

SANTA CLARA UNIVERSITY
SCHOOL OF ENGINEERING

48TH ANNUAL

SENIOR DESIGN

C O N F E R E N C E

ENGINEERING WITH A MISSION

MAY 10, 2018



SENIOR DESIGN CONFERENCE

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

Welcome to the 48th Annual Senior Design Conference. We are delighted to have you with us for this exhibition of our students' 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 showcase the hands-on, practical experience and theoretical learning that enables our students to graduate with the knowledge, skills, and vision necessary to make a difference in their communities and in the world.

Through a wide range of capstone projects—everything from a 3D printed robotic hand to cryptographic technologies for secure digital voting and a sustainable aquaponic farming system—our students have spent their senior year applying their knowledge to complex problems for the benefit of society, putting theory into practice while working collaboratively.

As we prepare to break ground on the new state of the art home of the School of Engineering, the Sobrato Campus for Discovery and Innovation, we are mindful of the ever-growing community of Bronco engineers who bring distinction to Santa Clara University. We congratulate our seniors for bringing their projects to fruition, and we thank those of you who have contributed to their success and to that of the School of Engineering.

Sincerely,



Alfonso (Al) Ortega, Ph.D., Dean
School of Engineering



PROGRAM SCHEDULE

Thursday, May 10, 2018

12–1:30 p.m.	Judges' Registration California Mission Room, Benson Center
12:30 p.m.	Judges' Lunch and State of the School Address* Alfonso Ortega, Dean <i>School of Engineering</i> California Mission Room, Benson Center
1:45 p.m.	Judges' Welcome and Orientation Alfonso Ortega, Dean <i>School of Engineering</i> Ruth Davis, Associate Dean of Undergraduate Studies <i>School of Engineering</i> California Mission Room, Benson Center
2:10–5:30 p.m.	Senior Design Presentations Benson Center, Engineering Center, The Harrington Learning Commons and Orradre Library, Vari Hall
5 p.m.	Project Demonstrations Engineering Quad
6 p.m.	Dinner Locatelli Student Activity Center

**Due to space constraints, this event is open only to Conference judges and invited guests.*

SENIOR DESIGN CONFERENCE

BIOENGINEERING SESSION 1

Bannan Engineering 107

MilkGuard: A Low-Cost Paper-Based Sensor to Detect the Presence of *E. Coli* in Donated Human Breast Milk

2:15 – 2:45

Nicholas Kikuchi, Margaret May, Matthew Zweber

ADVISORS: UNYOUNG (ASHLEY) KIM, MARYAM MOBED-MIREMADI, MICHELE PARKER

Our device utilizes an enzyme-substrate, colorimetric assay on a paper-based platform to detect the presence of *E.coli* in donated human breast milk. The project aims to reduce the cost and time of traditional bacterial detection methods in human breast milk banks.

Modifying Pore Size of Alginate Microcapsules While Maintaining Structural Integrity

2:50 – 3:20

Andrea Filler, Jordan Levine, Jerard Madamba, Natalie Ploof

ADVISOR: MARYAM MOBED-MIREMADI

Alginate hydrogels provide desirable biocompatibility and material properties for various biomedical applications but are limited by the polymer's natural pore size. This project aims to develop a methodology to increase the pore size of alginate-based hydrogels in a predictable manner without compromising their structural integrity.

3D Printed Hollow Microneedles for Transdermal Delivery of Encapsulated Cells

3:30 – 4:00

Chantell Farias, Cecilia Hemingway, Roman Lyman

ADVISOR: MARYAM MOBED-MIREMADI

Our goal is to develop a functioning hollow microneedle prototype utilizing 3D printing to create a robust, reusable device. By encapsulating cells in a structured 3D matrix and delivering them through hollow microneedles, we propose a method targeted to resist shear degradation and conducive to sustained viability in the epidermis.

BIOENGINEERING SESSION 2

Learning Commons 129,
Viewing & Taping A

Hands-Free Wearable Crutch

2:15 – 2:45

Cooper Schwabe, Marcus Kraus, TK Wasserman

ADVISOR: PRASHANTH ASURI

Traditional crutches are a physically demanding, uncomfortable, and inconvenient means of getting around with a lower-leg injury. We propose a hands-free crutch that will attach only to the leg, increasing maneuverability while preserving natural walking mechanics. Our product aims to be more customizable, comfortable and affordable than current hands-free solutions.

Active Auxetic Heel Support for Achilles Tendon Therapy

2:50 – 3:20

Anna Hinrichs, Kseniya Malukhina, Ishaan Sharma, Micaela Vierra

ADVISOR: EMRE ARACI

We are designing a force-activated support for Achilles tendinitis. It will include metamaterials that will not compress when force is applied, allowing the individual to be active and participate in daily activities without further injury.

Health.ai—A Clinical Framework for Adaptive, Transparent Diagnostics by Artificial Intelligence Systems

3:30 – 3:55

Randol Spaulding

ADVISOR: YULING YAN

“health.ai” is a doctor’s machine learning interface for precision medical diagnostics. Empowered by an Inception v3 neural network trained on 13,757 images of malignant and benign melanocytic skin lesions, health.ai provides a scalable workflow for physicians to both utilize and interpret AI for consultation.

CERVIS: Cervical Cancer Early Response Visual Identification System

4:05 – 4:35

Evangelia Bouzos, Ivy Fernandes, Marina Predovic

ADVISORS: PRASHANTH ASURI, MICHELE PARKER

CERVIS is a cervical cancer diagnostic developed for use in low resource settings. Our device screens for

biomarkers in the urine and provides a simple colorimetric readout that helps diagnose cervical cancer and distinguish it from the human papillomavirus infection.

Skin Graft Expansion Device

4:45 – 5:15

Maggie Alt, Josée Fournier, Madeline Krenek, Will Paton

ADVISORS: PRASHANTH ASURI, MICHELE PARKER

Skin graft meshers enable the expansion of graft surface area for the treatment of severe burns. However, current devices are expensive and time consuming. We aim to design an affordable, modular, and autoclavable meshing device that improves the overall success and quality of treatments in both high- and low-resource settings.

BIOENGINEERING SESSION 3

Learning Commons 133,
Viewing & Taping B

Engineering a Molecular Missile for Pancreatic Cancer Detection

2:15 – 2:40

Esther Bartlett, Sophia Castillo

ADVISOR: ZHIWEN (JONATHAN) ZHANG

Through the site-specific incorporation of an unnatural amino acid, we are engineering a peptide that binds to a pancreatic cancer biomarker with strength comparable to a monoclonal antibody. By targeting a sugar molecule, we will expand the potential diagnostic and therapeutic applications of this cost-effective, stable, and ethical modular design.

SENIOR DESIGN CONFERENCE

Engineering Synthetic Antibody for Prostate Cancer Detection

2:50 – 3:20

**Kimberley Gonzalez,
Tatum Prosswimmer,
Cassandra Stawicki**

ADVISOR: ZHIWEN (JONATHAN) ZHANG

Monoclonal antibodies, a standard in therapeutics and diagnostics, present ethical and economic challenges. Synthetic antibodies have potential to circumvent these challenges, allowing cost-effective, scalable production using *E. Coli*. We are engineering and quantifying the binding activity of a synthetic antibody for prostate cancer detection to improve current diagnostic techniques.

Development of a Stable Cell Line for the Production of Hematopoietic Stem Cell Targeted Exosomes

3:30 – 3:55

Anja Beard, Zach Ehlinger

ADVISOR: BILL LU

Current drug delivery systems face a broad range of limitations that can be effectively overcome with exosomes, naturally occurring nanovesicles. Using these nanovesicles tagged with the RD114 protein, we aim to develop a drug delivery system that is specific to hematopoietic stem cells.

Engineered Living Nanoparticles for the Treatment of Inflammatory Diseases

4:05 – 4:35

**Annie Brown, Alex Campanelli,
Adarsh Tantry**

ADVISORS: BILL LU,
JACQUELYN HENDRICKS

Rheumatoid arthritis is a painful autoimmune disease that results in inflammation of the synovium of the joints. Unfortunately, current treatments for the disease have significant drawbacks. Our project focuses on engineering TNF-receptors (TNFR) onto the surface of exosomes as a novel anti-inflammatory treatment.

Production of Leukemia Targeting Exosomes in Human Cells Using Integrative Technology

4:45 – 5:15

**Peter Mitchell, Michael Pierotti,
Matthew Piro**

ADVISOR: BILL LU

Our project uses human cells to produce extracellular vesicles known as exosomes. These exosomes are engineered with CAR-T, a surface protein proven to bind to leukemia cells.

CIVIL ENGINEERING SESSION 1

Bannan Engineering 325

Cob: A Sustainable Building Material

2:15 – 2:45

**Daniel Eberhard, Joseph Novara,
Brandon Popovec**

ADVISORS: MARK ASCHHEIM, TONYA NILSSON

Cob, a sustainable building material, has gained popularity due to its low costs and low environmental impact. This project tests the capabilities of the material through large-scale wall testing as well as small-scale sample testing.

Cob Property Analysis

2:50 – 3:20

**Gabi Brunello, Jose Espinoza,
Alexandra Golitz**

ADVISORS: MARK ASCHHEIM, TONYA NILSSON

The goal of this project is to work alongside the Cob Research Institute to help facilitate the use of cob in the United States building code. Cob structures are needed in today's society because they are relatively inexpensive and ecofriendly.

Analysis of Structural Components During Cyclical Loading of Steel Reinforced Earthbag Construction

3:30 – 4:00

**Emil Huebner-Schurch, Ethan Jensen,
Noah Strong**

ADVISORS: MARK ASCHHEIM, TONYA NILSSON

We present a pilot method for coupling reinforcing steel in earthbag wall construction. Benefits of earthbag wall

construction include use of alternative building materials, frugal cost, and ease of construction. The goal of the project is to establish predictable structural standards for eventual inclusion in residential building code.

Cyclic Testing of Reinforced Earthbag Walls

4:05 – 4:35

**David Aguilar Rodriguez,
Taylor Darby, Jeffrey Stein**ADVISORS: MARK ASCHHEIM,
TONYA NILSSON

We present the design, construction, and testing of earthbag walls for earthquake resistance properties to support research and advance inclusion of this frugal construction method in building codes. The project required comprehensive long-term planning, designing lab tests to validate field observations, and the design of wall base, reinforcement, and connections.

Charney Hall Redesign Using Cross-Laminated Timber

4:45 – 5:15

**Andrew Callens, Lauren Tetrev,
Joy Yusufzai**

ADVISOR: REYNAUD SERRETTE

This project involves redesigning Charney Hall at Santa Clara University using Cross-Laminated Timber as the primary material. Our goal is to demonstrate that this material can replace steel and concrete in larger structures, which is desirable because CLT weighs significantly less and requires much less water and energy to produce.

SENIOR DESIGN CONFERENCE

CIVIL ENGINEERING SESSION 2

Bannan Engineering 106

Design of a Green Community

2:15 – 2:40

Steven Ashe, Emelia Hamilton

ADVISOR: RACHEL HE

Our project consists of the design and analysis of a mixed use, green community near downtown San Jose. The goal is to create a healthy and enjoyable space that brings a community together and integrates sustainable practices benefiting the environment.

Rainwater Capture and Purification System for Rural Tanzania

2:50 – 3:20

Audrey Gozali, Nathan Miyashiro, Matthew Sasaki

ADVISORS: LAURA DOYLE, EDWIN MAURER

We designed a rainwater capture and purification system for a rural village located in the Buturi region of Tanzania. The project includes designs for gutters, ferroconcrete storage tank, and slow sand filter. The design team addresses the needs of the villagers by working with the nonprofit organization, The Buturi Project.

Climate Smart Farming in East Africa

3:30 – 3:55

Lauren Oliver, Cristina Whitworth

ADVISOR: LAURA DOYLE

We are working with the nonprofit organization, Collaborative Enterprise Exchange, to design and implement a

climate smart farming system in rural Uganda. This sustainable system, which will include an aquaponic system for growing vegetables and raising fish, will allow the women to provide for their families and increase their monthly income.

SCU Main Parking Garage Redesign

4:05 – 4:35

Katherine Cooke, Kevin Kestekyan, Daniel Kimoto, Dean Ricasa

ADVISORS: RACHEL HE, REYNAUD SERRETTE

The objective of this project is to address the increasing need for parking at Santa Clara University. This project includes an analysis of transportation and structural elements in order to redesign the current parking structure near the main entrance of campus. Our proposed parking garage will improve efficiency and sustainability.

Redesign of the I680/SR262 Interchange in Fremont, California

4:45 – 5:10

Melissa Elian

ADVISORS: RACHEL HE, HISHAM SAID

Due to the boom of the Silicon Valley, traffic volumes for the I-680/SR-262 interchange have increased beyond the capacity of the existing four cloverleaf design. The goal is to redesign to increase the level of service with a cost-effective, sustainable, and durable solution.

COMPUTER ENGINEERING SESSION 1

Sullivan Engineering 618

SpotMe Emergency Locator Service

2:15 – 2:45

**Kunal Bhimjiyani, Arya Faili,
Zain Umerani**

ADVISOR: SILVIA FIGUEIRA

During or after a disaster, people are sometimes stranded and need help to be found. We are developing a system through which stranded people can ask for help and rescuers can locate them.

Menstruation Education for Rural Africa

2:50 – 3:20

**Sarah Pagnani, Kelsey Pasco,
Sarek Sotelo Jimenez, Brandon Smith**

ADVISOR: SILVIA FIGUEIRA

Our goal is to create an Android application aimed at teaching young Kenyan women about women's health, specifically menstruation. Our intention is to eradicate the stigma associated with menstruation as well as to provide women with resources so that they can be better equipped to handle the challenges of menstruation.

Virtual Museum for NACHA

3:30 – 3:55

Sonali Chaudhry, Alisa Hawthorne

ADVISOR: SILVIA FIGUEIRA

Art and knowledge from the country of Cameroon is in danger of being lost due to political unrest and poor artifact conservation. To prevent this, we are creating a website where people all over the world will be able to view the unique culture of the Nso people of Cameroon.

Communication System for Firefighters

4:05 – 4:35

**Steven Booth, Nick Goodpaster,
John-Paul Hurley, Griffin Moede**

ADVISOR: SILVIA FIGUEIRA

We present a web application on Android devices for first-responders to communicate with their team and compile on-site media. The application aims to increase the efficiency and accuracy of report generation for teams of first-responders.

Diagnostic Color Strip Reader for World Health Partners Clinics

4:45 – 5:15

**Steven Hu, Jisoo Park,
Geminiano Yabut**

ADVISOR: SILVIA FIGUEIRA

We are creating an application designed to read and analyze fluid color strips and return medical results and diagnostics.

SENIOR DESIGN CONFERENCE

COMPUTER ENGINEERING SESSION 2

Sullivan Engineering 602

News Breaking

2:15 – 2:45

**Esai Morales, Nathan Tudor,
Kevin Velcich**

ADVISOR: YI FANG

With the continuing growth of digital news, it can be difficult to differentiate facts from false claims. We are tackling this problem by creating a web application that uses machine learning and natural language processing to scrape news articles, identify shared facts, estimate truth likelihood, and present succinct, fact-based summaries.

Symptom Search

2:50 – 3:20

**Isabela Figueira, Neesha Godbole,
Angelina Poole, Kelly Wesley**

ADVISOR: YI FANG

Symptom Search is a web-based application that uses FDA Adverse Effects Report data and machine learning to allow users to search for the root causes of their symptoms. Our system suggests products that could be triggering symptoms or reactions based on users' interactions with the products.

Honest Housemate: Smart Household Management

3:30 – 3:55

Brian Cox, Ian Richard

ADVISOR: YI FANG

We are building a customer-facing application with a smart backend that will allow shared-rent households to easily communicate, split expenses and keep their house organized. Additionally, our smart backend will automatically suggest new tasks, and assign housemates to complete the tasks based on previous history.

Perfect Snap

4:05 – 4:35

**Manoj Adhikari, Colby Harper,
Sean Karstein**

ADVISOR: YI FANG

Perfect Snap is an iPhone application that automates the process of photo capturing. This is accomplished with a machine learning model that analyzes the camera feed for facial features and automatically captures a photo at the opportune moment.

Kollab

4:45 – 5:15

**Chloe de Guzman, Deion Graham-Long,
Tasmine Hackson, Gabrielle Tordillos**

ADVISOR: YI FANG

In today's world, artists strive to work independently of record labels, agencies, etc., but lack the resources and connections to be successful. Kollab is a platform that not only helps artists find others to collaborate with, but also allows artists to gain more recognition through upfront accreditation.

COMPUTER ENGINEERING SESSION 3

Sullivan Engineering 605

Sherlock: A Virtual Reality Crime Scene Reconstructor

2:15 – 2:40

Ellen Tseng, Ken Wakaba

ADVISOR: DARREN ATKINSON

We are developing a VR crime scene reconstructor to tackle the issue CSI teams face of not having enough time to process the evidence taken. It enables the user to construct the scene piece by piece, allowing the user to visit the scene at a later time.

SCU Events

2:50 – 3:15

Kellen Bryan, Dan Mayer

ADVISOR: DARREN ATKINSON

We are attempting to overhaul the current event registration process as well as the current UI for the Santa Clara University events calendar.

SCU Evals

3:30 – 3:55

Fredrik Blomqvist, Joseph Theberge

ADVISOR: DARREN ATKINSON

We present a web application that allows verified SCU students to evaluate different aspects of courses and professors at SCU in a modern and easy-to-understand fashion.

Pet Watch

4:05 – 4:30

JB Anderson, Rachel Hale

ADVISOR: DARREN ATKINSON

The Pet Watch is a collar designed to monitor a pet's health and activity throughout the day, allowing owners to better provide for their pet's unique needs.

Click: Social Scheduling App

4:45 – 5:10

Benjamin Button, Phi Lam

ADVISOR: DARREN ATKINSON

Our project is a mobile application designed to make it easier and less stressful to schedule casual hang-outs with friends via secure schedule sharing.

SENIOR DESIGN CONFERENCE

COMPUTER ENGINEERING SESSION 4

Bannan Engineering 105

vPlot—Data Visualization in Virtual Reality

2:15 – 2:45

**Dante Dalla Gasperina, Kush Mahajani,
Alex Martin, Collin Walther**

ADVISORS: AHMED AMER,
CHRISTOPHER KITTS

Current data visualization software can be ill suited for visualization of many-featured data due to lack of customization. We are designing a system that allows users to interact with real-time streaming data in a virtual reality environment.

PresentVR

2:50 – 3:20

**Hamilton Coke, Reece Jackson,
Gurneev Sareen**

ADVISOR: AHMED AMER

Public speaking is often cited as one of individuals' most common fears. Our solution uses virtual reality to place the user in front of an audience in a realistic environment. This allows the user to combat anxiety and, through practice, overcome any associated fear.

VR Parental Empathy Training Tool

3:30 – 3:55

Lok Tung (Helen) Chan, Zheqing Li

ADVISORS: AHMED AMER, BARBARA BURNS

Parental empathy is crucial for a child's development and family relationships. Our project will allow parents to interact

with a VR child and experience situations from the child's perspective as training to empathize with their children and to stay calm when children are emotional.

Authenticated Authorship

4:05 – 4:35

**Stephen Chuang, Andrew Leonard,
Mikhail Smelik**

ADVISOR: AHMED AMER

Authenticated Authorship seeks to authenticate the authorship of messages, increasing users' trust of the internet. They specifically seek to tackle falsified journalism, yet build a system that can be used across sectors and mediums.

Pipeworks: An Out-of-the-Box Pipeline to Manage Computer Graphics Productions and Streamline Digital Content Creation

4:45 – 5:10

Bryson Lee

ADVISOR: AHMED AMER

Computer Graphics (CG) digital art projects (including 3D Animation, Visual Effects, and Cinematics), have highlighted the technical and logistical difficulties associated with creating professional CG content. Pipeworks is a suite of technologies that solves these issues by providing teams a comprehensive, out-of-the-box, and modular tool set to streamline CG production.

COMPUTER ENGINEERING SESSION 5

Bannan Engineering 101

Applying Blockchain Technologies to Digital Voting Algorithms

2:15 – 2:45

**Vishanth Iyer, Nathan Kerr,
Justin Meeken, Alexander Seto**

ADVISOR: YUHONG LIU

Voting is a fundamental part of democracy, but is often vulnerable to interference. By using blockchain technology and other cryptographic techniques, we will create a voting system where individuals can verify that their vote was properly cast and that the election results were tallied correctly.

Energy Conservation of Buildings Using IoT Devices

2:50 – 3:20

**Jun Chang, Darence Lim, Tracy Sun,
Patrick Wu**

ADVISOR: BEHNAM DEZFOULI

Buildings such as apartment complexes and high-rises consume large amounts of energy, some of which are unnecessary. Our solution entails a scalable, smart home system that will help renters, homeowners, and building managers lower energy consumption and increase energy conservation while maintaining the quality of living for these stakeholders.

Smart Mirror

3:30 – 3:55

Thomas Nguyen, Joseph Phan

ADVISOR: YUHONG LIU

We have designed a Smart Mirror that displays all the information you need to get started on your day and is customizable to any given user's profile.

Securing Facial Recognition with Machine Learning

4:05 – 4:35

Songjie Cai, Ruiwen Li, Tor Saxberg

ADVISOR: YUHONG LIU

This project aims to apply machine learning techniques to reliably distinguish user accounts by using common cameras to make facial recognition logins more accessible to website and software developers. We create a web API that recognizes a user's face to log them in to their account.

Creation and Analysis of Secure IoT Test Bed

4:45 – 5:10

Alejandro Hernandez

ADVISOR: YUHONG LIU

The main objective of the project is to design a test bed for analysis of different protocols and encryption algorithms in a secure communication between an IoT device with reduced resources and a server.

SENIOR DESIGN CONFERENCE

COMPUTER ENGINEERING SESSION 6

Sullivan Engineering 604

Musical Casual Creator for Easy Self-Expression

2:15 – 2:40

Louis Lin, Ian Santillano

ADVISOR: MAYA ACKERMAN

Our project aims to help people with autism express themselves. It is a tool that empowers them to communicate their thoughts and feelings through songwriting.

Snap-n-Snack

2:50 – 3:20

**Michael Enriquez, Steve Hoff,
Patterson Jaffurs, Quintin Wilde**

ADVISOR: MOE AMOUZGAR

There is a large demand for dietary tracking applications for phones, but popular methods are too slow and tedious for many consumers. We propose a system that will take advantage of image recognition and the internal camera of Android phones to identify food from a picture of a user's plate.

Grumble

3:30 – 3:55

Keerthana Duddi, Nithya Geereddy

ADVISOR: ANGELA MUSURLIAN

Everyone loves food. People usually have trouble deciding where they want to eat. Grumble is a web-based application that facilitates a user or a group of users to reach a common decision about the type of cuisine that would best suit them in that moment.

FrontDoor

4:05 – 4:35

**Nathan Amarandos, Michael Hao,
Eric Van Lare**

ADVISOR: RANI MIKKILINENI

Frontdoor is a web-based mobile application that helps streamline all aspects of renting. This app can improve the renting experience for both tenants and landlords by assisting with logistics such as household task management, fair rent splitting, and general communication.

Computational Music Biofeedback for Stress Relief

4:45 – 5:15

Jason Capili, Mark Hattori, Maile Naito

ADVISOR: MAYA ACKERMAN

Current stress relieving apps can unintentionally increase users' stress levels, also known as biofeedback anxiety. Our program makes it easier to relax by generating music and binaural beats in response to live brain wave data from the Muse Headband.

ELECTRICAL ENGINEERING SESSION 1

Learning Commons
Training and Instruction 203

At-Home Neurofeedback Treatment

2:15 – 2:40

Frank Cannizzaro, Sanah Imran

ADVISOR: SHOBA KRISHNAN

Neurofeedback is a therapy that can be used to treat depression, anxiety, ADHD, and other disorders. It uses EEG signals to self-regulate brain function; however, it is a costly treatment. Our project is a device that allows for cheaper, home-based neurofeedback treatment.

RealSense Relay

2:50 – 3:15

Shivam Gandhi, Sean Giblin

ADVISOR: RAMESH ABHARI

Our project focuses on an aspect of signal integrity in terms of high speed PCB design and we show its capabilities using Intel RealSense Cameras.

Wireless Multi-User Communication System

3:30 – 3:55

Andrew Song, Brian Tjahjadi

ADVISOR: RAMESH ABHARI

This project's ultimate goal is to send and receive information wirelessly from multiple unique users at once. Our design includes an antenna with beam-switching capabilities to serve multiple users at once. We are focused on providing a more compact solution along with additional uplink capability and power indication.

SENIOR DESIGN CONFERENCE

ELECTRICAL ENGINEERING SESSION 2

Learning Commons Training and
Instruction 205

Vehicle to Everything

2:15 – 2:45

**Andrew Harris, Michael Karachewski,
Nick Schnabel**

ADVISOR: SARAH KATE WILSON

The need for non-traditional forms of communication is constantly growing and, as such, this project looks to provide a proof of concept for the use of visible light communication to help create a better connected environment for smart vehicles.

Buturi Solar

2:50 – 3:20

**Patrick Mihelic, Alfredo Munoz,
Ruben Tapia**

ADVISOR: TIMOTHY HEALY

Our objective is to design and implement a solar microgrid system for a school building in Buturi, Tanzania. We will harvest enough solar energy each day to power 50 light bulbs for 6 hours, a single full charge for 25 laptops, and a single full charge for 10 cellular phones.

Process Optimization for Carbon Nanotubes-on- Graphene Fabrication

3:30 – 3:55

Andrew Michelmore, Julia Shaffer

ADVISOR: CARY YANG

Our objective is to develop a process to fabricate a conductive carbon nanotube-on-graphene nanostructure (CNT/Gr) with vertically aligned CNTs and minimal damage to the graphene. This can be a building block for an all-carbon on-chip interconnect network. This fabricated structure is targeted to yield a resistance of several k or less.

MECHANICAL ENGINEERING SESSION 1

Benson Center, Parlors B & C

Phoenix Y-6

2:10 – 2:45

**Sean Backes, Michael Destin,
Alastair Hood, Bruce Iverson,
Brian Meier, John Strong**

ADVISOR: MOHAMMAD AYOUBI

Our mission is to design and fabricate a VTOL, fixed-wing drone for use by emergency first-responders. This vehicle is designed for uses that include surveying wildfires and spotting vehicular accidents. We are developing a working prototype that will be able to collect and relay this important data.

Altered Carbon

2:50 – 3:25

**Caleb Alleva, Luke Correnti,
Daniel Eckstein, Adam Fontana,
Kyle McMorrow, Pranav Prabhakar**

ADVISOR: ROBERT MARKS

This project analyzes the structural properties of 7-axis 3D printing versus traditional FDM printing. The team is working with Arevo Labs to manufacture a motorcycle helmet made from carbon fiber in a PEEK matrix to pass DOT standards as a tangible representation of the capabilities of new additive manufacturing processes.

Active Stabilized High Power Rocket (Savitar I)

3:30 – 4:00

**Valeria Avila Guerrero,
Angel Barranco, Daniel Conde**

ADVISOR: MOHAMMAD AYOUBI

For high power rockets, flight stability is an issue. This active attitude control system, with six degrees of freedom mathematical model, will stabilize the flight path of a 6-foot tall rocket in order to deliver a 4-kg payload to a target altitude of 3 km.

3D Printed Carbon Fiber eBike Frame

4:05 – 4:40

**Chris Edwards, Parker Gribb,
Joseph Hurley, Fionn Ruder,
Mitchell Spinelli, Micah Thomas**

ADVISOR: ROBERT MARKS

Utilizing the continuous printing process offered by Arevo Labs, we have designed, printed, and assembled an electric mountain bike.

MECHANICAL ENGINEERING SESSION 2

Benson Center, Williman Room

Auxetic Metamaterial Design for Expanding Backpack Straps

2:10 – 2:45

**Bethany Hsu, Derek Lau,
Jamie Sahlberg, Titus Whitehead,
Leslie Yang, Alexander Winter**

ADVISOR: MICHAEL TAYLOR

This project designs a metamaterial to improve backpack strap comfort and safety for Nepalese porters in the extreme working conditions of the Himalayan Mountains. Auxetic metamaterials have a negative Poisson's ratio due to their geometric structure. The strap will widen under increased load, spreading the forces over a larger area.

6U CubeSat Platform for Disaster Relief Communications

2:50 – 3:25

**Uche Agwu, Duncan Bradley,
Corey Brown, Mani Gnanasivam,
Grant Mishler, Steven Parks**

ADVISORS: CHRISTOPHER KITTS,
MICHAEL TAYLOR

Natural disasters often devastate communications infrastructure, impeding relief efforts. The SCUCube mission aims to re-establish communications between locals and emergency responders via amateur radio. We have developed and verified the mechanical subsystems of a 6U nanosatellite platform for this continuing mission.

SENIOR DESIGN CONFERENCE

Soft Robotic Hand

3:30 – 4:00

**Zachary Kisner, David Leonardo,
Christopher Szigeti**

ADVISORS: PANTHEA SEPEHRBAND,
MICHAEL TAYLOR

Our team has designed a 3D printed, soft robotic hand controlled via a pneumatic control system.

SCU BAJA 2018

4:05 – 4:50

**Felicia Frans, Alexa Giralamo,
Mahina Kamoku, Hannah LeBlanc,
Justyn Li, Jean Moore, Kelsey Petersen,
Kamilah Prentice, Marieden Totanes**

ADVISORS: DRAZEN FABRIS,
MICHAEL TAYLOR

For the first time, nine female mechanical engineering seniors are designing and manufacturing an all-terrain vehicle that will compete in the SAE (Society of Automotive Engineers) Baja Collegiate Design Series in June. The competition consists of five events: acceleration, hill climb, maneuverability, rock crawl and endurance.

MECHANICAL ENGINEERING SESSION 3

Benson Center, Conference Room 21

Frugal Clay Press for Nicaragua

2:15 – 2:45

**Milan Copic, Kevin Ellis,
Rafael Guerrero, L. Isaac Marcia**

ADVISOR: TIMOTHY HIGHT

The Frugal Clay Press for Nicaragua is a human-powered device that allows clay brick makers in Ciudad Dario, Nicaragua, to more densely compact and rapidly produce bricks. This design is composed of sustainable and locally accessible materials that make the clay press especially appropriate for implementation in rural communities.

Dehydr8

2:50 – 3:25

**David Kim, Nicholas Lurie,
Catherine Murray, Logan Smith,
Ian Tierney**

ADVISORS: ON SHUN PAK, WALTER YUEN

Dehydr8 is an alternative method of food preservation for off the grid communities. The system relies on solar energy to dehydrate fruits and vegetables.

Vibration Attenuating Medical Platform (VAMP)

3:30 – 4:05

**Cameron Fisch, Noah Friedman,
Tyler Gambill, David Harris, Kelek Olais**

ADVISOR: GAETANO RESTIVO

Emergency response vehicles are often traveling at high speeds and over uneven terrain, causing vibrations, discomfort

or even further injuries to patients. Our platform is designed to attenuate part of the vertical motion, and it can be retrofitted into existing vehicles.

INTERDISCIPLINARY SESSION 1

Bannan Engineering 326

Pressure Ulcer Prevention System

2:15 – 2:40

Rey Palomares, Ojus Rao

ADVISORS: DANIEL LEWIS, SALLY WOOD

P.U.P.S. is designed to prevent injuries such as pressure ulcers from bed-bound patients. Based on information collected from on-body sensors, it will provide automated actions such as notifying a caregiver. It will then display the information on an easy to understand interface.

The Human Keyboard

2:50 – 3:20

**Derek Char, Thomas Chung,
Alex McKee, Allen Pai**

ADVISORS: AHMED AMER, SALLY WOOD,
YULING YAN

The objective of our project is to demonstrate the validity of mapping precise arm and hand muscle movements through the use of EMGs. We also strive to demonstrate a software library that can accurately track hand and finger movements.

BOGGLES: Boundary Optical GeoGraphic Lidar Environment System

3:30 – 4:00

**Miguel Chapa, Evan Hoerl,
Isaac Jorgensen, Carl Maggio**

ADVISORS: AHMED AMER,
SARAH KATE WILSON

We are creating a proof of concept system that scans the general layout of a room and superimposes the rendering of the scanned space onto a mixed reality headset. This will provide first responders with better spatial awareness in life or death situations.

Halo

4:05 – 4:35

**Benjamin Lampe, Taylor Mau,
Samantha Morehead,
Naeem Turner-Bandeke**

ADVISORS: BEHNAM DEZFOULI,
SHOBA KRISHNAN

Our project aims to create a device powered by energy harvested from its environment that can monitor and log air pollution levels. This device can be used in homes and cities regardless of current infrastructure to promote awareness of individuals' exposure to harmful particulates.

INTERDISCIPLINARY SESSION 2

Learning Commons 316, St. Clare Room

Unsupervised Parkinson's Disease Assessment

2:15 – 2:45

Alexander Adranly, Senbao Lu, Yousef Zoumot

ADVISORS: BEHNAM DEZFOULI, YULING YAN

Our goal is to create a device that will utilize a patient's daily actions, instead of choreographed actions, to monitor and quantify Parkinson's disease based on part of the motor control section of the UPDRS scale.

Powering a Biosensor Using Wearable Thermoelectric Technology

2:50 – 3:25

Anneliese Bals, Noah Barnes, Rafael Bravo, Nicolas Garcia, Joseph O'Bryan, Dylan Santana

ADVISORS: PRASHANTH ASURI, HOHYUN LEE

Using our wearable device, thermoelectric modules placed in contact with the skin convert body heat to electrical current, which charges a battery for use in a biosensor. This technology improves users' quality of life and offers a clean, renewable power source for biosensors when grid power is not available.

Enhancing Mobility and Independence of Wheelchair Users

3:30 – 3:55

Briar Blake, Paul Nauleau

ADVISORS: PRASHANTH ASURI, CHRISTOPHER KITTS

Our design for wheelchair seat and armrest modification to improve user mobility and independence uses an electric scissor jack mechanism to raise the seat and a track system to slide it past the wheels. These modifications help users achieve daily tasks such as accessing chairs, beds, toilets, and car seats.

Urinalysis Screening for Rural Communities

4:05 – 4:35

Dana Bren-Cardali, Lilian Dao, Jeff Destruel, Ryan Fernandez

ADVISORS: SILVIA FIGUEIRA, UNYOUNG (ASHLEY) KIM

The Urinalysis Screening for Rural Communities Project uses urine strip tests to perform health screenings for patients and communicates results with the mobile application.

INTERDISCIPLINARY SESSION 3

Vari Hall, Wiegand Room

**RF Roaming System Locator:
A Modular Omnidirectional
Antenna System**

2:15 – 2:45

**Christian Ayscue, George Stathakis,
Josh Sullivan**

ADVISORS: RAMESH ABHARI, AHMED AMER

We present a 3 sector antenna location tracking system. This system will track a 915 MHz signal and display the location on a GUI.

**Camera-Based Distance
Sensor**

2:50 – 3:15

Evan Holmes, Kai SchmidtADVISORS: ANGELA MUSURLIAN,
SALLY WOOD

Our team has designed an electrical component that uses a camera and laser point to sense distance up to 10 meters.

**CryptKi: Cryptocurrency
Hardware Wallet**

3:30 – 4:00

**Derrick Chan, Rowan Decker,
William Nguyen, Yuya Oguchi**

ADVISORS: AHMED AMER, SALLY WOOD

Cryptocurrency technology is growing at a rapid pace and security needs to be in place to protect users from malicious actors. The goal of this project is to provide a portable device built to withstand cyber-attacks and maintain the integrity of a user's funds.

**The Vessel for Autonomous
Research Underwater (The
VARUNA)**

4:05 – 4:40

**Tyler Briles, Shae Connor,
Erin Guthrie, Anthony Jackson,
Madeleine Peuroi**ADVISORS: CHRISTOPHER KITTS,
SALLY WOOD, WALTER YUEN

We present a low-cost Autonomous Underwater Vehicle for collection of volumetric water data. VARUNA is equipped with conductivity, depth, and temperature sensor payload, autonomous heading and depth control, and is capable of reaching 100 foot depth. This is the first year of a multi-phase project through the Robotic Systems Laboratory.

We wish to thank the following alumni, friends, and industry partners whose participation as judges contributes greatly to the success of the Senior Design Conference.

Jasper Adamek-Bowers '14

Boston Scientific

Jason Adkins '01

Martha's Corp Taxes and Insurance

Mujda Alamzai '16

Guardant Health, Inc.

Gabriel Alcantar '08

Kleinfelder

JP Allport '15

Super Micro Computer, Inc.

Charles Asaah '14

Turlock Irrigation District

Samit Ashdhir '00

Facebook

Cathy Avila '86

Avila and Associates Consulting Engineers, Inc.

Ernesto Avila '83

Avila and Associates Consulting Engineers, Inc.

Rebecca Barney '14

UC Davis

James Behel '13

Behel Capital, Inc.

Andres Bergeret '11

Lattice Semiconductor

Pranav Bheda '17

Zillow

Tom Bolich '70

Paolo Borges '15

Intel

Chris Brady '98

Stanislaus County Public Works

James Brady '65

Derrick Breska '13

Zilka Kotab P.C.

Kirk Bresniker '89

Hewlett Packard Enterprise

Martin Bringuel '81

Trimble, Inc.

Ralph Bruce '71, '78

Vanderbilt University

Erik Burd '05

Delta Analytics

Mike Callan '62

Chris Cardenas '14

Soraa

Sara Carmody '96

Hathaway Dinwiddie Construction Co.

Edmund Cheng '99, '14

Intuit

Chunlei Dai '16

IBM

Ross Dakin '07

Bank of America

Chethana Damodara '16

Stryker Neurovascular

Sushma Devarapalli '15

Chuck DeVita '62

Growth Process Group

Alberto Diaz '16

E*TRADE

Mai Anh Do '18

Richard Dobbins '16

SepiSolar

Travis Duncan '12

Sares Regis Group of Northern California

Jesse Encarnacion '11

SSL

Jimmy Erskine '13

Amazon Robotics

Cesar Escobar '92

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Google

Logan Fox '10

Schaaf & Wheeler

Chris Freitas '84

Santa Clara County

Michael Freitas '70

Freitas + Freitas Engineering and Planning Consultants, Inc.

John Giddings '91, '96

Podium Venture Capital

Maureen Goolkasian '85

Cornerstone Structural Engineering Group, Inc.

Todd Goolkasian '85

Cornerstone Structural Engineering Group, Inc.

Richard Grabinski '91

Flatiron West

Brendan Grace '07

TRC Solutions

Aron Gragnani '10

Avila and Associates Consulting Engineers, Inc.

Nick Greos '11

Deloitte

Matthew Hart '14

Roche Sequencing Solutions

Christopher Heckert '14

Devcon Construction, Inc.

Bernhard Henschke '58

Chris Hintz '98

Google

Alan Huang '05

Whistle Labs

Timothy Hult '83, '93

General Dynamics

Alexandra Jabuka-Godwin '13

Tuan and Robinson Structural Engineers, Inc.

Romil Jain '16

Cisco Systems

Brian Janjic '89

IBM

Jan Jansen '12

Bigge Crane and Rigging Co.

George Kaldas '17

Lockheed Martin

Elham Kaviani '12, '13

Applied Materials

Brady Knowles '10, '12

Intuitive Surgical

Chip Koehler '83

SSL

Nonda Kozas '14

BKF Engineers

Rahul Krishnakumar '13

Certain, Inc.

Kristen Kristich-Madar '03, '06

Versonix

Robert Lathrop '94, '01

Lathrop Engineering

Bun Lau '05

SSL

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Lumentum LLC

Douglas Leong '90, '01
NETGEAR, Inc.

Daniel Levy

Kirby Linvill '15
Accenture

Richard Liu '01
Netflix

Jazmine Livingston '10

Avery Lu '95
ActionSpot Startup Studio

**Hugo Mailloux-
Beauchemin '12, '13**
Rudolph and Sletten

Mark Maloney '93
Rohde & Schwarz, Inc.

Patrick McGuire '81
Xilinx, Inc.

Kevin Mo '07
Samsung

Dan Moomaw '10
Gridtential Energy, Inc.

Sam Moraleda '06
Genomic Health

Karthik Muthusamy '15
Cisco Systems

Hesham Naja '16
Palisade Builders

Shriram Natarajan '02
Persistent Systems

Kevin Nguyen '14
PayPal

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Biggs Cardosa Associates

Christine Nolan-Brady '02
Cisco Systems

Gerardo Noriega
Prostis Medical, Inc.

Mike Oberti '12
Sandia National
Laboratories

Julianne O'Brien '04
Sandis

Danny O'Malley '17
Blach Construction

Reid Palmquist '16
Hitachi Vantara

Shweta Panditrao '10
Google

Bobby Papadatos '01
Olympus

Sandhya Pappu '13
LinkedIn Corp.

Richard Pardini '67

Gunjan Patel '17
Tigera

Adithya Prabhakaran '16
Apple, Inc.

Pete Pragastis '85
National Instruments

Greg Richmond '85, '91
Intuitive Surgical

Christopher Sampson '12
Cupertino Electric, Inc.

Joe Sarmiento '14
Ruth & Going

Warren Savage '93
Silvaco

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Sean Schiff '09
Microsoft

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Omron Adept
Technologies

Srinivaas Sekaran '17
Datrium

Tahir Sheikh '95
TQR Technology

Dick Sherman '61, '64

Mitchell Shiver '03
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Carl Simpson '74, '79
Coronis Medical

Gordon Stitt '80
Nebula, Inc.

Guillermo Surraco '90
ABSL Construction

Noel Tamayo '90
Applied Materials

Danesh Tavana '86
Bigstream, Inc.

Alexander Thal '14
Google X - Project Loon

Jenny Van Truong '14, '15
Degenkolb Engineers

Graham Turbyne '13
Cisco Systems

Ifiok Umoh '12
Intel Corp.

Donald Van Buren '70

Evor Vattuone '68

Ursula Vaughan '10, '12
Intuitive Surgical

Abhishek Vikram
Anchor Semiconductor, Inc.

Michael Wang '93
ISSI

Kassie Watson '92
Kraemer North America

Blake Williams '12, '14
Medikine, Inc.

Ron Williams '81
Centerline Medical

Xander Wroblewski '11
Google

Jose Ysaguirre '11
iSystems

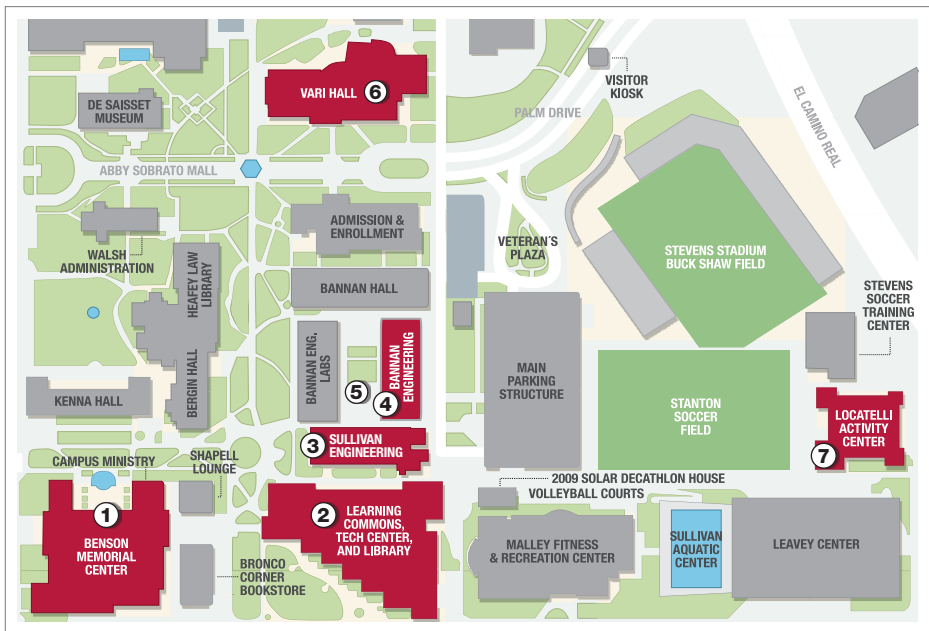


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1

Benson Memorial Center

- Judges' Registration
- Judges' Lunch and State-of-the-School Address
- Judges' Welcome and Orientation
- Senior Design Presentations

MECHANICAL ENGINEERING
SESSION 1, 2, 3

2

The Harrington Learning Commons and Orradre Library

- Senior Design Presentations

BIOENGINEERING
SESSION 2, 3
ELECTRICAL ENGINEERING
SESSION 1, 2
INTERDISCIPLINARY
SESSION 2

3

Sullivan Engineering

- Senior Design Presentations

COMPUTER ENGINEERING
SESSION 1, 2, 3, 6

4

Bannan Engineering

- Senior Design Presentations

BIOENGINEERING
SESSION 1
CIVIL ENGINEERING
SESSION 1, 2
COMPUTER ENGINEERING
SESSION 4, 5
INTERDISCIPLINARY
SESSION 1

5

Engineering Quad

- Project Demonstrations

6

Vari Hall

- Senior Design Presentations

INTERDISCIPLINARY
SESSION 3

7

Locatelli Student Activity Center

- Dinner

