Spring 2018

Engineering News, Spring 2018

School of Engineering

engineering news
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SANTA CLARA UNIVERSITY

DEAN'S MESSAGE

Two big trends, STEM Convergence and Innovation and Entrepreneurship, are shaping engineering education globally. Engineering and the sciences are increasingly interwoven in all important technology trends, and SCU is deeply entrenched in this movement, with plans underway for the $265M Sobrato Campus for Discovery and Innovation (SCDI) that will be home to engineering and science departments. The SCDI will provide opportunities for a converged, interdisciplinary education, preparing students for careers in that new paradigm.

The second trend encompasses a current of ideas converging at the intersection of design, innovation, and entrepreneurial thinking. SCU Engineering has been a leader in this area for several years, developing new programs, courses, and extracurricular activities geared toward unleashing our students' innovation and entrepreneurial mindset. Looking to broaden the impact of programming in this realm, the School of Engineering and the Leavey School of Business are exploring ways in which we can reimagine the B-school's Center for Innovation and Entrepreneurship as a university Community for Innovation and Entrepreneurship (CIE). With a major gift backing the effort, we are in the midst of ideating (to use a design thinking term) what this community is, who it serves, and how it will help our students be innovative and entrepreneurial, not only in their work, but in their lives!

But that's tomorrow. For now, examples of the creativity, innovation, and entrepreneurial thinkingx our existing programs are imbuing in our students abound. Enjoy!

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

Lighting the Way for Autonomous Vehicles

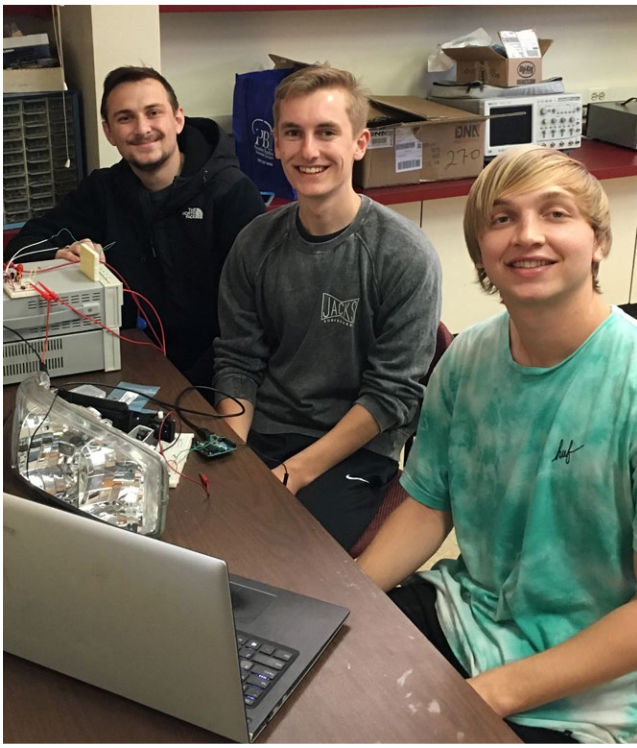
For decades, autonomous vehicles have been the dream of a society that craves independent, energy-efficient, and safe motoring—a society that might want to use the daily commute to get some work done or stream a video on its computers, tablets, or cell phones, rather than white-knuckling its way through traffic tie-ups.

But the explosion of these wireless devices over the past twenty years, and their ubiquity in our lives, creates a bit of a roadblock for driverless cars, whose wireless sensors vie for space on the radio frequency (RF) spectrum. "There is a limited amount of RF bandwidth available, and it's running out," said senior Michael Karachewski. So, he and fellow electrical engineering seniors Andrew Harris and Nick Schnabel are hoping to detour that problem by creating a better-connected environment for smart vehicles using visible light communication (VLC) as their senior design project.

The team is working on a system for communicating data using LED automotive headlights as a proof of concept. "You can communicate data by turning lights on and off really fast—so fast that the human eye can't notice any flickering. Our system, which uses light to communicate speed, position, and heading, would be used in addition to wireless sensors that use an if/then scenario to communicate with each other," said Schnabel. "This provides an extra channel of information. Autonomous vehicles need sensing everywhere. We're investigating whether VLC is viable in addition to other types of connections," added Karachewski.

The trio started with two quantifiable goals for the project: to increase the distance of transmission from tens of feet to at least 25 and achieve the 20kH data rate required by industry for maintaining a good connection between other cars, traffic lights, or road signs. Harris reports the team has had successes and challenges. "Testing has already exceeded our expectations, and we've gotten a very good signal at 30, 40, and even 50 feet, but working with the visible light spectrum is inherently finicky, and things that we expected to work perfectly, based on our modeling, produced different results in real time."

Photo: Heidi Williams



(From left) Nick Schnabel, Michael Karachewski, and Andrew Harris test their headlight in the electrical engineering lab.

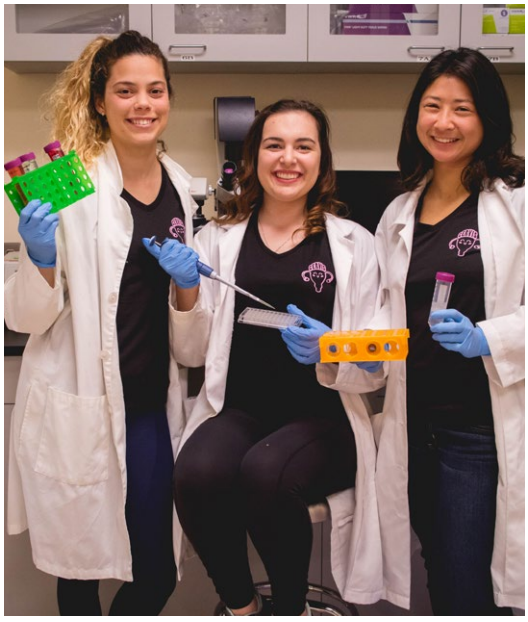
For this team, that's the fun of it. "It's different building something, as opposed to reading about it," said Schnabel. "When you learn about it in class, you're dealing with ideal situations. It's been fun experimenting and running into unexpected outcomes." Karachewski agrees. "This has been one of my favorite experiences as an engineering student. It's cool to play around with parts and build stuff, instead of just doing the math. And we've had the freedom to take the project where we want it to go."

In CERVIS to Women's Health

First, some facts from the World Health Organization: In women worldwide, cervical cancer is the second most common form of cancer, and the second leading cause of cancer-related death in less developed countries; 84 percent of cases occur in lower-income countries; cervical cancer is caused by infection with certain types of human papilloma virus (HPV); and early detection can significantly increase odds for successful treatment and reduce mortality.

But there is currently no low-cost and non-invasive detection system available for women worldwide. Bioengineering seniors Eva Bouzos, Ivy Fernandes, and Marina Predovic

Photo: Ivy Fernandes



From left: Ivy Fernandes, Eva Bouzos, Marina Predovic

are working to change that last fact by designing CERVIS: Cervical cancer Early Response Visual Identification System, a device that detects stage 0 and stage 1 cervical biomarkers in urine. Their goal is to create a paper microfluidic device prototype, similar to an at-home pregnancy test.

"Our first step was to determine if this actually is a problem in the developing world, what percentage of women have HPV, and where we might make an impact," said Predovic. They enlisted the help of three public health students to perform population-based research. "Having this information helped them put on a different lens—one that we are not able to address in technical classes," said Bioengineering Associate Professor Prashanth Asuri, who advises the team, along with Public Health Science Program Lecturer Michele Parker. "From our collaboration with the public health students," said Fernandes, "we found that Tanzania would work well as a test site for our product. A lot of the population lives in rural areas with no electricity or running water, but there is infrastructure in place for medical care and they do have big hospitals. You don't want to tell someone they have cervical cancer if they don't have access to a doctor. To get started in this region, we are collaborating with The Buturi Project, a nonprofit supporting a community of six poverty-stricken, rural villages in Tanzania."

Bouzos explained their device will test for biomarkers to detect the presence of HPV or cancer. "These biomarkers were specifically chosen to be able to distinguish early stage cancer," she said. "The unique thing about the diagnostics of our project is that it distinguishes between HPV, general cancer, and cervical cancer. HPV can be present for years without progressing. Sometimes it goes away on its own, but in some cases it leads to cancer. When that happens, the HPV goes away, so the device needs to test for all these biomarkers. Ideally, our device will alert women of an HPV infection so they can perform routine screenings over a period of years to be aware of disease progression if it occurs."

The team has been validating assays and designing a paper microfluidic device to detect the biomarkers in mock urine. Recently, the project was selected as a Social Impact Pitch at the 15th Annual Global Health and Innovation Conference at Yale University, the world's largest and leading global health and social entrepreneurship conference. "Learning from experts in this field helps us continually question our design and what we need to do to have a larger impact," Predovic said. "The final form of the device will be determined by how it will be deployed, which is still to be decided. It might be that a testing team travels from place to place and visits every year or so, or it could be used in clinics or hospitals. Conversations with The Buturi Project and with medical professionals in Tanzania will lead to the best solution for the people of Buturi."

Though the final design is to be determined, the team is dead set on one thing—an education component is a must. "The device will be supported by information that lays out what HPV is, how you get it, what cervical cancer is, how the two are related, what steps to take if you have either one, and the benefits of routine screening," said Bouzos. Fernandes added, "We have to educate people on the need for testing and determine the best way to connect people from testing to further help. Our goal is to develop a clear pipeline from education and outreach to diagnosis to treatment."

"What impresses me about this team is that they are truly developing a solution and not just a product," said Asuri, who is also director of SCU's BioInnovation and Design Laboratory. "Often, entrepreneurs focus on creating a fancy device with all the bells and whistles and describe it with buzzwords to make a splash. This team is working very hard to truly understand customer needs and empathize with the user. This is design thinking at play, and their work exemplifies their appetite to continue to learn and iterate from a human-centered perspective to deployment."

Fernandes shook off the compliments with a shrug, "It's the SCU Jesuit mindset," she said.

GETTING A GRASP ON SOFT ROBOTICS

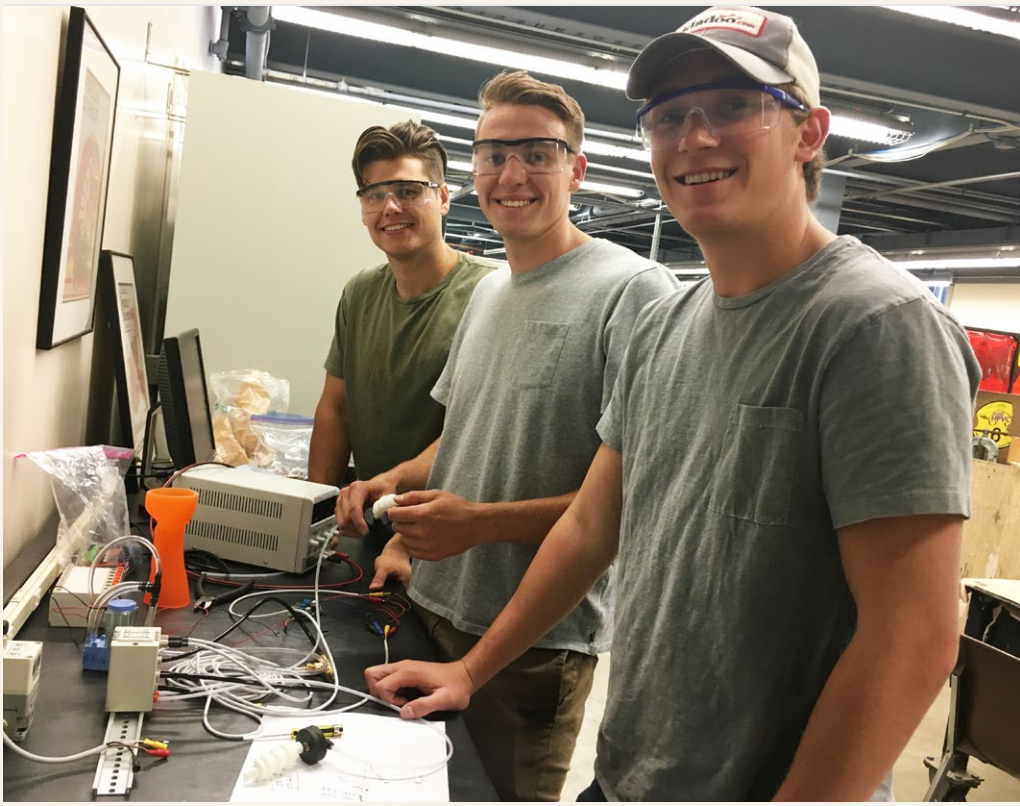
Futurists contend that rather than worrying about robots taking over all of our jobs, we should embrace a new reality in which humans work alongside automatons. But a couple of obstacles stand in the way of adopting this vision. One is the rigidity of metal robots—their inflexible gripping mechanisms and their inability to pick up and manipulate ordinary objects. Another problem is workers' fear of being injured by hulking metal machines in their work environment. A solution to these problems: flexible, soft robots made entirely from pliable materials that can grip a range of items but won't hurt co-workers in the event of a malfunction.

Soft robotics is a nascent field, but one with great potential, and mechanical engineering seniors Zachary Kisner, David Leonardo, and Christopher Szigeti are moving the needle on its adoption with their design and production of a 3D-printed, pneumatically controlled, soft robotic hand for use in manufacturing. The teammates bring a range of experience beyond the classroom to their project. Leonardo interned at a robotics company, Szigeti had internships in design work and product development, and for the past few summers Kisner worked at Molecule, a Concord, California, company specializing in chemistries and nanofluids for 3D printing and other markets. Molecule provided all the materials for their project, allowed access to its 3D printers, and—along with their academic advisors, Mechanical Engineering Assistant Professors Panthea Sepehrband and Michael Taylor—assisted in fleshing out the team's ideas and determining what their robotic hand would do. Kisner reported, "The goal was to have a product that could pick up an apple or a pill, demonstrating its ability to adapt to different weights and sizes."

With the project defined, the seniors began researching soft robotics and what applications are currently available. "This field is so new, there's not a lot of information out there," said Leonardo. "There are only about two industry research labs, one company, and a few college research labs working on this, so finding something similar to what we wanted to do was challenging. We had to go out on our own path."

"Our differentiator is that we're 3D printing our device," said Kisner. "Other devices using molded materials aren't as functional. Printing the components using fluid resin allows us to create more geometries, enabling more movement of the hand." As another bonus, 3D printing allows for rapid prototyping. "We can print five to ten iterations in an afternoon," said Leonardo. That function came in handy (no pun intended) as the team experimented with the printer settings and curing times that produced the most successful results.

Photo: Heidi Williams



From left: David Leonardo, Christopher Szigeti, and Zachary Kisner

In addition to the 3D printing aspect of the project, the team also designed hand and wrist movement geometries in 3D modeling software, and created a pneumatic control system in which a flexible tube mimicking a muscle is engaged by compressed air moved through a series of valves. "The control system involves more electrical engineering than mechanical, so we had to learn about the regulators, electronic components, and software to figure out how to achieve different motions by adjusting the air pressure," said Szigeti.

By late March, the team had successfully printed a gripper and three fingers, designed the control system, and finalized a prototyped thumb. "It's really cool to see how far we've come," Szigeti said. "Other examples we'd found in our research were just showing a proof of concept but had no functional purpose. To prototype an actual, functional soft robot that could work side by side with humans in the agriculture or pharmaceutical industry feels really good."

"And," Kisner added, "if it were to hit someone, it would be like being hit by a balloon!"

"The beauty of working on a project of this scope," said Leonardo, "is that a lot of it is beyond our discipline or what we've learned in class. We've been forced to learn a lot. It's been a really good experience."

After graduation, the three plan to start careers in product development or robotics. "Having worked on this project, we have a pretty good grasp on the industry," said Kisner, managing to keep a straight face.

THE CASE OF THE VIRTUAL CRIME SCENE

Imagine a crime scene. A head trauma victim is slumped, lifeless, in an easy chair. On the table by his side, a bottle and a gun. You carefully examine the wound, the potential murder weapons, and look for any other clues left behind by the perpetrator. But you are not actually in the room: You are doing some 21st century sleuthing aided and abetted by an Oculus Rift immersive virtual reality headset and Sherlock, a VR crime scene reconstructor imagined and designed by computer engineering seniors Ellen Tseng and Ken Wakaba.

Tseng's love of playing video games led her to the idea for a tool to help investigators who don't have enough time to process the evidence gathered on site to reconstruct the scene later, piece by piece. "I'd played a game where you determine how a crime was committed by inputting information about on site. AR holograms and animation would pop up based on the data you selected, and it was fun. When I looked into the types of crime scene re-creation tools available to actual law enforcement personnel, I found they weren't interactive and weren't as immersive and they could be, so I wanted to experiment with VR to make a reconstructor." Needing a partner in crime, she posted a Facebook message asking if any of her classmates were interested in teaming up.

"I said I'd be down with that," said Wakaba. "I thought it was a really cool concept. VR is a hot new technology, and there's going to be a lot more innovation happening in this area, so I wanted to get a jump on it and learn more about it now." The two of them enrolled in a VR "boot camp" put on by Santa Clara University's Imaginarium, a new on-campus space for experimenting with virtual and augmented reality. Over the past year, the courses have led the pair through the process of developing, prototyping, and refining their senior design project.

Initial steps included creating software models for weapons, furniture, bodies, and other items that might be relevant to a crime scene. Next, they moved on to determining what they wanted users to see, how the start menu would work, and designing the movement of the program itself. "We're using Unity as the game engine to create the program, and we've had to figure out how to code using C Sharp, which neither of us had used before. We were able to pick it up quickly, but we're learning as we go along," said Tseng.

In their prototype, users have two options—load a pre-saved crime scene or create a new one. In the first option, the user is brought into a crime scene and may interact with objects in the room. In "Create a Scene," the user can choose the lighting or weather, select items from an inventory menu to place in the scene, and re-create an actual crime scene.

The team sees their prototype as a tool, rather than a game. "This could be used for training CSI teams. A test scene could be created from scratch and trainees can learn what they should be focusing on in a real crime scene, or it could be used in court to remove bias involved when presenting evidence," said Wakaba, who is enrolled in the School of Engineering's five-year combined BS/MS program and is already taking graduate courses. "This project has been both time-consuming and enjoyable," he added. "It's cool that we get to play with VR, but it's not a walk in the park. It's been challenging and hard, but I'm learning a lot and appreciating what I'm learning."

Photo: Heidi Williams

Computer engineering seniors Ellen Tseng and Ken Wakaba work on their crime scene reconstructor in SCU's Imaginarium, a new on-campus space for experimenting with virtual and augmented reality.

Climate Smart Farming for Uganda

Coming from different concentrations within civil engineering, but with a shared desire to work on a humanitarian engineering project in a developing country, seniors Lauren Oliver and Cristina Whitworth are designing and implementing a climate smart farming system to enable women in rural Uganda to provide for their families and increase their monthly income. "Climate change disproportionately impacts developing nations, and in particular, women and girls—mostly because they are ill-equipped to handle the increased variations in climate resulting in more floods and more droughts," said the students' advisor, Civil Engineering Adjunct Lecturer Laura Doyle.

The pair was pitched this senior design project opportunity by the School of Engineering's Frugal Innovation Hub in conjunction with Collaborative Enterprise Exchange, a nonprofit with a mission to "develop leaders who drive the social transformation required to bring about a just, resilient, and sustainable world."

With Oliver's background in water resources and Whitworth's in sustainable construction, the project was a great fit. "It's focused on sustainable agriculture, but drawing on both of our skillsets, we're using recycled and locally available materials, solar power, sensors, and pumps to circulate water through the system. And it's a humanitarian project, which was important to us," said Oliver. Their sustainable system uses 20 times less water than typical farming techniques, requires less land, and allows women to grow the food they need—reducing transport. Also, because the system—which uses aquaponics for growing vegetables and raising fish—does not rely on fertilizers, it reduces climate impact.

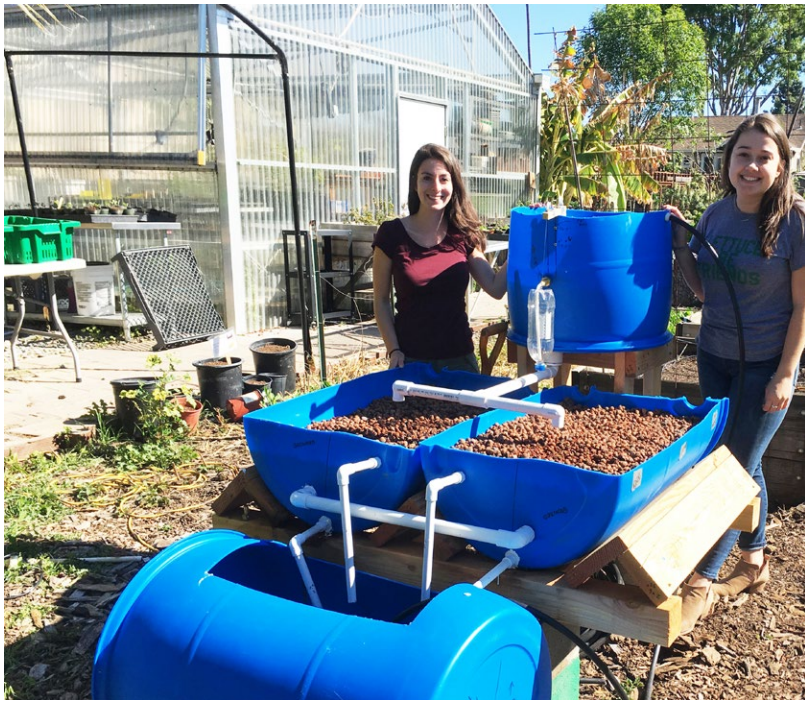
Akin to hydroponics, aquaponics grows plants in water rather than soil, but adds fish to the mix in a symbiotic system, Oliver explained. "The fish are not swimming in the same water where the plants are growing—they would eat the roots—but the system takes advantage of the fact that fish give off nutrients which are beneficial to plants, and plants give off nutrients and filter the water of potentially harmful elements, both of which help the fish and plants thrive. Water is pumped though the plants which drains into the fish tank and cycles back to the plants."

"It's basically a really big nutrient exchange," added Whitworth, "but you have to find the right balance—too many fish and the ammonia they produce could kill all your plants."

To design their system, the duo's first step was to determine design constraints for their product. "We learned from the women's collective that they wanted an aquaponics system that combined produce, chickens, and fish. We dove into the internet to find a way to connect these elements. Their only constraint was to build it 'as small as possible,' but what does that mean—10 fish, or 50? That phrase became something of a nightmare for us, but we proposed a product and built a prototype here on campus that can be adapted and scaled for any location they choose," said Whitworth.

They found a barrel-ponics (or frugal aquaponics) system online and adapted it to fit their clients' needs. "We had to adjust the design so many times because the original wouldn't work in Uganda, and we added solar because the pump needs to run consistently and draws significantly more power than is generally available there," said Oliver, who understands that limitation better than most, having spent last summer in Uganda as one of SCU's Global Social Benefit Fellows.

Photo: Heidi Williams



Cristina Whitworth and Lauren Oliver (right) with their prototyped aquaponics system built in SCU's Forge Garden.

After much research and design work, Oliver and Whitworth built a working prototype in the University's Forge Garden. This process was not without its headaches. The marine sealant they'd used peeled off and everything leaked. The resilient tilapia which is farmed in Uganda is illegal in Northern California, so goldfish were selected as stand-ins. Plus, the civil engineers had to learn a lot of mechanical and electrical engineering and wait on a frustrating two-week lag time to allow nutrient buildup in the cycling water before fish could be added to the system. But patience ruled, and by the end of winter quarter their prototype was working like a champ.

Just in time, too, as the pair headed off to Uganda with their advisor over spring break. There, they spent 12 days tweaking a design for the women's collective, buying materials, and starting the build. "We gained enough experience building our prototype to help them build theirs," said Whitworth.

"Working on this project has been the most rewarding experience for me at SCU," said Oliver. "It has allowed me to apply so many skills I have learned, both in my classes and during the Global Social Benefit Fellowship, in a meaningful way that will empower women half a world away. I have dedicated more hours to this project than I have for any other, but it was all worth it when we were working side by side with the women in Uganda, teaching them valuable new skills."

Nodding her head in agreement, Whitworth said, "It has been an amazing experience to be a part of an engineering project where I've been able to work with incredible women on the other side of the world. We've worked as a team for months to design a system that will empower women all across East Africa. This project and the group of women have inspired me to continue working on similar projects throughout my career."

Fixing a Failure to Communicate

Photo: Heidi Williams

(From left) Francesco Petrini, Nicholas Schnabel, Glen Chandler, Naeem Turner-Bandele, Taylor Mau, Allan Báez, Behnam Dezfouli, and Salma Abdel Magid share progress on their flood warning system for the City of San Jose.

Following a devastating 2017 flood that caused $100 million in damage, affected 14,000 residents, and left hundreds homeless for months, city and public works officials in San Jose, California, were roundly criticized for their lack of foresight and communication failures during the days and hours leading up to the catastrophic event. Citizens reported that their first warning of an imminent threat was hearing firefighters outside their doors ordering their evacuation. In the months after the flood, when the city commissioned an analysis of what went wrong, Mayor Sam Liccardo immediately took action, accepting responsibility for the city's failures, "and for ensuring it never happens again."

Taking a step in that direction, the Mayor's Office recently began working with the School of Engineering's Frugal Innovation Hub on a pilot program for a set of solutions to detect an imminent flooding situation in San Jose. "Four teams of undergraduate and graduate engineering students are developing an IoT system that could be installed on up to 50 bridges to detect water surge, debris accumulation, color of water, and the type of materials being carried in the water," said Allan Báez, the Hub's director of programs and partnerships. Báez advises the students along with Dr. Behnam Dezfouli, assistant professor of computer engineering, who serves as technical leader for the group. Dezfouli is guiding the students toward building the bridge-attached IoT devices as well as a cloud system for central collection, processing, and distribution of data, and mobile apps for receiving updates and alerts. He reports, "The collected data would be transmitted to a cloud platform through a wireless mesh network. The system will rely on both edge and cloud computing to analyze sensor and vision data. Anomaly detection would result in dispatching warnings to city officials and to the neighborhoods."

Computer engineering master's student Salma Abdel Magid '17 and junior Francesco Petrini are using machine learning for image recognition to devise an algorithm to process images and detect debris and other materials being carried in the water. "Finding the right open source machine learning library and system optimization to achieve an acceptable processing delay and energy consumption level on a very resource-constrained IoT device such as Raspberry Pi is challenging," Magid said. After testing their camera for face recognition, the pair began modeling for debris to test how the system operates. Petrini reports, "We found our image classification of animals, and even a vending machine, to be 99 percent accurate. But we need to make it faster and more energy efficient."

Electrical engineering undergraduates Naeem Turner-Bandele and Taylor Mau (who is double majoring in computer science and engineering) are working on solar energy harvesting for the system, determining the power needs, voltage, and current levels for the different components. "The system needs to recharge quickly, but the battery should be small. The electronics used for harvesting have to be very energy efficient, so we're studying the energy consumption of a variety of operations to ensure the system provides enough power," said Turner-Bandele. Dr. Dezfouli added, "The design of the energy harvesting sub-system depends on various factors. Most important, we need to ensure it can handle sudden variations in power consumption caused by computation and wireless transmission."

Long-range wireless communication for the device is a must, and Esha Jhamb, computer science and engineering master's student, and electrical engineering senior Nicholas Schnabel have that covered. With WiFi unavailable in some areas, the team needed a solution that did not use the LTE network for long-range and high data rate transmission to city and county officials of the images and other information collected by the sensors; at the same time, their method had to be frugal in its use of power. Schnabel explained, "We're researching LoRaWAN [long-range, low power Wide Area Network] and developing very efficient drivers to minimize the overhead of communication. We need to make sure there is no data loss due to environmental interference. Reliability and energy efficiency are very important, but one of the biggest challenges is to establish a mesh network that covers a large area."

Glen Chandler, computer engineering junior, and Immanuel Amirtharaj '17, computer science and engineering graduate student/research assistant are tackling the final components—a mobile application for human reporting of changes in creeks or rivers, and an alert system for notifying affected residents of a developing situation. "The Mayor's Office has identified community leaders who would monitor the waterways and report data through our app using the same parameters our bridge sensors use—color of water, debris, etc. As city and county officials determine a threat is evolving, citizens can be kept apprised with updates and notifications so no door-to-door action would be needed," explained Chandler.

Though working independently in teams, the entire group gathers weekly to maintain continuity, and they regularly meet with the mayor's policy advisor. As the project progresses they will interface with San Jose's Office of Emergency Services.

"It's gratifying for all of us to be part of this pilot program with the City of San Jose," said Báez. "Last year there was no reliable system of detection or warning, and information came too late. Our students' system could help officials make better decisions on when to evacuate and keep residents informed of what is happening in their neighborhoods."

YOU GET AN AWARD, AND YOU GET AN AWARD!

Congratulations to two of our outstanding undergraduates!

Kayleigh Dobson '19 (mechanical engineering) was selected for a prestigious Brooke Owens Fellowship, an award-winning, volunteer-led program awarding internships and senior mentorship to exceptional undergraduate women seeking careers in aviation or space exploration. One of just 41 selected from Ivy League universities, major research universities, liberal arts colleges, international universities and others, Dobson will enjoy a paid internship at Sierra Nevada Corp., recognized among the world's most innovative companies in space systems. There, she will be paired with a senior aerospace professional who will serve as her mentor.

"Feedback from the selection committee made it clear that Kayleigh's involvement in our NASA satellite mission control program was a distinguishing element of her application," said Mechanical Engineering Professor Christopher Kitts. "It is rare for a student to already have professional-level experience as a primary contributor to a real NASA space mission."

The Brooke Owens Fellowship Program was founded in 2016 to provide early career experience and mentorship to collegiate women interested in aviation and space. "What really excites me about this fellowship," said Dobson, "is the opportunity to gain experience and learn at an amazing company like SNC, and the chance to connect with the incredible support system that the program provides. I am so excited for this summer and to share this experience with 40 of the most driven, passionate, and inspiring women I have ever met. I am very grateful for this chance and for Santa Clara University's School of Engineering, which provided me with the opportunities that helped me realize my love of aerospace engineering."

www.brookeowensfellowship.org

Isabela Figueira '18 (computer science and engineering) was selected by the American Society of Engineering Education Pacific Southwest Region as the recipient of the 2018 ASEE PSW Student Award.

She was nominated for this honor by SCU computer engineering faculty, who cited her intelligence, initiative, and drive to make advancements with broad impact. Enrolled in the University Honor's Program, Figueira is also completing minors in mathematics and music. Yi Fang, assistant professor of computer engineering, said, "Her mathematical foundation gives her an exceptional ability to quickly grasp new concepts, and she frequently pushes herself to tackle new research areas, working independently to bring her own skills up to speed to make real contributions to group research."

"It's an honor to receive this award," Figueira said. "Next year, I plan to attend graduate school in pursuit of a Ph.D. in computer science. I have participated in summer research projects, and I wish to delve deeper into computing. I also ardently believe we need more women in computer science—and we especially need more women with advanced degrees—so I hope to make a difference through my continuing in school and my future research."

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SCU NSBE VOTED BEST SMALL CHAPTER

SCU's National Society of Black Engineers (NSBE) student organization was named their region's Best Small Chapter at the 2018 NSBE National Convention! Chapter President Uche Agwu reports that SCU members attended the NSBE convention in Pittsburgh, Pennsylvania, March 21-25, where they joined more than 10,000 current and future engineers for professional and leadership development, technical training, networking, and career opportunities.

Joyful SCU students pose with their "Best Small Chapter" trophy at the NSBE National Convention.

While the national convention is an annual highlight, here on campus throughout the year SCU's NSBE chapter fosters an environment of academic success, camaraderie, and professionalism to motivate its members to reach their career and educational goals. The group hosts weekly study halls, mentoring opportunities for underclass students, and a "Greatness Recognizes Greatness" series where black STEM professionals are recognized at each bi-weekly general meeting.

Beyond nurturing their own aspirations, reaching out to the engineers of tomorrow is a passion of SCU NSBE members. Each May they hold engineering workshops on campus to give over 100 middle school students the opportunity to practice different engineering principles.

"It was such an honor to be selected as the Region's Best Small Chapter," said Agwu. "We stand on the shoulders of chapter members who came before us. The SCU NSBE chapter has done great work with aiding our members and setting the foundation for future black engineers. As a chapter, we will continue to strive toward greatness and hold NSBE's mission of advancing the success of black students and engineers at the core of everything we do."

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