50TH ANNUAL
SCHOOL OF ENGINEERING
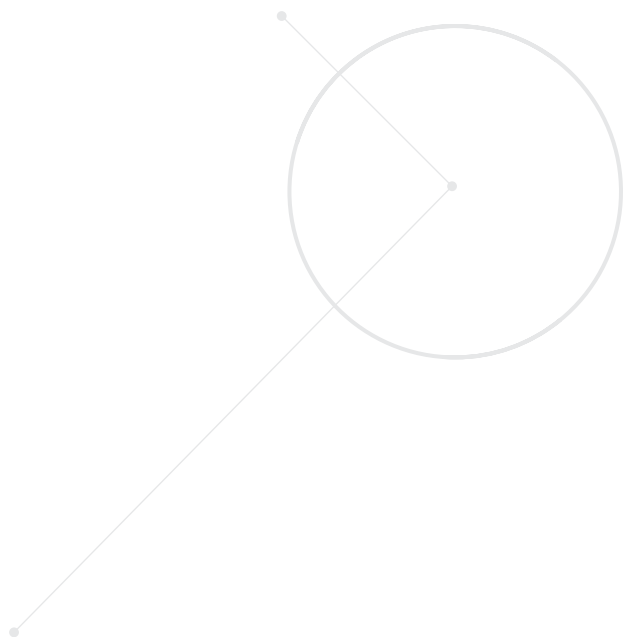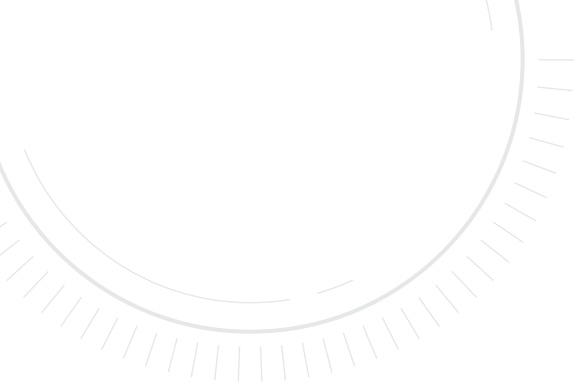
SENIOR
DESIGN
CONFERENCE

MAY 28, 2020 | 2 P.M.

Santa Clara University
School of Engineering

ENGINEERING WITH A MISSION

WELCOME

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Dear students, alumni, parents, partners, and friends:

Welcome to the 50th Annual—and first-ever virtual—Senior Design Conference! We are delighted to have you join us for our student presentations via YouTube (see scu.edu/engineering/senior-design/2020-virtual-conference for session viewing information).

This year's seniors have faced challenges unlike any their predecessors have encountered. Having worked on their capstone projects throughout the fall and winter quarters, the finish line was just coming into view when the coronavirus pandemic forced the shutdown of all campus facilities, students were asked to return home, and within 24 hours, instruction moved to a virtual format.

In adapting to these changes, a number of our teams had to adjust the parameters of their projects. Many students faced the disappointment of not being able witness first-hand their work deployed in a local community or foreign country as they had so yearned to do. But engineers are nothing if not resilient and innovative, and our faculty and students rose to the challenge of completing the work.

At the School of Engineering, our goal is to transform students' lives through distinctive engineering education that reflects both our Jesuit, Catholic tradition and Silicon Valley's innovative, entrepreneurial ethos. We aspire to educate engineers who advance technological innovation and entrepreneurship in the service of humanity. Today's presentations reflect the success of our endeavors.

As we celebrate a half century of senior design, and as we near the conclusion of our students' senior year, we applaud the drive and determination that brings us to this historic moment. Through all the years and all the changes, we are mindful of—and grateful for—the ever-growing community of Bronco engineers who bring distinction to Santa Clara University. We congratulate our seniors for bringing their projects to fruition under these most difficult circumstances, and we thank those of you who have contributed to their success and to that of the School of Engineering.

Sincerely,

Elaine

Elaine P. Scott, Ph.D.
Dean
School of Engineering

BIOENGINEERING
SESSION 1

Optical Strain Sensor for Physical Activity Assessment
2:15 – 2:40
Michael Cromie, Kristen Mosher
Advisor: Emre Araci

Our objective is to design a wearable optical strain sensor to track the physical activities of the upper extremities. Activity sensors currently on the market lack sensitivity, directionality, and electromagnetic immunity. Our optical sensor will provide wavelength-multiplexed spatial data with a single input/output, hence enabling simpler human-wearable device interfacing.

A Microfluidic SMILE: Sensor for Mental Illness Evaluation
2:50 – 3:20
Keala Johnson, Nicole Keller, Shriya Syal
Advisor: Emre Araci

We develop wearable microfluidic sensors to monitor human emotions. The skin deforms with changing facial expressions, causing strain on our sensors. This strain is converted to the displacement of ionic liquids and measured electrically or optically. The technology can be used in the management and diagnosis of mental health disorders.

Power Generation by Genetically Modified Bacteria in a Microbial Fuel Cell
3:30 – 4:00
David Bengford, Sarah Khoilian, Ann McMonigal
Advisor: Maryam Mobed-Miremadi

Our project aims to examine the potential of fourth generation biofuels (genetically engineered bacteria) in a microbial fuel cell (MFC). Our primary research objective is to improve the consistency of the system's power generation over time. Our work will contribute to the fields of bioengineering, materials, and sustainable energy.

Label-free Isolation of Circulating Tumor Cells Using Microfluidics
4:05 – 4:35
Brendan Heap, Samuel Nichols, Anthony Ramirez Guerrero
Advisor: Emre Araci

Circulating tumor cells (CTCs) shed into the vasculature from a tumor and can metastasize to other organs. Our objective is the development of microfluidic and microfabrication technologies for label-free detection and isolation of CTCs and CTC clusters.

BIOENGINEERING SESSION 2

CERVIS: Cervical Cancer Early Response Visual Identification System
2:15 – 2:45
Kira Palazzo, Lauren Serfas, Juliana Trujillo
College of Arts & Sciences Students: Lauren Cherrey, Will Nelson
Advisors: Prashanth Asuri, Michele Parker, Craig Stephens

The aim of CERVIS is to develop a low-cost, minimally invasive, highly specific screening device to detect cervical cancer in low-resource settings, mainly Uganda. The device will indicate the presence of fusobacteria, one that is highly correlated to cervical cancer diagnosis.

Predicting Depression Progression Rates in Radiotherapy Patients
2:50 – 3:30
Ardella Phoa, Joshua Vincent, Shani Williams
Advisor: Yuling Yan

Depression affects more than 10% of cancer patients worldwide and lowers the efficacy of radiotherapy treatments. Recent research shows that PET scans capture depression biomarkers in the brain. We use these images to train a convolutional neural network to identify these biomarkers and classify depression progression rates in radiotherapy patients.

Brainwave Distinguishing Network for EEG Control
3:30 – 3:55
Brent Baculi, Stu Cansdale
Advisor: Yuling Yan

Creating a neural network trained on EEG data that differentiates between focused and relaxed states in the brain. The goal of this network is to provide an alternative control method for people with motor disabilities.

Milkguard from Assay to Kit: Sensor Geometry Optimization
4:05 – 4:35
Emily Brogan, Ariana Haddad, Bridget Woody
Advisors: Ashley Kim, Maryam Mobed-Miremadi

MilkGuard, a hydrogel-based sensor, utilizes enzymatic reactions to produce colorimetric change when E. coli is present in donated human breast milk. By optimizing extraction processes, accounting for variability of conditions, and comparing strains of bacteria, our project lowers the limit of detection of the sensor and verifies robust data collection.

BIOENGINEERING
SESSION 3

Engineering a Switchable Nanosystem for Customizable Therapeutics
2:15 – 2:40
Hanzhe Chen, David Diebold
Advisor: Bill Lu

We are attempting to engineer an exosome with a switchable protein system that can be used for a variety of therapeutic purposes. Our engineered exosome binds to a specific peptide neo-epitope (PNE) which can then be fused with other antibodies to specifically target various surface proteins.

Novel Cancer Treatment Using Engineered Exosomes to Disrupt Cancer's Immune Escape
2:50 – 3:20
Abena Boateng, Carley Fowler, Maritza Soria
Advisor: Bill Lu

Our project is to engineer exosomes to create a novel cancer treatment. This immunotherapy treatment would use exosomes to promote the eradication of cancer by disrupting the PD-1 and PD-L1 immune-escape pathway exploited by cancer cells. Immune-escape pathway disruption would allow killer T-cells to eliminate the diseased cells.

Identification of Messenger Molecule Between Mammalian and Bacterial Cells
3:30 – 3:55
Anna Fraser-Philbin, Alexander Heiler
Advisor: Zhiwen (Jonathan) Zhang

The messenger molecule between bacterial and mammalian cells is identified by using chemical cross-linking techniques to capture and mass spectrometry to analyze the ligands. The molecules will serve as novel drug targets for the development of anti-infective immunotherapeutics.

CIVIL, ENVIRONMENTAL, AND SUSTAINABLE ENGINEERING SESSION 1

Design for Cultural Preservation Center for Nez Perce Tribe

2:15 – 2:45

Catherine Moore, Carolina Avelar, Rodolfo Leon

Advisors: Edwin Maurer, Reynaud Serrette, Sukhmander Singh

Preliminary design of the Cultural Preservation Center for the Nez Perce Tribe within the Nez Perce Reservation in Lapwai, Idaho. This project encompasses the design of a foundation and retaining wall, structural high-ceiling, open circular gathering space, and permeable pavement and infiltration trenches as part of a stormwater management system.

SCU Faculty and Staff Affordable Housing Development

2:50 – 3:20

Deirdre Bonitz, Rachael Han, Ayo Ogunfunmi, Spencer Saito

Advisors: Tracy Abbott, Laura Doyle, Edwin Maurer, Hisham Said, Reynaud Serrette

This project is a mixed-use affordable housing development for Santa Clara University's faculty and staff. Project components include structural analysis and design of the multi-story building; design of water, wastewater, and stormwater systems; and a comprehensive construction management program. A four-dimensional model of the proposed development will also be presented.

Climate Change Analysis and Stream Restoration in the Upper Truckee River Basin

3:30 – 3:55

Christian Raslowsky, Nick Szigeti

Advisors: Laura Doyle, Edwin Maurer

A climate change analysis of the Upper Truckee River Watershed was conducted using a hydrologic watershed model. The model predicts how watershed properties change with climate variations. Using model outputs, the group redesigned a section of the river to enhance floodplain interaction and thus reduce sediment transport downstream.

CIVIL, ENVIRONMENTAL, AND SUSTAINABLE ENGINEERING SESSION 2

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California High Speed Rail Central Valley Realignment
2:15 – 2:40
Jossian Pineda, Devin Schmidt
Advisors: Tracy Abbott, Girum Awoke

For our project we realigned the California High Speed Rail in the Central Valley. The new alignments will be routed through unused median space of Central Valley interstates. We focused on the macro level design and cost estimate of this realignment, utilizing designs and standards set by the CAHSR Authority.

Hester Gardens – A LifeMoves Temporary Interim-Housing Facility
2:50 – 3:20
Taylor Klauser, Jeffrey Meier, Megan Sauter, Jenna Tran
Advisors: Tracy Abbott, Tonya Nilsson

To combat Bay Area chronic homelessness, the design team partnered with the NGO LifeMoves to design Hester Gardens, an interim-housing facility. Two structural designs were completed, one using structural steel and one using steel storage containers. The team created a construction management plan and general civil plans for Hester Gardens.

Sobrato Campus for Discovery and Innovation Foundation Feasibility and Re-Design
3:30 – 3:55
Maxwell Quillin
Advisors: Sukhmander Singh

The first phase of the project involves the assessment of the feasibility of the existing foundation design using a combination of spread footings and ground improvements. The second phase includes two additional foundation design alternatives, one of which being a mat foundation, and the other being a deep foundation alternative.

COMPUTER SCIENCE AND ENGINEERING SESSION 1

Distributed Firewall for IoT
2:15 – 2:45
Anthony Fenzl, Ryan Lund, Chelsea Villanueva
Advisor: Behnam Dezfouli

Current IoT network security solutions fail to account for both the scale at which IoT devices can be deployed and the heterogeneous nature of the traffic they produce. We propose the use of a cloud-based management layer working in cooperation with fog node filters to manage end devices.

LeaPi: Wireless Diagnostic Assistant
2:50 – 3:20
Jeff Collins, Austin Iverson, Collin Seaman, Joseph Sindelar
Advisor: Behnam Dezfouli

An inexpensive, open-source diagnostic system coordinating multiple Raspberry Pi units to gather statistics and information on a given WiFi network. With a simple, meaningful display, users will find trouble spots in their house, diagnose why IoT devices are not working, effectively place WiFi extenders and mesh nodes, and more.

CentriFi: Centralized Wireless Access Point Management
3:30 – 3:55
Andreas Anderhub, Zackary Wilson
Advisor: Behnam Dezfouli

CentriFi is an access point management system that makes creating robust and customizable networks realistic and affordable. Built on the free OpenWRT platform, CentriFi allows for local area networks to be exactly configured and maintained on low cost hardware, intuitively and easily.

ACAS: Always Connected, Always Secure

4:05 – 4:35

Blaise Aranador, Antonio Gigliotti, Shining Liu

Advisor: Behnam Dezfouli

An ever-growing number of smart home security devices are being installed to monitor homes; however, these devices are reliant on having a stable internet connection. We are building a router that will allow devices to remain connected to alternative internet sources in the event of a home network outage.

SDHome: Securing Fast Home Networks

4:45 – 5:15

Christopher Batula, Holden Gordon, Tianyi Zhao

Advisor: Behnam Dezfouli

A plug-and-play device that allows network management and Distributed Denial of Service mitigation in home networks through a mobile app. The device allows custom flow installation and bandwidth management through a Software Defined Network framework.

COMPUTER SCIENCE AND ENGINEERING SESSION 2

Electric Hydrofoil Monitor

2:15 – 2:45

Peter Collins, Dylan Kertson, Akahi Troske

Advisor: Dan Lewis

Electric hydrofoil surfboards combine hydrofoil technology with an electric motor to produce a motorized flying surfboard. DIY electric hydrofoil surfboards are often untested and unreliable. Our monitoring system logs data from onboard sensors to refine these designs.

Neptune: Marine ROV Control System

2:50 – 3:20

Alex Achramowicz, Christoffer Layco, Cooper Zediker

Advisor: Christopher Kitts

This project involves the development of an enhanced electronics suite and software control system for SCU's tethered underwater robots. The system supports thruster-based maneuvering of the vehicle, control over sensors and peripherals, display of camera imagery, and a graphical user interface for pilots.

Life Motion

3:30 – 4:00

Michael Canniffe, Jak Kitts, Wei Wang

Advisors: David Anastasiu, Christopher Kitts

An AI weightlifting coach that provides real-time individualized feedback to the user. Using machine learning and motion capture, our coach allows them to analyze their movement quality and improvement over time.

PostureBot: Smartphone-Paired Posture Correcting Device

4:05 – 4:35

Ying Huang, Ali Nazemi, George Shappell

Advisor: Behnam Dezfouli

PostureBot is a device that aims to improve its user's posture by sending vibration alerts to the user when slouching and sending iPhone notifications to stretch, exercise, and promote a lifestyle with good posture.

Flomosys 2.0

4:45 – 5:10

Tai Groot

Advisor: Behnam Dezfouli

The goal of Flomosys 2.0 is to bring new features and functionality to Flomosys, the Flood Monitoring System of Silicon Valley. Flomosys 2.0 implements multi-client support, dynamic frequency scaling, an overhauled web UI, and a novel low-power security algorithm.

COMPUTER SCIENCE AND ENGINEERING SESSION 3

Road Condition Detection

2:15 – 2:40

Peter Ferguson, Brian Walker

Advisor: Behnam Dezfouli

Currently, the process of monitoring road health is done infrequently and is time-consuming. Therefore, many road quality issues are reported by people who drive on them. So, we are developing a smart sensor that processes and analyzes the data on the device and informs the city of the road quality.

The Character Jar: Facial Feature Generation

2:50 – 3:15

Angela Shao

Advisor: Maya Ackerman

This web application creates a face according to selected character traits. By using prior research on the correlation between facial features and associated characteristics and impressions, it becomes possible to generate targeted designs.

Trucking Management Software

3:30 – 3:55

Adam Miller

Advisor: Maya Ackerman

Developing a web application to aid truck dispatchers in finding the most efficient routes for their trucks based on a variety of factors unique to this application. The aim is to support efficiency as well as aid in the reduction of fuel consumption.

Water Quality and Weather Broadcasting Mobile Application

4:05 – 4:30

Rachael Freitag, Sarah Ortiz

Advisor: Angela Musurlian

This is a multi-platform application designed on behalf of the Association of Nicaraguan Social Development (ASDENIC), that town officials may use to distribute information to local farmers about weather forecasts and water quality. In addition to saving time, this application will eliminate the need for in-person meetings to disseminate information.

Club Grove

4:45 – 5:10

Travis Le, Lyman Shen

Advisor: Angela Musurlian

Club Grove is a service for club leaders to showcase their clubs and for students to learn more about clubs. Students can search for clubs and view events based on the clubs they are interested in. Club leaders can handle requests to join the club and add events.

COMPUTER SCIENCE AND ENGINEERING SESSION 4

Biometric Authentication via Electrocardiogram Signals

2:15 – 2:40

Carlos Garcia, Austin Miles

Advisor: Yuhong Liu

In this project, we develop a system that will provide authentication via electrocardiogram (ECG) signals. This system will employ a supervised machine learning approach to authenticate users. Once a user is authenticated, then the user will be allowed to have access to any devices for which they are registered users.

Securely Updating IoT Using Blockchain

2:50 – 3:15

Rachael Brooks

Advisor: Yuhong Liu

This research project aims to provide a framework to reduce resource strain on IoT devices for secure updates. This is accomplished by moving the verification of update messages from the device level to a Blockchain, specifically Ethereum, by using Smart Contracts.

Photorealistic Image Synthesis from Text Descriptions

3:30 – 4:00

Ryan Cain, Gabe Kralik, Campbell Munson

Advisor: Yi Fang

Our project aims to synthesize photorealistic images based on a free-form text description of a person's face. We combine advanced natural language understanding models with conditional generative adversarial networks to produce a set of corresponding faces. We utilize a simple website to demonstrate our model.

Mitigating Fake Digital Media and Quality Assurance

4:05 – 4:35

Xinyu Chen, Kyle Jiang, Hetesh Sehgal

Advisor: Yi Fang

The goal of our project is to mitigate fake data and improve the quality of content showed to users on Twitter by utilizing machine learning to cross-reference and authenticate the origin and information relayed in the tweet.

PLATICA

4:45 – 5:15

Philip Cori, Evan Johnson, Andres Morales, Nam Tran

Advisor: Yi Fang

PLATICA is a fully immersive chatbot application designed to help develop users' English language skills through conversation. Our chatbot will induce language acquisition naturally by holding stimulating conversations and providing relevant grammar feedback. Utilizing state-of-the-art deep learning technologies, we are building a robust and intuitive mobile application.

COMPUTER SCIENCE AND ENGINEERING SESSION 5

BoneHeads
2:15 – 2:40
Tobias Carothers
Advisor: Ahmed Amer

A high-skill Real-Time Strategy / Survival game in which the player controls undead minions to do their bidding.

WayPoint
2:50 – 3:20
Kunal Pandey, Jose Perez, Tate Sakai
Advisor: Ahmed Amer

An augmented reality iPhone application that guides a pedestrian to multiple buildings within campus.

A Document Escrow Service
3:30 – 3:55
Steven Herman, Dominic Lagorio
Advisor: Ahmed Amer

The proliferation of IoT devices and data collection necessitates more secure methods for storing data. Recent data breaches suggest single entity ownership of data is not enough to ensure its security. Using cryptographic techniques, we demonstrate easy to use escrow for multi-shareholder ownership of data.

Smart Quizzes
4:05 – 4:30
Andres Cisneros-Munoz, Cole Sanchez
Advisor: Ahmed Amer

A framework and prototype for adaptive quiz generation and evaluation.

AdvocaSea
4:45 – 5:10
Emily Dang
Advisors: Ahmed Amer, Brian Beams

A short form virtual reality experience exploring sustainability, plastic pollution in our oceans, and activism.

COMPUTER SCIENCE AND ENGINEERING SESSION 6

Implementing Universal Design in the Urban Habitat Website

2:15 – 2:40

Monika Devlin

Advisor: Silvia Figueira

Redesigning the website of a Bay Area nonprofit organization with the goal of implementing universal design; that is, user experience and usability design that is accessible for all users.

Sustainability Action Tracker

2:50 – 3:20

Gladys Hilerio, Patricia Ornelas Jauregui, Isabelle Termaat

Advisor: Silvia Figueira

Web application where students and faculty can log and track their progress toward earning sustainability badges as part of the Center for Sustainability's strategic action plan.

GalápaGo!

3:30 – 4:00

Kristina Andersen, Kat Hibbert, Mariah Manzano, Catrina Nguyen

Advisor: Silvia Figueira

Every year, more than 200,000 tourists miss out on numerous opportunities to connect with locals in the Galápagos Islands. The GalápaGo! team has teamed up with the Chamber of Tourism to develop a tourist-friendly application that encourages visitors to explore local businesses, respect sustainability efforts, and learn social customs.

OmwanaThrive: A Neonatal Mobile App

4:05 – 4:35

Story DeWeese, Tiffany Lee, Samantha Sy, Emily Zhang
College of Arts & Sciences Students: Tia Halsey, Hayley Seeno, Tatiana Valentine
Advisors: Silvia Figueira, Michele Parker

Eighty-one babies within their first month of life die each day in Uganda. Our solution is a mobile application for rural mothers that includes educational lessons with culturally relevant graphics and limited text, help with navigation to nearby clinics, and reminder messages about important healthcare checkup dates.

YouLearn: Offline Media Streaming Application for Rural Uganda

4:45 – 5:15

Emma Allegrucci, Jiabei Luo, Brianna McGovern
Advisor: Silvia Figueira

YouLearn is an offline media streaming application designed for rural areas that have limited access to electricity and internet. It provides videos and other media to educate and empower impoverished communities using tools such as vocational training and public health information.

ELECTRICAL AND COMPUTER ENGINEERING SESSION 1

3D Scanner
2:15 – 2:45
Tommy Heckman, Robert Kalb, Shreyes Nallan
Advisor: Andrew Wolfe

We aim to design, prototype, and test a 3D scanner that uses LIDAR to take position data instead of traditional cameras. We hope to fully scan and 3D print an object by April 2020.

Disaster Relief Communications
2:50 – 3:15
Kyle Johnson, Karter Naito
Advisors: Shoba Krishnan, Andrew Wolfe

The Disaster Relief Communications Box will provide those in disaster situations the ability to communicate with nearby users on a local network as well as send out important information to those on the network. In addition, it will be weather resistant and reliable due to having multiple power sources.

Delay-based Physical Unclonable Function Implementation
3:30 – 4:00
Abby Aguirre, Michael Hall, Timothy Lim, Jonathan Trinh
Advisor: Fatemeh Tehranipoor

PUFs are circuit primitives that use intrinsic variations of microchips created during the manufacturing process to generate a unique "fingerprint" for each chip. We aim to simulate several different PUF designs on an FPGA board to determine how changes to a starting design can affect the reliability, randomness, and uniqueness of these IDs.

ELECTRICAL AND COMPUTER ENGINEERING SESSION 2

Transmission System for Wireless Charging in Three Dimensional Space

2:15 – 2:40

Bradley Shirley, Amritpal Singh

Advisor: Kurt Schab

In order to circumvent the mobility issues of current wireless charging systems, a transmission system capable of delivering power throughout a given space, regardless of the receiving devices's position and orientation, is designed and simulated.

Wireless Power Receiving Platform

2:50 – 3:15

Daniel Bao, Simon Gebrai

Advisor: Kurt Schab

Our project aims to create a platform, within a Quasi-Static Resonant system, that enables a device to be charged without reliance on the orientation of the device. Objectives for our platform revolve around high power-conversion efficiency within the platform, a reasonable size constraint, and compatibility with widely used charging interfaces.

Solar Panel Monitor and Data Logger

3:30 – 3:55

Ryan Murray, Sharan Singh

Advisor: Sarah Kate Wilson

Our project interfaces with solar panel installations at remote locations and collects, logs, and processes data from these installations. This data is then uploaded to the cloud for better insight and visibility into the operation of the solar installations.

INTERDISCIPLINARY SESSION 1

EdgeAP: Enabling Edge Computing on Wireless Access Points

2:15 – 2:45

Christopher Desiniotis, Justin Majors, Cyrus Miremadi

Advisors: Behnam Dezfouli, Sarah Kate Wilson

EdgeAP is a programmable platform for the delivery of applications on access points/gateways. Use cases of the platform will be demonstrated via example applications. Additionally, the effects of edge computing on network performance will be characterized and evaluated in terms of CPU utilization and network quality of service.

Adaptive Robotic Chassis (ARC)

2:50 – 3:25

Darran Casey, Ryan Ku, Noah Kane Manuel, Isabella Morales, James Reimer, Lavelle Simmons

Advisors: Christopher Kitts, Godfrey Mungal

A small-scale agricultural robot chassis and motion control system has been developed. The robot can be mechanically adjusted in width to accommodate the spacing of various crops, and it can host a range of payloads and sensors for applications ranging from weeding to harvesting.

Adaptive Navigation Utilizing a Drone Cluster

3:30 – 4:00

Zach Cameron, Brendan Engh, Thomas Kambe, Aditya Krishnan

Advisors: Christopher Kitts, Sally Wood

This project involves the development of a distributed control system for a group of unmanned aerial vehicles. The system allows a single pilot to control multiple drones, autonomously control the formation of the drone cluster, and implement novel adaptive navigation techniques to find the location of a radio emitter.

Supreme Optimizer

4:05 – 4:35

Griffin Donnelly, Donovan Edwards, Michael Yue

Advisors: Yi Fang, Unyoung (Rachel) He, Sarah Kate Wilson

The Supreme Optimizer is a traffic light phase controller designed using reinforcement learning in order to reduce the average vehicle wait time at intersections around Santa Clara University. It is designed using a simulation environment based on real traffic data.

Heavy Lift Drone

4:45 – 5:20

Sam Carhart, David Cooper, Luis Gaitan, Michael Kaliterna, Sami Lama, Paul Rogel, Yuya Yabe

Advisors: Christopher Kitts, Jessica Kuczenski, Godfrey Mungal, Michael Taylor

This project focuses on the design and fabrication of an unmanned aerial vehicle capable of lifting a total system weight of 55 lbs and maintaining flight for 20-30 minutes. The drone features 12 contra-rotating propellers, custom chassis with ducts, and automated flight software supporting agricultural applications such as irrigation monitoring.

INTERDISCIPLINARY SESSION 2

Digital Height-Measuring Sensor Device

2:15 – 2:40

Valerie Woo

Advisor: Jessica Kuczenski

The Digital Height-Measuring Sensor Device (a.k.a Stadiometer) is a device used to accurately and efficiently measure the height of a patient. It is intended to replace the manual ruler height-measuring systems in current hospitals and pediatric clinics.

Human-centered Electric Prosthetic (HELP) Hand

2:50 – 3:25

Alonzo Billips, Tehmi den Braven, Bradon Hong, Seamus Hudnut, Fatima Israr, Garrett Stone, Taylor Yamane

Advisors: Prashanth Asuri, Christopher Kitts, Michele Parker

This project focuses on the design and fabrication of an electrically-powered, electromyographically (EMG) controlled prosthetic hand for transradial, unilateral amputees in India. The HELP Hand is a versatile prosthesis with multiple grip capabilities that is designed to be functional, robust, and low cost.

Developing a Skin Phantom for the Testing of Biomedical Wearables

3:30 – 4:00

Tawni Henderson, Ju Young Lee, Matthew Placide, Kiran Sutaria

Advisors: Ramesh Abhari, Prashanth Asuri, Shoba Krishnan

Our project aims to develop a skin phantom that meets the medical device industry's need for a synthetic platform that can accurately emulate the electrical properties of human skin. Such a skin phantom can be used in early-stage testing of wearable medical devices to minimize animal, human, and cadaver testing.

Hydroponics Garden in South African High School

4:05 – 4:40

Alex Estrada, Andrew Feldmeth, Katya Fairchok, Andrew Jezak
College of Arts & Sciences Students: Carson Edgerton, Claire Pavelka
Advisors: Laura Doyle, Hohyun Lee, Michele Parker

Our team has designed an adaptive hydroponics garden for use at a high school in the Limpopo province of South Africa. The garden system features two unique "grow beds" and utilizes an energy and water conscious design to produce a diverse blend of vegetables.

Basil Leaf Automation

4:45 – 5:25

Nikolas Abenoja, Johnny Goldsberry, Simon Liu, Christopher Nelson, Andrew Soong, Kalle Suzuki, Sherene Victor
Advisor: Christopher Kitts

Packaged food processors in the agricultural industry are currently overly dependent on labor to handle seasoning. Our project will provide a cost-effective solution to automate the handling of basil leaves to reduce human dependency and increase production output while championing food safety and cleanliness.

MECHANICAL ENGINEERING SESSION 1

GraftThis

2:15 – 2:45

Brendan Gescher, Molly Jansky, Jack Margolis, Kaleb Pattawi

Advisor: Hohyun Lee

GraftThis is a portable, self-regulating grafting chamber. Grafting is used to produce plants with desirable traits, like disease and drought resistance. The healing process has strict temperature and humidity requirements, which makes grafting very laborious. GraftThis aims to automate the healing process to increase access to the technology of grafting.

Sunny Side Solutions

2:50 – 3:20

Adrienne Lee, Malonda McElwee, Jada Paddock, Jesus Reyes

Advisor: Hohyun Lee

Sunny Side Solutions has partnered with Kenyan NGO, Sabore's Well, to design and build a solar-powered water heating system for a Maasai school shower for teachers to use on a daily basis, which will not only be relaxing, but will also encourage them to continue educating the next generation.

Hydrolastic Football Helmet

3:30 – 4:00

Mark Buesa, Ara Moosekian, Michael Simeon, Ian Watts

Advisor: Godrey Mungal

High rates of concussion in the NFL suggest that helmet technology is not satisfactory for the athletes, and soft foam padding has dominated the helmet industry since its inception. We propose that implementing a fluid-based hydrolastic suspension system into the helmet will reduce the risk of concussion in the NFL.

ESPR (Electronic Stacking and Placement Robot): Revolutionizing Labor in the Fruit-drying Industry

4:05 – 4:35

Kyle Asano, Shawn Davis, Anand Rajamani

Advisors: Christopher Kitts, Godfrey Mungal

Our team has designed a prototype robot capable of lifting, stacking, and placing large trays of fruit to facilitate drying. We focused on motor control, mechanical tray alignment through small scale prototyping, and a full scale design with the goal of being faster and safer than manual labor.

MECHANICAL ENGINEERING SESSION 2

The Bici Bomba Pedal Powered Well Water Purification System
2:15 – 2:45
Ally Belica, Devan Hollar, Matt Kamimura, Liam Scobey
Advisor: Gaetano Restivo

Our system is a bike-powered pump that pulls water up from a well of up to 100 ft. into a natural biosand filter and into a proper water storage system. All parts of this project are made up of local materials that can be found in rural Guatemala.

Neptune: Marine ROV Retrofit and Shape Memory Alloy Water Sampler
2:50 – 3:25
Sophia Cero, Artie Henderson, Garrett Nelson, Benjamin O'Brien, Eleni Spirakis
Advisors: Christopher Kitts, Gaetano Restivo

This project involves retrofitting an existing underwater robot for on-board battery power, with a new array of thrusters, lights, and sensors. A novel water sampling system using a shape memory alloy triggering device has also been prototyped for installation on the robot.

Ultrasonic Ribbon Bonder
3:30 – 4:00
Miguel Asturias, Tioga Benner, Brandon van Gogh
Advisors: Panthea Sepehrband, Calvin Tszeng, Dr. Henri Seppänen

Building an ultrasonic ribbon bonder for research at Santa Clara University specifically for Professor Sepehrband, Professor Tszeng and the materials science lab. The ultrasonic ribbon bonder will focus on allowing in situ visualization of the bond as it is being formed.
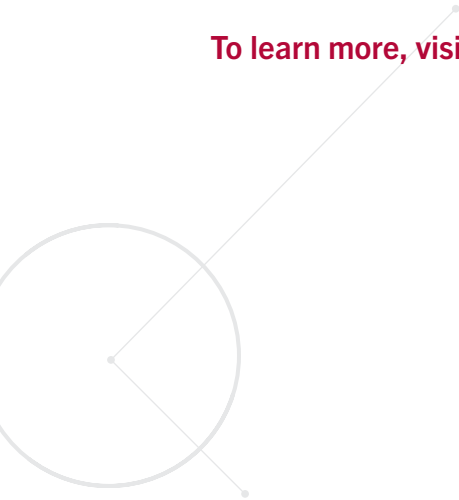
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