W | ELECTRICAL & COMPUTER ENGINEERING
UNIVERSITY of WASHINGTON

Virtual Exhibition

JUNE 3-4

2021 ENGINE

engineering | innovation | entrepreneurship

MESSAGE FROM **THE CHAIR**

Welcome to the sixth annual ENGineering INnovation and Entrepreneurship (ENGINE) Showcase at UW ECE. Every year, it's a delight to invite our industry and campus colleagues to join us as we feature and celebrate the hard work of our students, who will soon be graduating to become the next generation of electrical and computer engineers. The students here today comprise the majority of our graduating seniors.

Because of the ongoing impact of COVID-19, this year's ENGINE Showcase will be held virtually, with student panelists presenting their work online. Over two days, we are featuring 39 team projects that cover topics as diverse as digital health, cybersecurity, power systems, machine learning, communications and robotics.

The projects here arise from ENGINE — our engineering entrepreneurial capstone program. ENGINE was created to enable students to work in teams on industry-sponsored projects, and it is the culmination of a student's electrical and computer engineering education. This program, generously endowed by our alums Milton and Delia Zeutschel, is designed to develop students' skills in collaborative system engineering, innovation, entrepreneurship, project management and product development. It is also a way for our industry partners to benefit from the rich innovation culture at UW ECE.

ENGINE was developed in 2015, and with leadership from UW ECE Associate Professor and Industry Liaison Payman Arabshahi has grown from just four projects six years ago to approximately 40 over the last couple of years. Milt and his business partner John Reece have also spent significant time to give feedback and to shape the program. In addition, John has given several lectures to our students over multiple years on career development, teamwork, entrepreneurship and leadership.

I wish to extend a special thanks to all our industry sponsors for their generous contributions, as well as their flexibility and creativity, helping students to complete their projects in a virtual setting. I would also like to thank our faculty mentors: ENGINE Program Director Payman Arabshahi, as well as College of Engineering Capstone Director Jill Kaatz and Associate Director Dorian Varga. Together, they are responsible for establishing and coordinating industry partnerships that support the projects you will see today. Thanks goes as well to our amazing ENGINE teaching assistants, Shruti Misra, Daniel King and Haobo Zhang, for their excellent work and dedication to our students.

Congratulations to all students on the completion of your final capstone projects! The knowledge you have gained from this experience will serve you well in the coming years. I have no doubt that you will build successful and rewarding careers.

In closing, I want to recognize and thank our UW College of Engineering Dean Nancy Allbritton. She has been a steadfast leader and a great support to our Department during these most challenging times.

I look forward to having the chance to talk with you about future collaborations, whether in-person, virtually or via email. Enjoy the ENGINE Showcase!

Eric Klavins

UW ECE Professor and Chair

POSTERS

VIDEOS

Ring Color
Cyan
Blue

Mob Type 1	Mob Type 2	Players
Mob Type 1	Mob Type 2	Players
Mob Type 1	Mob Type 2	Players
Mob Type 1	Mob Type 2	Players

120 EV CHARGING SPOTS

2021 ENGINE PROJECTS

01

STUDENTS
QIHUANG CHEN,
CELESTE CHENG,
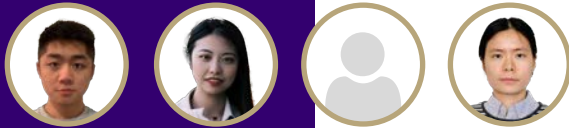COLLEEN PARK,
YILIN WANG

FACULTY ADVISER
KEN EGURO

INDUSTRY ADVISERS
MICHAEL NASSIRIAN,
MARKO MUNDA

SPONSOR
ARVR ACADEMY

eCoffee: Remote Ordering Development

In many current smartphone retail purchase applications, retailers lack foot traffic, exposure to customers, and have difficulties reducing inventory, while consumers lack access to time-limited sale items. This student team, sponsored by ARVR Academy, worked to design and implement a web interface/retailer dashboard that allows retailers to manually send notifications to customers, and a corresponding customer application that allows customers to place orders.

03

STUDENTS
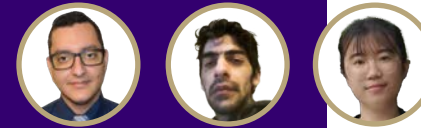RAFAEL LAYA,
UMAIR LIAQAT,
YUJIA LIU

FACULTY ADVISER
ARINDAM K. DAS

INDUSTRY ADVISERS
JOE EDWARDS,
JOEL VENDERGRIENDT,
ALDEN DOYLE,
JAMIE FREED,
AARON SEVERANCE

SPONSOR
MICROCHIP

Anomaly Detection for Disaster Prevention in an Industrial Setting

Industrial equipment degrades with time, making it hard to predict when a potentially costly system failure will happen. In certain cases, equipment's acoustic signatures changes as a result of degradation. This student team worked to demonstrate the ability of convolutional Neural Networks (CNNs) to detect various acoustic anomalies, help improve performance metrics, and perform inference.

02

STUDENTS
HONG LIANG CHEN,
JORDAN HSU,
KRISTIANA SORANAKA

FACULTY ADVISER
ELI SHLIZERMAN

INDUSTRY ADVISERS
GUOGUO CHEN,
XUCHEN YAO,
HARRISON HUANG

SPONSOR
SEASALT.AI

ngMeeting: Live Meeting Transcription and Action/ Topic Summarization

To help aid effective decision-making following a meeting, as well as extensive note taking during a meeting, this student team worked to increase the accuracy of ngMeeting, a meeting transcription system that records in-person and telephone meeting conversations to make spoken communications close to real-time, accurate and easily searchable and actionable.

04

STUDENTS
HANG MAI,
CIEL SUN,
HENG-YIN CHOU

FACULTY ADVISERS
JIM RITCEY,
JOHN REECE,
PAYMAN ARABSHAHI

INDUSTRY ADVISERS
GAIA BORGIAS,
BRIAN BROOKE,
SUZANNE SCHRECK

SPONSOR
SOUND TRANSIT

MIC Park & Ride Project

This student team worked to help the UW Mobility Innovation Center (MIC) and Sound Transit to create a cost-effective electronic system to gather data about the utilization of parking spaces and to share more accurate information about parking availability.

05

STUDENTS
HUNTER CAMFIELD,
LEXIE CHAU,
WAYNE LAI,
MICHAEL PHENICIE,
BRENDAN WEIBEL

FACULTY ADVISER
JOHN RAITI

INDUSTRY ADVISER
JONATHAN NESS

SPONSOR
VERAMINE

Disrupting Ransomware with Endpoint Deception Hax

Ransomware attacks are becoming more prevalent in the world. Some ransomware is designed to avoid computers with certain configurations. This student team worked to find common configurations that these ransomwares check for and to exploit them as a technique to obstruct ransomware encryption. They also worked to expedite the testing process to allow for rapid testing in the future.

07

STUDENTS
JAMES LEE,
CHASE DEITNER,
PETER TSANEV,
MILLER SAKMAR

FACULTY ADVISERS
SAM BURDEN,
BLAKE HANNAFORD

INDUSTRY ADVISERS
CASSANDRA RIEL,
BENJAMIN MAURER,
ERIC JONES,
JOE RECK,
NICK VALLADAREZ,
RYAN EDWARDS,
COOPER BOWEN,
JACOB YAKAWICH

SPONSORS
BOOZ ALLEN HAMILTON,
NUWC DIVISION KEYPORT,
UW APL

Human-Powered Submarine (HPS) Autopilot

University of Washington (UW) HPS is a student organization that races single-occupant submarines around timed courses. This student team worked to provide proportional, integral, derivative (PID) control of the submarine control fins to mitigate unintended roll at high velocities in races.

06

STUDENTS
ARAVIND NARAYANAN,
ZHUORAN ZHOU,
BOB LIN

FACULTY ADVISER
LILLIAN RATLIFF

INDUSTRY ADVISERS
CHANGZHENG JIANG,
SRINIVASA PARVATHAREDDY,
AKIRA ZHANG,
KUMAR MADDALI

SPONSOR
TELENAV

Error Detection of Text Queries Transcribed from Voice Input

People use their voices for in-car navigation systems. However, the system might have trouble processing exactly what the user says, depending on noise from surroundings as well as accents. The system will come up with a few strings for what the user could have said. For example, if the user said "university," then the system's voice processor might hear two possibilities: "university" and "universe city". This team worked to rank these possible queries in order of likelihood of what the user actually meant in order to help increase in-car navigation system accuracy.

08

STUDENTS
ALYSSA WEED,
SANDESH BANSKOTA,
MICHELLE CHUANG

FACULTY ADVISER
KEN EGURO

INDUSTRY ADVISERS
JACI BARTOL,
JAMES SEAGRAVES,
JIM PATTISON,
DAMON ZIRKLER,
CHRIS BARBER,
TONY HEUPEL,
COLLEEN PIPER,
LISA RODERIQUES

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ALASKA AIRLINES

Interactive Layout of Passenger Accommodation (LOPA) Tool

LOPAs are a standard way to represent the layout of passenger accommodations within an airplane, such as seats and lavatories. They are required by the Federal Aviation Administration to certify an airplane. This student team worked to create a web-based application that provides a seamless user interface for creating LOPAs – with a cloud-based LOPA storage and permission management system – to improve project creation, multitasking and editing. The student team also worked to integrate part information from all fleets into an easily accessible display system.

09

STUDENTS
CHRISTIAN LANCASTER,
APURV GOEL,
WENXUAN YANG

FACULTY ADVISER
BAOSEN ZHANG

INDUSTRY ADVISERS
AMAN NIJHAWAN
KEVIN GRADY

SPONSOR
NUTANIX

Infrastructure Power Management System "PowerMan"

Nutanix is a cloud computing company that offers a variety of services for on-premises and hybrid cloud deployments. Nutanix offers a disaster recovery service, Xi Leap, which utilizes Nutanix's own data centers to provide reliable storage for disaster recovery. Presently, the Nutanix data centers do not have a central solution for power management in their data center. To perform even a trivial power cycle operation, they must file an IT ticket, which is costly in terms of time and human labor. This student team worked to design a system as a microservices type application, developing on local Kubernetes cluster, to provide workload isolation and scalability, including processing incoming requests, securely communicating with devices in the Nutanix data center, and returning a response to the user.

10

STUDENTS
RIZHENG TAN,
ZIHENG LIN,
KAI TAN

FACULTY ADVISER
RANIA HUSSEIN

INDUSTRY ADVISER
LENNON DAY-REYNOLDS

SPONSOR
HASHICORP

Nomad Deployment Recipes

This student team worked to develop an open source command-line utility and API to support single-command application deployment and service catalogs (chart repositories) in Nomad, HashiCorp's workload orchestration and scheduler.

11

STUDENTS
CECILIA BARNES,
JIWOO PARK,
MATTHEW SULLIVAN

FACULTY ADVISER
ALEX MAMISHEV

INDUSTRY ADVISERS
TOM MITTAN,
PETE SLUCS,
MATTHEW NGUYEN,
JAMES WALTNER

SPONSOR
LOCKHEED MARTIN

Open Source Data Hub for Prognostics and Health Management

This student team worked to make state-of-the-art machine learning and artificial intelligence techniques more accessible to engineering domains by providing suitable benchmark datasets with interactive tutorials for advancing prognostics.

12

STUDENTS
USMAN KHAN,
MRINALINI MOHANRAM,
XINYUE SUN

FACULTY ADVISER
MING-TING SUN

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JAMES NELSON

SPONSOR
PACCAR

Autonomous Trucks: Thermal Imaging Camera–Machine Learning for Object Classification

Many autonomous vehicle systems in development today rely on traditional color video in addition to LiDAR and/or Radar information to identify and localize objects surrounding the vehicle by utilizing Deep Neural Networks. Unfortunately, some classes of objects such as pedestrians and cyclists can be difficult to identify. This student team worked to analyze the possibility of using thermal imaging data instead of camera data, and developed a Neural Network to optimize the performance.

13

STUDENTS
ADITYA KARAN,
ALEX WANG,
RUI YANG

FACULTY ADVISERS
PAYMAN ARABSHAHI,
ARINDAM K. DAS

INDUSTRY ADVISERS
BIJAN ARBAB,
MOHAMMAD HAGHIGHAT,
SRUIT SAHANI

SPONSOR
INTEL

Rise of Web–Based Computing Trends on Client Side

This team worked to explore behaviors and trends of web-based usage and specific user hardware attributes, to identify trends in user behavior that might be helpful for future CPU development.

14

STUDENTS
PARASHAR MOHAPATRA,
THAO NGUYEN,
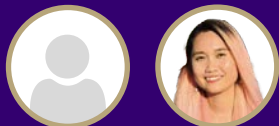JOSUE QUINTANA

FACULTY ADVISER
BLAKE HANNAFORD

INDUSTRY ADVISER
MARISSA KRANZ

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UW MEDICINE

Cyclotron Beam Current Amplifier: Redesign and Expansion

The Particle Cyclotron creates proton and neutron beams to remove tumor cells in cancer patients. As more cyclotrons have begun using proton beam radiation therapy, the cyclotron at UW Medicine is the only one left in the U.S. using neutrons to kill cancerous cells. Developed in the 1980s, the cyclotron has many components that are now outdated and require redesign consideration. The cyclotron's Beam Current Amplifier (BCA) System works by receiving feedback from devices that narrow beams and particles throughout the system, known as collimators. The BCA System receives the collimators' current when the particle beam is misaligned and represents it using a digital dial. Operators use this information to tune the trajectory of the beam. This student team worked to redesign the BCA System, now called the Beam Current Signal Conditioner Card, from an analog system to a digital system. This modernization and redesign helped with display output feedback precision, machine bulkiness, spacing and safety replacement issues, and also reduced the number of parts required to run the system.

15

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JINGHUI SONG,
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FACULTY ADVISER
BLAKE HANNAFORD

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ALESSANDRO BUSCICCHIO

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NASA JPL

Cooperative Autonomous Distributed Robotic Exploration (CADRE) R&D

The Cooperative Autonomous Distributed Robotic Exploration (CADRE) project led by NASA is an initiative focused on the creation of a network of shoe-box-sized mobile robots that could enable future autonomous robotic exploration of the Moon, Mars, and beyond. This student team worked to create a software stack to facilitate joint navigation between multiple robotic operators. Additionally, the team created design proposals for improved mobility and charging by creating an improved robotic tail, creating a charging platform, and creating a circuit designed to characterize solar cell efficiency taking into account dust and debris accumulation on the cells.

16

STUDENTS
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REESE O'CRAVEN,
KELSEY FOSTER,
CARMEN TWITCHELL

FACULTY ADVISERS
DANIEL KIRSCHEN,
JAN WHITTINGTON

INDUSTRY ADVISER
LUCIE HUANG

SPONSOR
SEATTLE CITY LIGHT (SCL)

Managed EV Charging

This student team worked to write a transportation electrification plan including solar generation for UW Transportation and for Recology, as well as develop a software tool to schedule and allocate charging for an EV fleet that meets operational requirements while optimizing the demand for solar grid capacity. The software tool and transportation electrification designs will help UW Transportation achieve its goal of reducing the University's carbon footprint to 45% in 2030 and help Recology electrify its fleet efficiently in the near future.

17

STUDENTS
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JUNYI WU,
WILSON MARTINEZ

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TORSTEN HIRCHE

SPONSOR
PIQARD

Spherical Drive Robotic Control

Currently, robots' movements are not very maneuverable for traveling in multiple directions. This student team worked on building a prototype for a self-balancing spherical robot that can be more flexible, agile and overall more maneuverable.

19

STUDENTS
ROCKY ZHENXIANG FANG,
SISIR KADIVETI,
ARMAN KAZI,
HANZE (SIMON) ZHANG

FACULTY ADVISER
RANIA HUSSEIN

INDUSTRY ADVISER
JASON MAJOR

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MICROSOFT

Improve Minecraft Pathfinding

In the world of Minecraft, there are many different types of mobs with distinct mob sizes and moving abilities. The current pathfinder in Minecraft has a very high time complexity in helping a mob with sizes larger than 1x1 find the optimal path to its target. In addition, Minecraft is limited in the types of blocks they can add due to limitations in the pathfinder. For example, vertical slabs create unique challenges that the existing blocks do not have. The current pathfinder in Minecraft cannot find the optimal path if the optimal path involves partial blocks. This student team worked to run pathfinder with various mob sizes with partial blocks, determining that Big O runtime is not affected when all search notes are generated before pathfinding.

18

STUDENTS
ROEE HOROWITZ,
ERIK HUANG,
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INDUSTRY ADVISERS
ROBERT SANCHEZ,
RADHA KOTAMARTI

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MICROSOFT

Apply the Design Pattern of Entity Component System (ECS) for a Cross-platform Network Layer

Minecraft's game engine is built on an ECS architecture, but currently its network and replication system is outside of the ECS. This student team worked to build a sandbox multiplayer game with an ECS engine using an ENTT game programming library. The team also built a replication system around that game and recommended a design pattern for an ECS replication system for Minecraft that assumes a reliable data transfer protocol.

20

STUDENTS
NICHOLAS B. IAROSLAVTSEV,
ZEYU YE,
FORREST MILLER

FACULTY ADVISER
DALE WINEBRENNE

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UW APL

Rise of Web-Based Computing Trends on Client Side

This team worked to explore behaviors and trends of web-based usage and specific user hardware attributes, to identify trends in user behavior that might be helpful for future CPU development.

21

STUDENTS
MICHAEL MUSTER,
YANG XU,
WILLIAM WRIGHT

FACULTY ADVISER
HUNG-MIN HSU

INDUSTRY ADVISER
KEVIN LIU

SPONSOR
WYZE

Harry Potter Marauder's Map

Similar to the way Harry Potter Marauder's Map functions in the popular and well-known literature series, this student team worked to provide a Multi-Target Multi-Camera Tracking system to help improve the security of a mapped space as well as the tracking of an individual within a mapped space. Some examples of how this technology can be used include tracking at-risk individuals in a long-term care home or detecting unauthorized intrusions.

23

STUDENTS
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CHENG ZHU,
YESIBAO MUHAMATI

FACULTY ADVISER
BLAKE HANNAFORD

INDUSTRY ADVISER
VIVEK BURHANPURKAR

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CYBERWORKS

Autonomous Self-Driving Wheelchair Lateral Drift Detection

Autonomous wheelchairs increase freedom and ease of mobility for the most vulnerable people in society. However, their autonomous navigation suffers from occasional loss of loop closure and localization. This can be disastrous in the real world either in a hallway, roadway or sidewalk. This student team worked to develop a system that uses camera vision to check for lateral drift of the wheelchair from the desired path.

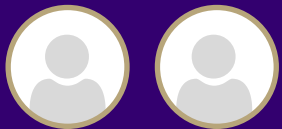# 22

STUDENTS
GREG JOYCE,
QISHI ZHOU

FACULTY ADVISER
FAISAL HOSSAIN

INDUSTRY ADVISER
FAISAL HOSSAIN

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WSDOT

UW Civil and Environmental Engineering Hydro-Cub

The hydraulic infrastructure or assets maintained by the state of Washington Department of Transportation (WSDOT) such as sewers, pipes, and culverts, need frequent monitoring for upkeep. This student team, building upon a platform from last year's team, worked to improve a remote controlled monitoring device that is able to access difficult to reach or tight spaces.

24

STUDENTS
KEYI ZHOU,
MINGCUN FAN,
YIFU WU

FACULTY ADVISER
XIANG CHEN

INDUSTRY ADVISER
XIANG CHEN

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TUPL

Intelligent Chatbot for Customer Support

Tupl, Inc. is a technology company that provides technical services and support to a variety of companies. Tupl sought to design an intelligent chatbot that can accurately and efficiently address the needs of a phone company's customers. While the chatbot is usually powered by natural language processing and machine learning, this student team worked to have the chatbot identify user intent from text input, as well as classify a user's problem, respond with logical answers, and take correct actions according to different customers' situations.

25

STUDENTS
JIARONG QIAN,
NANHSUN YUAN

FACULTY ADVISERS
SREERAM KANNAN,
PAYMAN ARABSHAHI,
WEI CHENG

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NSF,
UW ECE

Blockchain and AI Algorithm for Disaster Response

In the immediate aftermath of a mega-quake, all disaster response agencies and personnel will be completely overwhelmed. External help (primarily from the government) is unlikely to come immediately after a disaster. If neighborhoods rely mostly on such help as the status quo is now, it is likely there will be more fatalities and greater economic loss. As a result, neighborhoods are urged to prepare for community-based survival for up to three weeks. This means that residents must be able to share useful information, carry out essential activities (e.g., staying cool/warm in summer/winter, securing food), and use effective socially integrated technological solutions to enhance their ability for survival and real-time response. This student team worked to develop technologies that enable real time information gathering and sharing (while safeguarding privacy), and solutions for efficient resource matching by leveraging social ties.

26

STUDENTS
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JONATHAN WONG,
DAKOTA MATTHEWS

FACULTY ADVISER
DAVID KROUT

INDUSTRY ADVISERS
HONG TAT,
SAYATA GHOSE,
BRICE JOHNSON,
ROD TJOELKER,
JUN YUAN

SPONSOR
UW COE

Machine Learning Platform for In-Process and Post-Process Inspection

Camera footage of manufacturing processes are manually filtered through human supervision and require inspection for quality control. This student team worked to help Boeing apply computer vision techniques to automate defect detection and assist with quality control, and created an easy-to-use application to deploy these techniques onto local machines.

27

STUDENTS
VEEN OUNG,
KUANG-HSUAN LIN,
CHRISTOPHER ALEXANDER

FACULTY ADVISER
RANIA HUSSEIN

INDUSTRY ADVISER
ROBERT HUNT

SPONSOR
MICROSOFT

Microsoft Save Test Framework (Minecraft)

Minecraft Bedrock edition is currently utilizing "LevelDB" to save worlds data. Although this works well, Minecraft is pushing the technology to the limits. This student team worked to develop a testing framework in C++ that can be used to test and evaluate key/value store implementations in order to allow future Minecraft developers to easily experiment with "LevelDB" replacements.

28

STUDENTS
ERIC MUTSCHLER,
BEA FLORES,
MICHAEL MATHERNE

FACULTY ADVISER
BLAKE HANNAFORD

INDUSTRY ADVISERS
SAM LUEDLOFF,
CONNOR WEBB,
BLAKE WINNER

SPONSOR
ANPC

Transponder Landing System (TLS) Airdrop

Advanced Navigation and Positioning Corporation (ANPC) makes transponder-based aircraft navigation systems which allow for landing in remote environments and places without traditional airport infrastructure. The Transponder Landing System (TLS) has recently been scaled down from a shipping container form factor to the Small Footprint Precision Approach Landing Capability (SF-PALC) design, which makes the whole package able to fit on a 463L pallet- a MIL-STD pallet which is used for transport of items of a variety of shapes and sizes on many different military vehicles and aircraft. This student team worked to design a way to airdrop the TLS from an aircraft in flight, while ensuring the system lands in a target area undamaged, upright and ready for mission performance.

29

STUDENTS
COLLIN PERNU,
RYAN PARK,
RACHEL RODNEY

FACULTY ADVISER
NIRAV DESAI

INDUSTRY ADVISERS
IAN BYRNES,
HENRY BOWMAN,
TROND NILSEN,
BRIDGET SWIRSKI

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MOONBEAM

Moonbeam 3D Ideation Tool

Moonbeam uses virtual reality and artificial intelligence to transform the future of remote creative collaboration. They build tools to help corporate innovation groups work more effectively with startups without the constraints of geography. Through this capstone, this student team worked to develop features to support remote collaboration through diagramming within VR.

30

STUDENTS
ALAA SLEEK,
BATINA SHIKHALIEVA,
SAMUEL KIM

FACULTY ADVISER
RANIA HUSSEIN

INDUSTRY ADVISERS
JOHN SEGHERS,
ADRIAN ORSZULAK,
HALISHIA CHUGANI

SPONSOR
MICROSOFT

AI Behaviour System for Minecraft

Minecraft has over 131 million active users, each running more than 300 mob entities per game. Mob entities compete for resources and produce a high load on the Minecraft server. This student team worked to optimize mob behavior by implementing AI algorithms to improve game performance and reduce the server cost using.

31

STUDENTS
BAOHUA ZHU,
HUIHAO CHEN,
SHRUSTISHREE SUMANTH

FACULTY ADVISERS
HUNG-MIN HSU,
EYHAB-AL-MASRI

INDUSTRY ADVISER
XAVIER YUAN

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WYZE

Package Theft Detection on Wyze Cams

Package theft is a problem that negatively impacts the public, especially during a pandemic situation where the demand of online shopping and package delivery increase tremendously. This student team worked to build a machine learning-based software system that can identify package theft and improve home security levels for families and companies.

32

STUDENTS
BRIAN ARNOLD,
YU-JEN CHEN,
JOHN KELLER

FACULTY ADVISERS
PAYMAN ARABSHAHI,
JIM RITCEY

INDUSTRY ADVISER
PRECIA CARRAWAY

SPONSOR
T-MOBILE

Is This SIM a Drone?

SIM card usage in drones is increasingly popular because it provides a longer range (cellular) connection than Wi-Fi or Bluetooth. The problem with this trend is that Base Station antennas are optimized for terrestrial coverage and drone SIM usage can cause interference, and expose networks to security issues as well. Technology exists to accommodate for SIM usage in a drone, i.e., telecom providers offer drone-specific data plans. This student team worked to use a Logistic Regression model to help T-Mobile find a way to identify customers using SIM cards on cellular data plans to connect those clients to the appropriate technology for their needs.

33

STUDENTS
DEVYANSH GUPTA,
KELLY HO,
MEGAN BUI

FACULTY ADVISER
ELI SHLIZERMAN

INDUSTRY ADVISERS
JIM JENKINS,
RITU GOEL,
SIEKHUOY HOUT

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BECU

Cloud-Based Voice Recognition Security System

Voice recognition is widely utilized for automatic fraud detection. This student team developed a cloud-based voice recognition security system that helps the bank staff verify new and existing members of BECU.

35

STUDENTS
ZACK LYNCH,
KEVIN LIANG,
TANNER POLING

FACULTY ADVISER
TAI-CHANG CHEN

INDUSTRY ADVISERS
ROB GREENWALK,
GWYNN ST. JOHN

SPONSOR
STRYKER

Wireless Blood Oxygenation Sensor: Refactoring Prior Work

This student team worked towards designing a wireless pulse oximetry measurement device capable of measuring SpO2, SpCO and SpMET. The project is a continuation from last year. This year's team iterated on last year's device by refactoring and simplifying the system design to make the device more compact and suitable for use in real medical settings.

34

STUDENTS
AKKSHAJ SINGH,
BRIAN HSU,
ISAAC LI

FACULTY ADVISERS
PAYMAN ARABSHAHI,
JAMES RITCEY

INDUSTRY ADVISERS
AHAMD ARMAND,
JEFF AHMET

SPONSOR
T-MOBILE

T-Mobile Programmable Narrowband IoT Button

Achieving customized functionality on NB-IoT (Narrowband Internet of Things) devices can be time- and resource-intensive. Creating a single, customizable device would essentially eliminate the development process and give the user great flexibility. This student team worked to create an end-to-end NB-IoT device which communicates over the T-Mobile narrowband network. Deliverables included a front-end web application, a back-end for data storage, an IoT portion, and interconnections that execute automated functions.

36

STUDENTS
XIAOTONG YANG,
YUSIE YAO

FACULTY ADVISER
PAYMAN ARABSHAHI

INDUSTRY ADVISERS
TED HANSON,
BRIDGET FAHERTY,
DEBBIE CARNES,
SHELLEY PROSISE,
KONRAD SCHODER,
AL BROWER,
JESSE CHIEM

SPONSOR
UW ECE

Fiscal Web Portal ENGINE Phase II

Currently, the College of Engineering lacks a modern tool to manage requests for administrative services, specifically financial transactions. This student team worked to design and develop a web application that serves as an advanced ticketing tool for UW College of Engineering departments to manage fiscal related tasks (reimbursement, travel, purchase, etc.) from users' request submission through fiscal staff members' approval or denial.

37

STUDENTS
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Wireless Airway Management Systems for Emergency Medical Applications

Capnography is the waveform that shows how much CO_2 is present at each phase of the respiratory cycle. End-Tidal CO_2 ($ETCO_2$) is the partial pressure of CO_2 detected at the end of exhalation. The value is normally 35-45 mmHg. Existing capnography devices utilize side stream technology, which is inconvenient, messy and bulky, and does not provide Emergency Medical Technicians (EMTs) with the most helpful, real-time feedback. This team worked to create a portable capnography device that is capable of measuring End-Tidal CO_2 from the exhaled breath of patient, as well as inspiratory and expiratory flow rate and airway system pressure so that EMTs can know, real-time, whether they are ventilating a patient properly.

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Linewidth Enhancement Factor Measurement for Radio over Fiber Simulation over Multimode Optical Fiber

Currently, aircraft primarily use flexible steel cables and coax cables for control systems; however, the data demand of these systems is increasing exponentially. Optical communication systems utilize light, transmitted over fiber-optic cables, to deliver signals between computers and offer many advantages over electrical systems, such as low power consumption and high data transfer rates. Single-mode fiber (SMF) is well-characterized but transmits only a single signal and is sensitive to vibration and thermal instability, so multimode fiber (MMF) would be more advantageous. This student team worked to characterize a SMF signal with a physical test bench that can determine linewidth, or a way to quantify the received signal's power and quality in order to determine the respective qualities of both SMF and MMF signals and determine whether MMF is appropriate for aircraft applications.

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Autonomous Trucks: Camera–Radar Sensor Fusion for Object Classification and Tracking

Reliable visual perception plays a critical role in enabling autonomous vehicles to safely navigate unseen, unstructured environments. In order to anticipate and avoid obstacles, such a perception system needs to detect, classify, localize and track dynamic objects within range of the vehicle. Many perception systems in state-of-the-art autonomous vehicles rely on LiDAR (light detection and ranging) to produce an accurate geometric representation of the vehicle's environment; however, such systems can be costly to acquire and maintain. This student team worked to create a system that helps with 3D object classification, detection and tracking of dynamic objects to improve motion planning and navigation in autonomous driving.

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THANK YOU

Milt & Delia Zeutschel and John Reece

The UW ECE department is enormously grateful for the vision and generosity of Milt (BSEE '60) and Delia Zeutschel (pictured above), which has enabled us to develop the ENGINE program to its current scale. Through the magnitude of their endowment of the ENGINE program, the Zeutschels are helping to secure the futures of UW ECE engineers and promote continued local and statewide innovation.

We would also like to thank Milt's business partner, John Reece, for his unwavering support, having spent significant amounts of time giving feedback to shape the program. Additionally, John has given several lectures to our students over multiple years on career development, team work, entrepreneurship and leadership.

The ENGINE program is designed to develop students' skills in innovation, systems engineering, and project management. Initiated only five years ago, ENGINE has grown exponentially — from just four projects in 2016 to nearly forty in 2021.

Another component of the endowment is the Milton and Delia Zeutschel Professorship in Entrepreneurial Excellence, which was awarded to Professor Joshua Smith. The professorship allows the department to recruit, retain and reward entrepreneurially-driven faculty who will help build and sustain an engineering entrepreneurial ecosystem at the UW.

ECE is also deeply appreciative of our many industry sponsors for their support in mentoring students as part of the ENGINE program.

John Reece at the 2019 ENGINE Pitch Day event. Photo: Ryan Hoover

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