PAYING IT FORWARD

DERRICK MCMILLEN ( B.S. ’12 )
FROM SOFTWARE ENGINEERING TO PUBLIC SERVICE
LETTER FROM THE PRESIDENT

Wow, it's hard to believe it's been a few years since our last CSE Alumni Magazine! I am very excited to showcase the accomplishments and achievements of our students, faculty, staff and alumni in this latest edition. I'd also like to welcome the newest members of our CSE Alumni Advisory Board. Neha Chachra (Ph.D. '15) is a Research Scientist at Facebook in the Bay Area. Alvin Chen (BS '13) is a Project Manager at Microsoft Research in Redmond, and Kylie Taitano (BS '14) is a Software Engineer at Intel in San Diego. I am also thrilled to welcome our original founding President Lindsey Fowler (BS '05) back to the board after a brief hiatus! For profiles on all of our board members, visit our CSE Alumni website: https://cse.ucsd.edu/people/cse-alumni.

We have a number of upcoming events that I'd personally like to invite all CSE alumni to. On April 13th, we will be hosting a Tutor Reunion followed by the Triton 5K on April 19th. CSE's 5K team has historically done well in the past with lots of team members and lots of money raised, so here's to another great year. To register for the CSE team, go to http://5k.ucsd.edu and select “Race Condition” in the team field. Then fill in the Google Doc for our CSE team shirt (sizing chart is on the second tab). Please complete by noon on March 9th so that shirts will arrive on time. You must register with Race Condition to get a team shirt.

Looking forward to seeing you all at an event soon!

AARON LIAO (BS '05)
CSE Alumni Advisory Board President

INTRODUCING OUR CSE EXTERNAL AFFAIRS MANAGER: BECKY HAMES

It is a pleasure to be able to work with UCSD CSE alumni, current students, faculty, researchers and industry partners in this newly created position at CSE. I have been with UC San Diego for over 11 years, including serving as the Assistant Director of the Jacobs School of Engineering COSMOS Program, a summer academic enrichment program for high school students. In my specific work with alumni, I hope to assist CSE graduates in enabling better networking and connections with faculty, current students, staff, and corporate entities. One way I can better understand the needs of our alumni community is to request that CSE alumni participate in our CSE Alumni Survey: http://cse.ucsd.edu/people/cse-alumni/cse-alumni-survey. Your valuable input will help us shape our alumni events and activities going forward.

If you have not already visited our CSE Alumni website, http://cse.ucsd.edu/people/cse-alumni, I would encourage you to take a look at the resources that can be found there, including ways to connect with the CSE community via our social media outlets. I also invite you to check out our new CSE Diversity, Equity and Inclusion website: http://cse.ucsd.edu/diversity_equity_inclusion. If I can be of any assistance to you, or if you have ideas for future alumni events or programs, please feel free to contact me at bhames@cse.ucsd.edu.

I look forward to working with you on upcoming alumni opportunities.

BECKY HAMES
CSE External Affairs Manager

MARK YOUR CALENDAR

- FRIDAY, APRIL 13, 2018: CSE TUTOR REUNION
- SUNDAY, APRIL 15, 2018: TRITON 5K, SUNDAY
- ANNUAL CSE ALUMNI BBQ IN SPRING 2018 (DATE WILL BE ANNOUNCED SOON - WATCH YOUR EMAIL FOR EVENT INFO)
- APRIL 17-19, 2018: UCSD AND YOU WASHINGTON, DC AND NEW YORK CITY AREAS ALUMNI EVENTS
OUTREACH

FLYING THE (RAINBOW) FLAG AT OSTEM

For the first time, a UC San Diego delegation of two faculty and five undergraduate students, most from the CSE department, attended the annual Out in Science, Technology, Engineering and Mathematics (oSTEM) conference in November.

The national meeting coincided with the inaugural year of the new oSTEM Chapter at UC San Diego. Financial support from sponsors allowed the new chapter to send undergrads Kayla Ortiz, Terry Worlker, Joyce (Jian) Lor, Sotiryak (Tee) Srey, and Hasan Al-Jamaly.

"Being part of the conference was an exhilarating experience that opened my eyes to a community I never knew existed," said CSE junior Hasan Al-Jamaly. "More importantly, it’s a community I truly belong to and feel part of." Other attendees also reinforced the importance of solidarity with other oSTEM participants as an integral part of their experience at the conference.

The student delegation to Chicago was accompanied by CSE Prof. Arun Kumar and Mathematics Prof. Daniel Rogalski. UC San Diego faculty participation in the conference was made possible by campus units:

The new oSTEM chapter at UC San Diego gets support from corporate sponsors including Northrop Grumman, Boeing and Door of Clubs (a startup that matches college clubs with potential partners in industry).

In addition to sponsors Northrop Grumman and Boeing, organizations with booths at the oSTEM conference included NASA, Raytheon, Google, Genentech, Accenture, Lockheed Martin, and the nonprofit Human Rights Campaign. A number of elite graduate programs also had booths, including Columbia Engineering, John Hopkins, Cornell Engineering, UC Berkeley, University of Michigan, New York University, Pursue, and Georgia Tech.

CSE senior Sotiryak (Tee) Srey — current holder of the Center for Networked Systems Allen Turing Memorial Scholarship at UC San Diego — is secretary of the oSTEM chapter. "This is our first official year and our first time attending the oSTEM National Conference, and I was really hoping to leave the conference with concrete ideas that I could implement as an officer," said Srey. "After hearing from other chapters, I feel a sense of relief because of how well our chapter is doing so far. We typically draw about 30 people to our oSTEM meetings, which is roughly similar to the number of active participants at longer-established oSTEM chapters around the country. This shows that we are making an impact in LGBT visibility on campus."

According to CSE professor Arun Kumar, more UC San Diego LGBT faculty would benefit from establishing a community similar to the students’ oSTEM chapter on campus. "There was almost no other faculty from computer science at the national conference this year," noted Kumar. "An organized network of LGBT faculty could promote useful community-building within academia."

CAN GAMES BE THE BEST MEDICINE?

CSE Prof. Nadir Weibel and some of his students gave a public talk and demonstration at the Fleet Science Center in Balboa Park in October. The presentation, "Game Changer: Ubiquitous Computing for Health at UC San Diego," was part of a series of talks in connection with the Fleet’s ongoing exhibition, "Game Masters," which ran through January 15, 2018. Once a month, the museum invited local scientists, researchers and engineers to talk about how video game technology is helping them find imaginative solutions to the world’s challenges.

Two earlier speakers in the Game Changer series before Weibel have close connections to Computer Science and Engineering. They included CSE faculty-affiliate and structural engineering professor Falko Kuester, and CSE lecturer Jurgen Schulze, who is also a research scientist in the Qualcomm Institute at UC San Diego.

Weibel’s students co-presented with him at the outreach event. All are members of his Human-Centered and Ubiquitous Computing Lab. They included CSE Ph.D. student Danilo Gasques Rodrigues, CSE M.S. student Janet Johnson, and Wei bel’s Ph.D. student from Bioengineering, Vish Ramesh. Weibel also presented some of the work of CSE Ph.D. student Steven Rick.

The talks explored how gaming technologies, such as Kinect and goggles for virtual reality (VR) and augmented reality (AR), are being used to change the medical field. In their talks, Weibel and his students showcased current technologies they are developing. They explained how the Kinect gaming sensors can be used to monitor the human body in action, as well as for hand and gesture tracking, sign language — and even to help diagnose stroke (based on changes that may affect movement in the patient’s upper body).

The researchers came up with an approach they call UniStroke, which outlines specific measurements to determine impairment from stroke, including pupil tracking, finger tracking, posture detection, speech processing, synchronicity of movements, and electroencephalography (EEG). Taken together, these measurement tools can improve diagnosis of stroke, which is critical because there is a three-hour window to administer the main drug for the vast majority of strokes. After the window closes, the drug to minimize damage from a stroke cannot be administered.

The team also showed how "mixed reality", which combine AR, VR and regular vision, can be used to greatly increase the success rate in dealing with cardiac arrests outside of a clinical setting. They compared participants’ ability to perform CPR with the aid of a checklist in Mixed Reality versus a tablet interface. Using a HoloLens VR system and superimposing animated hands over the location of the user’s own visible hands, the team found that civilians used the right technique for chest compressions at double the rate of those who were not prompted with the animated hands. They also placed the defibrillator pads at the correct location on the patient over 66% of the time, versus barely 36% when the same users only had access to a tablet to guide them. They also responded much faster.
ALUMNI PROFILES
PAYING IT FORWARD
DERRICK MCMILLEN (B.S. ‘12)
LEAVES SOFTWARE ENGINEERING
FOR PUBLIC SERVICE

After doing summer internships at Yahoo! and Microsoft as an undergraduate in Computer Science at UC San Diego, Derrick McMillen (B.S. ’12) graduated and joined the ranks of software engineers, first at Salesforce.com, and later Facebook, where he worked for its Instagram unit. But that’s where he veered from the typical career path for many of his fellow computer-science graduates.

It all changed for McMillen in 2015, when he attended a fireside chat hosted by Khan Academy’s Sal Khan and the White House’s chief technology officer, Megan Smith. “Throughout the discussion, Smith was emphatic about the urgent need of engineers to engage in public service,” recalls McMillen. “A lot of our country’s infrastructure and public services have decayed and become hopelessly dysfunctional, and since we live in a democracy, we get the country and services we deserve. Investing in the future starts with skilled and motivated people who can participate directly in fixing the system.”

That call to public service did not fall on deaf ears. As McMillen tells it, he had already been thinking about using his academic background for the public good — to “pay it forward.” While studying at UC San Diego, he worked part-time at the San Diego Supercomputer Center (SDSC) as part of a joint program with UC San Diego Extension teaching middle and high school students.

“My experience teaching at SDSC demonstrated that I enjoy teaching and working with young people,” says McMillen, who says it was there that he was first exposed to the joys of teaching. “I designed and taught three summer courses that covered programming topics such as web develop-

After getting his undergraduate degree, McMillen opted to go the more established route of working in a high-tech company. But when he was at Facebook, the two worlds collided. McMillen found himself spending more and more time on activities that went beyond his job description. “I was holding lunchtime presentations for peers on new technologies, recruiting university candidates, and mentoring new colleagues and interns,” he remembers. “Those activities presented ways for me to share my passion for technology, and increasingly, the time I invested in other people’s success was far and away the most fulfilling part of my job.”

Facebook was also investing in a charter-school network called Summit Public Schools, and the company was building the technology and software infrastructure offered for free to any member school that would implement it. While considering whether to join the initiative, McMillen met with teachers and principals at Summit schools in the Bay Area.

“I realized that I wasn’t particularly interested in just writing software for schools,” muses McMillen. “I didn’t want to effect change from the periphery; I wanted to be in schools and experience the hard decisions that educators have to make every day to ensure the best possible learning outcomes for my students. By engaging with students, I could have a much more immediate impact on their lives.”

Meeting a lot of people in the Bay Area who worked in edtech, McMillen began to sound them out about any schools that wanted to invest in computer science education at the middle and high school level. “I was introduced to the principal at the Coliseum College Preparatory Academy [CCPA] in East Oakland, and shortly after, I started volunteering at the school in a math classroom,” he explains. “I worked with an Algebra 2 teacher to write a unit that applied quadratics to how computers draw curves (using the Bézier curve algorithm).” To demonstrate how the algorithm works, he built an app called PolyLauch for the students.

The experience of being in a school that serves largely underserved neighborhoods and students who might otherwise be unable to compete for the technology jobs of the future had a big impact on the computer scientist. It motivated McMillen to contemplate a full time switch into teaching and building a Computer Science program at CCPA.

“I decided that this was a school and community I wanted to join,” he notes. With students of color making up virtually the entire CCPA student body, McMillen recognized that many underserved students tend to get sidetracked long before college. For many of them, he says, they become marginalized while still in middle school, because that’s when they should start learning the basics of computer science. Warns McMillen: “It’s too late to start in high school, because they won’t be academically prepared for rigorous, post-secondary STEM education.”

McMillen was attracted to CCPA because of its reputation for recruiting, retaining and mentoring students so they can become college- or career-ready by the time they graduate from high school. Some 80% of CCPA’s graduating senior class enrolls in a four-year institution of higher learning.

CCPA hired McMillen to develop a Computer Science Pathways program. “Every student deserves the opportunity to learn about technology and programming,” he argues. “But unless we start a rigorous program in middle school, it’s too late for even the best students to play catch-up in upper division high school students.”

Still in its infancy, the Computer Science Pathways program at CCPA reaches all 8th-graders and after that, students in the Pathways program receive three years of Computer Science education as they progress through high school. The students go from Exploring Computer Science (in 9th grade), to AP Computer Science Principles (10th), and AP Computer Science A (11th).

Today, McMillen’s CS program serves over 120 students in grades 8-11. In addition to teaching half of those students himself, the CSE alumna was able to help a colleague transition from teaching English to teaching Computer Science, and his colleague now supports the other half of the CS students (while
McMillen teaches the half who are enrolled in AP Computer Science.

"We also assembled a robotics team that competes at UC Berkeley, and two of our students were interns at LinkedIn last year," says McMillen. He has also become an important contributor to the broader Oakland Unified School District, which has approximately 2,500 students enrolled in computer science courses.

McMillen goes on to say that he and his colleagues at the school are building relationships with students and fostering their innate creativity. "If you push students to achieve, hold them accountable, and give them a goal that they care about, they will do amazing work," adds McMillen. "We're developing the capacity within our students to achieve academically and think analytically. They've never been asked to work this hard before.

Looking to the future, he sees his mission as bringing those analytical skills and computer science itself to all of the students attending CCPA.

"To be effective with an underserved student means serving the whole student," states McMillen. "We've structured our school to ensure that students' emotional, physical, mental, and social needs are met by the services the school provides. My principal and our community deserve tremendous credit for building a culture where students have the opportunity to consider academics as a legitimate pursuit.

His teaching efforts are also helped by CCPA parents, who are highly engaged. "They work tirelessly to ensure their students can have the educational opportunities they did not," observes McMillen.

Indeed, the CSE alumnus sees his job as paying forward some of what he received during his undergraduate education.

"Gary Gillespie and Rick Ord invested in me when I was at UC San Diego," he says. "They dedicated so much of their time to mentoring students and giving us opportunities to lead. Their commitment to education has encouraged me in the short time I've been an educator. The Computer Science and Engineering department at UC San Diego epitomizes the high standards and commitment to student learning that we try to uphold at CCPA. The faculty taught me what excellence looks like, and I hope to bring that same enthusiasm for learning to all of our students."

The 26-year-old native of San Diego has no qualms about the switch from industry to teaching. "Tech life is pretty comly but I don't miss it," observes McMillen. "This is much more rewarding."

AYSE COSKUN (Ph.D. ’09)

In November 2017, CSE alumna Ayse Coskun (Ph.D. ’09) accepted an award from the Council on Electronic Design Automation (CEDA): the IEEE CEDA Ernest S. Kuh Early Career Award. The awards committee cited Coskun's "sustained and outstanding contributions to energy-efficient system-level design, including temperature-aware design and management, 3D-stacked system design, and management of large-scale computing systems."

Coskun is now a professor in the Electrical and Computer Engineering Department at Boston University (BU). "I am particularly honored because the award is available to a large number of outstanding nominees from both industry and academia," she said. "The competition must have been intense. At UC San Diego, Coskun worked in the System Energy Efficiency Lab (SEE Lab) led by her Ph.D. advisor, Prof. Tjajna Simunic Rosing. "There is a direct line from my work with Prof. Rosing to my current research interests," said Coskun. "I started my projects on proactive thermal management and 3D-stacked architectures while I was a Ph.D. student."

Coskun's current interests include modeling and optimizing systems with new technologies (e.g., systems with optical networking or co-design with cutting edge nanoscale cooling devices), and large-scale system analytics for cloud and high-performance computing systems.

The Early Career Award honors an individual who has made innovative and substantial technical contributions to the area of Electronic Design Automation in the early stages of his or her career. 2017 was a year of honors for the CSE alumni. She and her group accepted the Gauss Award with collaborators from Sandia Labs for their research paper on "Diagnosing Performance Variations in HPC Applications Using Machine Learning." Also in 2017, Coskun received a Dean's Catalyst Award from BU – an award she also received in 2010, her first year on the BU faculty.

Coskun also received two key grants in the past six months. She is the principal investigator of an interdisciplinary project with colleagues from BU, Brown University, and MIT. They received a $700,000 NSF grant over the summer for research on advanced processor cooling methods (with roughly one-third of the funding research in Coskun's lab). A co-PI on the same project and collaborator with Coskun, Brown University professor Sherif Reda, is also a UC San Diego CSE alum (Ph.D. ’06).

In the spring, Sandia National Laboratories awarded a $490,000 grant to Coskun and fellow BU professor Manuel Egele. They will use the funding to design automated analytics for improving efficiency and security of high-performance computing systems. Specifically, they aim to identify which data collected out of HPC systems would be useful for identifying performance characteristics, inefficiencies, and malicious behavior. Subsequently, Coskun and Egele will design automated methods to leverage those data to take runtime actions to improve efficiency and security.

Professor Coskun's past recognitions include an NSF CAREER Award in 2012, and in 2011, a Best Paper Award from the High Performance Embedded Computing (HPEC) Conference. Also in 2011, she was named a Junior Faculty Fellow at the Raffik B. Hori Institute for Computing at BU. Coskun is currently an associate editor of the IEEE Transactions on Computer Aided Design.

The CSE alumna is also looking to the future. In March 2018, she'll be in Dresden, Germany, as Program Chair for the Conference on Design, Automation and Test in Europe (DATE 2018) in Dresden, Germany. DATE is one of the largest venues for research on electronic design automation.
MATTHEW DER (M.S., Ph.D. ’13, ’15)

Just because he’s not in San Diego or Silicon Valley doesn’t mean a CSE alum – in this case Matthew Der – cannot work for a dynamic startup that would attract a blue-chip takeover. That’s exactly what happened to Notch, Co., a tech consulting firm in his hometown of Richmond, Virginia. A year after his brother co-founded the company, Matt Der joined as Chief Technology Officer in 2015 after completing his Ph.D. in Computer Science at UC San Diego, with a focus on machine learning.

“Having a Ph.D. in machine learning is a big differentiator, especially in a mid-sized market,” Der said after picking up an Emerging Technology Business Award in 2017. “It immediately gave us street cred, sales material and conversation starters.” Notch attracted so much attention that one of its own customers, credit-card giant Capital One, bought the company outright in December (for an undisclosed price). The CSE alumni and a dozen other Notch employees moved to Capital One’s nearby campus. (Capital One was already the largest employer in the Richmond region.)

Der and his colleagues joined Capital One’s team working on AI and machine learning for the credit-card industry, notably for cyber security, fraud prevention and customer service. “Capital One is already using machine learning and data in innovative ways,” says Der. “We are joining at a time ripe with opportunity to further transform the business with machine learning, and permeate it throughout the company.”

While the acquisition presumably buttressed Der’s bank account, he is staying put at Capital One for the immediate future while resuming involvement in academia as well. “There is a lot of goodwill we can do given Capital One’s size and customer base,” he explains. “Hopefully having a Ph.D. in Computer Science from UC San Diego will allow me to engage with Capital One’s partnering universities to conduct research and help fill Capital One’s talent pipeline.”

KC CLAFFY (M.S., PH.D. ’91, ’94)

CSE alumna Kimberly (KC) Claffy, who is also a faculty affiliate in the department, is the recipient of the prestigious Jonathan B. Postel Service Award from the Internet Society, which called her a “visionary in the field of Internet research.”

Claffy was selected by an international award committee comprised of former winners of the award. They cited her “pioneering work on Internet measurement through the development of infrastructure and methodologies for data collection, analysis, and sharing around the world.”

The Internet Society presented the award and a $20,000 honorarium in November at the 100th meeting of the Internet Engineering Task Force (IETF) in Singapore.

Not long after completing her Ph.D. in CSE, Claffy became the founder and first director (in 1997) of the Center for Applied Internet Data Analysis (CAIDA), located in the San Diego Supercomputer Center (SDSC), where she was a research scientist. CAIDA remains a world-class repository for network research and a leader in research infrastructure to handle large-scale data for the scientific research community.

Claffy’s own research interests span Internet topology, routing, security, economics, future Internet architectures and policy. In particular, she is a pioneer in the field of measuring and understanding the Internet, not only through her research contributions, but her commitment to establishing and operating infrastructure to support large-scale data collection, curation and sharing within the scientific research community.

The first of Claffy’s many papers on Internet traffic measurement and analysis was published in 1992—two years before her doctoral dissertation, and even before the Internet transitioned to the global, private sector-led network it is today. Since then, she has published dozens of papers and received numerous grants and awards for her work.

“Dr. Claffy’s long-standing and pioneering work has helped the global community better understand the Internet and how it is used,” explains Kathy Brown, President and CEO of the Internet Society. “In addition to leading the way in the field of Internet measurement and analysis, her dedication of resources to ensure widespread access to measurement data has allowed a range of disciplines—from network science and network operations to political science and public policy—to benefit from her efforts.”

The 2017 Postel Award recipient is hopeful that the past few decades of Internet development will pale in comparison with where the Internet is going from here. “I want to make the world safe for Internet science,” Claffy said in accepting the award. “The American people need better data—to understand what the Internet is, how it’s connected, and how data is being used.”
FACULTY HONORS

Three computer scientists from UC San Diego have been elected Fellows of the Association for Computing Machinery (ACM), the world's largest educational and scientific computing society.

ACM CITED:

- CSE professor Ravi Ramamoorthy for his "contributions to computer graphics rendering and physics-based computer vision"; 
- CSE professor Alexander Vardy, whose primary faculty appointment is in Electrical and Computer Engineering, was cited for his "contributions to the theory and practice of error-correcting codes and their study in complexity theory"; and 
- CSE professor Geoffrey M. Voelker was honored for "contributions to empirical measurement and analysis in systems, networking and security."

"Professors Ramamoorthy, Vardy and Voelker have all been pioneers in their respective fields of graphics and vision, computer systems and networking, and information and coding theory," said CSE Chair Dean Tullsen. "They all richly deserve the honor of being elected by their peers to be Fellows of the ACM."


Ramamoorthy – who became an IEEE Fellow at the beginning of 2017 – and Vardy – who became an IEEE Fellow in 1999 – are now two of only six CSE faculty to be Fellows of both ACM and IEEE. The others are professors Kahng, Tullsen, Zhou and Gupta.

The CSE faculty members will be inducted as ACM Fellows in June 2018 at the ACM Awards Banquet in San Francisco.

HIGH-RISK, HIGH-REWARD

CSE professor Melissa Gymrek, who splits her time between CSE and the Department of Pediatrics, accepted a National Institute of Health Director’s Early Independence Award. It’s part of the agency’s 2017 High-Risk, High-Reward Research awards, which honor “exceptionally creative scientists” to support unconventional approaches to major challenges in biomedical research. Gymrek was cited for her work on algorithms to better understand genetic variation in humans and diseases caused by gene mutations.

Awardees are encouraged to think outside the box and to pursue exciting, trailblazing ideas in any area of research relevant to the NIH mission. Gymrek, who joined UC San Diego in 2016, focuses on mutations linked with variations in copy numbers of short tandem repeats, or microsatellites. Such mutations are implicated in roughly 30 conditions, most notably Huntington’s Disease, which causes the progressive breakdown of nerve cells in the brain. About 30,000 people suffer from the condition in the United States.

Also in 2017, Gymrek was selected as one of Forbes magazine’s 30 Under 30 researchers.
ROSSING ELECTED IEEE FELLOW

CSE Prof. Tajana Rosing has been elected a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) in the Class of ‘18. She was honored for her “contributions to power and reliability management of Systems-on-Chip.”

That’s not the only honor bestowed on Rosing in the past year. She was named holder of the John J. and Susan M. Fratamico Endowed Chair in the Jacobs School of Engineering, and co-director of the Artificial Intelligence and Healthy Living Center (AHL), a new joint center between UC San Diego and IBM Research.

AHL will focus in depth on the impact that daily habits, the environment, genetics and the microbiome have on the cognition of older adults. The groundbreaking center promotes critical research and applications in two thematic areas: Healthy Aging (led by Rosing) and the Human Microbiome (led by CSE and Pediatrics Prof. Rob Knight), together with co-directors from IBM Research.

Rosing leads the System Energy Efficiency Laboratory in CSE, focusing on energy efficiency in all kinds of systems, from sensor nodes to smart cities. In addition to energy-efficient computing, her primary research interests include context-aware computing, human-cyber-physical systems design, embedded systems hardware and software design, resource management at the system level, and the design of approximate and highly efficient architectures. Rosing also investigates efficient, distributed data collection, aggregation and processing of data in the context of smart cities, wireless healthcare, and Internet of Things applications.

The computer engineer has also leveraged context to optimize the operation and design of embedded systems by maximizing energy efficiency in exchange for controllable and tolerable inaccuracies in computation. According to Rosing, her research has resulted in systems that are up to 1,000 times more energy efficient with less than a 10 percent error in computation. “These systems are especially applicable to many Internet of Things applications where the data sources themselves are not completely accurate,” says Rosing.

Prior to joining the CSE faculty in 2005, Rosing was a full-time researcher at HP Labs, focusing on low-power wireless media and embedded systems. While at HP Labs in Palo Alto, she finished her M.S. and Ph.D. degrees at Stanford in 2000 and 2001, respectively. Previously, she worked as a senior design engineer at Altera Corporation.

SEMI-FINALIST FOR THE WOMEN’S SAFETY XPRIZE

Next June in Mumbai, India, the Anu and Neven Jain Women’s Safety XPRIZE will be awarded to one of the 21 semifinalists who are competing for the Grand Prize — $1 million.

CSE Prof. Debasish Sahoo, who has a joint appointment in Pediatrics, and his wife have reached the semifinals of the global competition. Competing teams must come up with inexpensive devices to help women respond to many kinds of threats in order to “leverage technology to create accessible and affordable safety solutions that help tackle violence and harassment against women.”

To keep the price of innovation down and ensure that any breakthrough can be made available to women in developing countries, the winning device or technology must be cheap enough to sell for no more than $40.

Sahoo’s team Shanvi — named for the couple’s two-year-old daughter — now has six months to develop a prototype of their wireless device. The minimum functionality must show that an emergency alert can be triggered, and critical information relayed to a community of responders, within 90 seconds.

Powered by body movements, the Shanvi wireless device would always be charged, so it won’t require new batteries. The device is designed to be worn discreetly near the ear as an earplug or earring. If the device senses a specific change in a woman’s breathing pattern, it could immediately alert a smartphone app that can be used by family member, friend or emergency responder. Says Sahoo: “The advantage here is that by simply altering her breathing, a woman could send a distress signal in any situation, even if she can’t speak or use her arms.”
TEST-OF-TIME AWARD FOR RETURN-ORIENTED PROGRAMMING

In early November, CSE Prof. Haviv Shucham was recognized for a paper he presented 10 years earlier that introduced the field of "return-oriented programming." The Computer and Communications Security (CCS) Test-of-Time Award went to Shucham's 2007 paper for its lasting impact on security research and practice during the past decade. He was sole author of the prize-winning paper — his first published after joining the CSE faculty that same year.

Applications running on a computer keep track of what task they are performing and what tasks they are to perform next in a region of memory called the stack. Programming errors in these applications often allow the stack to be overwritten, confusing the application and causing it to misbehave or crash. Worse, an attacker who carefully crafts malicious input can confuse the application into running code he injects. Fixing all bugs in all applications is a hopeless task, so systems designers have devised defenses that rule out such code-injection attacks, by distinguishing "good" application code from attacker-introduced code. Since attackers must inject new code to achieve their ends, the thinking goes, ruling out the introduction of new code rules out attacks.

Security researchers working in industry had developed techniques that allowed them to exploit buggy programs and cause them to undertake certain "bad" behavior — even in the presence of defenses against code injection. Shucham's paper unified and generalized these exploit techniques under the rubric of what he jokingly called "return-oriented programming." A return-oriented attack doesn't introduce any new code. Instead, it makes use of short snippets of the original "good" program's code. The attacker combines these snippets in clever ways that allow the attacker to synthesize any behavior desired from them.

"An analogy to return-oriented programming is a kidnapper who puts together a ransom note with letters cut from magazine headlines," said Shucham. "With all 26 letters gathered (and a photocopier), he can compose any message he wishes." Such a set of building blocks is said to be " Turing-complete."

Shucham's techniques have stuck, both in academia and in industry. Shucham's paper has been cited more than 900 times. Where his original work considered only Intel's x86 family of processors, researchers have since extended Return-Oriented Programming (ROP) to other popular processors, including the ARM processors that power nearly all smartphones. A 2014 Microsoft report (see Microsoft Security Intelligence Report, Volume 10) found return-oriented techniques used in more than 90% of exploits targeting Microsoft products. Microsoft, Intel, and ARM have all announced new security mechanisms in their products specifically to mitigate the threat of return-oriented programming.

AROUND THE DEPARTMENT

NEURAL NETS ON THE (FASHION) RUNWAY

CSE Prof. Julian McAuley, his Ph.D. student Wang-Cheng Kang and collaborators at Adobe Research have demonstrated how artificial intelligence and neural networking could one day go beyond making recommendations about what fashion to buy, to helping retailers and apparel makers design bespoke clothing for consumers based on what they can learn from a buyer's preferences.

Their findings were published in early November in a paper on "Visually-Aware Fashion Recommendation and Design with Generative Image Models."

"This suggests a new type of recommendation approach that can be used for recommendation, production and design," argues CSE's McAuley. "These frameworks can lead to richer forms of recommendation, where content recommendation and content generation are more closely linked."

The project tested how well tools from artificial intelligence (AI) and machine learning can help the fashion industry and consumers — particularly those among the growing cohort of shoppers eager to buy clothing over the Internet.

While there are many algorithms and tools to help online retailers recommend designs to potential buyers, the UC San Diego-Adobe team went a giant step further. They wanted to see if it would be possible to crunch preference and other data not only to make recommendations, but potentially to enable computers to produce new clothing designs that would have an edge because they reflect a consumer's individual preferences.

Initially, the researchers focused on devising a system to create better recommendations, particularly in the case of visual recommendations (where consumers can be swayed by how the product looks as in the case of fashion apparel or artworks). According to the paper, building such systems is particularly challenging in fashion "due to the high level of subjectivity and the semantic complexity of the features involved." The Creditors go on to note that visual recommendation can be made more accurate by incorporating visual signals directly into the recommendation objective, using off-the-shelf feature representations derived from deep networks.

The team demonstrated that recommendation performance can be significantly improved by learning "fashion-aware" image representations directly, by training the image representation (from the pixel level) and the recommender system jointly.

"We show that our model can be used generatively, i.e., given a user and a product category, we can generate new images in this case clothing items) that are most consistent with the user's personal taste," said first-author and Ph.D. student Kang. "This represents a first step toward building systems that go beyond recommending existing items from a product corpus, to suggesting styles and helping to design new products.
ALUMNI ATTEND HACKATHON RECEPTION

Approximately 700 students from universities around the country participated in the third annual SD Hacks hackathon in October 2017. It took place over three days in RIMAC Arena on the UC San Diego campus, and gave the CSE Alumni Advisory Board an opportunity to host a reception overlooking the RIMAC floor.

On the first evening of the hackathon, a CSE Alumni Reception attracted some of the department's former students who were competing or serving as mentors during SD Hacks 2017. Appetizers, desserts and beverages were served at the reception for CSE alumni only.

CSE junior Elise Wong, a computer-engineering major, was the lead organizer of SD Hacks. She says campus organizations play an important role in the event. "We have workshops run by other UC San Diego student organizations," notes Wong. "The Computer Science and Engineering Society held a workshop, App Developers at UCSO held a workshop, and so did the student Virtual Reality Club. I think it is pretty cool that we work closely with those groups."

The Grand Prize went to a team of five students who built a VR Tracking app designed to track where the user goes in virtual space as well as in the physical world. The app reads accelerometer data and tracks the user's position. The students used Javascript and HTML to write the software. "We built something that is presentable and comes close to what we expected," wrote the team on their DevPost page. "We also learned a lot about VR tracking and integration."

Other hacks submitted by the end of SD Hacks 2017 included "Dining with Alexa", which gives students access to daily menu information from campus cafeterias, restaurants and dining halls via voice commands through Amazon's Alexa platform. It was built by recent CSE alumnus Calvin Xavier Gomez (M.S., '17), M.S. students Tushar Koul and Janet Johnson, and Markus Duerer, a CSE visiting international student from Germany.

CSE’S STRONG PRESENCE AT NIPS 2017

Nearly 8,000 experts packed a Long Beach, CA, conference center in December for the 31st annual conference on Neural Information Processing Systems (NIPS), and CSE Prof. Kamalika Chaudhuri was the leading UC San Diego attendee. Chaudhuri presented multiple papers and talks during the conference.

"Historically, UC San Diego has always had a strong presence at NIPS," said Chaudhuri. "Every year we have quite a few papers, and a couple of years ago, the best paper award went to a team from UC San Diego."

UC San Diego’s presence included a tutorial taught by Chaudhuri on "Differentially Private Machine Learning: Theory, Algorithms and Applications," together with former CSE postdoctoral researcher Anan Sarwate. The tutorial was taught by CSE professor Kamalika Chaudhuri and Rutgers University professor Anand Sarwate (who is now a professor at Rutgers University).

Chaudhuri was also senior author on two papers accepted to the main research track at NIPS 2017. "Renyi Differential Privacy Mechanisms for Posterior Sampling" was co-authored with CSE Ph.D. students Joseph Geumleak and Shuang Song, and Chaudhuri co-authored "Approximation and Convergence Properties of Generative Adversarial Learning" with her Ph.D. student Shuang Liu and Google's Olivier Bousquet. Another student in Chaudhuri’s group, Ph.D. student Songbai Yan, collaborated with recent CSE alumnus Chicheng Zhang (Ph.D. ’17) for a paper on “Revisiting Perceptron: Efficient and Label-Optimal Learning of Halfspaces.” Zhang is currently a postdoctoral scholar at Microsoft Research in New York City.

Chaudhuri also delivered invited talks at workshops co-located with NIPS 2017: "Privacy-Preserving Mechanisms for Correlated Data," and "Analyzing Robustness of Nearest Neighbors to Adversarial Exemplars."
NEW FACULTY

HADI ESMAEILZADEH  
Associate Professor | Ph.D. University of Washington

Esmaeilzadeh is a computer architecture expert whose work focuses on designing next-generation systems to accelerate emerging applications. He aims to make immersive machine intelligence a reality by bridging the gap between algorithms and innovative hardware technologies through full-stack solutions. He is the founding director of the Alternative Computing Technologies Lab.

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SICUN GAO  
Assistant Professor | Ph.D. Carnegie Mellon University

Gao develops design automation techniques for cyber-physical systems, such as autonomous cars and cardiac pacemakers. He leads the development of dReal, an automated reasoning tool capable of verifying and synthesizing complex cyber-physical system designs. The tool has been used by many groups, including the Toyota Research Institute, NASA, and the Royal Victoria Infirmary in the UK.

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NADIA POLIKARPova  
Associate Professor | Ph.D. ETH Zurich

Polikarpova’s goal is to build practical tools and techniques that make it easier for programmers to construct secure and reliable software. Her research focuses on software security, automatic debugging, and automatically generating programs that meet high-level specifications.

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HAO SU  
Assistant Professor | Ph.D. Stanford University

Su is interested in artificial intelligence disciplines, including machine learning, computer vision, computer graphics, robotics and smart manufacturing. He focuses on deep learning for 3D data understanding and interconnecting 3D data with images, texts, etc. Applications include robotics, autonomous driving, virtual/augmented reality, smart manufacturing and more.

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JISHEN ZHAO  
Assistant Professor | Ph.D. Penn State

Zhao’s research connects computer architecture and system software, with an emphasis on memory and storage systems, acceleration mechanisms, and high-performance computing. Her research is driven by emerging technologies such as 3D integration and nonvolatile memories, and modern applications like big-data analytics, machine learning and scientific computing.

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CSE EXPANSION

Pursuing the goal of creating a student-centered environment for all its graduate and undergraduate students, in September 2017 the CSE department hosted a grand opening of its new spaces and a grand staircase connecting undergraduate laboratories to research laboratories throughout the building. The modification also added 4,500 square feet of new space, including five new TA rooms. The project was entirely funded by alumni gifts received during the "Inspiring Imaginations" campaign launched in 2013 at the celebration of 25th anniversary of the department.