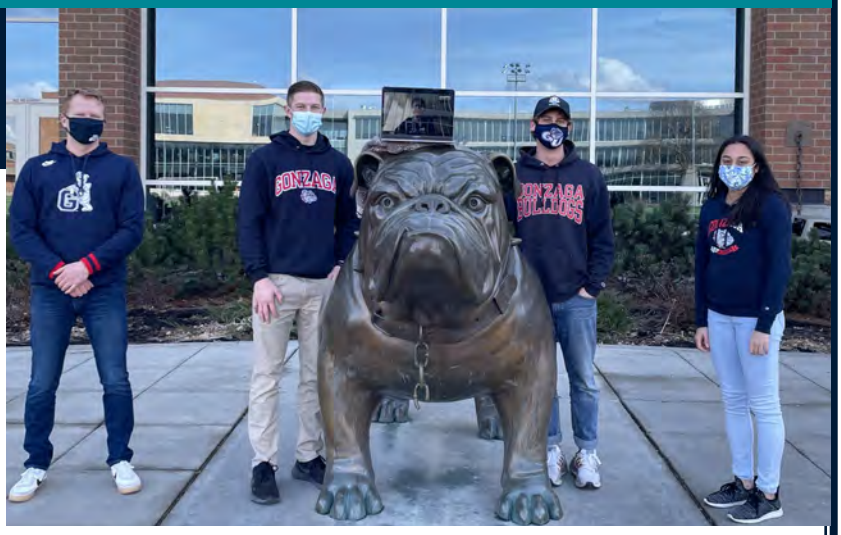
ENSC 69—Nonplanar 3D Printer

Andrew Gothro
Steven Mamolo
Andrew Hall
Jared Weyer
Hunter Desimone
Advisor: Jacob Laete
Sponsor: CEDE
Liaison: Dr. Tim Fitzgerald

3D printing technology has progressed rapidly over the past decade. However, parts printed in the traditional planar layer-by-layer method exhibit anisotropic mechanical properties and undesirable stair-stepping of top and bottom curved surfaces. Although limited tools have been developed to allow for true nonplanar 3D printing (i.e. printing with three or more axes simultaneously), they are difficult to use and not widely available to the public. The goal of this project is to modify an existing FDM 3D printer to allow for true nonplanar printing of top and bottom surfaces, as well as to enable five-axis printing by implementing two rotational degrees of freedom. These techniques will allow for printed parts with superior mechanical properties and smooth, aerodynamic top and bottom surfaces.

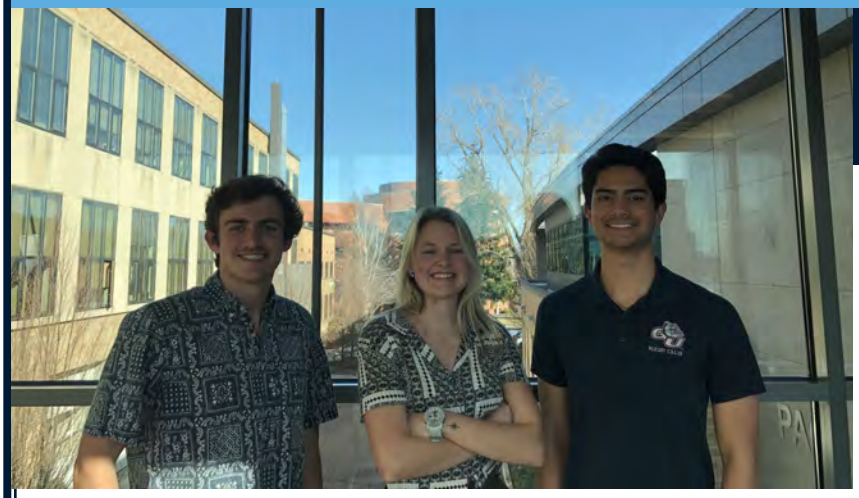
Mechanical Engineering Projects

ENSC 70—Pediatric Incentive Spirometer



Brian Hodes
Kalika Singh
Ryan Finn
Marissa Encarnacion
Advisor: Shane Pacini
Sponsor: Lung Technologies LLC
Liaison: Kerry Curran

ENSC Team 70 was tasked with creating a pediatric incentive spirometer that addresses poor patient adherence during recovery from post-surgical anesthesia and other respiratory complications such as COVID-19. To do this the team created a spirometer and detachable electronic device that monitors the prescribed inhalations and provides feedback to the patient and medical professional. The detachable electronic device uses a proximity sensor to detect the passing diaphragm of a successful inhalation and records the data. Notifications were built in to remind the patient at consistent intervals and then displays the information on the electronic interface. The spirometer was built with the focus of a modern design that would also be suitable for pediatrics while maintaining all functionality of a typical spirometer. The spirometer and electronic device fit seamlessly together while maintaining the adaptability for all patients from pediatric to geriatric.

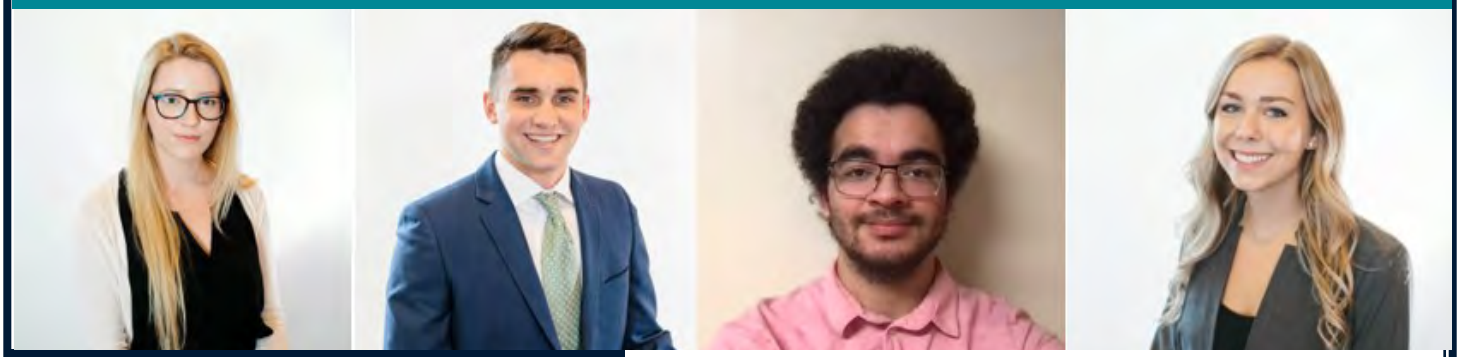


ENSC 71—Repurposing Carbon Fiber

Alec Steinhilber
Hannah Stubson
Tanner Thiel
Advisor: Gerry Snow
Sponsor: The Boeing Company
Liaisons: Daniel Barnhart, Brian Withrow

The purpose of this project was to create a smaller scale and manual version of the Carbon Fiber Layup process used at Boeing for the reuse of excess Carbon Fiber samples. The reuse of this material will reduce the environmental impact and costs of the 777X program. The project team was tasked with continuing this project on behalf of the Boeing Composite Wing Center and student teams from the previous three years. We completed the design and assembly of the prototype before producing and testing layup samples.

Mechanical Engineering Projects



ENSC 72—Recycling Thermoplastic Composites II

Bridget McShane, Zachary Gerhardt, Joseph Coppock, Karli Wagner
Advisor: Gerry Snow
Sponsors: The Boeing Company, ATC Manufacturing
Liaisons: Nicholas Questad, Jon Robbins, John Hemmingson, Trevor McCrea, David Leach, Jamie Langabeer
School of Business Partners: Dr. Chris Stevens, Erin Sofianek, Bryce Owen, James Rebro, Meghan Mahoney, Matthew Huguet, Niko Jacobson

In carbon fiber thermoplastic manufacturing, the disposal of waste parts is a growing concern. Carbon fiber by nature is not a biodegradable product and it will essentially last forever. Our project addresses this issue by finding a way to repurpose the carbon fiber thermoplastic waste material through reconsolidating scrap fibers. We were able to create a recycled sheet of carbon fiber thermoplastic and test the mechanical, physical, and thermophysical properties of the material. With the acquired data we were able to suggest multiple market segments in which this material could be used to create parts for sale, thus suggesting the possibility of a more sustainable waste stream in the carbon fiber thermoplastic manufacturing space.

ENSC 73—Solar Updraft Tower

Logan Wentland
JJ Doria
Kevin Smith
Melise Santos
Nathan Harvill
Kameron Jackson
Advisor: Dr. Pat Ferro
Sponsor: Avista Utilities
Liaisons: Carlos Limon, Curt Kirkeby

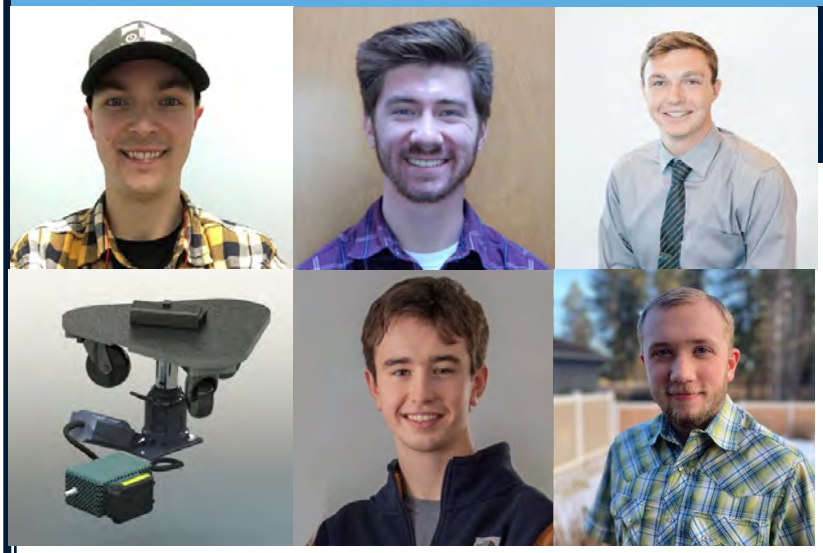
A solar updraft tower is an up-and-coming form of clean energy that harnesses forced convection and converts it into electricity with a wind turbine and generator. The focus of our project is to improve upon past towers by optimizing chimney, collector, turbine efficiencies, and adding a thermal energy storage system underneath the tower. Today there are 1.3 billion people without electricity which results in minimal access to light, heat, communications, refrigeration, health devices, running fresh water and more. Providing a low maintenance, clean energy resource, would allow these communities to generate electricity that is free from importing fossil fuels and free from pollutants that may contaminate water or destroy other resources. Therefore, we are working with Avista to develop a prototype solar updraft tower that can provide communities with the electricity for these resources.

Mechanical Engineering Projects

ENSC 74—Underwater Structural Sensor Development

Joshua Masters
Alex Lloyd
Martin Geiger
Max Gantar
Advisor: Dr. Tim Fitzgerald
Sponsor: Niricson Software
Liaison: Joshua Fowler

Our sponsor, Niricson Software, has a mission to make dam infrastructure condition assessment safer by using their patented 3D digital technology software to detect voids and potential hazards within the structure underwater. Our team was tasked with two key objectives to tackle this issue: to create two different types of concrete samples for testing, one with voids and cracks, and the second without. The second task was to create a hardware that is able to detect the faults and cracks of the dam structure underwater. We as a team had procured the samples of concrete so that it can simulate a typical dam wall structure and can be transported safely to an underwater environment for further testing without harm to real dam structures. We had also created a feasible prototype that has waterproof capabilities which allows our sponsor's 3D software abilities to safely identify subsurface and surface-level defects in an underwater environment. Niricson Soft-



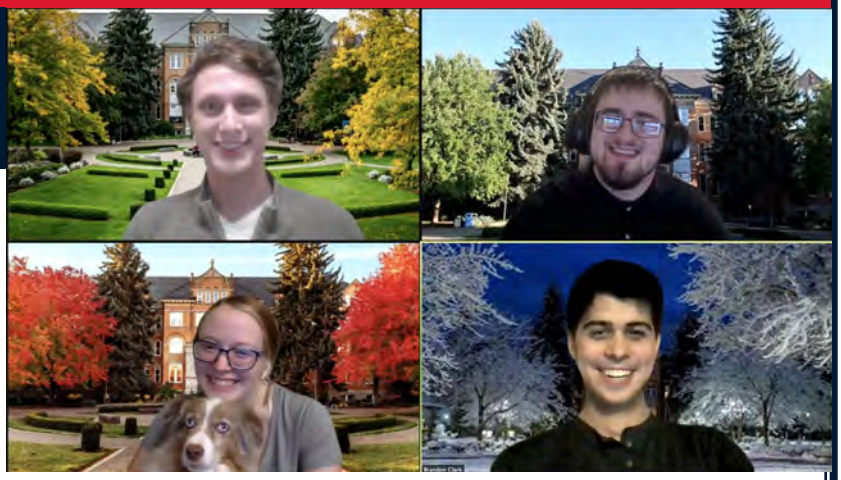
ENSC 75—Self-Leveling Skate

Nick Carter
Matt Jewell
Patrick Gaylord
Joseph Benson
Advisor: Mitch Beard
Sponsor: Haakon Industries

Our sponsor, Haakon Industries, challenged us to design and manufacture a new means of leveling their high-end custom HVAC units during the build phase. The preexisting skate that Haakon utilizes to move these builds works well within the facility, meaning that our team was left with engineering a lifting mechanism and system capable of reaching a high degree of level. Design iterations led us to the decision that automation of the lifting would be accomplished through sensors which communicate with a low-profile bottle jack, powered by previously existing shop floor airlines, to stop raising the HVAC frame upon reaching a level plane. Our completed project reduces the labor time from an hour and a half to mere minutes. Instead of using a pry bar to raise the frame enough to fit thin metal shims for leveling, the unit can now be leveled with the touch of a button.

Computer Science Projects

CPSC 01—BioPath Tools for BioChemistry



Daniel Strub
Sean Letts
Hailey Mueller
Brandon Clark
Advisor: Rob Bryant
Sponsor: Dr. Jeff Watson

The problem our product ventures to solve is the lack of easy to use online programs that allow students to simulate and learn about biochemical pathways (long chains of chemical reactions). Our product addresses this issue through an easy to use interface with a user friendly video that explains how to use our website and navigate from page to page. The goal our team was tasked with these past two semesters was to implement several key functionalities such as the ability to study circular pathways and running the server on Amazon Web Services (AWS). Running the web server on AWS allows anyone, including those off of Gonzaga's wifi to use it. The addition of curricular pathway functionality allows for pathways like the citric acid cycle to be created which expands the material students can study using the site.

CPSC 02— ComSem

Alex Giacobbi
Jalen Tacsiat
Joey Torii
Nate Kirsch
Advisor: Rob Bryant
Sponsor: Dr. James Hunter

Communication Seminar , or "ComSem" for short, is a virtual learning environment that equips teachers with the tools they need to provide corrective feedback (error detection) for English as a Second Language (ESL) students who are pursuing a higher understanding of English grammar and syntax. Educators using ComSem can create online worksheets for their classes of students to fill out, then can directly evaluate their students' understanding of English by listening to reformulations of the students' answers and the typed expressions. This year, we focused on developing three key areas: Speech to Text functionality for Teachers and Students, a sentence analysis screen where teachers can break down student sentences with grammatical errors, and finally, a search screen for those annotated sentences. After these three key areas were fully developed, we then developed Machine Learning capabilities for the sentence analysis screen.

Computer Science Projects

CPSC 03—GU Walking Tour App

Nick Latham
Toby Okoye
Michael Peters
Spencer Jacobs
Advisor: Rob Bryant
Sponsor: Dr. Veta Schlimgen

Even before we were met with the challenges of a global pandemic, the only way for visiting families to learn about Gonzaga was to set up an in-person tour. Although informative, the process of taking a tour required a significant amount of time, something that not everyone has. The administrative web portal and walking tour application that we have developed gives students – both current and potential – a more practical way to learn about our University. It gives staff and faculty an outlet to share the amazing stories behind our institution, and it ultimately breathes new life into who we are and where we come from as a University. Administrators (I.e., staff members, archivists, professors etc.) can create tours through the web portal, designating stops on a map, uploading text, images, or videos to specific stops, and finally publishing those tours to be taken by anyone with a smartphone. Visiting families and current students alike can download the smartphone application and select one of the tours hosted by an organization near them, learning about the extraordinary history and intricate culture of Gonzaga University along the way. All at their own pace, on their own time.

CPSC 04—VR Escape Room

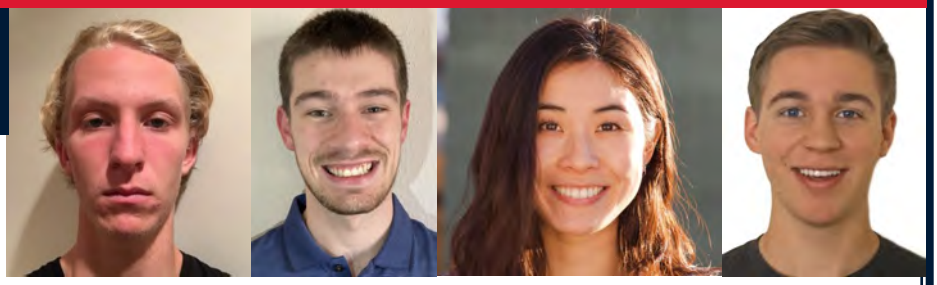
Elizabeth Larson
Amy Fraizer
Charles Walker
Chloe Crawford

Advisor: Rob Bryant

There is a constant push to make learning fun and engaging. Our project adds to these efforts, by combining education with the interactive component of virtual reality (VR) and the thrilling nature of escape rooms. The software we created allows teachers to input questions that they want their students to answer, allowing for a customized experience for all subjects and grade levels. Students can answer these questions by strapping on an Oculus Quest headset and completing a series of challenges to try and escape the VR room.

Computer Science Projects

CPSC 05—Real Estate Machine Learning



Kyle Pavey, Matthew Schwartz, Nicole Bien, Ryan Brown
Advisor: Bruce Worobec
Sponsor: Immobiliare
Liaison: Graham Morehead

Product Immobiliáre focuses on calculating future real estate pricing predictions for both house and rental properties. Machine learning and complex system analysis will be used to model Washington D. C's future real estate prices. These computed values will be generated based on a neural network which will train on years of preexisting data and then be able to make accurate predictions of future real estate prices. This product will help housing developers make rational and just decisions on when and where to invest. It will allow investors to potentially see future economic trends, as well as predict when and which neighborhoods will start growing. With Immobiliáre, it will mitigate guesses by providing a consistent and reliable system. Furthermore, it will lead to an increase in revenue for companies and less risk when considering what areas to develop in.

Matthew Triebes, Sabrina Ollestad, Alex Weaver, Nathan Flack
Advisor: Bruce Worobec
Sponsor: Kaiser Aluminum Liaison: Jeff Foutch

CPSC 06—Roll Management System

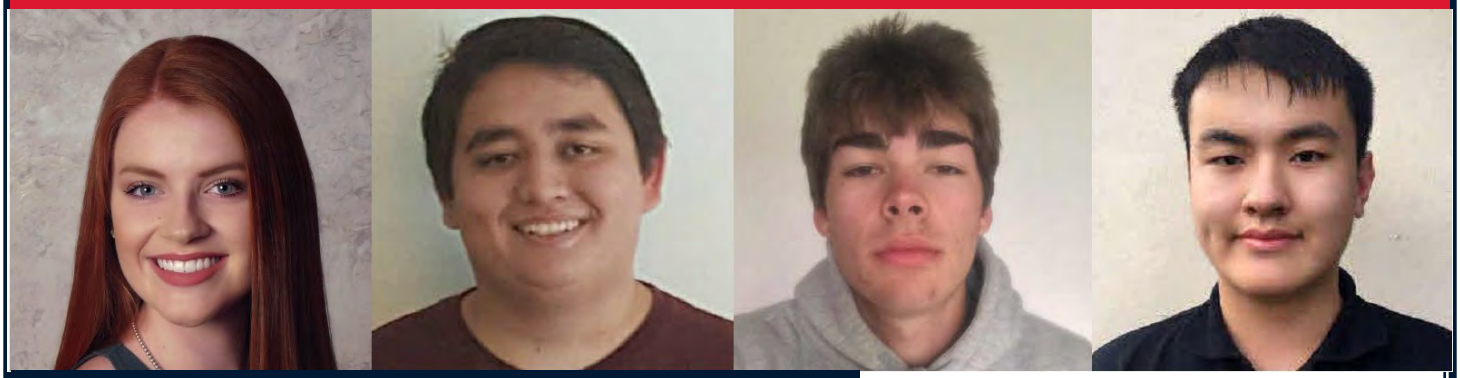
Kasier Aluminum currently relies on a paper forms system to keep track of their chock and bearing records as well as a manual system to monitor their rolls. Our project provides them with an automated system to keep better maintenance records for their chock and bearings as well as a web-based application to view roll grid histories and calculates predictions for their lifetimes in the shop. The system we set up allows Kaiser Aluminum to better prepare for the purchasing of a new roll far enough in advance to not have to pay expensive expedite fees. The chocks and bearings management system fully transfers the current all paper system over to the web for easier recordkeeping.

CPSC 07—Semipro Games

Jackson Lindsay, Ian Gioffre, JR Palmer, Jackson Ricks
Advisor: Bruce Worobec

People want to create and join micro-tournaments with their friends and others. Semipro Games allows a space for users to do this. For Semipro Games, our team has improved the website and made for a more user-friendly experience. This allows users to more easily play in tournaments with friends and other competitors.

Computer Science Projects



CPSC 08—Test Data Analysis Software

Bailey Stone, Nicholas Kenworthy, Ben McDonald, Arron Cushing
Advisor: Bruce Worobec
Sponsor: Buck Knives Liaison: Mike McDonald

Our project addresses the difficulty of processing knife test data that has been collected by Buck Knives to gauge quality and detect trends. Prior to the completion of our project, Buck Knives had been manually inputting the data into excel and manipulating it by hand, which resulted in inconsistencies and inefficiencies in the end result. We ultimately produced a data processing app that automates this process by graphing, filtering, and curve-fitting the data with the push of just a few buttons. Our application works on three different types of knife testing methods: CATRA, Impact, and Cycle tests.

CPSC 09—Facial Recognition Security Lock

Not pictured: Kevin Lunden, Carter Mooring, Drew Bies, Shawn Jones
Advisor: Scott Broder
Sponsor: CEDE

The goal of our project is to provide users with an easy way to register themselves and friends to enter their home at any time, simply from a glance. We will take the footage from a Ring Doorbell, OpenCV will analyze the faces in the footage and determine if the person is allowed in the home. If the person is recognized and allowed, the Noke Smart Lock will be told to open, and access is granted to the person at the door.

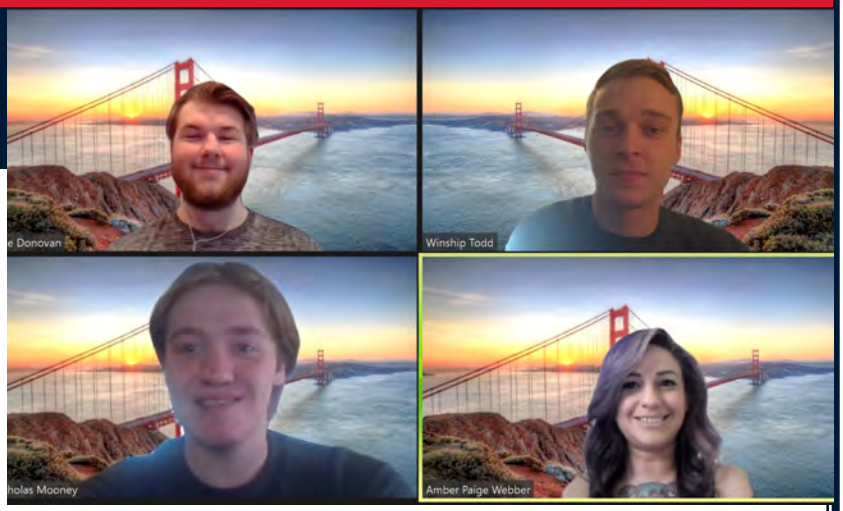
CPSC 10—Align

Max Nelson
Anna Smith
Caterina Valdovinos
Advisor: Scott Broder
Sponsor: CEDE
Liaison: Tanya Edgley

Those who enjoy practicing yoga alone and are unaware of the proper alignment are at risk to self-inflicted injures caused by poor form. Our app seeks to provide a way for people to receive professional feedback at home. Align is an Android application that checks a user's yoga form using live feed video, suggesting areas for improvement as the user practices yoga. This not only protects the use but also educates them on the proper form.

Computer Science Projects

CPSC 11—Boeing Cabin Experience



Cole Donovan
Win Todd
Nick Mooney
Paige Webber
Advisor: Dr. Gina Sprint
Sponsor: The Boeing Company

Currently engineers can only parse through data gathered by flight tests when the flight test has been grounded. This can make it a difficult task to troubleshoot a new program onboard the aircraft. Preferably engineers would like to gather and analyze this data while the flight test is in the air and being able to analyze the data without having to be at the location of the flight. We have created an app that gathers and displays data for Boeing employees in real time. This allows for quicker and more efficient testing of Boeing products and features.

CPSC 12—ZagIM

Cade Newell
Gharin Pautz
James Stevenson
Kat Sotelo Jimenez
Advisor: Dr. Gina Sprint
Sponsors: Rudolf Fitness Center (RFC)

Gonzaga University boasts one of the highest levels of intramural engagement from students among all universities, sitting at just above 60% participation. However, the current system Gonzaga uses for hosting intramurals, called *IMLeagues*, has issues relating to its user interface, usability, admin features, and much more. Our project, *ZagIM*, seeks to improve the admin and participant experience of participant experience of participating in intramurals by creating a new and improved website. ZagIM allows admin users to create sports, divisions, and leagues and automatically schedule games, which reduces and improves their existing workflow. Participants can create and join teams and provide their own availability. Our team has produced a platform for Gonzaga University's Rudolf Fitness Center to easily host intramural leagues and promote higher participation from students and athletes alike.

Computer Science Projects

CPSC 13—BOEING 360-Web App

Armando Valdez, Luke Mason, Eric Av, Karsen Hansen
Advisor: Dr. Yanping Zhang Sponsor: The Boeing Company Liaison: Donald B. Lee

The problem our team addressed was the disconnect between airplane passengers and the wonders of our world that lie just below our feet, yet out of view and reach as we soar past it all. Our team sought to connect passengers with these global points of interest from the unique perspective of 30,000 feet above them, through the engaging and exciting new perspective of 360 degree, HDR live streams along with live maps. Both of these features include pop-ups for nearby points of interest which can be interacted with in a meaningful way; whether that be to pass the time or plan a whole new trip. To accomplish this our team built out a custom web application which widely adopted the MERN web-technology stack (minus REACT). This web app was the foundation of our project, hosting our flagship features; the 360-degree live stream and the offline capable live-map, both of which are capable of securely operating over local area network without web accessibility. To capture and stream in 360-degree video we built a custom 360-camera using a Jetson Nano microcomputer from NVIDIA which features robust graphics processing capabilities and easily scales into AI/AR (as opposed to Raspberry Pi). For the camera component, we used a PICAM360 camera module and processed the output using proprietary libraries to ultimately embed the dewarped, navigable 360-stream into our web app. We then built out simulated location services, along with a database for points of interest which dynamically populate as they pass nearby (within a defined radius). These populating points of interest can then be interacted with to view, engage, and connect with in a meaningful way.

CPSC 14—Intelligent Virtual Assistant

Ryan Schoenlein
Kellie Colson
John Hyde
Caroline Sonnen
Advisor: Dr. Yanping Zhang
Sponsor: Verint
Liaison: Cynthia Freeman

When arriving in a new town, college students often feel overwhelmed by being in a new city and getting acquainted with their new surroundings both on and off campus. We have created a chatbot to act as an Intelligent Virtual Assistant for students and community members to ask questions and get recommendations on where to eat and what to do. We have produced the chatbot and database using the Google products Dialogflow and Firebase to create a chatbot that asks the user questions and uses their answers to get the perfect output from the database.

THANK YOU to our Sponsors!

The design projects and resources required to implement the many engineering and computer science projects during the 2020-2021 academic year were generously provided and supported by the following sponsors:

Above: ENSC 43 testing their prototype, MySleeve, a shooting sleeve that collects data that analyzes an individual's shooting form that provides feedback to improve a player's shot. Along with the shooting sleeve with motion trackers, this team designed a desktop application as well as a backend server to store the data.

Assured Independence
ATC Manufacturing
AVISTA
Buck Knives
Carlos Limon
Christopher Nicol
City of Spokane
Colin Quinn-Hurst
Comsem.net
Dan Buller
Dan Parshall
David Leach
DOWL
Dr. James Hunter
Dr. Jeff Watson
Dr. Marsha Pactol
Dr. Steve Schennum
Dr. Veta Schlimgen
Gonzaga Basketball
Gonzaga University Biochemistry
Gonzaga University Dept. of Mech. Eng.
Gonzaga University ESL
Gonzaga University History Dept.
Haakon
Immobiliare
Integrus Architecture
John Hemmingson
Joshua Fowler
Kaiser Aluminum
Keely Jenkins
Kerry Curran
Kevin Damron
Knife River
KREM 2
Lung Technologies LLC
Mags Shaffer
Mike McDonald
NIOSH
Niricson Software
Oregon State University
Osborn Consulting
Quanta Subsurface
Ron Seubert
Rudolf Fitness Center
SAE Baja Club
SARL
Scott Broder
Spokane County
Spokane Wastewater Management
Tanya Edgley
The Boeing Company
The Lands Council
Trevor McCrea
Tyler Seth
Verint
WaltJay Consulting
Walter Jakubowski
xpollin