

SANTA CLARA UNIVERSITY
SCHOOL OF ENGINEERING



47TH ANNUAL

SENIOR
DESIGN
CONFERENCE

Engineering with a Mission

MAY 11, 2017

SENIOR DESIGN CONFERENCE

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

Welcome to the 47th 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 mix of 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 targeted leukemia cancer therapy to a human-powered concrete mixer—our students have spent their senior year applying their knowledge to complex problems for the benefit of society, putting theory into practice, and in many cases, working collaboratively across disciplines.

Now in our second century of excellence in engineering education, we are ever mindful of the 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,



Godfrey Mungal, Dean
School of Engineering



PROGRAM SCHEDULE

Thursday, May 11, 2017

12 – 1:30 p.m.	Judges' Registration California Mission Room, Benson Center
12:30 p.m.	Judges' Lunch and State-of-the-School Address* Godfrey Mungal, Dean <i>School of Engineering</i> California Mission Room, Benson Center
1:45 p.m.	Judges' Orientation Ruth Davis, Associate Dean of Undergraduate Studies <i>School of Engineering</i> California Mission Room, Benson Center
2:15 – 5:30 p.m.	Senior Design Presentations Benson Center, Engineering Center, The Harrington Learning Commons and Orradre Library
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 invited guests.

SENIOR DESIGN CONFERENCE

BIOENGINEERING SESSION 1

Learning Commons 129,
Viewing & Taping A

.....

Wearable Microfluidic Strain Sensor with Smartphone Integration

2:15 – 2:45

Katie Connelly, Ryan Tan, Rachel Teel

ADVISOR: EMRE ARACI

Our goal is to develop a wearable microfluidic strain sensor that can be monitored using a smartphone. The device can be used for physical and occupational therapy purposes to quantitatively measure the progression of finger bend and hand strength after a stroke or trauma.

.....

Low-Cost Sensor for the Detection of *E. coli* in Donated Human Breast Milk

2:50 – 3:20

Nina Morrison, Samantha O'Connor, Callie Weber

ADVISORS: UNYOUNG (ASHLEY) KIM,
MICHELE PARKER

The paper-based breast milk sensor is designed to test for the presence of pathogenic *E. coli* in donated human breast milk. The goal is to ensure distributed human breast milk post-pasteurization is safe for infants to consume without the use of traditional lab culturing methods.

Portable, Powerless Automation of Valve Actuation for Microfluidic Large-Scale Integration Technology

3:30 – 3:55

Matthew Fitzgerald, Andrew Schmidt

ADVISOR: EMRE ARACI

Microfluidic Large-Scale Integration is a growing field in which relatively few engineers are properly trained. Most mLSI experimentation must be outsourced to facilities with the abilities to perform these tasks. Our device is a portable, powerless controlled alternative to mLSI standards that operates without the use of complex equipment.

.....

Detection of the Contaminant Phosphate in Drinking Water

4:05 – 4:35

Brandon Miura, Alex Wagner, Philip Wu

ADVISOR: UNYOUNG (ASHLEY) KIM

Our project focuses on developing an affordable and easy-to-use microfluidic sensor that can accurately detect and pinpoint water sources contaminated with phosphate. Our device integrates with a hand-held analyzer and a mobile app that automate interpretation and mapping of our detection results.

Immunomagnetic Capture and Release of Circulating Tumor Cells for Personalized Treatment

4:45 – 5:15

Nikita Bhatnagar, Abby Ribisi, Alanna Sewalt

ADVISOR: EMRE ARACI

Our project involves optimizing the immunomagnetic capture and release of circulating tumor cells (CTCs). The project objective is to maximize the elution of captured circulating tumor cells from a magnetic sifter chip. This "liquid biopsy" would reduce the need for invasive tumor biopsies for personalized cancer treatment and diagnosis.

BIOENGINEERING SESSION 2

Learning Commons 133,
Viewing & Taping B

Characterizing Spheroids and Exosomal Communication Using a Microfluidic Platform

2:15 – 2:45

Michelle Jewett, Erik Risa, Kevin Wake

ADVISOR: UNYOUNG (ASHLEY) KIM

Current cancer research utilizes cell culture methods that do not represent natural tumors. We aim to develop a microfluidic platform to study the movement of exosomes—naturally secreted nanovesicles that can deliver drugs—within 3D clusters of cancer cells, called spheroids. Our research will inform the fundamental questions of tumor biology.

Chimeric Antigen Receptor (CAR) Protein Tagged Exosomes for Targeted Leukemia Cancer Therapy

2:50 – 3:20

Jacqueline Cummings, Nicole Jewett, Jennifer Yarp

ADVISOR: BILL LU

We aim to add chimeric antigen receptor (CAR), a known Leukemia-localization protein, to cell-secreted nanovesicles called exosomes to create a carrier for a safer, targeted Leukemia cancer treatment. This carrier construct exclusively targets cancer cells and eliminates the need for cellular carriers, resulting in fewer side effects.

Exosome Membrane Bound TNF-Receptor for Treatment of Rheumatoid Arthritis

3:30 – 3:55

Kevin Curley, Natalie Duong

ADVISOR: BILL LU

Rheumatoid arthritis (RA) is an autoimmune disease that causes painful inflammation of the synovium of patients' joints. Current treatments for RA are limited and have a variety of drawbacks. Thus, we are proposing a new treatment: TNF-receptors (TNFR) anchored onto the surface of exosomes, naturally secreted nanovesicles.

SENIOR DESIGN CONFERENCE

Engineering Synthetic Antibody with Expanded Genetic Code

4:05 – 4:35

Elizabeth Batiuk, Casey Kiyohara, Tracy Nguyen

ADVISOR: ZHIWEN (JONATHAN) ZHANG

A peptide, predicted by an *in silico* library screen, will be engineered by site-specific incorporation of an unnatural amino acid to bind its cognate prostate cancer biomarker comparably to a monoclonal antibody. This modular synthetic antibody design creates a cost-effective, stable, and ethical tool for countless diagnostic and therapeutic applications.

Machine Learning Offers Predictive Insight into the Silver Nanomaterial Protein Corona

4:45 – 5:10

Matthew Findlay, Daniel Freitas

ADVISORS: MARYAM MOBED-MIREMADI, KORIN WHEELER

This project develops a classification model for protein enrichment on engineered nanomaterials (ENMs) to inform predictive, mechanistic models for protein corona formation. A predictive model for this formation is necessary for accurate prediction of ENM surface chemistry, reactivity, and fate within the environment and in systems relevant to human health.

BIOENGINEERING SESSION 3

Bannan Engineering 105

Pel-vised

2:15 – 2:40

Jonathan Huber, Christopher Wright

ADVISOR: PRASHANTH ASURI

Every year, there are more than 300,000 total-hip-replacement surgeries conducted in the United States. The Pel-vised is designed to reduce the rate of hip dislocations following these surgeries. In order to accomplish this, the device secures the initial orientation of a patient's hips.

Collagen Vitrigels for Corneal Replacement

2:50 – 3:20

Alexandra Krmptic, Wil Morrison, Kevin Vuong

ADVISORS: PRASHANTH ASURI, JAMES GRAINGER

A severe shortage of donor corneas has led to millions of untreated blind patients worldwide. We are working with Eyegenix, LLC, to develop an efficient protocol to create a biosynthetic cornea that can aid in the donor shortage and provide alternative transplant options.

Biologic Therapeutic Patch

3:30 – 4:00

**Anjel Brown, Johnathan Der,
Chloe Herczeg**

ADVISOR: MARYAM MOBED-MIREMADI

Our patch consists of three porous biocompatible layers that will control the delivery of superoxide dismutase, which is responsible for breaking down free radicals that result from cellular metabolism. By inhibiting the free radicals, we will be able to promote cell growth and enhance the beginning stages of wound healing.

Pressure Actuated Mechanical Scanner for Optical Needle-Like Probe

4:05 – 4:30

John Christian Mariano, Steven Shiba

ADVISOR: EMRE ARACI

Design and development of a pressure actuated mechanical scanner resulting in an optical probe with a higher field of view compared to current devices.

Microfluidic Device for the Characterization of Perfluorinated Emulsions

4:45 – 5:10

Daniel Horvath, Nam Anh (J.T.) Tran

ADVISOR: PAUL ABBYAD

Using a specially designed microfluidic chip, we determine the concentration of surfactant required to induce droplet coalescence in perfluorinated oils. Using this data, we offer mechanisms to coalesce droplets that do not require cumbersome external devices, which often expose microfluidic devices and their contents to high energy input.

CIVIL ENGINEERING SESSION 1

Bannan Engineering 106

Panelized, Pre-Engineered Light Frame Structural System

2:15 – 2:45

**Jack Dinkelspiel, Joyce Fung,
Anna Harris, Kara Horwald**

ADVISOR: REYNAUD SERRETTE

Rising housing costs require innovative solutions. Our structural system uses 2'x10' panels made of cold-formed steel and sheathing. These wall and floor panels are pre-engineered and prefabricated. Panelization lowers material, labor, and design costs.

Material Effects on Strawbale Wall Seismic Capacity

2:50 – 3:15

**Margaret Ackerson,
McKenna Williams**

ADVISOR: MARK ASCHHEIM

Our seismic test series will analyze the effect of mesh wire type on ductility and the validity of the existing wall slenderness limits. By performing four tests in a consistent lab environment, the results can be reliably compared to each other and used as evidence to improve code.

SENIOR DESIGN CONFERENCE

Box Frame Shear Walls for Low-Rise Construction

3:30 – 3:55

Benjamin Mullen

ADVISOR: REYNAUD SERRETTE

A redesign of the structural lateral system in an existing building using a new kind of shear wall called a Box Frame, designed to allow opening for windows. The project involves determining the design process for the Box Frame shear walls using existing test data.

Highway Interchange Redesign of I-880 and US-101

4:05 – 4:30

Damani Nkeiruka, Stephen Warnick

ADVISOR: RACHEL HE

We are redesigning the existing I-880 and US-101 interchange to improve the level of service. This project consists of a level-of-service study with the geometric design of a proposed interchange. We look to also incorporate mitigation and cost estimation of proposed work.

CIVIL ENGINEERING SESSION 2

Bannan Engineering 325

Garbage Beam

2:15 – 2:40

Paula Back, Mariela Murillo

ADVISOR: TONYA NILSSON

This Senior Design Project aims to replace expensive steel reinforcement found in concrete with common, non-compostable waste to provide a lightweight and less expensive

reinforcement while addressing the growing waste management issue in developing countries. Concrete beams reinforced with potential materials will be designed, built, tested, and analyzed.

Syrian Refugee Shelter Design Competition

2:50 – 3:25

Julia Anderson, Katie Bipes, Antonio Gonzalez, Danny O'Malley, Colin Skaggs, La'akeaikawaiola Warren

ADVISORS: TRACY ABBOTT, HISHAM SAID

We are participating in the Disaster Shelter Competition hosted by John Brown University in which we designed and built a prototype shelter for refugees coming from the Middle East into Greece. We also created a budget and plans for housing 5,000 people in a refugee camp.

Design of a Single Family Earthbag Home and Rooftop Rainwater Catchment System in Nepal

3:30 – 4:00

Olivia Carreon, Nabila Farah, Makena Wong

ADVISORS: EDWIN MAURER, TONYA NILSSON, SUKHMINDER SINGH

The 2015 earthquake in Nepal destroyed villages, which remain unbuilt. Additionally, subsistence farmers in Takure, Nepal, struggle to provide for their families due to a long dry season. To address these issues, we designed and traveled to Takure to construct a single-family, seismically resistant Earthbag house and rooftop rainwater catchment system.

Pervious Concrete Design

4:05 – 4:30

Jonathan Ang, Erik Lindahl

ADVISOR: EDWIN MAURER

For our project, we are going to develop a mixture of porous concrete that will not only be functional, but also cost effective. By varying the aggregate, water-to-cement ratio and types additives, we hope to achieve maximum compression strength while having a certain amount of permeability.

CIVIL ENGINEERING SESSION 3

Bannan Engineering 107

Sustainable Recharge of Flint Lake

2:15 – 2:40

Melene Agakanian, Cathy Cantoni

ADVISORS: LAURA DOYLE, EDWIN MAURER

This project will focus on designing a pump and pipe system to bring water from a groundwater well over a hillside using either wind or solar power. This system will allow for the recharge and rehabilitation of Flint Lake, a dry pond located at the St. Francis Retreat, in San Juan Bautista, California.

Denitrification Reactor System for Removing Nitrate in Contaminated Water

2:50 – 3:15

Andrew Highlander, Patrick Johnson

ADVISOR: EDWIN MAURER

A bioreactor system will be constructed and tested for its effectiveness in reducing nitrate in contaminated water supply for the St. Francis Retreat Center in San Juan Bautista, California. The goal is to recharge a nearby pond with water clean enough for human contact and to sustain the pond's ecosystem.

Vrishabhavathi Valley Wastewater Treatment Plant System Upgrade

3:30 – 3:55

Vijay Chellaram, Christian Miller

ADVISORS: STEVEN CHIESA, HISHAM SAID

The project aims to increase the existing secondary treatment capacity of the Vrishabhavathi Valley Wastewater treatment facility in Bangalore, India. By adding modular activated sludge and secondary clarifier treatment options, the facility will be able to treat much more wastewater in order to meet the demands of the growing population.

SENIOR DESIGN CONFERENCE

Decentralized Wastewater Treatment Plant in Bangalore, India

4:05 – 4:35

Cameron Akhavan, Simon Barbe, Alejandro Fernandez

ADVISORS: STEVEN CHIESA, HISHAM SAID

This project involved designing a medium-capacity decentralized wastewater treatment plant for the Kengeri region of Bangalore, India. The plant was designed to handle sewage needs of this area and to drain the treated water into the Vrishabhavathi River. Construction of the plant was then planned, estimated, and scheduled.

COMPUTER SCIENCE AND ENGINEERING SESSION 1

Sullivan Engineering 605

Intelligent Coordination and Automation for Smart Home Accessories

2:15 – 2:40

Alex Choulos, Tian Zhang

ADVISOR: YI FANG

Smart home accessories are rapidly becoming more popular. The existing accessories require tedious configuration to get any sort of enhanced functionality over their analog counterparts. This project's purpose is to build a general model using machine learning to automatically learn one's usage preference and provide suggestions for setup.

Conversation Station

2:50 – 3:15

Davis Allen, Robert Bayer

ADVISOR: YI FANG

We are building a mobile application that will improve speed and personalization in conversations for people struggling with verbal communication. Many people diagnosed with autism and other disorders face daily challenges involving communication due to speech impediments. Our solution will speed up personalized communication by applying machine learning principles.

BLE Location

3:30 – 3:55

Karsten Andersen, Matthew Gibson

ADVISOR: AHMED AMER

This project uses existing RF hardware to create an accurate relative positioning system. The software layer will utilize a variety of algorithms to interpret the relative signal strength of known transmitters and will be able to return a useful, three dimensional, representation of the relative location of a smartphone or similar device.

Emojent

4:05 – 4:35

Kevin Boehnlein, Wilson Burchenal, Sathya Krikanth

ADVISOR: AHMED AMER

Our Senior Design Project comprises an Android mobile application that facilitates reading emotions from interpersonal communications by processing a video or audio stream

from a mobile device and then analyzing facial features or vocal cues, respectively, in order to make a prediction.

Meshing of 3D Objects Using Point Clouds and Google Tango

4:45 – 5:10

Julian Callin, Maxen Chung

ADVISOR: AHMED AMER

Point clouds offer an alternative to computationally intensive methods for capturing and recreating 3D objects on mobile devices. Our project utilizes Google Tango and advances in mobile device hardware to capture and store the physical world around us.

COMPUTER SCIENCE AND ENGINEERING SESSION 2

Sullivan Engineering 604

HUDdy

2:15 – 2:45

Ryan Khodi, Ryan Nakagawa, Brian Pingel

ADVISOR: AHMED AMER

This project entails research and development of an adaptable heads-up display system for cars. Using sensor array technology, the display can be altered to adapt to any projectable surface. This allows HUDdy to be retrofitted into any car.

Modeling Magnetic Resonance Imaging Data in Virtual Reality

2:50 – 3:20

Quinten Parker, Jimmy Patel, Nicholas Rinaldi

ADVISOR: AHMED AMER

Current solutions for modeling and interacting with MRI data lack intuition and usability. To address the failures of current solutions, we are creating a virtual reality application that allows users to intuitively interact with MRI data as a three-dimensional model.

Virtual Reality Rhythm Game

3:30 – 3:55

Jordan Lai, Joshua Yi

ADVISOR: AHMED AMER

The rise of virtual reality over the past few years has made it possible for players to experience their favorite game genres in a new media. This project aims to explore the possibilities of immersion and interactivity through the creation of a rhythm game on the HTC Vive.

EHRaS

4:05 – 4:35

Jack Kingsman, Evan Paul, Max Werner

ADVISOR: AHMED AMER

EHRaS is an inexpensive, mobile-first electronic health care record management system for ad hoc settlements such as refugee camps. EHRaS gets vital patient information to healthcare providers in the field quickly, securely, and cost effectively, especially in locales where traditional healthcare systems would be unfeasible.

SENIOR DESIGN CONFERENCE

SmartMirror

4:45 – 5:10

Jason Chen, Matthew Koken

ADVISOR: AHMED AMER

This project aims to create an open source platform regarding the development of ubiquitous displays. The prototype will be in the form of a discrete display, a SmartMirror, allowing users to interact with media through a graphical user interface.

COMPUTER SCIENCE AND ENGINEERING SESSION 3

Sullivan Engineering 602

ShotClock

2:15 – 2:40

Kory Bartlett, Fred Feyzi

ADVISOR: BEN STEICHEN

Sports highlights is a growing industry; however, there are many problems with the current implementations out there. We are striving to build a new sports-highlight platform that supports continuity among pages between the sports, no pointless articles, and guaranteed all-game highlights.

Track My Hoist

2:50 – 3:20

**Brett Harrison, Madison Rubia,
Paras Zaveri**

ADVISOR: RON DANIELSON

Construction sites rely on hoist lifts for transporting material and workers at the job site. The purpose of this project is to create a software application that will allow managers and employees of construction companies to efficiently track and manage hoist lifts, leading to greater effectiveness in managing the lifts.

SCUdent Books: A University- Focused Bookselling Platform

3:30 – 4:00

**Winston Chang, Christina Ciardella,
Renee Prescilla**

ADVISOR: BEN STEICHEN

Our solution to the struggle of acquiring textbooks is an online bookstore called SCUdent Books that allows students on the same campus to purchase, sell, and exchange books with one another.

Pro-Resume: The Infographic Resume Builder

4:05 – 4:35

**Sanika Lakka, Tanisha Rai,
Kyra Wayne, Ivy Wu**

ADVISORS: BEN STEICHEN, AMIR ATTIA

Pro-Resume is an infographic resume builder, a web app that guides its users in creating visual resumes in order to be more competitive in today's job market. Our system allows for easy integration with LinkedIn, and will have several infographic templates from which to choose as well as customization options.

Real Time Analysis of Eye Gaze Data

4:45 – 5:10

Nathan Ng, Andrew Wei

ADVISOR: BEN STEICHEN

Eye tracking is an up-and-coming form of technology that allows for the analysis of human interaction and attention patterns. We are going to build a system that bridges the gap between data gathered by eye-tracking devices and the real-time applications of that data.

COMPUTER SCIENCE AND ENGINEERING SESSION 4

Sullivan Engineering 618

Virtual Insurance Broker (VIB)

2:15 – 2:45

Malika Mission, Muna Sinada, Mose Yoloye

ADVISOR: YUHONG LIU

A web application designed for millennial business owners that serves as a virtual broker platform for business insurance. This application is a central source to learn about business insurance, request a quote, communicate, and manage policy information in one secure location.

Multi-Bot Easy Control Hierarchy

2:50 – 3:20

Ryan Cooper, Marton Demeter, Jonathan Ho, Alan Nguyen

ADVISOR: CHRISTOPHER KITTS

This project designs a UI and a software library that handles data flow for the control of ostensibly any robots using Matlab control algorithms.

AI Hardware Accelerator

3:30 – 3:55

Maor Bernstein, Patrick Miller

ADVISOR: WEIJIA SHANG

This project aims to improve training performance of neural networks by offloading matrix operations to optimized hardware.

Secure Trust and Authentication in a MANET

4:05 – 4:35

Immanuel Amirtharaj, Eric Bonilla, Parker Newton

ADVISOR: YUHONG LIU

A cryptographic problem in mobile ad hoc networks is the on-demand authentication of nodes. The problem of nodes establishing trust for authentication purposes is also predominant. We designed an authentication scheme that includes a direct/indirect hybrid trust model to provide trust data to a distributed web-of-trust.

SENIOR DESIGN CONFERENCE

Restaurant Recommendation Application

4:45 – 5:10

Eric Castronovo, Adrian Yen

ADVISOR: WEIJIA SHANG

Our application aims to help users discover new restaurants that are recommended by friends. Users will be able to connect with friends who have similar tastes and preferences and then view their recommended places to eat.

COMPUTER SCIENCE AND ENGINEERING SESSION 5

Bannan Engineering 101

Taking Afrobarometer Data Everywhere

2:15 – 2:45

Christen Nguyen, Sean Thomas, Adrienne Tiña

ADVISOR: SILVIA FIGUEIRA

Afrobarometer is an organization that collects data on African infrastructure. This project will make this data available via tablets throughout Africa. Of particular interest to this project is data caching to enhance performance. This application allows users to access comprehensible data. Future work concerns the application's compatibility on commercial-size touchscreens.

Automating Libraries in Rural Areas of Africa

2:50 – 3:20

Matthew Johnson, Jose Santillan, Michael Walsh

ADVISOR: SILVIA FIGUEIRA

Friends of African Village Libraries (FAVL) is a nonprofit organization that establishes community libraries in rural areas of Africa. Our project will provide the librarians with a mobile application that automates librarian tasks such as checking in and out books, with the intention of easing their workload.

SCLOrk 2.0

3:30 – 3:55

Juan Miguel Baluyut, Jowy Curameng

ADVISORS: DANIEL LEWIS, BRUNO RUVIARO

This project is a mobile web application that allows an audience to interact and play with the Santa Clara Laptop Orchestra (SCLOrk) during their performances.

PowerPlaylist

4:05 – 4:35

Sara Cassella, Alexander Polatnick, Kristen Ronhovde

ADVISOR: DARREN ATKINSON

PowerPlaylist is an online collaborative playlist that allows guests of a party to have private access to the host's playlist. Guests can access the queue of songs, request songs, or "up-vote" and "down-vote" songs already requested by other guests. PowerPlaylist aims to give every guest a voice.

ELECTRICAL ENGINEERING SESSION 1

Learning Commons,
Training and Instruction 205

Anthrolink: Phased Antenna Arrays and Applications in Wireless Connectivity

2:15 – 2:40

Jonathan Lee, Srinivaas Sekaran

ADVISOR: RAMESH ABHARI

Anthrolink is a next generation communication system that has the potential to connect the next 3 billion individuals to the Internet. It uses phased antenna arrays and algorithms for beam scanning at 5.8 GHz. End-to-end system validates key components of a potential 5G network that supports IoT topologies of the future.

AmbientLife

2:50 – 3:20

**Renee Bakker-Zenon, Ryan Scott,
Shaun Suezaki**

ADVISORS: RAMESH ABHARI,
LEYNA COTRAN

AmbientLife is a wireless sensor hub aiming to help patients who are recovering from addiction by measuring and transmitting basic vital signs to a smartphone or laptop via Bluetooth, where the results can be viewed by patient or physician. It also has the capability of harvesting power through radio frequency (RF).

ForSpotter—Providing Weight Distribution for Squatters Using Force-Sensing Arrays

3:30 – 3:55

Oliver Jakobi, Randy Louie

ADVISOR: SHOBA KRISHNAN

Using force sensors, this project aims to measure weight distribution for each foot of a person while squatting. By measuring force applied at specific points on the feet, a person's form can be labeled as proper or improper.

Cmag—IoT Baby Monitor

4:05 – 4:30

Xiaoting Liu, Kyle Takeuchi

ADVISORS: TOKUNBO OGUNFUNMI,
SHIVAKAUMAR MATHAPATHI

Our project is to design an IoT camera monitor that can detect early symptoms of sudden infant death syndrome (SIDS) and alarm parents and caregivers in order to decrease the response time and increase the survival rate when SIDS occurs.

Waterless Light Fountain

4:45 – 5:10

Lucas Villalba

ADVISOR: SHOBA KRISHNAN

This project entails the design and build of a waterless light fountain, which will be displayed on Franklin Street. The fountain is going to be user interactive, in which the lights should move accordingly to the music, transforming the fountain in an audio spectrum analyzer, and displaying a light show when no music is on.

SENIOR DESIGN CONFERENCE

ELECTRICAL ENGINEERING SESSION 2

Learning Commons,
Training and Instruction 203

Carbon Nanotubes on Graphene—Interfacial and Electrical Properties for 3D Structures

2:15 – 2:45

Zachary Baron, Richard Senegor

ADVISOR: CARY YANG

We investigate the viability of carbon nanotubes grown on graphene as a functional alternative to copper and tungsten interconnects in integrated circuits based on scanning electron microscopy and electrical measurements on structures fabricated using sputtered iron, cobalt, or nickel catalysts and chemical vapor deposition or plasma-enhanced chemical vapor deposition processes.

Solar Microgrid in Togo

2:50 – 3:15

**Alexander Mayorkis,
Christian Jason Wintery**

ADVISORS: TIMOTHY HEALY,
CONSTANT BOSSOU, S.J.

We are designing a solar microgrid for a selected village in Togo, Africa, called Danyi Mepasssem. We identified the primary needs and desires of the villagers to be lights, cell phone chargers, and television. We are designing a system that will best provide them with electricity for their needs.

Multi-Robot Cluster Control

3:30 – 3:55

Addison Fattor, Ethan Head

ADVISORS: CHRISTOPHER KITTS,
SALLY WOOD

A software framework will be presented that enables robots to execute complex behaviors and allows users to define these complex behaviors easily. The system may be used on any vehicle and will enable robots to work collaboratively.

Smart and Sustainable Aquaponics

4:05 – 4:35

Kevin Claggett, Justin Goh, Ryan Toal

ADVISORS: MICHAEL MCELFFRESH,
SALLY WOOD

We are building a sustainable and automated aquaponics system, which combines aquaculture (raising fish) and hydroponics (soil-less growing of plants) to achieve greater food production density and efficiency. We are using solar energy harvesting techniques and embedded systems to increase the sustainability and reduce the energy investment of the system's user.

INTERDISCIPLINARY SESSION 1

Bannan Engineering 326

Multi-Spectral Marine Sea Grass Imaging System

2:15 – 2:45

**Ryan Baron, Justin DePalatis,
Jaime Doussinague, Teddy Thorogood**ADVISORS: GAETANO RESTIVO,
SALLY WOOD

Our objective is to create a low-cost, easy to implement multispectral imaging system for marine seagrass. Mounted on a quadcopter drone, the system will allow researchers to study seagrass populations in bays and estuaries without having to dedicate the significant time and money required for existing methods of data acquisition.

Vinifera

2:50 – 3:20

**Pranav Bheda, JJ Galvin,
Marcus Grassi, Ryan McCracken**

ADVISORS: TIMOTHY HIGHT, DANIEL LEWIS

Vinifera is a device for use in viticulture that performs chemical analysis of wine grapes to help determine the harvest schedule. Vinifera streamlines what are currently a number of tedious tasks into one simple process that crushes, samples, and records data in the field.

Vital Sign Multi-Sensor Kit for Use with Telemedicine in Developing Countries

3:30 – 4:00

**Natalie Arrizon, Jose Hernandez,
Antonio Maldonado-Liu,
Alejandra Pacheco**ADVISORS: UNYOUNG (ASHLEY) KIM,
TOKUNBO OGUNFUNMI

Our objective is to develop a kit equipped with sensors that will be used to take a patient's blood pressure, heart rate, oxygen concentration, and blood glucose concentration non-invasively. This kit will then allow doctors to have access to a patient's vital signs through most mobile devices.

SMS-Enabled EKG for Use in Developing Countries

4:05 – 4:35

**Augustus Boling, Gabriel Christ,
Shachi Kakkar, Michael McElroy**ADVISORS: DANIEL LEWIS,
SARAH KATE WILSON

To fully meet the screening needs of rural populations, we propose a two-part solution involving a simplified electrocardiogram device that will utilize cellular networks prevalent throughout the world to send and receive EKG waves to be evaluated by doctors in developing nations.

SENIOR DESIGN CONFERENCE

BETA: Bioprinting and Engineering Technology for Academia

4:45 – 5:25

Max Abrams, Jeff Barone, Cynthia Le, Jacob Ososke, Franz Plum, Emily Takimoto, Josie Warren

ADVISOR: CHRISTOPHER KITTS

We are collaborating with a Bay Area startup to supplement their existing product line that brings 3D bioprinting to high school classrooms. We are creating an incubator with light, temperature, and image control, and working on a feasibility study for adding dual extrusion and automatic syringe calibration to the 3D bioprinter.

INTERDISCIPLINARY SESSION 2

Learning Commons 316,
St. Clare Room

Visible Light Communication

2:15 – 2:45

Alicia Chan, Gemi Griffin, Ryan Meyer, Andrew Yu

ADVISORS: DANIEL LEWIS,
SARAH KATE WILSON

Visible light communication (VLC) uses existing LED lighting to transmit data, offering an efficient alternative to radio communications. Our project is centered on a VLC system that combines lighting with consumer advertising information.

Portable Reading Assistant Headset for the Visually Impaired

2:50 – 3:20

Yang Li, Luis Abraham Millan, David Blake Tsuzaki

ADVISORS: YI FANG, SALLY WOOD

We have designed a novel wearable device that allows the visually impaired to gain a better understanding of the textual world around them by having a system learn a textual understanding for them and then providing more significant and natural feedback based on users' semantic queries regarding the text at their gaze.

RF Location Tracking: A Modular Antenna System Implementation

3:30 – 4:00

Tao Feng, Razma Mogharrab, Carlos Rivera

ADVISORS: RAMESH ABHARI, AHMED AMER

This project is centered on the creation of a completely modular radio-frequency-based location tracking system that is self-reliant and will operate for applications, such as tracking drones, that do not rely on global positioning systems (GPS).

Rail Launch UAV

4:05 – 4:40

**Jackson Beadle, Ryan Broderick,
Jeffrey Jones, Jordan Mesch,
Ryne Okuhata**

ADVISORS: CHRISTOPHER KITTS,
MICHAEL TAYLOR

This project aims to develop a solution for the U.S. civil service system to conduct low-cost, high-quality surveillance and scouting. We have developed a portable pneumatic launcher, integrated autonomous control, and incorporated an on-board computer into an RC plane in order to create a product capable of aerial imaging and image processing.

SCUCube

4:45 – 5:25

**Matthew Condino, Andrew Drape,
Evan Eberheart, Cooper McDonnell,
Brayton McKnight, Isaac McQuillen,
James Olwell, Laura Tschudy**

ADVISORS: CHRISTOPHER KITTS,
MICHAEL TAYLOR

We have designed a small satellite (CubeSat) to provide communications services to areas suffering from natural disasters, utilizing a semi-passive gravity gradient attitude control system.

MECHANICAL ENGINEERING SESSION 1

Benson Center,
Williman Room

The Hydrobike

2:15 – 2:45

**Sydney Lindeman, Joe McKenna,
Conor Rounds, Kyle Schumann**

ADVISOR: DRAZEN FABRIS

The Hydrobike is a human-powered watercraft that uses a hydrofoil to reduce the drag on the hull, thus increasing the speed capabilities of the vehicle.

Experimental and Computational Simulation of the Fontan Graft

2:50 – 3:25

**Neil Mehta, Dayna Obenauf,
James Porter, Max Reese,
Trevor Valentine**

ADVISOR: ON SHUN PAK

This project will use a combined experimental and computational approach to simulate blood flow from the superior and inferior vena cava to the pulmonary arteries through a Fontan graft. The hepatic flow distribution will be evaluated to characterize the performance of the Fontan graft.

SENIOR DESIGN CONFERENCE

Variable Drive Vehicle

3:30 – 4:00

**Christopher Clark, Michael D'Arrigo,
Graham McClone, Joseph Sahyoun**

ADVISOR: MICHAEL TAYLOR

The versatility of current vehicles is often limited by a single drive system. By combining the strengths of multiple drive systems, we intend to create a platform with enhanced mobility. The Variable Drive Vehicle is a prototype that addresses this problem by integrating multiple driving methods into an augmented system.

VTOL Search and Rescue Aircraft

4:05 – 4:40

**Francesca Caruso, Nicholas Gagliardi,
Nicholas Keyes, Kiavash Moazzami,
Joshua Ramayrat**

ADVISOR: MOHAMMAD AYOUBI

Each year in national parks alone, there are more than 2,600 conducted search and rescue missions. We have designed a hybrid aircraft capable of vertical and horizontal flight that allows for long endurance flight and easy deployment, minimizing the search time, cost, and exposure to search and rescue team members.

SCU Mini BAJA

4:45 – 5:30

**Reuben Contreras, Christian Hellmers,
Mauricio Jimenez, Anmol Josen,
Matthew Nagy, Angel Robles,
Christian Ruiz, Chad Russick,
Westley Tusa**

ADVISORS: TIMOTHY HIGHT,
MICHAEL TAYLOR

Nine mechanical engineering seniors are working on the design and complete fabrication of an all-terrain buggy that will then compete in the SAE's (Society of Automotive Engineers) mini Baja competition in April.

MECHANICAL ENGINEERING SESSION 2

Benson Center,
Parlors B & C

Poly Pelletizer

2:15 – 2:45

**Logan Costa-Smith, Ian Maltzer,
James Martino**

ADVISORS: TIMOTHY HIGHT,
PANTHEA SEPEHRBAND

We are using recycled water bottles to create polyethylene terephthalate (PET) pellets. These pellets are to be utilized for a past Senior Design Project called the AKAbot, which will turn them into usable 3D printing filament.

Forge 2.0: Clean-Burning Cookstove

2:50 – 3:20

**William Gebb, Emily Gray-Gribble,
Matthew Lee, Thai Ha Sloan**

ADVISOR: ROBERT MARKS

The objective of this project is to build a clean-burning cookstove for rural Nicaraguans. The purpose for building this stove is to help reduce respiratory illness caused from cooking with biomass. Our stove utilizes gasification to burn off harmful emissions, reducing negative environmental impact caused by burning wood.

Extrusion Auger Improvement Project

3:30 – 3:55

Maureen O'Neill, Aaron Wagner

ADVISOR: PANTHEA SEPEHRBAND

Ugandan social enterprise AEST makes and sells agricultural waste charcoal briquettes. The extrusion auger used wore down quickly, hampering production. The team worked to find a better material or heat-treatment process to improve the auger through the use of a custom built pin-on-disk testing apparatus and electron microscopy.

Human-Powered Concrete Mixer

4:05 – 4:35

**Madelyn Bustard-Gustafson,
Nathan Metzger, Connor McLoughlin,
Nicholas Szychowski**

ADVISOR: ROBERT MARKS

Amigos for Christ, based in Chinandega, Nicaragua, requires a mobile, cheap, and efficient concrete-mixing method to replace the existing method of hand-mixing with shovels. Our Human-Powered Concrete Mixer provides all of these features, allowing Amigos for Christ to complete projects—such as building schools and feeding centers—more quickly.

Bench-Top Centrifuge for Materials Science Applications

4:45 – 5:15

**Abhay Gupta, Ryan Schulz,
Thomas Valentine**

ADVISOR: ROBERT MARKS

Designed for materials science, this centrifuge will aid faculty-advised research at SCU. It is designed with a swing-bucket system, as opposed to the more common fixed-angle centrifuge, in order to produce a high-quality sediment.

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.

Tom Adam

Cray

Don Adams '83

Adams & Associates

JP Allport '15

Dell EMC

Geoffrey Alves '10

Space Systems Loral

Samit Ashdhir '00

Facebook

Cathy Avila '86

Avila & Associates

Ernie Avila '83

Avila & Associates

Rene Bahena '03

McDermott Will & Emery

Patrick Barney '81

Sandia National Labs

Rebecca Barney '14

UC Davis

Aditi Bellary '14

Stanford School of
Medicine

Vidya Bharat '93

Palo Alto University

**Arpan Bhattacharjee
'10, '13**

Synopsys

Ronald Bhuleskar '11

Workday

Jagjoth Bhullar '16

UC Berkeley Law

Tom Bolich '70

Santa Cruz County Dept.
of Public Works

Mason Borda '14

Gen Life

Chris Brady '98

Stanislaus County Public
Works

James Brady '65

Lawrence Livermore
National Lab

Michael Brew '15

Onerent

Martin Bringuel '81

Trimble

Erik Burd '05

Procept BioRobotics

Lawrence Burke '56

Lawrence Livermore
National Lab

Erik Chang '15

Cisco Systems

Anulekha Chodey '99

Cisco Systems

Jeff Cymerys '02

Amazon Web Services

Ross Dakin '07

Microsoft

Nayana Dawalbhakta '00

Hewlett Packard
Enterprise

Mike DeKlotz '89

Stellar Solutions

Sushma Devarapalli '15

Chuck DeVita '62

Growth Process Group

Hina Dixit '12

Apple

Travis Duncan '12

Tesla

Arman Elahi '16

Proofpoint

James Foley '68, '70

Consultant

Todd Forsman

QuickCarl

Chris Freitas '84

Santa Clara County

Michael Freitas '70

Freitas + Freitas

Engineering and Planning
Consultants

Nicholas Giustini '15

UCLA

Todd Goolkasian '85

Cornerstone Structural
Engineering Group

Brendan Grace

TRC Solutions

Jared Guerrero '11

Stryker

Scott Handley '94

Jawger

Ryan Harami '08

Cisco Meraki

Joseph Harkins '76

Lawrence Berkeley
National Lab

Matthew Hart '14

Roche Sequencing
Solutions

Alan (Shao En) Huang '05

Whistle Labs

Brian Janjic '89

IBM

Donald Johnson '69

Lockheed Martin

Sheila Johnson '84

Lockheed Martin

Brady Knowles '10, '12

Intuitive Surgical

Robert Komoto '93

American Products
International

Shantanu Kothavale '88

Jeff Krenek '87

Hewlett Packard
Enterprise

Kristen Kristich-Madar

'03, '06

Versonix

Duc Le '06

Lumentum

Ryan Leary '08

Facebook

Billy Li '00

SAP

Stacie Lim '15

Santa Clara University

Richard Liu '01

Dropbox

Avery Lu '95

Palo Alto Scientific

Mark Maloney '93

Rohde & Schwarz

Brian Mapel '93

BMA Construction
Engineers

**Joseph Mastroieni '73,
'77**

Diocese of San Jose

Erik McAdams '14

Degenkolb

Don McIntosh '66

AMD

Anthony Mei '70
U.S. Army Corps of
Engineers

Giovanni Minelli '06, '11
Naval Postgraduate
School

Kevin Mo '07
Samsung

Robert Mullen '85
Siemens

Hesham Naja '16
Palisade Builders

Chris Neely '12
Xilinx

Peter Nghiem '87, '14, '17
Santa Clara University

Andrew Nguyen '05
Applied Materials

William Nguyen '06
Lockheed Martin Space
Systems

Christine Nolan-Brady '02
Cisco Systems

**Athmane (Atman)
Nouiouat**
Engoders

Louis Pace '83
Abbott Diabetes Care

Reid Palmquist '16
Hitachi Data Systems

**Charalambos Papadatos
'01**
Olympus

Richard Pardini '67
San Jose Water Company

Michael Posadas '13
(stealth startup)

Adithya Prabhakaran '16
Apple

John Quilici '77, '81, '88

Isaac Raven '15
Santa Clara Valley Water
District

Matt Renner '11
Digital Realty

Glenn Roberts '71
City of Gilroy

Steven Rodriggs '85
Lockheed Martin

Phillip Satterfield '00
Tyto

Bill Sautter '84
Galaxy Ventures

Sean Schiff '09
Microsoft

Ryan Schmidt '96
Pxt Consulting

Tahir Sheikh '95
TQR Technology

Chrissy Shuh '13
Intuitive Surgical

David Silver '12
Upthere

Carl Simpson '72, '79
Coronis Medical

Kris Singh '05
SRII

Steve Spence '04
KPPF

Eric Steuben '90, '95
Clarity Medical Systems

Guillermo Surraco '89
Sierra Monitor

Noel Tamayo '90
Applied Materials

Lillian Tatka '15, '16
Nano Precision Medical

Mari Tollan '14, '15
Blach Construction
Company

Tim Tran '14
BKF Engineers

Jenny Truong '14, '15
Degenkolb Engineers

Donald Van Buren '70
Bay Area Air Quality
Management District

Sam Varney '16
SlipChip

Evor Vattuone '68
Northrup Grumman

Ursula Vaughan '10, '12
Intuitive Surgical

Abhishek Vikram
Anchor Semiconductor

**Joseph Wackerman
'82, '87**
Cisco Systems

Michael Wackerman '08
Carmel Partners

Mark Wagner '13, '15
NASA Jet Propulsion
Laboratory

Michael Wang '93, '97
Micron Technology

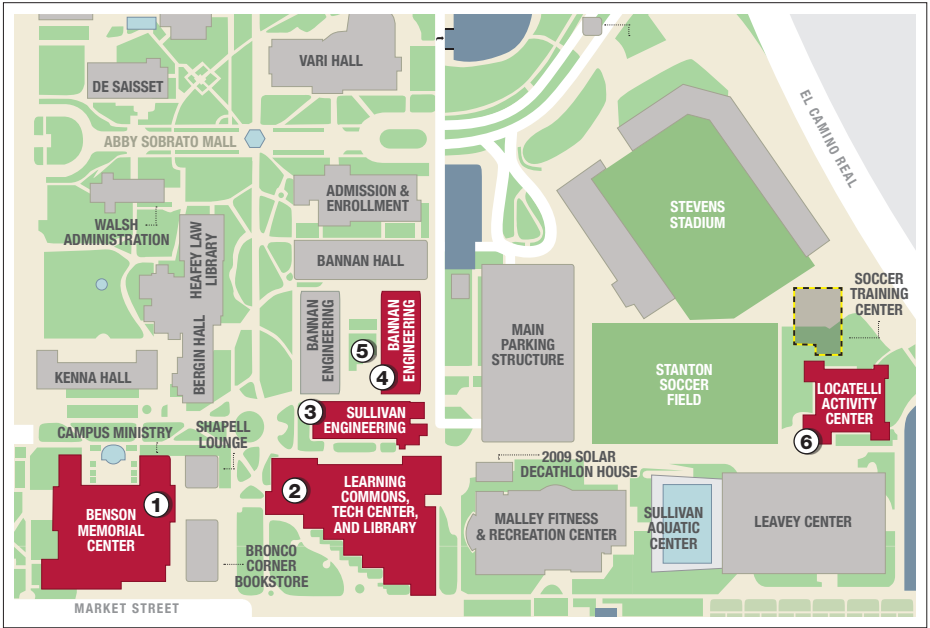
Jose Ysaguirre '79
LumaSense Technologies



SANTA CLARA UNIVERSITY

SCHOOL OF ENGINEERING

The School of Engineering provides an outstanding theoretical and practical experience for both undergraduate and graduate students. Distinguished faculty, academic excellence, personal attention, and a culture of social responsibility are hallmarks of our program. **To learn more, visit www.scu.edu/engineering.**



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

②

The Harrington Learning Commons and Orradre Library

- Senior Design Presentations

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

③

Sullivan Engineering

- Senior Design Presentations
- COMPUTER ENGINEERING**
SESSION 1, 2, 3, 4

④

Bannan Engineering

- Senior Design Presentations
- BIOENGINEERING**
SESSION 3
CIVIL ENGINEERING
SESSION 1, 2, 3
COMPUTER ENGINEERING
SESSION 4
INTERDISCIPLINARY
SESSION 1

⑤

Engineering Quad

- Project Demonstrations

⑥

Locatelli Activity Center

- Dinner