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Since its early days at UC Irvine, computing has been viewed as much more than a new technical discipline; it has been approached as a new human-technology frontier. Half a century later, with information technology permeating every aspect of our society, our human-centered perspective on computing innovation in the Donald Bren School of Information and Computer Sciences (ICS) is more pertinent than ever before.

The pages of the 2019 Year in Review are filled with stories that exemplify our continued commitment to the advancement of human- and society-aware computing technologies. This year's issue highlights some of the ways our faculty and students push the boundaries of artificial intelligence, an area of traditional excellence and sustained investment in our School, ranging from foundational research on new machine learning algorithms to the exploration of how artificial intelligence can promote social welfare, economic progress and justice. It also highlights our work in numerous other core areas and application domains of computing, including data science, digital health, security and human-machine interaction, as well as our nation-leading efforts to engage a broad and diverse student body.

Reflecting the growing appeal and impact of our programs, the number of applications for admission to ICS is at a record high, reaching 17,000 for fall 2019 admission. Selectivity is also at a record high, with about 1,000 new students entering ICS in fall 2019. Total enrollment this academic year stands at approximately 4,300 students, with about 3,500 undergraduates, almost 500 master's students and more than 300 doctoral students. On the faculty front, growth has continued unabated, advancing our School's strategic priorities in the areas of artificial intelligence, data science and big data systems, while strengthening our collaborations across campus in the areas of health informatics and computational discovery. Eight new tenure-track faculty have joined ICS this academic year, bringing the total count across our three departments to an all-time high of 95. A search for 10 new tenure-track faculty is currently underway.

In early October, UCI launched its Brilliant Future capital campaign with a \$2 billion target. ICS is embarking on this campaign aspiring to coalesce its alumni and friends around long-term priorities that are vital for our School and our nation. I invite you to learn more about these priorities, as highlighted in this issue, and I welcome your thoughts and insights as we work together to shape the future of our School and its impact on our world.

Marios C. Papaefthymiou

Professor of Computer Science

Ted and Janice Smith Family Foundation Dean

On the Cover

The photo shows a wolf surrounded by snow. Professor Sameer Singh's group uses similar photos in its work to explain the criteria that machine learning algorithms rely upon to make their decisions. To demonstrate via a simple example that these criteria could be counterintuitive, unexpected or even irrational, Singh and his collaborators have developed a machine learning algorithm that can very accurately differentiate between wolves and huskies (a breed of dog that looks similar to wolves) based on existing photos of the animals. Singh's research shows that the algorithm's accuracy is misleading: When deciding between a wolf and a husky, the algorithm actually ignores the animal, instead using the fact that the animal is in the snow to say that it is a wolf (see image on the right).



Read about Singh and other ICS faculty members involved in AI projects starting on page 4.

2019 Year in Review

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ICS By the Numbers

Degrees Granted 2018-19



With 1,000+ students graduating each year, ICS contributes about 2% of the roughly 50,000 new Ph.D., M.S. and B.S. degrees per year in the U.S. and Canada.

Incoming Freshmen Fall 2019



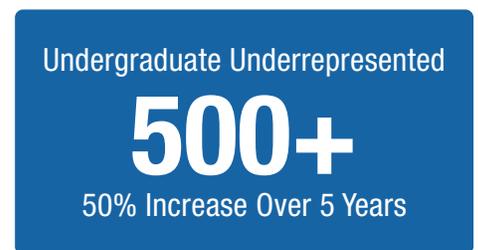
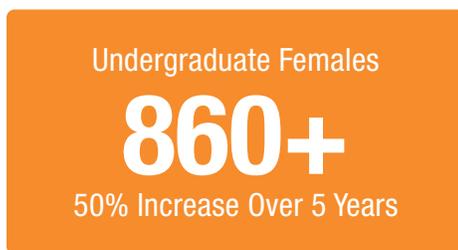
4.06 Average GPA

1,399 Average SAT

11,000+
Total ICS Alumni

\$20 Million
Annual Research Expenditures **FY19**

Fall 2019 Enrollment



95 Tenure-Track Faculty
40% Increase Over 5 Years

7 UNDERGRADUATE PROGRAMS

- Business Information Management
- Computer Game Science
- Computer Science
- Computer Science and Engineering
- Data Science
- Informatics
- Software Engineering

5 PROFESSIONAL GRADUATE PROGRAMS

- Master of Computer Science
- Master of Data Science (Starting 2020)
- Master of Embedded and Cyber-Physical Systems
- Master of Human-Computer Interaction and Design
- Master of Software Engineering

5 RESEARCH GRADUATE PROGRAMS

M.S. and Ph.D.

- Computer Science
- Informatics
- Networked Systems
- Software Engineering
- Statistics

Highlights

- Computer Science is UCI's 2nd-largest undergraduate major.
- 50% of ICS students are minority, female or first-generation.
- Top 15 Computer Science Graduate Program among public universities, as ranked by *U.S. News & World Report*.
- Software engineering research is ranked #2 and HCI research is ranked #8 by *CSRankings.org*.
- Game design program is ranked 3rd among public institutions by *Animation Career Review*.
- Statistics received 2 of the 13 NSF Graduate Research Fellowships awarded to statistics students nationwide in 2019.

Pushing the Boundaries of

AI

Although still in the relatively early stages, artificial intelligence (AI) is advancing rapidly, with pioneering researchers from the Donald Bren School of Information and Computer Sciences (ICS) leading the way in exploring not only technical solutions but also their societal implications.

“It is not an exaggeration to suggest that the universities that will play a leading role in the 21st century, educating the next generation of AI investigators, will be those that invest broadly in AI now,” says Distinguished Professor of Computer Science Pierre Baldi, who was recognized last year by Deep Knowledge Analytics in its report, “Top 100 AI Leaders in Drug Discovery and Advanced Healthcare.” In fact, with more than 15 faculty and 70 Ph.D. students conducting cutting-edge

AI research with application in areas ranging from biomedicine and physical sciences to public policy and social sciences, ICS is at the forefront of this transformative field.

“AI is an area of traditional excellence and continued investment in ICS,” says ICS Dean Marios Papaefthymiou. Since the late 1960s, ICS has been offering undergraduate and graduate concentrations in AI — a decade earlier than most computer science programs. This aggressive beginning helped create the foundation for today’s innovative research, a foundation that includes UCI’s Machine Learning Repository (archive.ics.uci.edu/ml), created by computer science Ph.D. student David Aha in 1987. The repository now houses more than 465 datasets as a service to the machine learning community.

AI's Transformative Potential

ICS researchers work across a broad spectrum of areas related to AI, with data science on one end, symbolic AI on the other and machine learning in the middle. Their efforts vary from collaborations that help the School of Physical Sciences better analyze data and make predictions, to Baldi's use of machine learning to solve the Rubik's Cube and his collaborations with medical professionals to improve diagnostic techniques, to efforts by Associate Professor of Computer Science Marco Levorato to coordinate autonomous swarms of drones. These and many other ICS researchers are constantly moving us one step closer to realizing the transformative potential of AI.

As you'll read in the pages that follow, Assistant Professor of Computer Science Sameer Singh and his natural language processing (NLP) research group have partnered with the Allen Institute for Artificial Intelligence (AI2) to build AI algorithms that can read and understand text. Assistant Professor of Computer Science Stephan Mandt is developing deep learning approaches that need less human supervision and is working with Baldi and particle physicist Daniel Whiteson to use those approaches to increase the resolution of particle physics detectors. Professor of Computer Science Alexander Ihler is also in a collaboration with UCI's Department of Physics and Astronomy, looking at celestial bodies and calibrated uncertainty, while Associate Professor of Computer Science and Statistics Erik Sudderth, director of the Center for Machine Learning and Intelligent Systems, recently received a Facebook gift to support his machine learning work, "Scalable Variational Inference for Probabilistic Programs." At the same time, Associate Professor of Informatics Kai Zheng and Chancellor's Professor of Computer Science Padhraic Smyth are collaborating with the enterprise software company SAP to develop software systems that will lighten the administrative load of physicians. Using AI-based technologies, they aim to simplify the time-intensive process of clinical documentation for doctors and nurses.

Societal Implications

ICS researchers are not solely viewing the potential of AI through the lens of technology: They're also considering its effects on society. Chancellor's Professor of Informatics Paul Dourish is overseeing \$1.1 million in funding for Ph.D. fellowships related

to socially responsible AI thanks to a Graduate Assistance in Areas of National Need (GAANN) award from the U.S. Department of Education. Research focuses on avoiding problems of bias, discrimination and invasions of privacy, and explores how AI can promote social welfare, inclusiveness, economic progress and justice.

Researchers are also pushing for community involvement. Informatics Assistant Professor Roderic Crooks partnered with Yeshimabeit Milner, founder of Data for Black Lives, last year to host a two-day workshop, "Datafication and Community Activism: Redrawing the Boundaries of Research." Crooks understands that to battle cases of algorithmic bias, input from marginalized communities is needed, so in March 2019, he brought together a diverse group of activists and academics to tackle digital discrimination.

The School of ICS is also in the process of creating a new course offering, "Artificial Intelligence Frontiers: Technical, Ethical and Societal." The course, proposed by Baldi, will be offered in spring 2020 to both undergraduate and graduate students and will complement the more technical AI courses currently offered.

Additional AI Activities

In addition to working on research projects and taking classes, students can glean AI knowledge by joining the AI@UCI club, which has 70 undergraduate and graduate members. Launched in 2017, the student-run club hosts Q&A sessions on AI and machine learning with experts from companies such as Disney, Google, Microsoft and Nvidia, while also offering workshops on nontechnical topics such as "Careers in AI."

For those who want to put their AI knowledge to the test, some of Baldi's graduate students have developed a multiagent reinforcement learning environment called ColosseumRL, which lets intelligent agents compete against each other in multiagent free-for-all games. The first UCI reinforcement learning competition, a Tron tournament, took place in fall 2019 and rankings were released at the end of the quarter (see <https://rl-competition.igb.uci.edu>).

ICS students and faculty alike are fully invested in exploring and expanding the reach of AI. This 2019 Year in Review provides just a sampling of the many projects and activities helping this technology soar to new heights. 



AI in Healthcare: Hands-Free Clinical Documentation

ICS researchers are collaborating with SAP to develop software systems that will lighten the administrative load of physicians.

Project members (from left): Hans-Martin Will (SAP), Professors Kai Zheng and Padhraic Smyth, Ph.D. candidate Jihyun Park, Luxi Li (SAP), Tobias Schimmer (SAP) and graduate student Brian Tran.

In response to a 2018 *Medical Economics* survey asking what is “ruining medicine for physicians,” the No. 1 response was “paperwork and administrative burdens.” This comes as no surprise to Associate Professor of Informatics Kai Zheng, who explains that “clinician burnout as a direct result of increased documentation has become a worrisome phenomenon.”

The implementation of electronic health records (EHRs) has left clinicians with significantly less time for patients. “Clinicians feel like they’re spending half of their day just dealing with paperwork instead of caring for patients,” says Zheng. “They spend four to five hours a day working with a computer, entering data.”

To address this issue, he is collaborating with Chancellor’s Professor of Computer Science Padhraic Smyth on a new project funded by the enterprise software company SAP. The project involves leveraging AI-based technologies to simplify the time-intensive process of clinical documentation for doctors and nurses.

“SAP is interested in our research involving speech recognition and natural language processing,” explains Zheng. By automatically recording, transcribing and analyzing patient-clinician conversations, the goal is to create hands-free clinical documentation. “It would just automatically happen, magically,” says Zheng.

A Novel Collaboration

SAP opened its newest Innovation Center Network in Newport Beach last year and, according to co-founder

Tobias Schimmer, the project is a “proof of concept for our idea of starting a new location in the heart of Southern California and collaborating with UCI.” With his background as a visiting researcher at UCI, Schimmer is helping connect and integrate the complementary work of Zheng and Smyth for SAP.

“We’re both interested in AI and medicine and automation in healthcare, but from different angles,” notes Smyth. “This project is at the intersection of our research.”

Zheng and his group in UCI’s Health and Information (HAI) Lab are focused on the clinical environment and stakeholder needs. A critical aspect of their research is exploring the work of medical scribes through comprehensive literature reviews and in-person interviews (medical scribes specialize in recording physician-patient encounters in real time). “My piece is really about understanding the design requirements of the hands-free speech-recognition technology,” says Zheng.

Working closely with Zheng’s group, Smyth and his research lab are studying automated technologies for clinical documentation. In particular, they are conducting experiments to assess the accuracy of automated speech-recognition (ASR) and natural language processing (NLP) technologies.

Promising Results

Smyth’s team is building on its prior studies of patient-physician interactions involving roughly 300 recorded conversations and human-generated transcriptions

(see http://bit.ly/UCIICS-YIR2019-AI_priorwork). For the SAP study, the Smyth and Zheng project team — including graduate students Brian Tran and Jihyun Park — is again transcribing these conversations, this time using various commercial speech-recognition systems. Then, they are comparing the ASR- and human-generated transcriptions.

“We’re trying to measure if we went with this ASR path, how much would we lose downstream in terms of accuracy,” says Smyth. So the team is examining both the accuracy of the speech recognition as well as its effect on the output of an NLP algorithm generating a high-level summary of topics discussed. The topics range from “biomedical history and symptoms” to “preventive care” and “test diagnostics.”

So far, although the word-error rate of the ASR systems has ranged from 10% to 30%, it has not greatly affected downstream classification accuracy. “What’s noteworthy is that if we use the best system [one with a 10% word-error rate], there is essentially zero loss in downstream accuracy,” says Smyth. They determined this by comparing a human classification of the human-generated transcripts to the algorithm’s classification of the ASR-generated transcripts. Even with error rates of 30%, the classification accuracy was reduced by only a small percentage thanks to redundancy in the conversation. “You can tolerate errors in words,” he says, “and still get the gist of what’s being discussed.”

Furthermore, such issues could be addressed with more engineering. “We didn’t fine-tune the system to process medical-specific data,” says Zheng. For example, they didn’t add in a medical dictionary, which could improve performance.

“Broadly speaking, we’re very happy with this kind of performance,” says Smyth.

Next Steps

Of course, there’s little room for error in a hospital setting, so Smyth and Zheng are in the process of examining the words that weren’t correctly recognized. “That’s our next stage of evaluation,” says Zheng. “We need to drill down on the medical terms.”

Once they fine-tune the ASR, a natural next step is to focus attention on the NLP phase. “Humans know exactly what they should capture and what they can ignore,” says Zheng. “That is where we can use a lot of insight from medical scribes, because even knowing which parts of the conversation should go in clinical documentation is not a trivial task for computers.”

The researchers will need to help the system identify critical pieces of information in the conversation. “Even if the algorithm is not 100% sure which specific medications are being discussed,

it should know that the speakers are talking about medication,” notes Smyth.

The system will also need to convert the conversational dialogue into professional language for documentation in a permanent medical record. “That is a giant leap,” admits Zheng. The benefits, however, go beyond simply automating tasks for clinicians and creating medical records for insurance billing purposes.

Improving Patient Care

“The potential outcomes of this project have huge implications for not only efficiency but also the quality of data and quality of interaction,” explains Zheng. These technologies could help provide more comprehensive documentation and could even monitor the patient’s emotional state and track the quality of patient-clinician interactions.

“I think it is incumbent on us to make sure that the technology is used beneficially for the patients,” says Smyth, acknowledging the significance of performing this work in a university setting. “AI is very promising, but it is important to be aware of the balance between quality of patient care and economic considerations when introducing new technologies.”

It is also critical to recognize the potential for unintended consequences based on training data. For example, AI algorithms are typically trained using population data, which can be skewed toward dominant demographic groups. “Current AI systems, for example, tend to pick up any implicit bias that is present in the data with respect to minority groups,” says Zheng. “It’s not intentional, but it’s definitely a problem to be addressed.”

Similarly, speech recognition is more accurate for native English speakers. “So while the error rate for English language speakers might be only 5% to 10%, if it’s 20% to 30% for non-native speakers, that’s going to impact the quality of care,” says Smyth. Both researchers are working to raise awareness of and address such issues. As Smyth notes, “university hospitals are places where we can take a leadership role and figure out how to address these issues so that the technology benefits all patients.”

“The bottom line,” adds Zheng, “is that more comprehensive and higher quality clinical documentation could benefit everyone.”

Furthermore, according to Hans-Martin Will, director of SAP’s Newport Beach Innovation Center, the benefits could extend to other areas as well. “Improving our understanding of the impact of ASR errors on downstream NLP tasks is very valuable, even beyond applications in the medical domain.” 

A glowing wireframe brain is positioned on a dark circuit board. Below it, a 3D bar chart with numerous vertical bars of varying heights is also illuminated. The background is filled with various electronic components like chips and capacitors, all rendered in a dark, futuristic aesthetic with some blue and white highlights.

Deep Learning, Unsupervised

Computer Science Professor Stephan Mandt is collaborating with other ICS faculty to develop a new generation of machine learning models that require less human supervision.

Machine learning has been powered by probabilistic modeling for many years. Complex data is described by means of probability, while predictions have relied on those types of algorithms that humans could easily interpret and understand. However, the recent revival of artificial neural networks, called “deep learning” algorithms, has changed this picture. Neural networks are complex and powerful prediction models, but their reasoning is not easily explained. Furthermore, unlike probabilistic models, they consume vast quantities of annotated data, making their use expensive in practice.

These problems have led Stephan Mandt, assistant professor of computer science, to develop ways to integrate probabilistic modeling and deep learning.

“How can we design algorithms that let probabilistic models drive those parts that we want to be able to interpret while having the deep network power the layers beyond that?” he asks.

Mandt, who was head of the statistical machine learning group at Disney Research before coming to UCI in 2018, is working alongside others in the Donald Bren School of ICS to develop a new generation of machine learning models. (Also see the sidebar on Erik Sudderth’s related work.) By drawing on probabilistic graphical models and Bayesian statistics, Mandt seeks to develop deep learning approaches that need less human supervision. Such advances will be critical as we increasingly rely on predictive analytics in areas such as healthcare.

Developing New Approaches

Integrating deep learning with probabilistic modeling promises to allow us to automatically discover patterns in the data, removing the need for humans to annotate vast quantities of data such as images. Problems that Mandt has worked on in the past include algorithms that automatically discover the concept of laughing and smiling in face recordings of humans. In addition, together with ICS Postdoctoral Researcher Robert Bamler, he developed a model that reviews digitized text to automatically detect changes in the semantics of language over hundreds of years.

“It is all about getting unsupervised learning — that is, learning without a teacher — into the world of deep learning,” Mandt says. This approach has worked well in probabilistic modeling but is still in its early stages of development in the field of deep learning. Applying the algorithms in an unsupervised manner without telling them what to look for can reveal hidden structures in unlabeled data.

Among the hybrid models of deep learning and probabilistic modeling that Mandt has investigated are variational autoencoders, which have become popular due to their ability to produce natural-looking images. He recently developed a new model — the disentangled sequential autoencoder — which extends this concept from static images to video. Given the beginning of a video, the model can generate multiple plausible continuations. If trained on a very large dataset of walking cartoon characters, it can synthesize new characters and let them walk just like the others. Also, when given two videos of characters performing actions, it can swap the two characters and let them carry out the actions of the other. “This is relevant,” Mandt notes, “because disentangling motion from shape information allows you to manipulate videos in a controlled way.”

Most recently, Mandt has explored how to use these tools to improve video compression. To this end, he builds on his prior work on disentangled sequential autoencoders to develop a new generation of video codecs based on artificial neural networks. Although currently restricted to low-resolution videos, his model already shows promising performance compared to classical video compression technology.

Going beyond core computer science research, Mandt is working with Distinguished Professor of Computer Science Pierre Baldi and particle physicist

Erik Sudderth’s Probability and Programming Research Award

At the Principles of Programming Languages (POPL) conference in January 2019, Facebook launched a request for proposals related to probability and programming that “address fundamental problems at the intersection of machine learning, programming languages and software engineering.” In May, it was announced that Associate Professor of Computer Science and Statistics Erik Sudderth was one of 10 award recipients, receiving Facebook funding to support his machine learning work, “Scalable Variational Inference for Probabilistic Programs.”

In talking about his efforts to further automate the building of statistical models of the world, Sudderth notes that “in some sense, it’s about democratizing statistical modeling and data science, because there are lots of people who want to use these models who don’t have Ph.D.s in machine learning.” Initial test cases he’s looking at include methods for automatically generating inference code for topic models of text data or relational models of social network data. Another set of applications relate to automatically determining the accuracy of data collected on online crowdsourcing platforms.

“My focus is on scalable variational inference algorithms, where ‘variational’ means that we use optimization methods for more efficient probabilistic reasoning,” explains Sudderth. The goal is to let users focus on modeling the data they care about, without needing an expert to write custom inference code for each new model. Unlike some existing probabilistic programming systems, the inference engines that Sudderth seeks to develop will apply to problems with billions — rather than hundreds — of data points. “The dream of the work I’m doing here is that someday we can expand the scope of problems where automated reasoning is feasible,” he says. “We’re developing methods that exploit more of the structure of the probabilistic program so that you can get much more efficiency, achieving essentially the same order of magnitude as state-of-the-art hand-coded inference algorithms.”

Daniel Whiteson of UCI's Department of Physics and Astronomy to apply deep learning in the context of particle physics detectors, helping physicists develop a new generation of tools for data analysis. (The "Celestial Bodies and Calibrated Uncertainty" sidebar below presents another collaboration between ICS researchers and the Department of Physics and Astronomy.)

Preparing the Next Generation

In addition to researching these methods, Mandt has also been teaching them in a graduate course on deep

generative models that was offered in Spring 2019 and will be offered again in 2020. The course centers on ways to integrate probabilistic machine learning with neural networks in order to create artificial data. "There's something special about an algorithm being able to produce something that a human could have thought up, creating text, video, images or even music," says Mandt. "That is something that humans are fascinated by, and these are all fairly recent developments." So, along with advancing next-generation machine learning, Mandt also works to ensure that ICS students know how to apply these methods to tomorrow's challenges. 



Celestial Bodies and Calibrated Uncertainty

Professor of Computer Science Alexander Ihler's Ph.D. student, Noble Kennamer, received his B.S. in physics from UCI but is now studying computer science. "Machine learning has a tremendous number of applications to physical sciences," says Ihler. So the two are now collaborating with Professor David Kirkby in UCI's Department of Physics and Astronomy.

The three researchers are building on last year's published work, "ContextNet: Deep Learning for Star Galaxy Classification," which developed a model to classify celestial objects as either stars or galaxies. "The ContextNet model extends a classic machine learning problem of observing something and deciding which of two categories it belongs in, but in this case, that decision isn't independent... so it ends up being more complicated than something like a classic email spam filter," explains Ihler.

Now the team is working on calibrated uncertainty. "When you make a prediction, there's always a chance

that you're wrong," says Ihler. "So your ability to correctly predict what you don't know becomes very important. The data that go into these astrophysical models are fundamentally simulations and may not quite match the reality."

Because astrophysicists lack true ground truth data about these celestial bodies, he explains that "we're interested in models that try to produce well-calibrated uncertainties, so that the probabilities that come out are accurate about their confidence and hopefully degrade smoothly as you move away from the training data." In other words, as the model starts observing data that differs greatly from what it was trained on, the prediction will grow less and less certain. "Many models don't do that — they just stay certain, so that's how you end up with really strange but high-confidence predictions," Ihler notes. "We're interested in producing well-calibrated uncertainty that degrades as you move away from what you learned on."



ICS Partnership With Allen Institute for AI Advances Machine Learning

AI2 researcher Matt Gardner (front left) and Computer Science Professor Sameer Singh (front right) with members of the UCI NLP group (from left): Zhengli Zhao, Robert Logan, Eric Wallace (an AI2 intern), Pouya Pezeshkpour and Dheeru Dua.

The mission of the Allen Institute for Artificial Intelligence (AI2) is to “contribute to humanity through high-impact AI research and engineering.” In support of that mission, the nonprofit — started by Microsoft co-founder Paul Allen — often collaborates with other institutions, and one of its latest partnerships is with the Donald Bren School of ICS.

“Researchers from a diversity of institutions bring different perspectives, motivations and previous experiences to a cross-institution collaboration,” says Matt Gardner, a senior research scientist at AI2. “This is a huge help in both identifying and executing on the most promising new research directions.” As a member of the AllenNLP team, Gardner’s research focuses on deep learning for natural language processing, and he’s now furthering that work as a visiting scholar at UCI.

“UCI specifically has a strong history of excellence in machine learning and employs several world-class scientists in the field, making this a really beneficial partnership for us at AI2.” In particular, Gardner is working closely with Assistant Professor of Computer Science Sameer Singh and his NLP group.

“Our high-level research goal is getting machines to read,” says Singh, whose group will host additional AI2 employees and interns throughout the year. In return, AI2 is providing funding for graduate student support. The team is currently working to build AI algorithms that can read and understand paragraph-size text.

“One of Paul Allen’s original goals in starting AI2 was to have a computer that could read a college biology textbook and talk to you about what is in it,” explains Gardner. “Imagine a system that could read

all of PubMed and answer doctors’ questions about the latest research related to a particularly challenging case they see in a patient, or a system that could read all of PACER and tell lawyers what precedents are applicable to their current litigation.” The AI2/ICS team is starting with paragraphs but will slowly build toward larger and more complex pieces of text.

The collaboration has already resulted in five papers, the first of which describes a new research dataset, “DROP: A Reading Comprehension Benchmark Requiring Discrete Reasoning Over Paragraphs.” The paper introduces a new English reading text comprehension benchmark and a model that combines reading text comprehension with numerical reasoning. Gardner and Singh, along with Singh’s Ph.D. student Dheeru Dua, presented the work at the 2019 Annual Conference of the North American Chapter of the Association for Computational Linguistics (NAACL).

“When I moved to Irvine,” notes Gardner, “Sameer and I were thinking of projects to start collaborating on... and this seemed like a natural fit — something I had been wanting to do and that Sameer and Dheeru were excited about working on.”

Singh and his team are indeed excited about the work. “AI2 is a top-tier research institute,” says Singh, pleased with the partnership and looking forward to continued work with AI2 researchers. “We are just now starting to gain momentum.”

Gardner agrees. “We’ve done some great work already, and we have more in progress,” he says. “AI2 is growing in Irvine, and we’re looking forward to a long and fruitful collaboration with UCI.” 

Modeling Wildfires, Rainfall and Climate Systems

Professor Padhraic Smyth's involvement in several climate modeling projects highlights the critical role of computing in modern data analysis.

For decades, NASA researchers have been collecting satellite images of the entire planet every day. However, pulling useful information from the massive amounts of raw data to gain insight into real-world problems is no small undertaking. “There are plenty of amazing scientists and engineers who are collecting data — it’s phenomenal — but we need more people deriving useful knowledge from that data,” says Chancellor’s Professor of Computer Science Padhraic Smyth. This is where his expertise in data science and machine learning come into play. “Modern data analysis,” he explains, “involves a lot of computing.”

In an effort to use big data to better understand our environment, Smyth is participating in several projects involving researchers from both the Donald Bren School of ICS and the Earth System Science (ESS) Department. “UCI has a very strong Earth System Science Department, as well as a wealth of expertise in machine learning in ICS, so it’s great to have these collaborations,” he says. “ESS researchers know where to access large archives of climate-related scientific data, and we can combine the different types of data and apply machine learning to generate new insights and predictions.” Ultimately, the goal is to create data analysis tools that can help decision-makers and communities address problems related to fire, rainfall and land use in the context of climate change.

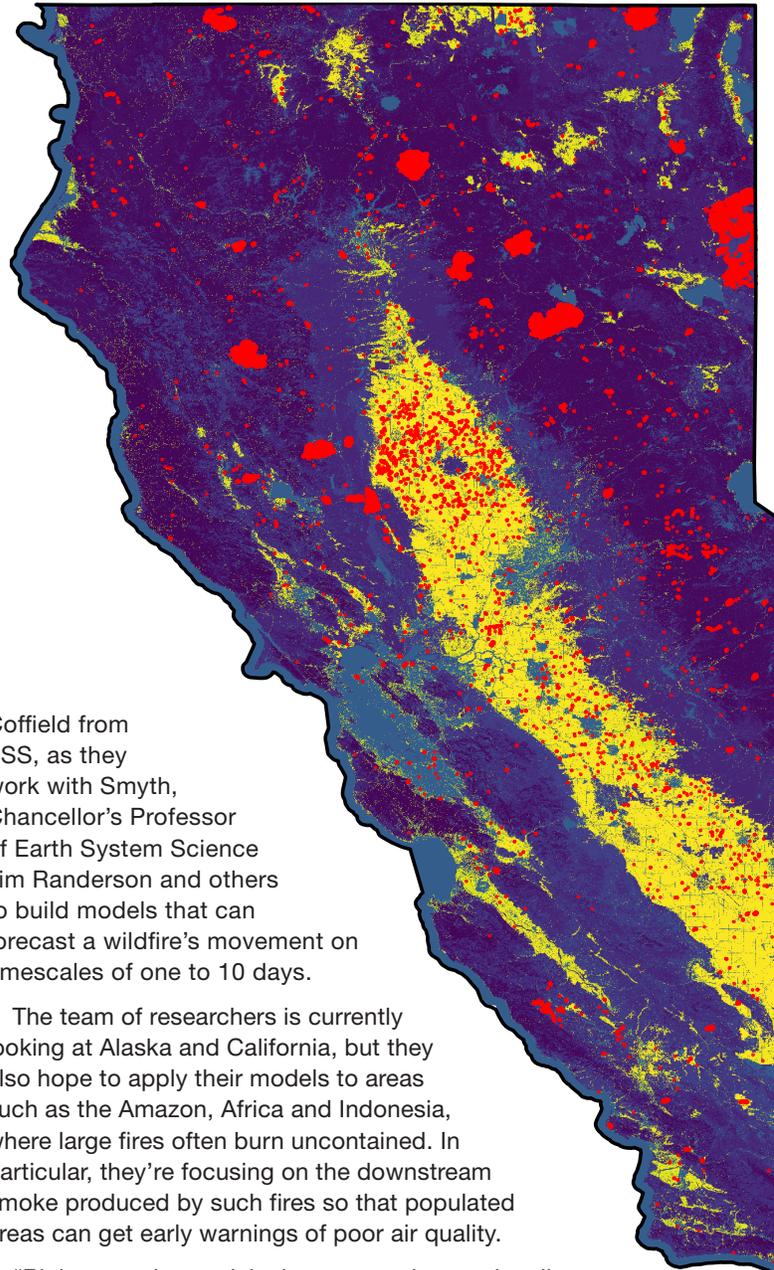
Modeling Wildfires

The first project focuses on forecasting characteristics of wildfires on daily timescales. The work is funded by the National Science Foundation (NSF) through its National Research Traineeship (NRT) program, which supports a wide range of Ph.D. research projects at UCI at the intersection of the physical sciences and machine learning. A portion of the five-year, \$3 million NRT grant (see maps-nsf.uci.edu) is supporting two Ph.D. students, Casey Graff from ICS and Shane

Coffield from ESS, as they work with Smyth, Chancellor’s Professor of Earth System Science Jim Randerson and others to build models that can forecast a wildfire’s movement on timescales of one to 10 days.

The team of researchers is currently looking at Alaska and California, but they also hope to apply their models to areas such as the Amazon, Africa and Indonesia, where large fires often burn uncontained. In particular, they’re focusing on the downstream smoke produced by such fires so that populated areas can get early warnings of poor air quality.

“Right now, the models that are used operationally for smoke prediction are very simple,” says Smyth. “We’re trying to replace that with something more sophisticated.” Using a NASA dataset of global fire detections from satellite images captured daily over the past 20 years, the team is applying machine learning techniques to better understand the heat



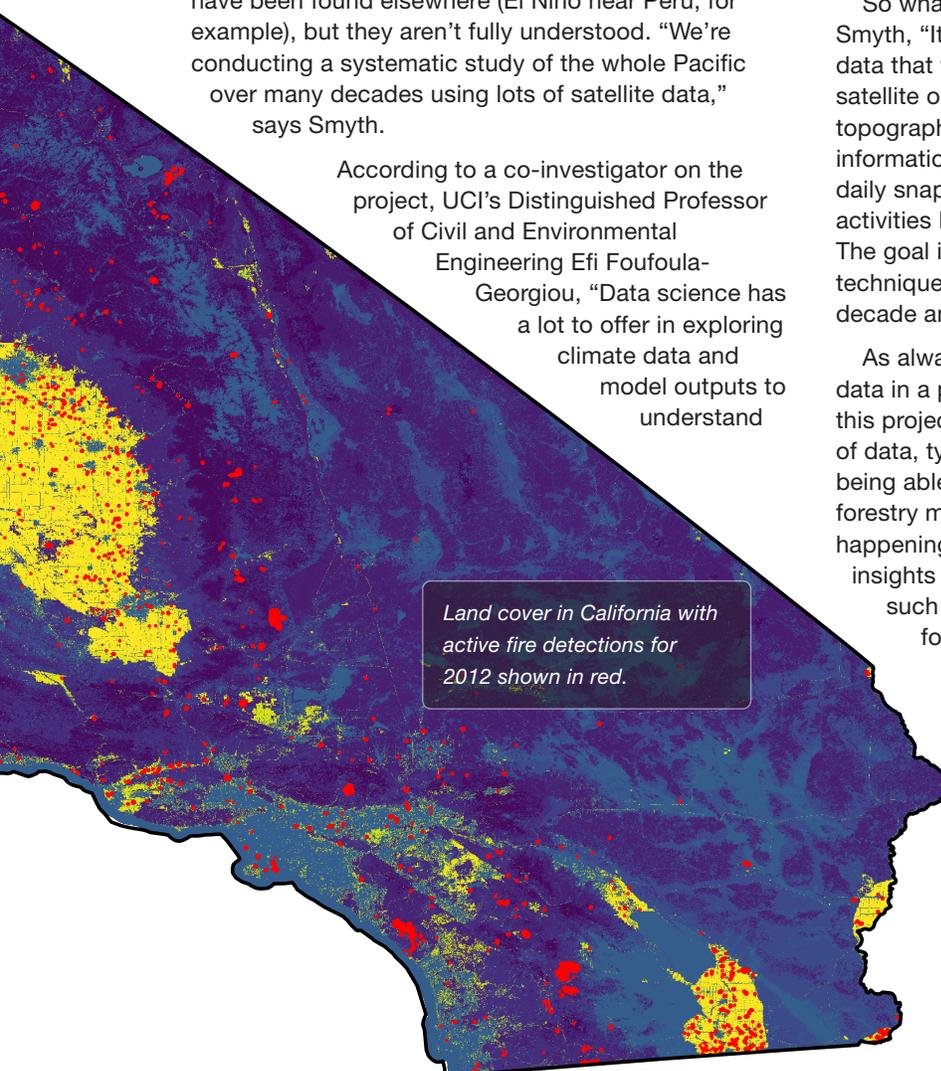
signatures and to identify predictors of a fire's growth and movement. This involves combining the heat signatures with other types of data, such as the local temperature, humidity and moisture levels, vegetation and so on.

"Using the data, we hope to identify the relevant variables and how they interact," says Smyth. "At the end of the day, both the physics and machine learning components will complement each other."

Predicting Rainfall

Moving from fire to water, the second project aims to predict seasonal (winter) rainfall in the western U.S. on monthly timescales. The work, which is part of the NSF Transdisciplinary Research In Principles Of Data Science (TRIPODS) program, is a collaboration between UCI, the University of Chicago and the University of Wisconsin-Madison. Again using satellite images and machine learning, the team aims to identify how sea-surface temperatures in the Pacific Ocean can predict rainfall in California, Nevada and Arizona six months later. Such teleconnection patterns have been found elsewhere (El Niño near Peru, for example), but they aren't fully understood. "We're conducting a systematic study of the whole Pacific over many decades using lots of satellite data," says Smyth.

According to a co-investigator on the project, UCI's Distinguished Professor of Civil and Environmental Engineering Efi Foufoula-Georgiou, "Data science has a lot to offer in exploring climate data and model outputs to understand



Land cover in California with active fire detections for 2012 shown in red.

and attribute climate modes of variability and change to develop better predictive models."

At the same time, Smyth and his team are advancing their own ICS research. "Both of these projects — on the wildfires and rainfall — bring up very interesting machine learning challenges for students to work on in depth, generating new research directions that are more abstract and that have potentially broader applications beyond these specific problems."

Managing Natural Lands

The latest project Smyth is involved with is a \$4.6 million grant from California's Strategic Growth Council (SGC) to UCI and UC Merced, in collaboration with UC Berkeley, UC Davis, Stanford, San Diego State University and various state agencies. The three-year project, "Innovation Center for Advancing Ecosystem Climate Solutions," is just now getting underway in developing tools and methods to better manage California's natural lands in the context of climate change.

So what exactly does that mean? According to Smyth, "It means bringing together all the relevant data that we have from the last 20 to 30 years — satellite observations of trees, forests, landcover, topography, fires and so forth — and then overlaying information about water and weather to get a detailed daily snapshot for comparison with management activities by the state forestry management agencies." The goal is to determine which management techniques will have a significant impact over the next decade and beyond — reducing fires, for example.

As always, Smyth and his team are looking at the data in a principled, systematic way. "A big part of this project is to bring together lots of different layers of data, types of data, registering it spatially and being able to provide tools for different scientists and forestry managers to go in and review what's actually happening over time," he says. "We want to gain insights into the mechanisms that drive phenomena such as fires and drought and to produce forecasts that leverage relevant human knowledge as well as all of the detailed spatial data we have available."

Moreover, Smyth points out that these are the kinds of projects students get excited about. "They get to work with some of the world's experts and with some extraordinarily cool datasets, and they get to make predictions that are very useful to broad segments of society." 

Data Science: The Best of Both Worlds



Graduates of the new data science undergraduate degree program blend computer science and statistics skills to answer real-world questions.

Do Democrats tweet differently from Republicans? Are we drinking contaminated water? Are we less active when air quality is poor? This is just a small sampling of questions you might try to answer if earning a B.S. degree in data science at UCI.

“‘Data scientist’ is a pretty common job title these days, and it’s one of the most desired jobs in industry,” says Statistics Professor Vladimir Minin, who, as vice chair of undergraduate affairs in the statistics department, oversees the degree program. “The supply is lacking,” says Minin, “so data scientists are in huge demand right now.”

Foreseeing this demand back in 2015, UCI created the first data science undergraduate degree program offered in the UC system. Four years later, the 2019 graduating class is prepared to fill the void with a strong foundation in the principles of both computer science and statistics.

Striking the Right Balance

The vision for the program was always to create a rigorous yet balanced program. “Our students are mathematically prepared to understand statistics and machine learning,” explains Minin, “but at the same time, they’re very good at computing, which is typically a weak point for a statistics major.”

The Donald Bren School of ICS is uniquely positioned to cater to the needs of data science majors, because it houses both the Department of Statistics and the Department of Computer Science. “We share the same space both physically and intellectually, so our students have this nice balance that is needed quite badly in industry right now,” notes Minin. “They get the best of both worlds!”

Tackling Real-World Problems

In addition to the rigorous coursework, data science students attend seminars with industry representatives from companies such as Cylance, Magid and Microsoft. Furthermore, the students complete a two-quarter capstone course during their final year. Working in teams, they apply statistical and computational principles to solve a large-scale real-world data analysis problem. This is a critical component of the program. As Minin explains, “Applying the skills you’ve learned to sanitized, contained homework problems is not the same as using them on a longer-term, large-scale project.”

To better understand real-world challenges,

students must use at least two sources of data. “If they’re exploring a correlation or an association between, say, fitness activities and air quality,” says Minin, “they might use Twitter and NOAA [National Oceanic and Atmospheric Administration] data.”

The projects involve both back-end and front-end data science, focusing on everything from databases and data management to machine learning, prediction, analytics, statistics and data visualization. “It’s pretty ambitious in terms of what we ask them to do,” admits Minin.



A group of graduating data science majors at UCI's 2019 Commencement ceremony.

For example, for one of the projects, students collaborated with Maura Allaire from UCI's Department of Urban Planning and Public Policy to assess the prevalence of water contaminant levels in the U.S. that fall below regulatory thresholds. “After extracting the data, we used regression in order to predict ‘non-detectable’ values of contaminant levels,” says Shannon Jusman, who joined the data science program as a freshman in 2015. This type of tracking is important because even low levels of exposure can negatively impact your health. “We then identified the spatial and temporal patterns of these contaminants,” she says, “looking at the reported contaminant level, characteristics of the water utility and community as key factors.”

Jusman, who will be studying business analytics as a graduate student at UCI, says her professors were very hands-on and responsive. “The program challenged me and pushed me to work hard, but it was very rewarding.”

Another data science student, James Purpura (read his spotlight on page 16), focused his project not on health but politics. “My partner and I studied the differences in languages between Republicans and Democrats,” says Purpura, who also joined the program as a freshman. “We used tweets by members

of Congress to predict where they fall on the political spectrum.”

Purpura particularly enjoyed the diversity of classes offered by the major. “I took several classes in each of the ICS departments — statistics, computer science and informatics — and I believe the major encourages students to enroll in a breadth of classes.” Purpura moved to Seattle after graduation and is now a program manager at Microsoft.

He credits the data science program with helping him get a head start on his dream career. “I earned an internship after my second year in large part because of my major,” he says. “I spoke with a small

company at the STEM Career Fair in fall quarter, and the company was impressed to find undergrads with a data science background.”

The students who graduated with a B.S. in data science in spring 2019 are all experienced in intertwining computer science and statistics to leverage big data in tackling real-world challenges. “The vision was rigor and balance, with a genuine 50/50 partnership between the two fields,” says Minin. Now that the 2019 graduating class has helped realize that vision, ICS already has plans to support the future data science workforce by launching a master of data science professional program in the fall of 2020. 

Data Science Spotlight: James Purpura, B.S. '19



It was the movie “Moneyball,” portraying the Oakland Athletics’ rise to fame in 2002 through the novel use of baseball statistics, that motivated James Purpura to study data science. Now, as part of the first graduating class for UCI’s new data science major, Purpura graduated with a dual emphasis in statistics and computer science, and is currently working as a program manager at Microsoft.

Can you talk about your path to UCI and your decision to study data science?

I was born and raised in Orange County, so UCI was a great fit! I grew up obsessed with

the statistical side of baseball, and watching “Moneyball” encouraged me to pursue a career involving data analytics. I committed to UCI after hearing about its introduction of a data science major. I was accepted as a software engineering major because data science wasn’t an option when I first applied to UCI, and then I switched majors at the student parent orientation program. It has all worked out so far! I was a data engineering intern at Green Street Advisors during the summer of 2017, and I was a software engineering intern at SendGrid during the summer of 2018.

What are your thoughts on being part of the first graduating class for this new major?

It’s really exciting to see the major become more well known over my time at UCI. During my first year, I always had to explain to others what “data science” means because the major was so new. After four years, many people seem quite familiar with the field. I have definitely enjoyed watching the major grow from the handful of us in 2015 to the size it is now.

What advice would you give prospective data science students?

It’s definitely an exciting time for data science students! UCI is a great choice, as the School of ICS was one of the first in the world to offer an undergraduate degree in data science.

Center for Statistical Consulting: A One-Stop Shop for Data Analysis

When Joni Ricks-Oddie became the first full-time director for UCI's Center for Statistical Consulting (CSC) in 2018, her goal was to make the CSC a "one-stop shop" for data analysis. By also serving as head of the more medical- and clinical-focused Biostatistics, Epidemiology and Research Design (BERD) unit within the Institute for Clinical and Translational Sciences (ICTS), she aimed to better align the two groups to address a variety of campus and community needs. Since then, the CSC has redesigned its website to better advertise its services, hired additional staff and developed more training sessions, as well as entered into a new partnership that expands its reach.

The CSC helps investigators at all levels of research, from grant proposal development and sample size calculation, to data analysis and manuscript preparation. The CSC also offers seminars and short courses. One recent class, *Power Analysis in SAS*, was created by Senior Statistician Farideh Dehkordi-Vakil, who taught statistics for more than 20 years at Western Illinois University.

"One of the main questions that we get from the researchers," says Dehkordi-Vakil, "is how many subjects do I need in order to make sure that my results can be relied on?" So to help answer this question, she developed a workshop on sample size and power analysis.

In fact, the CSC doesn't just help with basic scientific research. "Even administrative questions can often be answered from a statistics point of view," explains Ricks-Oddie. Although nearly 80% of their work is statistical analysis for a research- or grant-related project — they co-authored five publications in the past year — that is not all they do. "We had a lecturer from the School of Biological Sciences who wanted to explore how to seat students for exams such that students who tend to finish faster could sit on the outside instead of the inside to minimize distractions," she says. They have also fielded questions from UCI Hospitality and Dining Services about finding optimal seating arrangements and predicting when students use the cafeteria the most.

The team performs statistical analysis for outside companies and organizations as well. Recent projects have included biostatistical collaboration with a medical device company, predictive modeling for search engine optimization and statistical assessment of risk management metrics for banks.

"There's a lot of uses for models that predict certain



Statistical Consulting staff (from left): Megan Smith, Kurt Yamamoto, Joni Ricks-Oddie, Farideh Dehkordi-Vakil and Jodi MacGregor.

types of behaviors," says Ricks-Oddie, "whether it's financial behavior, students and how they seat themselves, or animal behavior."

In addition, through ICTS, the CSC signed an agreement with Chapman University to provide statistician services. "Chapman had expressed that they needed support statistically and wondered if they could use the resources we have here at UCI," says Ricks-Oddie. "Through the agreement, they'll have access to both the Center for Statistical Consulting and BERD."

Ricks-Oddie also works with CHOC Children's Hospital through ICTS. "The projects can run the gamut, from treatments for cancer to studies of infections and different kinds of projects on their patient populations." She plans to reach out to other hospitals and universities for similar types of partnerships in the future.

With the center's previous director, Professor of Statistics Babak Shahbaba, now acting as the faculty liaison, the CSC is ready to tackle any project thrown its way. "There are times when there's a particular project that requires a specific skill set or a novel strategy, and Babak is really great about interfacing and helping me navigate the faculty here or anyone else on campus who might be helpful to answer a certain type of question if it's beyond the experience that we have," says Ricks-Oddie.

Looking to the future, the CSC plans to continue expanding partnerships on campus, increasing engagement outside of UCI among industry and organizations, and providing additional workshops to graduate students.

Learn more about the CSC at statconsulting.uci.edu. 



The Connected Learning Lab Expands Its Reach

Photo: Alex Fledderjohn

The Connected Learning Lab (CLL, connectedlearning.uci.edu) conducts research and development at the intersection of technology and education, leveraging a multidisciplinary team. Led by Mimi Ito, a professor in the Department of Informatics, the CLL takes a “people-first” approach to digital learning, prioritizing student interests, cultural relevance and daily community life.

The CLL has actively sought cross-campus and community collaborations since being established as a research center in the Donald Bren School of ICS in 2017. Given this background, it should come as no surprise that the CLL was recently recognized as an Organized Research Unit (ORU), with UC Irvine formally supporting its expansion and making it easier for the lab to facilitate multi-investigator research across multiple schools.

“In our bid to become an ORU,” explains Ito, “we’ve expanded from serving an original group of seven faculty to now a group of 36 faculty from all over campus.” Representing a diverse range of disciplines and departments, the CLL has faculty from anthropology, comparative literature, computer science, education, English, informatics, nursing, psychological sciences, and sociology, and their work is greatly increasing the number — and profile — of interdisciplinary CLL projects.

Supporting Digital Well-Being for Teens

“The ORU also is an opportunity to attract different kinds of funding and interests,” says Ito, citing as one example her latest project, “How Can Digital Connections Support Mental Wellness for Vulnerable Teens?” The study is a collaboration with Developmental Psychologist Candice Odgers and

Assistant Professor of Psychological Science Stephen Schueller, spanning two schools at UCI: ICS and social ecology. Combining their prior work on teen digital learning, mental health and device use, the trio hopes to leverage online technologies and affinity networks to support vulnerable teens.

Furthermore, the work on mental health attracted the attention of Pivotal Ventures, an investment and incubation company created by Melinda Gates. Partnering with different organizations and individuals, Pivotal aims to advance progress for women and families in the U.S., and through its recent gift to the CLL, it is supporting research and interventions for digital well-being among young people. “This funding from Pivotal is helping us foster an interdisciplinary collaboration between some of our prior projects,” says Ito. The goal is to produce a report on digital connections for vulnerable teens for educators, parents, developers and young people, and then to design and implement digital interventions. This is one of several CLL projects in the area of digital wellness.

Connecting Learning and Play

The CLL’s involvement with esports is another example of its multidisciplinary, multiorganizational work. CLL faculty member and Informatics Professor Constance Steinkuehler helped launch the North America Scholastic Esports Federation (NASEF) last year, which capitalizes on student interest in esports to teach communication, collaboration and problem-solving skills. Through the CLL, NASEF was able to evaluate existing and potential alignments to educational standards, ensuring the program had a solid academic framework rooted in STEM education. “At the CLL, we have particular expertise in games for learning and learning in informal contexts,” she says.

NASEF founder Gerald Solomon, who also serves as executive director of the Samueli Foundation (which funds the federation), agrees. “The CLL is ostensibly the top lab in the world for research and development of learning experiences that connect kids’ interests to social networks (of mentors and peers) and to opportunities — academic, career and otherwise.”

Also helping with NASEF is Katie Salen Tekinbaş, a founding member of the CLL who joined the

Department of Informatics in 2018 and is now leading the esports coaching and mentorship for NASEF. As the founding executive director of the Institute of Play (IoP), she brings a wealth of expertise and experience in game-based learning. “IoP was one of the leading nonprofits doing work on game-based learning,” says Ito. “They were behind the design of the Quest to Learn school and a lot of significant innovations in bringing game-like learning into the educational context.”

Now, as IoP winds down, it is entrusting its entire archive to the CLL. “In order to ensure its legacy, IoP decided to gift a license to all of its assets to the CLL, where they will remain freely available,” says Salen Tekinbaş, who, in addition to NASEF, has a number of other CLL projects in the works, including Raising Good Gamers, Healthy Gaming and Playing Minecraft After School.

New faculty such as Salen Tekinbaş and Kylie Pepler, a CLL member and associate professor in both informatics and education at UCI, are fostering new research directions and collaborations. As Ito notes, “We’ve been really successful at recruiting a bunch of pretty impressive faculty in this area.”

With its new status as a campus ORU, increased interest from prominent organizations and a growing number of prestigious researchers, the CLL is clearly expanding its reach. 



CLL faculty from ICS (from left): Katie Salen Tekinbaş, Daniel Epstein, Constance Steinkuehler, Mimi Ito, Rebecca Black, Gloria Mark and Stacy Branham. (CLL faculty from ICS not pictured: Roderic Crooks, Nikil Dutt, Gillian Hayes, Kylie Pepler, Debra Richardson and Kurt Squire.) Learn more about CLL at connectedlearning.uci.edu.

INTRODUCING OUR NEW FACULTY FOR 2019



Sangeetha Abdu Jyothi

Assistant Professor, Computer Science
Ph.D., Computer Science, University of Illinois at Urbana-Champaign

Abdu Jyothi's research interests are in the areas of computer networking and systems, with a focus on building application-aware self-optimizing systems through automated resource management. Her work leverages learning and optimization techniques for achieving resource efficiency in large-scale networked systems. It is also concerned with problems at the intersection of systems and machine learning, including network scheduling for accelerating machine learning systems and network flow prediction using machine learning in data center environments. Her recent focus is on optimizing machine learning systems and designing resource management frameworks for micro data centers at the edge. Abdu Jyothi is currently a postdoc at VMware Research and will be joining the ICS faculty in September 2020.



Veronica Berrocal

Associate Professor, Statistics
Ph.D., Statistics, University of Washington

Berrocal was a National Research Council postdoc research associate at the Environmental Protection Agency and a postdoc research associate at Duke University and the Statistical and Applied Mathematical Sciences Institute (SAMSI) before spending the last nine years on the faculty at the University of Michigan. Her research interests are in spatial/spatio-temporal, environmental and Bayesian statistics with an emphasis in environmental sciences, environmental health, and atmospheric and geophysical sciences applications. Berrocal has served as an ad-hoc member in several scientific advisory panels for the EPA, held various officer positions in the Section on Statistics and the Environment (ENVR) of the American Statistical Association (ASA), and received the Early Investigator Award from the ENVR section of ASA. She joined the ICS faculty in September 2019.



Mine Dogucu

Assistant Professor of Teaching, Statistics
Ph.D., Quantitative Research, Evaluation, and Measurement, The Ohio State University

Dogucu focuses on designing the modern statistics curriculum. Her work in curriculum design includes integration of data science topics and making advanced statistics topics accessible to novice statisticians. Her focus for the latter is making Bayesian statistics accessible, specifically at the undergraduate level. Dogucu also advocates for pedagogical training for anyone who teaches for the first time, and she has extensive experience in teaching teachers. In addition to pedagogical research, her work includes collaborative research in applications of survey design, measurement and missing data. Dogucu was a visiting assistant professor of data analytics at Denison University prior to joining the ICS faculty in September 2019.



Roy Fox

Assistant Professor, Computer Science
Ph.D., Computer Science and Engineering, The Hebrew University of Jerusalem

Fox is the founder of the Intelligent Dynamics Lab at UCI's Donald Bren School of ICS. He was previously a postdoc in UC Berkeley's BAIR, RISELab and AUTOLAB, where he developed algorithms and systems that interact with humans to learn structured control policies for robotics and program synthesis. Fox's research interests include theory and applications of reinforcement learning, dynamical systems, information theory and robotics. His current research focuses on structure, exploration and optimization in deep reinforcement learning, and imitation learning of virtual and physical agents. Fox joined the ICS faculty in September 2019.



Milena Mihail

Associate Professor, Computer Science
Ph.D., Computer Science, Harvard University

Mihail's research areas are theoretical computer science and networks. Her theory work focuses on spectral graph methods in algorithms, randomized and approximation algorithms, efficient Monte Carlo sampling, and rapidly mixing Markov chains, an area that she has pioneered. Her work in networking spans from the design of classical backbone networks to the study of structure, function and mathematical modeling of distributed networks that arise in technology and society. Mihail has been a director and senior scientist at Bell Communications Research and an associate professor of computer science at Georgia Tech. Mihail joined the ICS faculty in September 2019.



Annie Qu

Professor, Statistics
Ph.D., Statistics, Pennsylvania State University

Qu's research focuses on solving fundamental issues regarding unstructured large-scale data. She works to develop cutting-edge statistical methods and theory in machine learning and algorithms for text-sentiment analysis, automatic tagging and summarization, recommender systems, tensor imaging data, and network data analyses for complex heterogeneous data. Her work helps extract essential information from large-volume high-dimensional data. Before joining UCI, Qu was Data Science Founder Professor of Statistics and the director of the Illinois Statistics Office at the University of Illinois at Urbana-Champaign. She received an NSF Career Award and is a fellow of both the Institute of Mathematical Statistics and the American Statistical Association. Qu joined the ICS faculty in January 2020.



Michael Shindler

Assistant Professor of Teaching, Computer Science
Ph.D., Computer Science, UCLA

Shindler, who received his B.S. from the Donald Bren School of ICS, spent the last five years teaching theory, machine learning and systems courses at USC, where he played a major role in the creation of the undergraduate Machine Learning course and the Concepts of Programming Languages elective. Shindler also served as the faculty adviser for AthenaHacks, a student organization that annually hosts Southern California's premier all-female hackathon. His research was formerly in theory and machine learning, but now he focuses on computer science education, with an eye toward teaching at scale, particularly promoting feedback and engagement. Shindler joined the ICS faculty in September 2019.



Sean Young

Associate Professor, Informatics and Emergency Medicine
Ph.D., Psychology, Stanford University

Young studies digital behavior and prediction technology, examining how and why people use social media, mobile apps and wearable devices. As executive director of the UC Institute for Prediction Technology, he leverages social and behavioral data to detect real-world problems. His research applies insights from psychology to online behavior-change interventions, transforming time-consuming and expensive community-based interventions into online variants that more efficiently reach the masses. Working with public health officials, he is now developing tools that mine social data to identify potential areas of disease outbreak, crime and poverty. Young joined the ICS faculty in June 2019.

Faculty Highlights

Stern Receives \$15M to Continue Early-Life Adversity, Brain Research



In 2013, with a grant from the National Institute of Mental Health (NIMH), UCI established the Conte Center to explore how early-life experiences influence brain programming, which can in turn affect mental resilience or vulnerability. After recently securing \$15 million through another five-year NIMH award, researchers — including

Chancellor's Professor of Statistics Hal Stern, who heads the center's biostatistics, computation and data management (BCDM) research core — are eager to build on their preliminary work. With renewed funding, the Conte Center is now collaborating with the Department of Psychiatry at UC San Diego involving a study of Marines to identify those vulnerable to post-traumatic stress disorder (PTSD). Stern's BCDM group worked with Conte Center psychologists to develop a recall-based approach to assess the childhood experiences of the Marines. Stern and neurobiology collaborators are also exploring the role of epigenetics. "Epigenetic changes may serve as a biological marker of whether you were exposed to unpredictability and potentially could identify those at risk for mental illness," he says. Using his \$750,000 portion of the grant, Stern will collaborate with graduate students in statistics as well as with UCI's Center for Statistical Consulting to "elucidate the mechanism by which unpredictable maternal behavior turns out to have these cognitive and emotional consequences."

Franz Awarded Humboldt Research Award



Chancellor's Professor of Computer Science Michael Franz has been named a recipient of the 2019 Humboldt Research Award, also known as the Humboldt Prize. The award, given by the Alexander von Humboldt Foundation of Germany and funded by the German federal government, recognizes renowned researchers outside of Germany whose "fundamental

discoveries, new theories or insights have had a significant impact on their own discipline and who are expected to



NSF Renews Funding for AsterixDB With \$2M Grant

The National Science Foundation (NSF) recently provided \$2 million for the AsterixDB project (asterixdb.apache.org). Computer Science Professors Michael Carey and Chen Li will receive \$1.1 million for the NSF grant, "Supporting and Sustaining Apache AsterixDB for the CISE Research Community" (the remainder will go to UC Riverside). This work originated in 2009 with database researchers from UCI, UCR and UCSD embarking on the NSF-funded ASTERIX research project to improve database storage and queries. The result, now an Apache project, is the only open source parallel NoSQL database system available today. Apache AsterixDB is a highly scalable Big Data Management System that stores, indexes and manages large volumes of structured and semi-structured data. It also supports a full query language with the expressiveness of SQL. This grant continues Apache AsterixDB's development as a resource for the NSF Computer and Information Science and Engineering research community by providing a foundation for extracting insights from high-volume, low-value big data in areas such as public safety and health.

continue producing cutting-edge achievements in the future." The award includes a cash prize of €60,000 as well as an additional travel stipend for prize winners and their spouses to travel to Germany. In addition to the prize money, the award comes with an invitation to spend a period of up to one year cooperating on a long-term research project with specialist colleagues at a research institution in Germany, as well as a lifelong membership in the worldwide "Humboldtians" network connecting alumni of all Humboldt award categories.

Guindani Named ASA Fellow



Statistics Professor Michele Guindani was named a Fellow of the American Statistical Association (ASA) for his many contributions to statistical methodology, collaboration, teaching and service to the profession. Guindani, an expert in Bayesian modeling and the analysis of high-dimensional data, is currently studying how interactions among

brain regions change dynamically over time — as individuals complete different tasks, for example. He is also involved in UCI's Microbiome Initiative, which aims to explore the complex interrelationships between the body's microbiome, health and disease. Guindani joins current UCI statistics faculty members Daniel Gillen, Hal Stern and Bin Nan, and emeriti faculty Jessica Utts and Wesley Johnson, in obtaining this prestigious recognition from the ASA.

Mark, Mandt Awarded \$1M Collaborative Future of Work Grant



The future of teamwork will require the integration of technological advances, yet we are largely relying on tools and techniques from the 20th century for team facilitation. This problem is addressed in a new NSF collaborative grant awarded to Informatics Professor Gloria Mark. The Future of Work at the Human-Technology Frontier program, under which the grant is awarded, is one of the NSF's 10 Big Ideas. UCI is the lead for the grant, "Intelligent Facilitation for Teams of the Future via Longitudinal Sensing in Context," with Assistant Professor of Computer Science Stephan Mandt as co-PI. The \$1.1 million in funding is split between UCI, the University of Notre Dame and the University of Colorado. The project aims to develop and validate an AI-based team facilitator using sensing and dynamic intervention to promote better team coordination, increase performance and ultimately lower worker burnout. Once the facilitator is developed, the performance of teams using it will be experimentally compared against matched controls in a longitudinal in-situ study.

Lopes Named IEEE Fellow



Informatics Professor Crista Lopes has been named an Institute of Electrical and Electronics Engineers (IEEE) Fellow for her contributions to ubiquitous and immersive programming. IEEE Fellow is a distinction reserved for select members whose "extraordinary accomplishments in any of the IEEE fields of interest are

deemed fitting of this prestigious grade elevation." Lopes pioneered the concept of Aspect-Oriented Programming



Unlocking Data for Smart Firefighting

Computer Science Professors Nalini Venkatasubramanian and Sharad Mehrotra's SciFire project (www.ics.uci.edu/~dsm/scifire) received a second year of funding from the National Institute of Standards and Technology (NIST). The collaboration with Casey Grant and Kathleen Almand of the National Fire Protection Association aims to better enable infrastructure and information resilience for smart firefighting. During the project's first year, the researchers explored how best to gather and prioritize heterogeneous sensory data from smart spaces for various stakeholders during structural fires. The team is now working to improve the reliability and resilience of the information gathered and distributed, and Donald Bren Hall is serving as a testbed for the project. The plan is to create a digital version of a Knox Box (an "Ebox") that, during a fire, provides information such as floor plans, Wi-Fi passwords, sensor data and surveillance camera footage from the building. The team has also developed FireDex, a fire data exchange system that defines access levels and prioritizes information. The project involves taking what is learned from Donald Bren Hall and scaling it for high-rise buildings.

(AOP) and was an early contributor to AspectJ, an AOP extension to Java, as well as one of the main architects of the OpenSimulator immersive virtual world platform.

Gago-Masague Collaborates on \$1.8M Grant to Counter Negative Medication Beliefs



A collaboration between Sergio Gago-Masague, assistant professor of teaching in computer science and director of UCI's Engaging Technology and Application Design Lab, along with UCI School of Medicine researcher John Billimek, has resulted in their proposal, "Mi Propio Camino (My Own Way): Addressing Negative Beliefs

about Medication to Improve Adherence among Hispanic Adults with Hypertension," being awarded \$1.8 million by the National Institutes of Health through its National Heart, Lung and Blood Institute. The goal is to test an intervention driven

Developing an AR Platform to Better Train American Workers



Informatics Professor Kylie Peppler is part of a multi-organizational team, led by Purdue University, that received an NSF Convergence Accelerator award worth \$1 million for its project, “Skill-LeARn: Affordable and Accessible Augmented Reality Platform for Scaling Up Manufacturing Workforce, Skilling, and Education.” The project comprises a multidisciplinary team of computer scientists, mechanical and electrical engineers, psychologists and education researchers. The goal is to tackle bottlenecks faced by small and medium enterprises in terms of time and cost when addressing the need for larger-scale rapid training. In particular, Peppler is working with a group of graduate students and research staff at UCI led by Joey Huang, a Ph.D. candidate in learning sciences and a researcher within the Creativity Labs — where Peppler serves as director. As Peppler notes, “this project will be an exciting opportunity for UCI students to be on the cutting edge of real-world AR applications.”

by an IoT system focused on addressing negative beliefs about medication in a large, high-risk population — Latino adults with diabetes and uncontrolled hypertension. The researchers will test a conceptual framework that will inform future development of novel interventions tailored for other at-risk populations. Gago-Masague is in charge of the technical side of the project, including software implementation, data collection and data visualization.

Zheng Elected ACMI Fellow



Informatics Professor Kai Zheng was elected a Fellow of the American College of Medical Informatics. ACMI Fellows are elected by their peers and are individuals who “have demonstrated major contributions in biomedical and health informatics, have achieved national

recognition in the field, and are committed to advancing the charitable, scientific, literary and educational purposes of ACMI.” Zheng’s research draws upon techniques from the fields of information systems and human-computer interaction to study the use of information, communication and decision technologies in patient-care delivery and management.

Shahbaba, Minin Help Develop Framework to Investigate Complex Biological Systems



Statistics Professor Babak Shahbaba is the principal investigator of a new three-year, \$800,000 grant from the NSF. The project, “Modulus: Data-Driven Mechanistic Modeling of Hierarchical Tissues,” brings together an interdisciplinary team of biologists, statisticians and mathematicians, including co-PIs Statistics Professor Vladimir Minin and Assistant Professor Angela Fleischman from the UCI School of Medicine. The goal is to develop a new mathematical framework that combines statistical and mechanistic models to help scientists discover emergent biological phenomena and to understand the rules that govern them. The researchers plan to use the framework they develop to investigate hematopoiesis, the biological process responsible for creating and maintaining blood cells. Although this will specifically help scientists gain insights into physiologic hematopoiesis, the methodology will also be transferable to other complex systems in developmental biology, ecology and epidemiology.

Nicolau Elected Into Academia Europaea



Department Chair and Distinguished Professor of Computer Science Alex Nicolau has been elected into the Academia Europaea, Europe’s academy of humanities, letters and sciences that comprises esteemed scientists and scholars who collectively aim to promote learning, education and research. Nominated by their peers, members are selected

after a rigorous review process that is based on sustained academic excellence in their field. Academia Europaea members include 73 Nobel Laureates and six Turing winners. Joining Professor Gene Tsudik, who became an Academia Europaea member in 2015, Nicolau is one of only 17 members from the U.S. in a computing-related field.

Nardi Receives EUSSET Lifetime Achievement Award

Informatics Professor Emerita Bonnie Nardi received a Lifetime Achievement Award from the European Society for Socially Embedded Technology (EUSSET). This society is comprised of researchers interested in socially embedded technologies and how they influence our everyday lives. Recognizing that traditional methods for systems design often do not take into account important aspects of human, social and cultural life, EUSSET members present this award to scholars who have reshaped the computing field with innovative human-centered approaches. Nardi's work puts her squarely in this group of scholars as she has been reshaping the field with her research into activity theory, interaction design, games, social media, and society and technology for decades.

Amiri Sani's NSF Grant Aims to Secure Mobile Devices



Assistant Professor of Computer Science Ardalan Amiri Sani has received a \$500,000 NSF CAREER award for his research on "Securing Mobile Devices by Hardening their System Software." The NSF CAREER program supports early career-development activities of those who are integrating research and education. Amiri Sani's

project aims to enhance the security of mobile devices such as smartphones, tablets and wearables, while simultaneously training students in systems software programming through outreach and tutorial activities. The awarded project will use three approaches to help reduce the vulnerabilities in the operating systems of mobile devices: First, it will develop a security monitor to provide security and privacy guarantees for a mobile device despite a compromised operating system. Second, it will design novel tools to identify and fix mobile operating system vulnerabilities. Finally, it will create a vetting layer to safeguard the operating system interface against malicious applications.

Hayes Receives SIGCHI Social Impact Award



Robert A. and Barbara L. Kleist Chair in Informatics Gillian Hayes, who was recently appointed UCI's vice provost for graduate education and dean of the Graduate Division, has received the 2019 SIGCHI Social Impact Award, which recognizes those "who promote the application of human-computer interaction

research to pressing social needs." The award comes with a \$5,000 honorarium. Focusing much of her HCI research on vulnerable populations, including children and under-represented groups, Hayes excels in this area. Hayes is the 19th member to join this distinguished group of researchers leading the way in using HCI for social good.

Study Shows Crowdsourced Traffic Data Could Save Lives



Associate Professor of Informatics Sean Young is part of a UCI-led pilot study that found, on average, Waze "crash alerts" occur 2 minutes and 41 seconds prior to their corresponding California Highway Patrol (CHP)-reported crash, which could mean the difference between life and death. The

paper, "Crowdsourced Traffic Data as an Emerging Tool to Monitor Car Crashes," was published in the August 2019 issue of *JAMA Surgery*. The study reports that crowdsourced data, collected by software applications like Google's Waze, are highly correlated with conventional reporting data that are often costly to collect and suffer from reporting lag time. The ability to use crowdsourced user-generated traffic data has several immediate clinical implications for treatment and mortality rates among motor vehicle crash victims as well as for improving efficiency around emergency department operations in the U.S., though further research is still needed. The pilot study was funded by the National Institute of Allergy and Infectious Diseases and the National Human Genome Research Institute, and conducted in collaboration with the CHP and Waze/Google.

Qualcomm Funds Research Projects in Computer Vision and Machine Learning

Qualcomm Inc. has provided gift funding to Computer Science Professors Charless Fowlkes, Stephan Mandt and Padhraic Smyth that will support Ph.D. students involved in basic research projects across the three groups on topics related to the development of new theories and algorithms in the areas of computer vision and machine learning. The initial award is \$255,000. The funded projects will involve collaborations with Qualcomm's rapidly expanding research and development work in artificial intelligence, with a particular focus on Qualcomm AI/ML research labs in San Diego and Amsterdam.

Irani Receives IEEE TCMF Distinguished Service Award

The steering committee of the IEEE Technical Committee on Mathematical Foundations of Computing (TCMF) and IEEE Symposium on Foundations of Computer Science (FOCS) awarded Computer Science Professor Sandy Irani the TCMF Distinguished Service Award for her “dedicated and indispensable service to the theory community.” Irani earned the honor after leading efforts to combat harassment and discrimination in the Theory of Computing (TOC) community, including chairing the ad-hoc SafeTOC committee to “discuss and propose coordinated policies, procedures and institutions to deal with harassment and related ethical issues.” The committee produced a report in October 2018 with recommendations, and Irani has helped implement those recommendations at various theory conferences, including FOCS 2019.



Nan Awarded NSF Grant to Improve Statistical Inference



Statistics Professor Bin Nan was awarded \$200,000 over three years by the NSF for his proposal, “High-Dimensional Inference Beyond Linear Models.” The research addresses the bias issue for estimates in nonlinear models with a large number of predictors. When investigating the associations between a set of predicting variables and some

outcome variables, researchers often use regression models. As outlined in the grant abstract, “estimates of regression coefficients and their confidence intervals provide useful information of the predicting variables, for example, the importance of certain genetic variants to lung cancer, or brain regions associated with memory loss in an aging population.” However, because regularized methods yield biased estimates, such methods can’t be directly used for statistical inference without correcting the biases. Nan aims to develop theories and methods “for the generalized linear models and the Cox regression model with a large number of covariates, and for the functional regression models with applications in brain imaging studies, without imposing the non-verifiable sparsity assumption on the Hessian matrix.” The distributional theory and confidence intervals provided for the statistical models in this project should “lead to more reliable results than existing methods in scientific research.”



UCI Machine Learning Repository Receives \$1.8M Upgrade

Computer Science Professors Sameer Singh and Padhraic Smyth, along with Philip Papadopoulos, director of UCI’s Research Cyberinfrastructure Center, were awarded \$1.8 million for their NSF proposal, “Machine Learning Democratization via a Linked, Annotated Repository of Datasets.” They plan to upgrade UCI’s Machine Learning Repository (<https://archive.ics.uci.edu/ml/>) — first established in 1987, when computer science Ph.D. student David Aha started gathering datasets for researchers studying supervised learning. Over the decades, faculty and students helped the collection grow, and the Repository now has 469 datasets. Yet with the growing number of machine learning research papers, algorithms and datasets, it is becoming difficult to track the latest performance numbers for a particular dataset, identify suitable datasets for a given task or replicate the results of an algorithm run on a particular dataset. The upgrade aims to enhance the Repository with rich metadata, links to research papers, and automated extraction and presentation of metadata and performance data. It will also provide systematic support for reproducible science by letting users validate empirical machine learning results on testbed datasets.

Jun Awarded Funding for Two New Projects



Assistant Professor of Computer Science Sang-Woo Jun received funding for two new projects, furthering his research into high-performance and high-efficiency systems. He was awarded \$500,000 over three years from the NSF for his grant, “MintCloud: An Elastic Multitenant FPGA Cloud.” The MintCloud project

aims to design a cloud platform for elastic allocation of field-programmable gate array (FPGA) resources and implement a development and execution environment for distributed FPGA acceleration in such a cloud environment. Jun also received

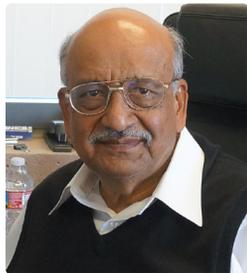
\$75,000 from VMware Research for his project, “Flash Management for Smart SSDs.” This project involves designing and evaluating various applications that could benefit from smart solid-state drives, where computation units are embedded in fast peripheral component interconnect express (PCIe) SSD storage devices.

Branham NSF Grant Supports Children’s Literacy

Assistant Professor of Informatics Stacy Branham has received \$175,000 from the NSF’s Computer and Information Science and Engineering Research Initiation Initiative to fund her project, “Making Universally Usable Technologies to Enhance Parent-Child Co-Reading and Early Literacy Skills at Home,” which addresses gaps in early literacy development. Children from low-income families often enter kindergarten far behind peers from wealthier families. To address this gap, Branham is building on research that shows the importance of reading to children at home. In particular, she’s starting by working with low-income families where one parent has a disability. The goal is to create new technologies that these parents can use while reading with their children to enhance “extratextual” interactions. Branham will work with a Ph.D. student to design a prototype that promotes co-reading experiences and extratextual interactions to better achieve “reading readiness.” This project will focus on helping blind parents in low-income families as they co-read with their sighted children, but follow-up investigations will examine how identified solutions might benefit broader populations.

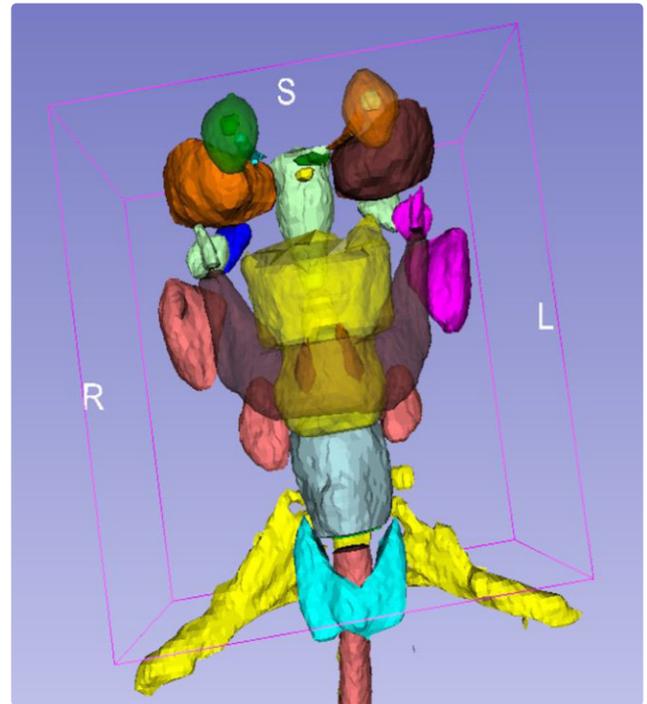


Jain Awarded Inaugural IEEE TCMC Impact Award



Donald Bren Professor in Information and Computer Sciences Ramesh Jain was awarded the inaugural IEEE Computer Society Technical Committee on Multimedia Computing (TCMC) Impact Award for his pioneering and widespread impact to multimedia computing for the past four decades. “When I started championing multimedia, the main

applications were multimodal communication,” says Jain. “Now, multimodal processing is central to our personal health – the most important thing for every human being.”



UCI Researchers Develop Deep Learning Technique to Identify At-Risk Anatomy in CT Scans

Computer Science Professor Xiaohui Xie collaborated with researchers from China’s Shanghai Jiao Tong University School of Medicine and DeepVoxel Inc. to develop an automated technique to identify organs at risk during radiation therapy using a deep learning algorithm. Their work was published in the September 2019 issue of *Nature Machine Intelligence*. Using their model, it’s possible to delineate an entire CT scan in a few seconds, a task that would take a human expert over half an hour. “On a dataset of 100 CT scans, our deep learning method achieved an average similarity coefficient of more than 78%, a significant improvement over analyses done by radiation oncologists,” says Xie. He says the success of his team’s approach can be attributed to the model’s two-stage design: First the system identifies regions containing vital organs, and then it extracts image features from these focal areas. “Our deep learning neural network greatly enhances the ability to delineate anatomies even with low-contrast CT scans,” says Xie. “And the setup is more computationally efficient than other methods, enabling it to be done with more standard levels of graphics processing unit memory. This means the technique can be deployed more readily in actual clinics.”

Zhao Aims to Transform Physical Acquisition Pipelines



Assistant Professor of Computer Science Shuang Zhao has been awarded \$400,000 over three years by the NSF for his proposal, “Physics and Learning Integration Using Differentiable Rendering.” The project advocates combining the complementary advantages of physics-based simulation and machine learning to create better and faster physical acquisition

pipelines for a large variety of applications. The goal is to create general-purpose computational tools that are both efficient and accurate by combining the complementary advantages of physics-based and machine learning-based techniques. Zhao is taking a three-step approach for this work: 1) create a new class of physically accurate simulators, specifically designed to be compatible with the algorithms used to learn data-driven algorithms; 2) develop computational inference algorithms that synergistically combine machine learning models with physics-based simulators; and 3) integrate physics-based simulation and machine learning and demonstrate its effectiveness in a variety of applications in autonomous sensing and navigation, material science and fabrication, and biomedical imaging.

Epstein’s Health Grant Supports Food Journaling Research



Assistant Professor of Informatics Daniel Epstein received \$175,000 from the NSF’s Computer and Information Science and Engineering Research Initiation Initiative to fund his proposal, “Examining a Multimodal Approach to Lowering the Burden of Food Journaling.” Over the next two years, Epstein will work with a Ph.D. student to explore how systems for journaling health data can better leverage the many devices

people use. Then, they will recruit a group of people to test the tools and study what influences their modality choices and food descriptions. The goal is to use the findings to inform how food journaling apps are designed. Epstein also expects the studies to inform journaling apps in other domains, such as stress or mood apps. As outlined in the grant proposal, this research will “address a major public health goal of promoting people’s ability to collect, and get value from, health data.”

Nicolau, Veidenbaum Mix AI and Art for Venice Biennale Installations



Alex Nicolau, UCI Distinguished Professor and chair of computer science, and Computer Science Professor Alex Veidenbaum, along with a team of ICS graduate students, collaborated with Israeli-Romanian artist Belu-Simion Fainaru to create three art installations for Italy’s 2019 Venice Biennale, one of the oldest and most prestigious cultural festivals. Under the banner “Unfinished Conversations on the Weight of Absence,” all three works are examples of posthumanist art that combine computer-generated imagery and speech, using artificial intelligence to create an interactive experience for the viewer that aims to be both thought-provoking and emotionally involving. “Talking Head” allows observers to interact with paintings of the 20th-century Jewish-Romanian poet Paul Celan and Romanian communist leader Nicolae Ceausescu. Artificial agents for human discourse (also known as chatbots) are used to facilitate conversations between viewers and the avatars. The “Talking Plant” installation is a potted plant that interacts with viewers through touch and voice response. It may react to a person’s caresses by reciting poetry by Celan or, if the plant considers the advances to be inappropriate, by requesting that the human stop.

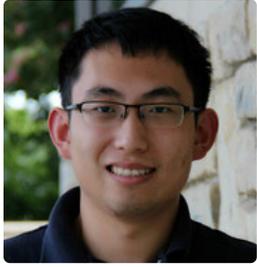
Thornton Recognized as Lecturer of the Year



Continuing Lecturer Alex Thornton, who has taught at UCI since 2000, was recognized for Excellence in Undergraduate Teaching at UCI’s 26th Annual Celebration of Teaching, where he was named the 2019 Lecturer of the Year. He is currently teaching “ICS45C: Programming in C++ as a Second Language,” and one of his strengths, being a senior software

architect at Conduent, is framing assignments in terms of real-world deployment.

Chen's NSF Grant to Secure Self-Driving, Smart Transportation



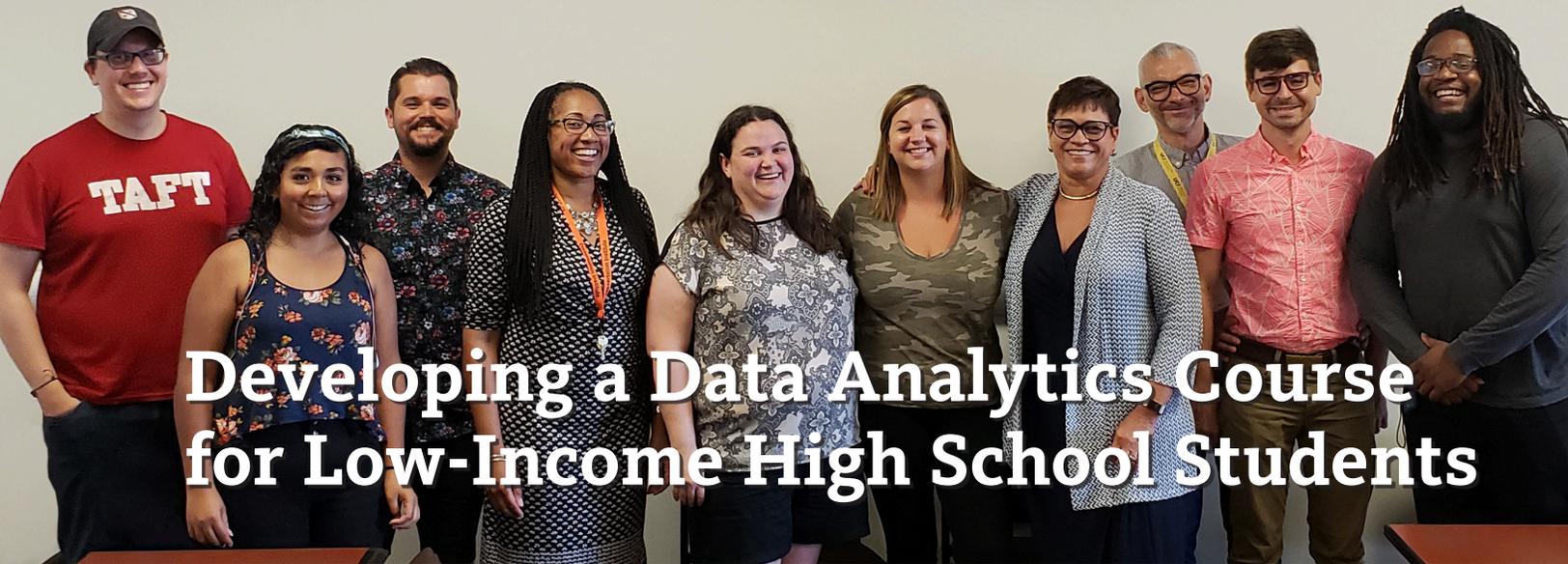
Assistant Professor of Computer Science Qi Alfred Chen tackles the question of what happens when sensor data from self-driving vehicles comes under attack with his new NSF grant, "Automated Security Analysis of Software-Based Control in Emerging Smart Transportation Under Sensor Attacks." Funded as part of

the NSF's Computer and Information Science and Engineering

Research Initiation Initiative, Chen will put the \$175,000 toward evaluating the robustness of software-based control in emerging smart transportation systems. Hacked systems can alter control decisions in smart transportation functions, leading to unsafe driving. Chen's group thus plans to design a dynamic security analysis system based on an evolutionary algorithm approach. Using their research findings, they will propose novel solutions to challenges in generating analysis input, discovering semantic problems and analyzing dataflow-centric decision processes. Ultimately, they hope their research efforts will fundamentally change how smart transportation systems are designed and implemented to offer stronger security and safety guarantees. 

In the News

-  *Forbes* included Pierre Baldi in an article on "The 100 Leading Pioneers of AI Drug Development" (Feb. 13, 2019).
-  ABC News (Australia) interviewed Bryan Cunningham as a cybersecurity expert: "Australian Citizens Are Unwitting 'Combatants' in Cyberspace" (Feb. 17, 2019).
-  *Parenting OC* featured an article on Rebecca Black's current research: "Autism and Fanfiction" (April 24, 2019).
-  CNN interviewed Gloria Mark for an article "Slack Is Ruining My Life and I Love It" (June 20, 2019).
-  NPR highlighted Mimi Ito in the story "Can Screens Help Your Child's Brain? 4 Tips to Get the Most From Kids' Media" (June 24, 2019).
-  *The Los Angeles Times* featured an article on Alex Nicolau and Alex Veidenbaum's AI-inspired art installation: "UCI Computer Scientists Make Art Come Alive at the Venice Biennale" (July 3, 2019).
-  *Wired* reported on a new research study led by Sean Young: "Waze Data Can Help Predict Car Crashes and Cut Response Time" (July 8, 2019).
-  *The Atlantic* interviewed Melissa Mazmanian for an article on "The Slackification of the American Home" (July 11, 2019).
-  *Newsweek* highlighted Pierre Baldi's recent research: "Rubik's Cube Solved in 'Fraction of a Second' by Artificial Intelligence Machine Learning Algorithm" (July 16, 2019).
-  BBC cited Bonnie Nardi in an article on "The Forgotten Software That Inspired Our Modern World" (July 23, 2019).
-  *The New Yorker* featured the expertise of Gloria Mark in an article "Was E-mail a Mistake?" (Aug. 6, 2019).
-  *Financial Times* interviewed Ian Harris for an article titled "Cyber Fraud Techniques Evolve Into Confidence Trick Arms Race" (Oct. 13, 2019).
-  89.3 KPCC broadcast a report featuring Jessica Utts: "Vexed By College Statistics Courses? New Approaches Emphasize Practical Learning" (Oct. 21, 2019).



Developing a Data Analytics Course for Low-Income High School Students

A new class offering at select high schools in San Jose, Philadelphia and Cleveland is exposing low-income students to data analytics, preparing them to leverage future career opportunities stemming from advances in machine learning and artificial intelligence. The new curriculum was made possible with a grant from Deloitte Foundation, which supports education through a variety of initiatives that help develop the talent of the future and promote excellence in teaching, research and curriculum innovation, and Base 11, a nonprofit focused on engaging students from low-resource communities with STEM education, and was developed in consultation with UC Irvine. The award was made to UCI to develop a high school data analytics course targeting the needs of low-income students and involved a partnership between UCI's Office of Access and Inclusion (OAI) for the Donald Bren School of ICS and The Henry Samueli School of Engineering.

"The goal is to introduce high school seniors to data analytics so they know how to use, analyze and visualize data and can learn about possibilities for pursuing further education and career options," says Sharnnia Artis, assistant dean of access and inclusion. Together with project team leaders from Deloitte Foundation and Base 11, Artis worked with Assistant Professors Roderic Crooks of informatics and Sameer Singh of computer science to develop the curriculum and train the teachers.

"For low-resource communities, data science offers a bridge to high-skilled jobs," says Singh. "The proliferation of data science means there are jobs

available in many areas." In fact, data scientist was No. 1 on Glassdoor's list of the top 50 jobs in America for 2019. Singh also points out that "with readily available public datasets, documentation and source code, and the need for only a basic computer, many of the barriers to training are removed." Recognizing the role STEM education can play in creating opportunities, the project team set out to design the new data analytics course.

Engaging and Flexible by Design

"This was the first time I was helping to develop a course at this level, so it was challenging," admits Singh. The project team had to determine how much technical background to include for both the students and teachers and find ways to ground abstract machine learning concepts in examples relevant to the students. "We focused on interactive, exercise-based teaching, which is uncommon for how machine learning has been traditionally taught," says Singh. "Identifying appropriate exercises was challenging but fun."

They also had to account for a wide range of teacher experience and expectations as well as differences in class size, course placement and geographic location. The teachers they hosted in August for a weeklong training session all came from schools that are part of the Cristo Rey Network of schools for students from economically disadvantaged families.

"We wanted to emphasize the many ways that data science is already a part of daily life," says Crooks. "We

included examples of people using data for creative inquiry, community organizing and self-expression in domains as varied as public health, civil rights, fan culture and professional sports.”

Flexible by design and grounded in experiential learning and culturally relevant pedagogy, students at the various schools are all learning the same concepts and tools, but they’re doing so using unique examples and projects. “We wanted to create a curriculum that would let students see examples of data and data science in action and enable them to choose to use data for their class projects that coincides with their interests,” says Crooks.

The curriculum also emphasizes real-world implications, including the potential for mistakes and data misuse. “Results from data analytics directly impact us,” says Singh, “so it is important for high school students to be equipped with not only the necessary technical skills, but also an understanding of the pitfalls and shortcomings so they become responsible data scientists.”

Off to a Promising Start

With classes already underway, the pilot of this new program is off to an excellent start, “due mostly to the very effective, very dedicated teachers,” says Crooks. “A key goal of this first year was to get teachers excited about the vision for the course and to find ways to help them adapt this vision to their own students.” Artis enthusiastically agrees. “I think the format of this course is truly unique. It’s really designed to be culturally relevant, using the students’ everyday experiences and embedding them into the classroom.”

Artis, Crooks and Singh regularly check in with the teachers and plan to evaluate the curriculum midway through the school year and again at the end of the year, making adjustments where needed. The next phase of the award from Deloitte Foundation and Base 11 provides support for the UCI team to transition the summer training to a virtual approach and to build out a digital platform for the course materials so that more Cristo Rey high schools can introduce data analytics to students in low-resourced communities.

For more information about this work, contact Sharnnia Artis at sartis@uci.edu. 



Artis Named IAspire Leadership Academy Fellow

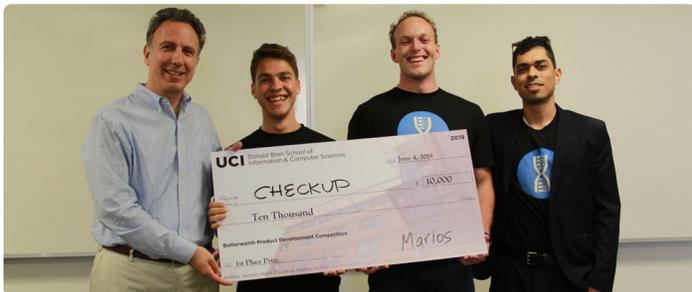
Assistant Dean of Access and Inclusion Sharnnia Artis was recently named a fellow in the inaugural cohort of the IAspire Leadership Academy, which is helping STEM faculty from underrepresented backgrounds ascend to leadership roles at colleges and universities. The program, which is part of the Aspire Alliance’s Institutional Change Initiative (IChange), addresses a national need to broaden diversity and increase inclusion in STEM fields and higher education leadership.

The new leadership academy, housed at the University of Georgia, provides professional development for academic leaders from underrepresented groups so they can aspire to and succeed in more senior leadership roles. Fellows will learn effective executive leadership skills for increasingly complex higher education environments as well as how to build confidence to influence institutional transformation in their current and future leadership positions.

As a fellow, Artis is hoping to collaborate with others on ideas for a new campuswide initiative called STEW (Science Technology Education Workgroup). “I want to grow professionally to be a transformational leader for the campus,” she says, “leveraging IAspire to provide insight on how best to build an effective work group to enhance our culture here at UCI.” Her goal is to develop pedagogical approaches for supporting all students, especially underrepresented students in STEM, as well as increasing retention and graduation rates at UCI.

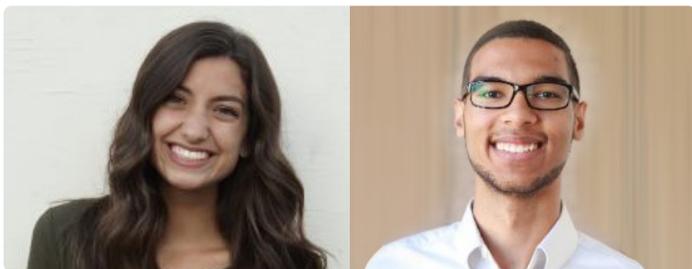
Student Highlights

Healthcare App Takes Top Prize at Butterworth Product Development Competition



This year's cash prizes for the top three teams in the Butterworth Product Development Competition, sponsored by UCI alumnus Paul Butterworth, totaled \$20,000, and with 40 teams, composed of 175 students, the competition was steeper than ever. Taking first place was Team CheckUp (Zachary Little, Kenneth Rhee, Dan Appel and Francisco Barcena), which developed a health data collection tool that uses a mobile app interface to sell consumer blood tests, immunology tests, whole genome sequencing and mobility assessments. Second place went to Team GIV (Lucas Erb, Haven King, Ryan Luu and Nisarg Shah) for its mobile-first online-giving experience that prioritizes modern donors by delivering curated, short-form video content from vetted nonprofits and centralizing charities to simplify discovery. Team PYRI (Salahaldeen Ali and Niijan Al-Amin) took third place for its two-sided platform that allows travelers to acquire foreign currency from their lodging. This year's Butterworth judges were Tony Crisp (CRISPx); Brian Dao, B.S. '03 (Alpha Sprouts); Dan Jenkins (Smart Health Clubs); Zack Ji, B.S. '07 (Oracle); Roger Lloyd (Pericia Solutions/Grupo Cognitiva); David Ochi (Alpha Sprouts); Neil Sahota, B.S. '00 (IBM-Watson Group) and Jojo Seva (Mission Federal Credit Union).

Statistics Ph.D. Students Awarded NSF Graduate Research Fellowships



Statistics Ph.D. students Olivia Bernstein and Jaylen Lee earned Graduate Research Fellowships from the National

Science Foundation (NSF). The program provides a three-year annual stipend of \$34,000 in addition to paying \$12,000 to the university to cover the recipient's tuition and fees. Bernstein is working to develop prediction assessment methods that account for the difference between a biased sample and the target population, leading to better predictions. She plans to use her methods in modeling the onset of Alzheimer's disease and identifying early biomarkers. Lee is interested in using functional MRI (fMRI) data to model the conditional dependence between different regions of the brain.

Multidepartmental Collaboration on Detecting Code Clones Leads to Distinguished Paper Award



Faculty and graduate students representing all three departments of ICS received a Distinguished Paper Award at the 26th ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE 18). Software engineering Ph.D. students Vaibhav Saini and Farima Farmahinifarahani, along with their adviser, Informatics Professor Crista Lopes, and statistics Ph.D. student Yadong Lu and his adviser, Distinguished Professor of Computer Science Pierre Baldi, were recognized for their paper, "Oreo: Detection of Clones in the Twilight Zone." The Twilight Zone is where the distinction between clones and non-clones gets increasingly harder to make. The Oreo approach, named by Saini because the tool's architecture resembles an Oreo cookie, combines machine learning, information retrieval and software metrics to detect clones in this zone. The applications of code clone detection include detecting license violations and software theft as well as optimizing code.

Cullen Selected as ARCS Scholar



The Advancing Science in America (ARCS) Foundation selected informatics Ph.D. candidate Amanda Cullen to be an ARCS Scholar. Cullen will receive a \$5,000 stipend per year for two years, helping her pursue research interests ranging from anthropology and game culture to social media, fandom/fan studies, and

gender and sexuality studies. Recently, Cullen moderated a panel discussion on “Video Game Live Streaming: Challenges and Possibilities for Diversity and Inclusion” at UCI, and her dissertation will explore the experiences of women in video game livestreaming.

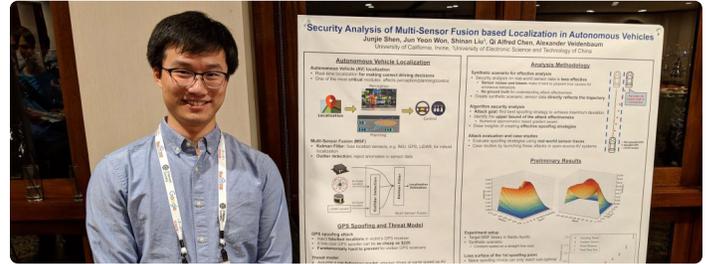
ICS Teams Make Strong Showing at ACM ICPC SoCal Regionals



UCI sent five teams to the Southern California Regional competition of the November 2018 ACM International Collegiate Programming Contest (ICPC). Two UCI teams — Filter and Iterator — made it into the top 10, while the other three teams — Lambda, Map and Reduce — placed in the top 25 (out of 98 teams). Additionally, a UCI team was the first to solve a problem for four of the 10 problems provided, with Team Filter receiving that recognition twice. Senior Lecturer of Computer Science Richard Pattis organized the teams, which were coached by graduate student Karthik Gajulapalli.

ICS Researchers Win NDSS Poster Award

A group of ICS researchers is exploring how autonomous vehicles (AVs) defend themselves against attacks, looking in particular at GPS spoofing attacks. The group recently received the Distinguished Poster Presentation Award for new work at the Network and Distributed System Security (NDSS) Symposium. The poster, “Security Analysis of Multi-Sensor Fusion Based Localization in Autonomous Vehicles,” was presented by computer science Ph.D. student Junjie Shen (pictured top right).



It is the result of his collaboration with fellow graduate student Jun Yeon Won, Shinan Liu of the University of Electronic Science and Technology of China, and UCI Computer Science Professors Alex Veidenbaum and Qi Alfred Chen.

Parekh Receives Distinguished Anteater Award



Data science major Raj Parekh '19 was one of 13 UCI undergraduates recognized with the Distinguished Anteater Award for 2018-19, earning him \$1,500. Parekh, who graduated in the spring, is one of the few UCI students to triple-major across three different schools: data science (through the School of ICS), quantitative economics (School

of Social Sciences) and mathematics (School of Physical Sciences). During his time at UCI, Parekh was involved in a variety of extracurricular activities and founded the UCI branch of 180 Degrees Consulting, the world's largest student-driven social impact consultancy.

Johnson Receives Community-Based Research Fellowship



The UCI Newkirk Center for Science and Society named informatics Ph.D. student Jazette Johnson a Community-Based Research (CbRI) Fellow for the 2019-2020 year. Johnson will receive \$5,000 and will work with a local community partner. Johnson's current research involves working with the nonprofit organization Alzheimer's Orange County, designing technologies to support healthy independent

living for older adults with dementia. As a CbRI Fellow, Johnson is looking forward to starting a new community-based research project with the other fellows.

Cyber@UCI Develops Third-Place Cyber Defense Team



The new Cyber@UCI student club's National Collegiate Cyber Defense Competition (CCDC) team advanced to the Western Regional Championship for the first time and took third place overall. The team was supported by alumnus Howard Chen '18, who founded the club and now works as an information security specialist at MeridianLink. The team, led by senior informatics major Orbel Golanians and faculty sponsor Ray Klefstad, earned the top spot of the UC schools competing and brought back a trophy for Donald Bren Hall.

Pei Receives Zonta Women in Technology Scholarship



Since 1923, Zonta International has been empowering women through service and advocacy, providing more than \$41 million through clubs in 63 countries to expand access to education, healthcare, economic opportunities and safe living conditions. This year, Zonta

offered its inaugural Women in Technology scholarship, and informatics Ph.D. student Lucy Pei was one of the recipients. The selection process was based on "outstanding potential in the field," and Pei won \$1,000 from the Newport Harbor club, where she attended a meeting to talk about her research into technology for social good. She is especially interested in how immigrant and resettled refugee communities adopt digital technologies in the context of community literacy centers. Pei is now eligible to win a district-level scholarship of \$2,000.

Li Takes Second Place in UCI Stock Market Competition

Informatics major YuHeng Li '19 took second place for his strategy to invest \$100,000 in virtual funds in UCI's 2019 Stock Market Competition, hosted by the Center for Investment and Wealth Management and Financial Literacy Association of UCI. According to Li, the competition provided a practical way for him to combine his informatics and economics education, using patterns and programming languages to scrub the data and analyze the stocks. Last year, computer science major Praneet Sah took third place as a freshman.

ICS Students Win Best Web App at HackSC



In April, a team of ICS students won the "Best Mobile or Web App" award at HackSC, a large-scale hackathon held at USC, for their Align app, which helps people create interest-driven support groups. Inspiration for their app came from a brief talk given during the event's opening ceremony that touched on the difficulty many people with multiple sclerosis have in finding others with MS who experience similar symptoms. The team built on the idea of helping people with MS connect with others, expanding the app to include people with other isolating conditions (such as cancer or depression) and matching people by interests so they have more to talk about than just their symptoms.

UCI Sweeps IEEE GameSIG 2019

UCI's Team Stealth Bomb took the top prize for its game "Overthroner" at IEEE GameSIG 2019, the Intercollegiate Computer Game Showcase of the IEEE special interest group in computer games. UCI has walked away with the trophy five years in a row, but this year UCI won all three top spots as well as the award for Game Design. The event was held at UCI, with the top 10 Southern California finalists competing on May 26 and presenting their games to a panel of industry judges



from companies such as Blizzard and Intellivision. Members of Stealth Bomb – Nikhil Sharma, David Jamgochian, Dikai Fang, Benson Ishii, Diego Guzman and Brian Lam – were all senior computer game science majors, and their twin-stick multiplayer battle-royale game evolved as part of the Informatics Capstone Game Project Course.

Baldwin Receives UCI Engage Great Partner Award

In May, informatics Ph.D. student Mark Baldwin received the UCI Engage Graduate Student Great Partner Award. UCI Engage builds campus-community partnerships that align UCI's resources and expertise with the knowledge and strengths of local communities, and this award honors graduate students who have initiated or participated in such partnerships. Baldwin's work on the Makapo Aquatics Project, creating a steering system to allow visually impaired individuals to participate in outrigger canoe racing, is a perfect example of a successful campus-community collaboration (see story on back cover).



ICS Scholarships and Fellowships 2018-19

GRADUATE ENDOWED FELLOWSHIPS/AWARDS

ICS Innovation Endowed Fellowship

Yao Du
Neftali Watkinson

Roberta Ellen Lamb Memorial Endowed Fellowship

Eugenia Rho

Rob Kling Memorial Endowed Fellowship

Leah Horgan
Samantha McDonald

Bob & Barbara Kleist Endowed Graduate Student Award

Clara Calderia
Jazette Johnson
Kevin Storer

Robert L. Newcomb Memorial Endowed Graduate Student Award

Hina Arora
Tong (Anthony) Zou

Fred M. Tonge Endowed Graduate Student Award

Phoebe Chua

NON-ENDOWED SCHOLARSHIPS/AWARDS

Sumalee Johnson Transfer Student Award

Carlos Puentes

NCWIT Aspirations in Computing Scholarship

Areeta Wong

UNDERGRADUATE ENDOWED SCHOLARSHIPS/AWARDS

Accenture Endowed Outstanding Junior Award

Brett Galkowski
Nabhan Khan

Essie Lev Endowed Memorial Transfer Student Award

Joshua Gatmaitan
Tayler Nielsen

Steve & Jenny Mizusawa Endowed Student Award

Soochin Kang
Sarah Memon

Bob & Barbara Kleist Endowed Transfer Student Award

Liza Joseph
Pooya Khosravi

Kenneth Simms Endowed Memorial Scholarship

Emma Anderson
Alexander Jimenez
Bradley Johnson
Ryan MacWhorter

Julian Feldman Endowed Scholarship

Paramdeep Atwal
Navid Bazmoon
Jenny Chong
Guillermo Ignacio Sanchez Lamas



Educating Tomorrow's Software Engineers

ICS expands its portfolio of professional programs by welcoming its first cohort for the new master of software engineering program.

In September, the Donald Bren School of ICS launched its latest professional graduate program, with 37 students starting their 15-month journey to earn a master of software engineering (MSWE, mswe.ics.uci.edu) degree. “It’s a very practical, hands-on program,” says Crista Lopes, professor of informatics and MSWE faculty director. “It gives the students the skills to be software engineers in a variety of fields.”

The program is specifically designed to accommodate a variety of backgrounds. In this first cohort, 14 students have undergraduate degrees related to computer science or software engineering, while the rest have degrees in a range of fields, including applied physics, biology, oceanography and sociology. The mix of domestic (27%) and international (73%) students includes some with graduate degrees or industry experience, and 32% are women — supporting efforts to close the tech industry’s gender gap. All students will receive dedicated career advising support.

“One of the features that makes this program different is the variety of students we serve,” says Lopes. Students are spending the first quarter taking six self-paced intensive courses, with high-level TA support, to solidify their computing knowledge. “It’s a self-learning kind of experience,” explains Lopes. “It’s basically to equalize all the students’ knowledge of basic computer science material.”

The remainder of the program is geared toward software construction, with students spending an estimated 1,300 hours writing, reading, analyzing and testing code. There will be guest lecturers from industry and a required summer internship, and the final quarter includes a capstone project, challenging students to design and implement a substantial piece of software.

The program is currently lining up local industry partners for the internship and capstone elements, which, as Lopes points out, presents unique recruitment opportunities (email mswe@ics.uci.edu for more information). “These are smart people who are motivated to become software engineers professionally, and they’re ready and willing to learn lots of new things.”

The MSWE program builds on that motivation, providing students with the skills and opportunities necessary to succeed. In fact, the program follows in the footsteps of three other successful professional programs offered through ICS.

The master of embedded and cyber-physical systems (MECPS, mecps.uci.edu) program, a joint program with the Samueli School of Engineering, was the first in the U.S. to focus on both embedded and cyber-physical systems, which integrate hardware and software. It offers small-cohort, immersive-based education, and 100% of the inaugural graduates of the program were hired within three months.

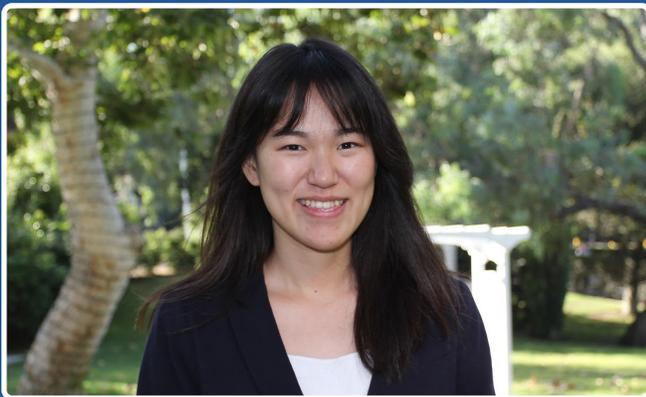
The master of human-computer interaction and design (MHCID, mhcid.ics.uci.edu) program, now in its fourth year, has continually been ranked in the top 12 by Value Colleges for the best value in HCI. The growing program graduated 34 students this past September, after hosting its annual UX Conference at UCI's Applied Innovation. Students presented their capstone projects to the industry partners: SAP, Hulu, Project Jupyter, Monterey Bay Aquarium, Obsidian Security, CoreLogic, CellMark and Catalia Health.

The master of computer science (MCS, mcs.ics.uci.edu)

program graduated 100 students in 2018 and planned to graduate another 113 in December. In the first cohort, 86% secured full-time employment within three months of graduation, and 70% received salaries between \$100,000 and \$150,000 at companies such as Amazon, Cisco, Google, LinkedIn, Microsoft, Salesforce, SAP and Tesla.

The MSWE program presents yet another opportunity for growth and development, as ICS adds to its portfolio of professional programs educating tomorrow's technology leaders. 

MCS Graduate Student Spotlight: Tzu Yu “Zoe” Chao



Today, Tzu Yu “Zoe” Chao is working in her dream field: robotics. Yet she’s also continuing her education as a graduate student in the UCI master of computer science (MCS) program.

Chao’s path to becoming an MCS student wasn’t so straightforward. In high school, she considered enlisting in the military as a way to help with the cost of college. As a first-generation student, she worried about how to pay for tuition. However, through hard work and a little luck, Chao secured the financial aid and a scholarship that allowed her to pursue an undergraduate degree in mechanical engineering.

With that support, she was able to attend UCI, where, during her sophomore year, she was hired as a student assistant to help develop drones, rovers and hovercrafts. Tasked with building a rover that could navigate along a simple black line, Chao had her first experience building an autonomous system. “I felt super powerful and it gave me confidence,” she says. “I was thrilled to program more robots, something I previously never thought I could do.”

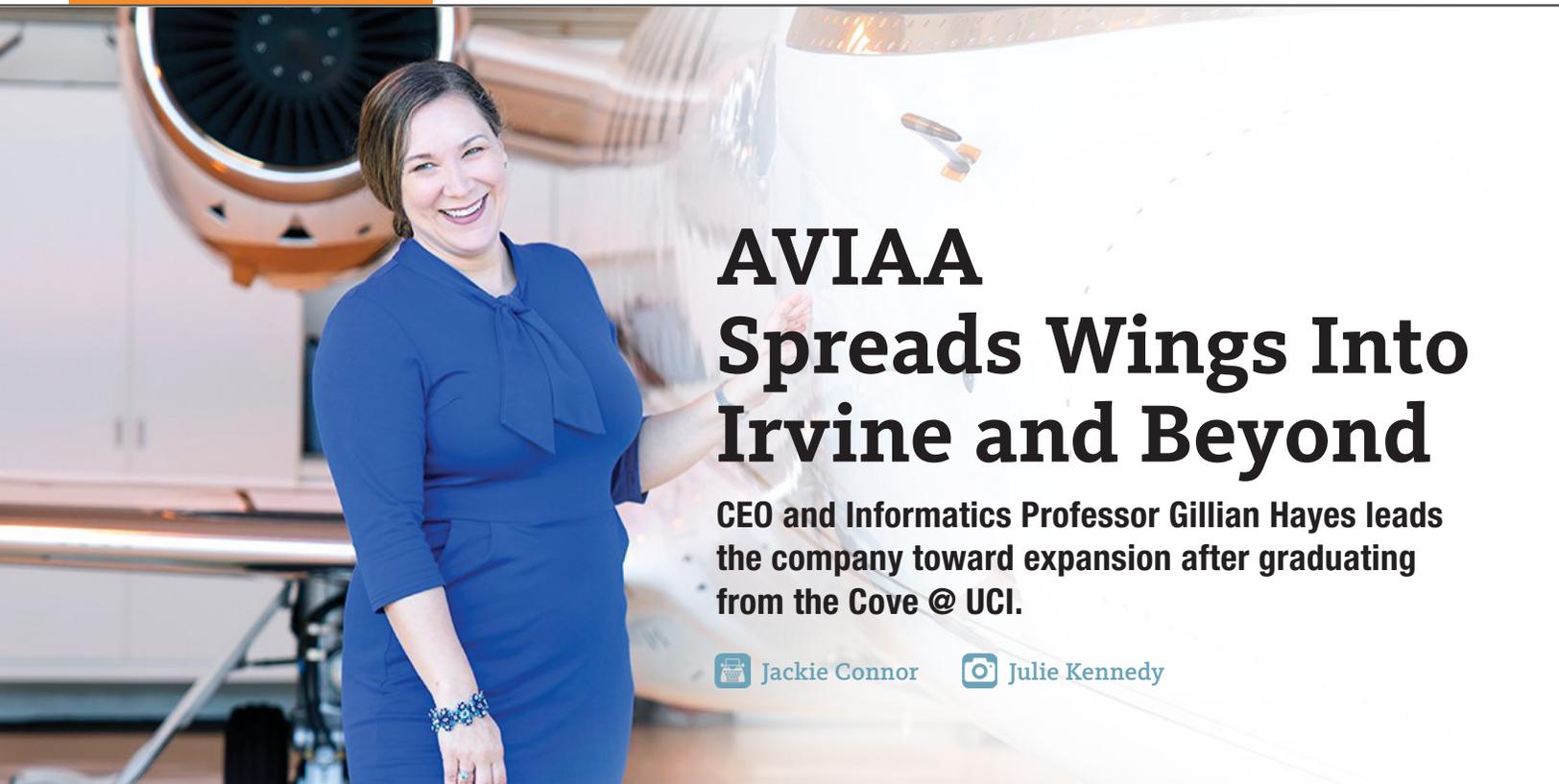
Chao went on to minor in information and computer science at the Donald Bren School of ICS and credits her professors during those early years with inspiring her to pursue a graduate degree in computer science. The multidisciplinary field of robotics was another major influence.

Before entering the MCS program, Chao worked at Caterpillar Inc. from 2015 to 2018. During this time, she used computer science in her day-to-day engineering job. Then, a massive layoff hit the company. At a time when nearly half of her peers were let go, Chao credits her programming skills with saving her job. “In daily mechanical and electrical engineering life,” she stresses, “everyone needs to code something.” So while it was her engineering degree that opened the door for her, it was her computer science minor that helped keep it open.

The experience helped Chao realize the value of a computer science education in the engineering fields. She graduated from the MCS program in December 2019. “MCS has given me a lot of knowledge in fundamentals like OS, algorithms and data structure to design an efficient program,” she says. “It also gave me understanding of machine learning and AI, which helps make robots smarter.”

This has been a good thing, as programming robots is still one of her favorite things to do. “I especially like computer science because it is the brain of the system, controlling what the robots do,” she says.

As her academic journey comes to an end, her story has come full circle. In her spare time, Chao has given back by sponsoring a student in Ghana. “I wanted to sponsor him just as I was supported by my scholarship and financial aid,” she says. “Education is really important to improve a person’s standard of living.”



AVIAA Spreads Wings Into Irvine and Beyond

CEO and Informatics Professor Gillian Hayes leads the company toward expansion after graduating from the Cove @ UCI.



Jackie Connor



Julie Kennedy

Gillian Hayes, the Robert A. and Barbara L. Kleist Professor in Informatics, experienced a migratory life growing up, as her parents would move the family from state to state pursuing careers in academia at universities. After landing in Athens, Georgia, she discovered her talent for the STEM field. And, as her own academic career began to unfold, Hayes eventually found herself with a fateful internship at the National Institutes of Health's AIDS laboratory that helped define her future when her cultures grew mold and didn't yield the results they needed.

"It was such a hot time to be doing AIDS research," said Hayes. "But I decided that growing mold wasn't going to work for me, and it was all just so slow, so when I went back to school I changed my major from molecular biology to computer science."

Her decision to pursue computer science as a second major unveiled a newfound passion.

"I just fell in love with computer science and seemed to excel in classes that were considered more challenging in computer science, where in bio I had struggled," said Hayes.

That small change set the foundation for what is now Hayes' career as an informatics professor and, as of January 2018, CEO of startup company AVIAA (aviaa.com). AVIAA is an international group purchasing organization for business aviation started in the U.K., now headquartered in Irvine with offices worldwide.

With a goal to drive more transparency in the general aviation industry, AVIAA was founded by serial

entrepreneurs who brought together their passion for aviation with expertise in procurement. Originally hired on as a consultant in 2017, Hayes developed the original data strategy behind business aviation purchasing for suppliers.

"On the surface, the company is very much a group purchasing organization focused on professional procurement for business aviation," said Hayes. "Under the guts of that, we're really basically a software as a service (SaaS) company that's very focused on data."

AVIAA strategizes ways of using the data they collect to improve the most efficient spending habits possible for aviation product buyers and sellers, professionalizing the entire procurement process and reducing friction costs for all involved.

"We still believe in relationships," said Hayes. "We believe in community, we believe in all that. We also really believe in data and making smart purchasing decisions based on the data that you have."

In December 2017, AVIAA founders asked Hayes to take over running the company as CEO and move to their home base in England. However, her research on business aviation combined with her desire to maintain her UCI connection grounded her in Irvine.

"The U.S. is still by far the biggest market for business aviation in the world," said Hayes. "There are massive growth rates in Asia, Africa, the Middle East and Europe, but the U.S. and Europe are the most mature markets. We just have the most jets."

Aimed at being a one-stop shop for business aviation owners, operators and suppliers, AVIAA helps customers balance value equation with sophisticated data analytics.

“**Right now, exactly half of our 16 employees are women. That’s exceedingly rare in business aviation and in tech.**”
— Gillian Hayes

“Anyone can look at a rate sheet and say ‘Ah, it’s cheaper over here,’” said Hayes. “But what we see is this desire by our membership to actually get high-quality services. They need to make sure that all the services – like fuel, catering, cleaning – are going to be available, will be served well, and at a fair price. So, it’s not just about price.”

Paired with wanting to maintain her relationship with the UCI community and her startup team, AVIAA became a tenant at UCI Beall Applied Innovation’s Cove in 2017 where the team utilized the talks and networking events. Within one year, AVIAA nearly tripled in staff size. Alongside its sister startup company, Assure Point, a next-generation suite of insurance products that cost at least 20 percent cheaper than market price, AVIAA graduated from the Cove @ UCI to a 3,600-square-foot office space in Irvine’s Park Place in August 2018.

“Working with Gillian and her AVIAA team has been great for us at Assure Point and has helped each company have better perspectives on effective tactics,” said Aaron Soto, chief architect of Assure Point. “It’s great to have such a direct connection to Gillian and her team.”

In January 2019, AVIAA also acquired their European counterpart, Convolus. With the acquisition, AVIAA now has an office in Munich, Germany, in addition to their locations in Park City, Utah, and Oxford, England.

“Having a really solid high-quality handling network across Europe that’s also servicing planes at a good value is a huge thing for our members,” said Hayes. “Convolus provided that network. They also have a completely European fleet of aircraft.”

The agreement added 150 new aircrafts to AVIAA’s fleet, which will support a member fleet of nearly 500 private and commercial aircrafts in addition to a larger network of suppliers and global operations. As CEO and UCI professor, Hayes frequently draws her

inspiration from AVIAA employees and her students.

“They constantly keep me motivated,” said Hayes. “I can see that they’ve had situations with bad bosses or professors, and I certainly make mistakes, but all I want to do is make a really cool place for people to work and study and be the best they want to be. That’s what really motivates me more than anything else.”

Through AVIAA and her classroom, Hayes continues to blaze trails for women in computer science and is passionate about incorporating more women in the industry.

“The CEO of the company we just bought, who is now going to be my managing director in Europe and the Middle East, is a brilliant woman,” said Hayes. “Right now, exactly half of our 16 employees are women. That’s exceedingly rare in business aviation and in tech.”

According to the Pew Research Center analysis, despite research showing that women make up three-quarters of healthcare practitioners and technicians classified within the STEM fields, women remain underrepresented in computer science, making up only 25% of the U.S. population’s career field.

The U.S. Department of Labor estimates that from 2016 to 2026, computer and information technology occupations are projected to grow 13% faster than the average for all occupations, adding 557,100 new jobs with the demand.

“We need a lot more people thinking computationally and doing computational type work,” said Hayes. “We’re not expanding the field the way we need to be.”

For business aviation, AVIAA continues to expand their global market presence having launched a second platform for their software service in May. As CEO of AVIAA, Hayes’ personal goals with AVIAA are well within reach. With immense support from her founders, Hayes aims to take the company to new heights, as well as encourage women in STEM fields and women entrepreneurs to forget stereotypes and pursue their passion.

“As women, we’ve often been socialized to build collaboration, to build consensus,” said Hayes. “Most of the time, that’s how I lead. However, as a startup CEO sometimes, you just have to be strong to be like ‘This is what we’re doing.’ You don’t have to be rude about it, but just stand by your decision.”

With Hayes piloting AVIAA’s ever-growing future in the business aviation industry, coupled with her passion for computer science, the sky is the limit.

This article first appeared in the March 2019 issue of the UCI Beall Applied Innovation’s Rising Tide magazine (innovation.uci.edu/category/rising-tide). 

HALL OF FAME CELEBRATION 2019



From left: Justin Erenkrantz, Jim Berney, ICS Dean Marios Papaefthymiou, Gerald Bortis and Erin Bradner.

Now in its fourth year, the Hall of Fame once again honored alumni from the Donald Bren School of ICS who have made a significant impact in their profession or otherwise brought distinction to their alma mater. In February, ICS inducted four more esteemed alumni during a ceremony at the Tustin Hangar. Noted for being one of the largest wooden structures in the world, the immense venue — with a rotating spotlight highlighting the vast open space surrounding the vibrant central event — seemed a perfect reflection of the far-reaching accomplishments of the night's inductees. Learn more about the ICS Hall of Fame at tech.uci.edu/halloffame.

JIM BERNEY

B.S. '89, Information and Computer Science

Berney is an Academy Award-nominated freelance visual effects supervisor whose portfolio of work includes Warner Brothers' "Aquaman" and the "Minecraft" movie, as well as Legendary's "Pacific Rim 2." WormStyle, a visual effects company he started in 2013, was responsible for nearly 100 shots for "Divergent." Berney also worked on the Academy Award-nominated "The Chronicles of Narnia: The Lion, the Witch and the Wardrobe," for which he was nominated for the Oscar for Outstanding Achievement in Visual Effects. Berney began his career working for DARPA as an ADA programmer at a large software engineering consortium. He majored in computer science and economics at UCI, focusing in AI research.

GERALD BORTIS

Ph.D. '16, Software Engineering; M.S. '07, B.S. '05, Information and Computer Science

Bortis is vice president of software development at NextGen Healthcare, a leading provider of healthcare technology solutions. He manages a global development team of more than 100 people, supporting numerous solutions that generate over \$100 million in revenue. His team developed NextGen Office, a web-based electronic health record and practice management system. Bortis started his career as a software engineer with Mirth in 2005 where he was one of the founders of Mirth Connect, an open source data integration engine that is now used worldwide to transfer and transform data between health information systems. Bortis earned both his bachelor's and master's from ICS before receiving his Ph.D. in software engineering from UCI under adviser André van der Hoek.

ERIN BRADNER

Ph.D. '01, M.S. '98, Information and Computer Science

Bradner is a director and research scientist at Autodesk in San Francisco where she helped found the Generative Design initiative and now manages Autodesk's Robotics Lab. She has led strategic research partnerships on manufacturing automation with institutes such as the U.S. National Laboratory in Livermore and NASA's Jet Propulsion Lab. Bradner has led hundreds of research projects over the course of her career — a common thread across them being that her research helps amplify human creativity through intelligent and intuitive technology. She has authored research in human-computer interaction with collaborators at Autodesk, IBM, Boeing and AT&T, and is a co-author on patents in advanced design.

JUSTIN ERENKRANTZ

Ph.D. '09, M.S. '04, B.S. '02, Information and Computer Science

Erenkrantz is senior vice president of software engineering for Major League Baseball (MLB), where his teams are responsible for delivering the core technology that supports the game. Prior to joining MLB in 2017, Erenkrantz was at Bloomberg LP as head of computer architecture where he helped to lead the transformation of their underlying hardware and software infrastructure that powers the information flow for the global capital markets. Erenkrantz is also a member of the Apache Software Foundation, serving as president from 2007 until 2010 and contributing to the development of the Apache HTTP Server, Apache Portable Runtime, and Flood. Throughout his career, he has also worked at several startups (Joost and VDIO) and large companies (Google). 



More than 300 people gathered inside the Tustin Hangar for the fourth annual Hall of Fame.

Hall of Fame Alumna Spotlight: Erin Bradner Designs Technology to Amplify Creativity



When Erin Bradner (Ph.D. '01, M.S. '98) was first introduced to human-computer interaction and artificial intelligence as an undergrad at UC San Diego, she was intrigued by the concept of neural networks. “Why wouldn’t we mimic the circuitry of the human mind to make software smarter?” asks Bradner. This intrigue followed her into the workforce and ultimately led her to UCI, where she earned her M.S. and Ph.D. in information and computer science. Now, as director of robotics at Autodesk where she co-founded the Generative Design initiative, she is constantly exploring how technology can “amplify human creativity.”

What led you to attend UCI for your Ph.D.?

After graduating with my B.S. in cognitive science at UCSD, I worked for a small software company that introduced pioneering user interfaces that we now take for granted, including non-contiguous text selection, multiple undos, and voice and text annotations. It was a dream job for a budding software interaction designer and user researcher, but I had a nagging urge to go back to school. I wanted to find a program with an emphasis on human-centered software design and HCI. My thinking was that because human computational systems (neurons, etc.) and human input devices (eyes and ears, etc.) were likely to evolve far slower than non-human hardware and software, my best educational investment would be a strong foundation in HCI. Human cognition, sensation, perception and even social behavior are complex yet largely stable. Computing paradigms are malleable. I chose UCI’s information and computer science program so I could explore principles of good design from a technical and human perspective.

Talk about using technology for creativity.

When I was straining to capture the essence of what I do for my LinkedIn profile, it occurred to me that amplifying human creativity through technology is at the root of all my work. I’ve long been interested in how technology enables creativity — not exclusively artistic expression, but the exploration of ideas to produce new and unexpected creations in any profession. At Autodesk, which makes architectural design, engineering and entertainment software, I’ve worked with hundreds of architects, engineers and animators. These professionals each approach their work with a unique mix of experience, intuition and formal

training, yet the vast majority of them favor software design tools that support exploration. They want tools that let them quickly iterate on traditional ideas as well as a few harebrained suggestions and maybe even create a mashup of both. I find it deeply satisfying knowing that software tools I helped develop have allowed people to design with more creative freedom and passion. The best digital design tools — from CAD tools to photo editors to word processors — amplify creativity when they let us play around with a vastly wider range of design alternatives.

What new technologies are you exploring?

I manage an industrial research lab — everything we do is exploratory! Today, researchers from NASA’s Jet Propulsion Lab are in our lab using generative design algorithms to make an experimental space lander; the researchers on my team are using AI to teach a robot how to assemble toy blocks and timber framing for buildings; and I’m researching the technical drivers that will shape the future of robotics in construction. I’m excited about it all. I particularly like the challenge of extrapolating how machine learning and 3D modeling will impact robotics in the near future. Spoiler alert: Robot armies won’t invade factories, homes and construction sites in droves to displace human workers! However, a new class of adaptable, responsive robots will be turning up at work sites across industries to help out with a range of tedious jobs.

Tell us about the nonprofit Build Change.

I serve on the board of directors, applying my expertise in technology design and 3D modeling for architecture. Build Change designs disaster-resistant houses and schools in emerging nations, training homeowners and government officials to build them. Nearly a quarter of a million people are in safer homes or schools thanks to their work. I studied technology adoption at UCI, and it’s clear to me that disaster-resistant building practices will be adopted only when the right technology is locally available, when it’s intuitive to implement, and when it’s culturally accepted. It’s a challenging design problem that I feel very passionate about.

How has your UCI education helped along the way?

My UCI education gave me a solid technical background in software programming techniques and in research methods, which has helped me choose the right tool for the task. As a technical manager, for example, I know when to focus on system architecture or performance optimization or when to tweak our process. As a research manager, I know what kind of answers I can expect to get out of running a structured experiment versus collecting qualitative field observations or conducting a literature review. My ICS degree exposed me to multiple ways of thinking about technology, so I also understand how to tap people from different disciplines for the types of insights they’re best equipped to provide. 

Event Highlights

2019 Commencement Ceremony: A First for ICS



At UCI's 54th annual commencement, the Donald Bren School of ICS held its own commencement ceremony for the first time, with more than 1,000 bachelor's and master's students graduating. According to Computer Science Professor Gopi Meenakshisundaram, the associate dean of student affairs for ICS, the number of ICS graduates has increased almost 300% over the last 10 years. "It was gratifying to provide undivided attention to our graduates, celebrating their accomplishments," he says. The student commencement speaker was David Kwon, a computer science major who now works as a software engineer at Taco Bell headquarters in Irvine, while the main speaker was ICS alumna LouAnne Boyd (Ph.D. '18), founding faculty member and assistant professor of computer science in the Fowler School of Engineering at Chapman University.

Ingenuity 2019 Captures the Spirit of Innovation



Nearly 200 people gathered at the Beckman Center for Ingenuity 2019, the seventh annual celebration featuring top student innovations and influential alumni from ICS and the School of Engineering. In the keynote address, President of Partner Solutions at Experian Consumer Services Jennifer Leuer discussed how she creates a culture of ingenuity, outlining the need for incrementalism, teamwork, diversity,

customer outreach and curiosity. Alumnus Vince Steckler, B.S. '80, CEO of Avast, received this year's Ingenuity Award for his cybersecurity work and charitable contributions to ICS. Six ICS student teams then gave brief presentations and showcased their projects at the evening's outdoor reception.

Academics and Activists Unite to Tackle Digital Discrimination



On March 8, Yeshimabeit Milner, founder of Data for Black Lives, gave a talk, "Abolish Big Data," to a packed room in Donald Bren Hall. The public talk kicked off a two-day workshop, "Datafication and Community Activism: Redrawing the Boundaries of Research," hosted by Informatics Professor Roderic Crooks in collaboration with Milner. The rest of the invitation-only workshop brought together a diverse group of activists and academics. There were activists from the Bronx Defenders, Measure Austin, Our Data Bodies and Stop LAPD Spying Coalition, as well as researchers from the Center for Internet and Society (India), Data & Society and the Urban Institute. From the scholarly community, the participants came from more than 20 universities, including UC and California State University schools, Harvard, MIT and Georgia Tech.

IGB Hosts Biomedical AI, ML Symposia

UCI's Institute for Genomics and Bioinformatics (IGB) hosted its first Southern California AI and Biomedical Symposium on May 31, featuring speakers from UCI, UC San Francisco and the University of Copenhagen. Distinguished Computer Science Professor Pierre Baldi, who hosted the event, also gave a talk on AI and natural intelligence. There was a powerful keynote by Atul Butte (UCSF) on "Translating a Trillion Points of Data into Therapies, Diagnostics, and New Insights into Disease." IGB also hosted its annual Southern California Biomedical Imaging and Machine Learning Symposium on Oct. 4, featuring speakers from UCI, UCLA and USC. Baldi, again hosting the event, gave a talk on "Deep Learning in Biomedical Imaging."

CPRI-ISR IoT Security and Privacy Conference



UCI's Cybersecurity Policy and Research Institute (CPRI) teamed up with ISR for a one-day event in May on Internet of Things (IoT) Security and Privacy that attracted nearly 100 people from a broad range of companies, institutions, defense contractors, national and regional government agencies, and law firms. University of Michigan Professor Kevin Fu gave a keynote talk on "The Physics of Sensor Cybersecurity." There were also presentations by CPRI Executive Director Bryan Cunningham and ISR Director Sam Malek, as well as a panel on IoT Privacy Regulation. The event concluded with a research showcase featuring posters and demonstrations by UCI graduate students.

HackUCI 2019 Inspires Creative Coding and Learning



Now in its fifth year, HackUCI 2019 drew more than 400 undergraduate and graduate students to UCI's Student Center for 36 hours of coding in a fun and collaborative environment. The event was a huge success, with \$5,410 in prizes and participants creating 76 new hacks, ranging from useful websites and novel safety devices to creative augmented reality apps and entertaining and educational games. The award for Best Overall Hack went to Listen, a website that lets you search audio files just as you would a text document. The Hacker's Choice and Best UI and UX awards went to Emoclean, a website that can track and analyze the mood of users watching a video.

ISR Launches New Software Engineering Symposium

The Institute for Software Research held its new Southern California Software Engineering Symposium on June 7, attracting more than 100 researchers, leaders in industry and technical practitioners for the multidisciplinary event to discuss software development and interactive and collaborative technologies. The program included eight short talks by faculty, as well as keynote speeches by SAP's Hans-Martin Will and Google's Emerson Murphy-Hill. The day also featured an open house with posters and demos of faculty and student research projects from the Department of Informatics.

Alumni Unite in NYC



In October 2019, ICS alumnus Tim Kashani, B.S. '86, once again hosted a group of nearly 30 alumni from the schools of ICS and engineering for an evening of networking with the schools' deans in New York City.

LA Alumni Converge at Petersen Auto Museum



The schools of ICS, engineering and physical sciences hosted more than 150 alumni, faculty and friends for a special evening at the Petersen Automotive Museum in Los Angeles on Aug. 27. What's become an annual tri-school alumni event included exclusive access to the museum's exhibits and its scenic views of Hollywood. Stephen Ritchie, director of UCI's Institute for Transportation Studies, gave a talk on "UCI and the Mobility Revolution," and UCI alumnus Daniel Han discussed the "Hyundai Mobility Project."

Distinguished Speakers 2018-19

The 2018-19 academic year brought several distinguished speakers to the Donald Bren School of Information and Computer Sciences. Stay informed about upcoming ICS events by visiting ics.uci.edu. View videos of the distinguished speakers below by visiting youtube.com/UCIBrenICS.

ICS Distinguished Lecture Series in Information Technology and Society



Alvin Roth
Professor of Economics, Stanford University
2012 Nobel Prize in Economics
“Who Gets What? The New Economics of Matching and Market Design”



Alex “Sandy” Pentland
Toshiba Professor of Media Arts and Science, MIT
“The Human Strategy”

Department of Computer Science Distinguished Lecture Series



Ronitt Rubinfeld
Professor of Electrical Engineering and Computer Science, MIT and Tel Aviv University
“Local Computation Algorithms”



Vikram Adve
Donald B. Gillies Professor of Computer Science, University of Illinois at Urbana-Champaign
“A Case for Shipping ALL Software Using Virtual Instruction Sets: The ALLVM and HPVM Projects”



Somesh Jha
Lubar Professor of Computer Science, University of Wisconsin-Madison
“Towards Semantic Adversarial Examples”



William Gropp
Thomas M. Siebel Chair in Computer Science and the Director of the National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign
“Challenges in Programming Extreme Scale Systems”



Jeffrey D. Ullman
S.W. Ascherman Professor of Engineering (Emeritus), Stanford University
“Data Science: Is It Real?”

Institute for Software Research Distinguished Speaker Series



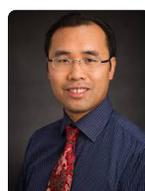
Emerson Murphy-Hill
Staff Research Scientist, Google
“Software Developer Diversity and Inclusion”



Tevfik Bultan
Professor of Computer Science, UC Santa Barbara
“Software, Logic, and Automata: Automating Dependability of Software”



Daniela Damian
Professor of Computer Science, University of Victoria
“Never Alone: How Collaboration Has Changed and Is Changing in Software Development”



Tao Xie
Professor and Willett Faculty Scholar in Computer Science, University of Illinois at Urbana-Champaign
“Intelligent Software Engineering: Synergy Between AI and Software Engineering”

Inaugural ICS Industry Showcase Delivers

Bringing together more than 2,000 students, faculty and corporate participants, the daylong showcase was the largest ICS event ever held on campus.



The chatter of networking filled the UCI University Club at the inaugural ICS Industry Showcase as industry leaders mingled with faculty and students during the kickoff luncheon. ICS Dean Marios Papaefthymiou welcomed the crowd to the full-day showcase on Oct. 16, which was designed to strengthen research and recruitment partnerships between industry and the ICS community. In addition to lunch, the free event featured a Student Career and Resources Fair, a faculty presentation on “AI



ICS Dean Marios Papaefthymiou welcomes students, faculty and industry leaders at the kickoff luncheon.

and ML Solutions: From Research to Practice,” four Corporate Partner Info Sessions, and a networking reception hosted by the UCI Cybersecurity Policy and Research Institute.

Students, Faculty Dine With Industry Leaders

As Papaefthymiou highlighted during his welcome, the School of ICS has more than 1,000 students graduating each year and a growing number of faculty with expertise in areas such as AI and machine learning, cybersecurity, human-computer interaction and software engineering. With seating arrangements that intentionally filled tables with a mix of corporate and academic attendees, the 230 participants had plenty to talk about.

Jason King, associate director of corporate relations in ICS, notes that the luncheon was a unique component of the larger event. “It let companies directly connect with motivated, highly sought-after students from diverse backgrounds,” he explains, “and also connect with senior faculty and department chairs conducting research in growth areas like AI, machine learning, cybersecurity and data science.” In planning the event, the emphasis was on inclusivity.

Each element of the day was part of a concerted effort to address the needs of a variety of stakeholders. “This event was a coordinated response to feedback gathered over several months,” says Ashley Teran, senior director of development in ICS. It addressed student requests for greater access to companies, company requests for graduates with certain soft skills and for partnerships in machine learning, and faculty and staff requests for greater visibility around internal resources. And it ended up being the largest ICS event ever held on campus.

Career Fair Caters to ICS Students

Immediately following the luncheon, guests moved to the courtyard, where roughly 2,000 participants attended the Student Career and Resources Fair. While some attendees learned about ICS resources, such as the Office of Access and Inclusion (OAI), or the Women in Information and Computer Sciences (WICS) and Artificial Intelligence (AI@UCI) student clubs, most of the traffic was around the 20 industry booths. Swarms of students gathered to talk with representatives from companies in a wide variety of fields, from entertainment (including Blizzard, Hulu and Paciolan) to tech (such as Aerospace Corp., BlackBerry/Cylance, Hexagon and ID Tech), and from finance (including Acorns and Experian) to those offering products and services (such as Bio-Rad, Garmin, Glidewell, HireRight, Pacific Dental and Taco Bell).

One company representative was recent ICS graduate Jose Vargas, now an IT associate at Ingram Micro, which hosted a booth. “My colleagues and I had so much fun talking to students and building connections,” says Vargas. “As a UCI alumnus, being on the other side of the table brought me a huge sense of pride. It was extremely rewarding to have students come up to me and engage professionally.”



Google engineer and ICS alumnus Anthony Mays talks with students visiting his company's booth.



Senior software engineer MB Aouad speaks at the SAP info session.

Student Engagement at Info Sessions

In addition to talking with representatives at the Student Career and Resources Fair, students could attend Corporate Partner Info Sessions, presented by CoreLogic, Google, SAP and Twilio (all of which also had booths set up at the fair). These 45-minute talks were tailored to ICS students, giving them a chance to learn more about the companies through demos and to ask follow-up questions.

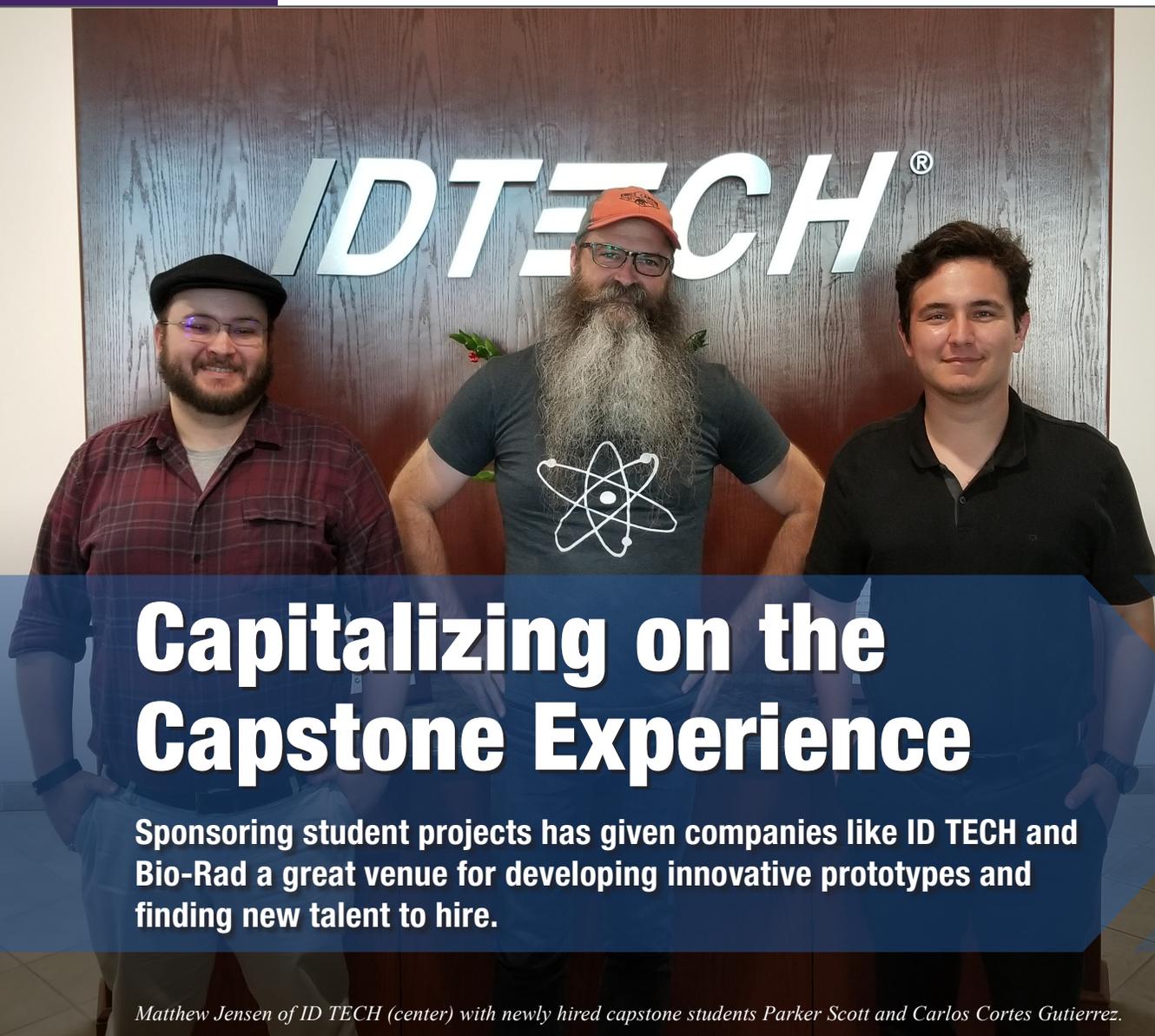
Ally Lee, program manager at Twilio, was impressed by the students and their questions. “We were able to get an idea of the depth and caliber of ICS students from this one-hour engagement.” Bethany Cooper, principal of talent acquisition at CoreLogic, also had nothing but positive feedback: “We were blown away by the quality and quantity of [ICS] tech students.”

Showcasing ICS Talent and Research

Industry executives were also given the chance to attend presentations, with ICS Professors Erik Sudderth and Sameer Singh hosting a talk on “AI and ML Solutions: From Research to Practice.” Sudderth talked about applications of AI in law, finance, healthcare, national security and the environment, highlighting support from companies such as Amazon, Facebook, Qualcomm and SAP, and presenting AI partnership opportunities. Singh discussed one such partnership between ICS and the Allen Institute for AI that focuses on teaching machines to read.

The day concluded with a networking reception hosted by the Cybersecurity Policy and Research Institute. During the reception, CPRI Executive Director Bryan Cunningham and Computer Science Professor Ian Harris talked about the institute's strategies to address cybersecurity's technical, legal, policy and human challenges.

Learn more about the ICS Industry Showcase and future events at industryshowcase.ics.uci.edu. 



Capitalizing on the Capstone Experience

Sponsoring student projects has given companies like ID TECH and Bio-Rad a great venue for developing innovative prototypes and finding new talent to hire.

Matthew Jensen of ID TECH (center) with newly hired capstone students Parker Scott and Carlos Cortes Gutierrez.

Capstone courses give students the opportunity to put their skills to the test by letting them work with local organizations to solve real-world problems. The two-quarter Informatics 191 A and B Senior Design Project course in the Donald Bren School of ICS presents a win-win situation, as hands-on learning for the students can result in practical solutions for the sponsoring company. For a few students and companies, however, the benefits extend even beyond impressive portfolios and innovative prototypes.

ID TECH Taps New Talent

“I remember the day they pitched the project to the class,” says Carlos Cortes Gutierrez, referring to Cliff Frescura and Matthew Jensen of ID TECH (idtechproducts.com), which designs and manufactures secure payment solutions. “They had mentioned that they were looking to expand

their team,” recalls Cortes Gutierrez. Now, the recent UCI graduate is a junior software engineer for the company, helping develop software that accommodates a wide range of platforms and products pertaining to payment devices. Fellow graduate and capstone teammate Parker Scott is doing the same.

“What I like best about the capstone course is that it gives students the opportunity to connect with real clients that have real problems,” says Scott. “We get a chance to see what it can be like to actually listen to client requirements, propose solutions and adjust based on client feedback or shifts in client priorities.” It also gives the companies a chance to see how students perform in that real-world environment.

“The capstone project was an essential part of the hiring decision,” says Jensen, ID TECH’s manager of software engineering. “We were able to see how the students approached problem solving

and communication within their team, and we could evaluate the technical contributions and quality of work.” That work involved creating a mobile web app that lets customers and technicians manage their payment devices.

“I truly felt like I was learning something that you just cannot get from sitting in a classroom,” says Cortes Gutierrez. In the end, both he and Scott gained not only invaluable experience but also a job offer.

“We were able to give a small project to the students that had a lot of fun elements and learning opportunity for them and proved the concept of the idea we had,” says Jensen. “That proof was enough for us to pursue the project internally with the additional benefit of finding and developing new talent to hire.”

Bio-Rad Trio Has High EQ

Bio-Rad (*bio-rad.com*), which develops, manufactures and markets a broad range of products for life science research and clinical diagnostic markets, also got an added benefit from the course — as did three of its team members. In addition to a prototype tool, software manager David Lokietz left the capstone course with a summer intern and two new developers.

To better communicate with customers, Lokietz says Bio-Rad “decided to ask a highly motivated UCI capstone team with an entrepreneurial spirit to create a prototype.” The team exceeded their expectations, creating not only a prototype but also a refined front-end solution for feedback as well as an interactive dashboard.

“Working with Bio-Rad truly was an exciting and amazing experience,” says Matthew Morales, who started his new software developer position with Bio-Rad on July 1. “I was excited at the opportunity to get some real interviewing experience and feedback on my resume,” he says. “I was surprised to actually receive an offer!”

Christopher Zhao, a software engineering major who graduated in the fall of 2019, joined Morales at Bio-Rad for the summer with an internship. “The best part about the capstone project was it allowed me to experience the full software development cycle and what it’s like working on a big project,” he says. “It was something I had never experienced in any other courses.”

Teammate Jacklyn Grace Truong also started working at Bio-Rad in July. “I’m really looking forward to continue working with everyone at Bio-Rad,” she says. “We’ve already been working with them for 20 weeks now — it’s like the honeymoon phase is over and I’m ready for the marriage to really begin.”

It is, after all, a perfect match. “The capstone experience allowed us to interact with the team

members,” notes Lokietz. “We were able to understand their technical capabilities and, more importantly, to gauge their Emotional Intelligence (EQ).” He explains that although Bio-Rad can test for technical skills, assessing the EQ — which comprises motivation, interactive and communication skills, awareness of the organization, and personality traits — is difficult when limited to just a few hours. Working with the students for 20 weeks helped Bio-Rad better “understand the overall fit.” At the same time, the students were able to get a feel for the organizational culture and what role they might play within it.

“I have found graduating candidates don’t always have the ability to articulate why they want the job,” says Lokietz. “When interviewing these candidates, they had formulated a really good ‘why’ they wanted the job at Bio-Rad.”



The best part about the capstone project was it allowed me to experience the full software development cycle and what it’s like working on a big project.”

—Christopher Zhao, B.S. in software engineering '19 and Bio-Rad summer intern

From Project to Position

Both ID TECH and Bio-Rad plan to sponsor future projects. “Absolutely, yes,” responded Jensen when asked about future capstones. “We already have several ideas that we are developing.”

According to Lokietz, the benefits of sponsoring a capstone include having a “contained team” that can focus solely on a proof of concept without having preconceived solutions based on how “it’s always been done.” The company then gets a prototype for determining next steps as well as “exposure to new talent (IQ) technical capabilities” and an “understanding of people’s EQ.”

For students, the goal of the course is to obtain real-world experience to boost their resumes, but some land jobs in the process. “David took it upon himself to become more than a sponsor,” says Morales. “He was a leader, our mentor and now — luckily enough — our boss!”

Contact Associate Director of Corporate Relations Jason King at jason.king@uci.edu to learn more about sponsoring a capstone project. 

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The Dean's Leadership Council is an advisory board of executive-level leaders who help advance our research, teaching and public service goals by strengthening the School's ties to industry and the community.

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In Memoriam: Steve Anderson, B.S. '86

Donald Bren School of ICS alumnus Steve Anderson died Dec. 27, 2018. He was 55. Anderson was a long-time partner at Quinn Emanuel Urquhart & Sullivan in Los Angeles where he led the firm in intellectual property litigation, and used his ICS background to provide counseling in an array of computer-related and other technologies. He was also named numerous times as a Southern California "Super Lawyer" by *Los Angeles Magazine*. Anderson received his B.S. in information and computer science in 1986 before earning his J.D. degree from Harvard Law School in 1990. In 2016, he was a recipient of UCI's Lauds & Laurels Distinguished Alumni Award for his service and support of ICS alumni, research and students. Anderson had also been a member of the ICS Dean's Leadership Council since March 2015. He leaves behind his wife, Michelle, and their daughter, Sydney. In honor of Anderson, ICS has established a student scholarship in his name.

Corporate Partners

The Corporate Partners Program allows companies to grow their relationships with the ICS community to reach their strategic goals, while also being highly visible collaborators in moving the ICS mission forward. For more information, contact Associate Director of Corporate Relations Jason King at jason.king@uci.edu or (949) 824-3088.



Honor Roll of Donors

Thanks to the generous supporters of the Donald Bren School of Information and Computer Sciences, ICS raised \$3.2 million in gifts from businesses, foundations, alumni, faculty and friends during the 2018-19 fiscal year. These gifts helped fund faculty research and teaching, undergraduate scholarships, graduate student awards, and other essential expenses. For more information on giving to support ICS, please visit connect.uci.edu/ICS or text UCICS to 41444. You can also contact Senior Director of Development Ashley Teran at arteran@uci.edu or (949) 824-4588. ICS acknowledges the generosity of those who gave anonymously as well as the donors named below:

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An ICS Trailblazer

Alumnus Jim Hobbs, B.S. '73, helps pave the way for others by establishing the Julian Feldman Scholarship.



Jim Hobbs, B.S. '73, was one of 22 esteemed Anteaters honored in May at the 49th Annual Lauds & Laurels awards gala, an event recognizing alumni whose achievements have brought distinction to UCI. Hobbs retired from Intel in 2008 after almost three decades of work in technical management positions — including strategic program manager and senior enterprise architect — and has spent much of his retirement doing volunteer work. Throughout the years, he has always maintained close ties to UCI's Donald Bren School of ICS, where he not only earned his ICS degree, but also held various technical positions and bonded with the first chair of ICS, Julian Feldman. In 1998, in honor of his beloved mentor, Hobbs and his wife, Monica, established the Julian Feldman Scholarship, funded through annual donations that continue to this day. The scholarship, which became an endowed scholarship in 2006, has touched the lives of more than 25 undergraduate ICS students.

What led you to attend UCI and study information and computer science?

During high school, I took some classes about computers and computer programming from David Feign, Ph.D. '80, who was the father of one of my classmates. He had access to an Autonetics RECOMP II at work, and we were able to write programs for it. This was done on coding sheets, and we manually translated the code to octal. David would take the code to work, enter it into the RECOMP II and bring us a memory dump so we could see how the programs and

data turned out. The experience with David, and later with other teachers and mentors, made me determined to study computers, although I didn't know of a computer science major at that time.

However, I had met UCI's Chancellor Daniel Aldrich at an event held at the Orange County Medical Association. He gave me a very favorable impression of what would be happening at UCI, which made me want to go there. So when it was time to apply for college, I really only wanted to go to UCI — that was the only place I applied.

Fortunately, I was accepted, and I entered UCI in the fall of 1967. I started working at a student job within the Information and Communication Science Department — renamed Information and Computer Sciences in early 1968. When Julian Feldman, the department chair and my boss, returned from a meeting one day, he announced that ICS had been granted status as an academic department and could start accepting undergraduate majors. I said that I would be back in a few minutes and walked over to the registrar's office and changed my major to ICS. I graduated in 1973. My mentor, David Feign, ended up receiving his Ph.D. in ICS from UCI in 1980.

What did you enjoy most about working in the tech industry?

The informal slogan at Intel was “faster, better, cheaper.” I enjoyed the pace of change, relentless growth (punctuated by periodic industry contractions), continual improvement and

novelty, helping lower unit costs, and the ability to contribute to the industry.

Something that was similar when I moved from my job at UCI to the one at Intel was working with some very smart people. One of the great things about working at Intel then was having the opportunity to interact with the founders. The pace was different from UCI though. Intel was growing very quickly (a 9,450% increase in annual revenues during my time there), and the information technology infrastructure had to keep up.

I was working in IT, not product design, but because we were an IT organization inside a company selling to the IT market, we had a great opportunity to participate in strategic planning and design reviews. We also shared our experience with the world at www.intel.com/it.

Our day job, of course, was to provide faster, better and cheaper IT services to the company. We were always adding computing power. I remember the day that I realized that I had more memory on my desk than the company had in its corporate computer centers when I arrived! We constantly increased our networking capabilities as well. After a large-scale reimplementation of our core networking capabilities, we were benchmarked by an outside consulting group as having both the best-in-class corporate network and lowest-in-class unit cost.

How did your ICS education help you throughout your career?

I worked for ICS most of the time that I was a student, and continued to work for UCI for over five years after graduating, so through both my education and work experiences, I learned quite a few things that helped me for the rest of my career. First of all, I learned that hardware is ephemeral, but software can last forever. Before ICS, my mental model was that computers were durable goods, and software was expendable. That quickly changed! Most of the computer architectures in use in 1967 are long gone, but people are still writing code in COBOL.

I learned that process is more important than a particular implementation, and bad analysis is usually harder to fix than bad coding. I learned to optimize the frequently executed code and that there is value in building a proof of concept for almost everything. I also learned to test with enough data and to test at the margins. Most programs work most of the time and work with the expected data. It's things like out-of-range data (or no data) that get you. I was invited to try out a "bulletproof" piece of software and crashed it with the first keystroke. It was a key that they never imagined anyone would press.

On the other hand, I learned you need to use software in the way that it is intended to be used — meaning the way that it was tested. Deviating from the defaults can cause trouble that isn't worth the deviation. For example, a programmer at the UCI computing facility turned off multiprocessor features in a system that had only one processor to save space and processing time.



ICS Dean Marios Papaefthymiou presenting Jim Hobbs with his 2019 Lauds & Laurels Award.

Subtle errors started occurring, and it took months to figure out that we were the only people in the world who had turned off those features, and that turning them back on solved everything.

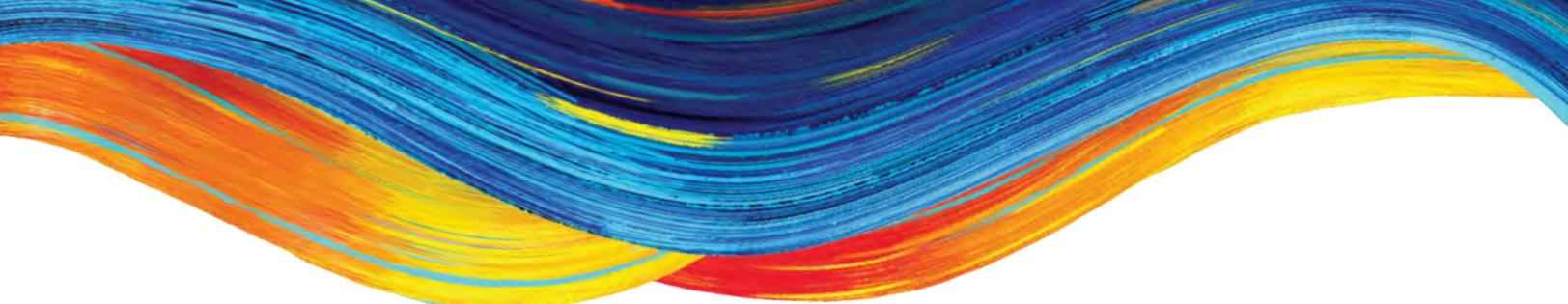
Can you share any memorable ICS moments?

People who came to UCI the year that I started found a campus in which the Ring wasn't complete, and most of the sidewalks weren't in. They looked for places that foot traffic had worn the groundcover down and paved that. So, in a way, in the '60s, we were actually trailblazers.

The original ICS computer lab was in a trailer. Opening in late 1968, we called it the UCI ICS Computer Center. It had a Varian Data 620/i and several teletypes that were used to prepare programs on paper tape and provide printing. The printed zeros and letters "O" were indistinguishable, which was a problem for computer programmers. My father was a dentist with a machine shop in his garage, so I disassembled the print mechanism and took home the print drums. My father drilled a hole in each drum and inserted a peg so that we could tell a "0" from an "O." I have other stories, like the time a student came to get me and said, "Come quick! There's lightning in the computer room!" But space does not permit.

What motivated you to start the Julian Feldman Scholarship?

Julian influenced me as a teacher, mentor and friend. He was also my first boss at UCI. I really appreciate all that he and others at ICS and UCI did to help get me started in my professional life. The thing his students remember most is his sincere concern for them. ... UCI provided me an excellent education at a very modest cost. I appreciate what I learned through my study and work at UCI, so I was happy to do something that would help other students in ICS. 



Brilliant Future The Campaign for **UCI**

Founded in 1968 as a department, the Donald Bren School of Information and Computer Sciences continues on a path of unprecedented growth over 50 years later. Educating nearly 4,000 undergraduate and over 800 graduate students in its three departments (Computer Science, Informatics and Statistics), ICS offers a remarkable breadth and depth of research and education programs, with strengths in the areas of artificial intelligence (AI), cybersecurity, data science, human-computer interaction and software engineering.

Here in ICS, computer scientists, informatics experts and statisticians work side by side, combining a range of expertise rarely found under one roof. Drawing on analytical talents and a knack for creative integration, our faculty and students fluidly move across the spectrum to invent new computing technologies and explore their use in a broad variety of application domains. ICS is home to a remarkable breadth of research and education programs with core strengths in fields of national priority, including AI and machine learning, cybersecurity, data science, software engineering, human-computer interaction and health informatics, to name a few.

A founding tenet of the School that permeates research and education initiatives in ICS is that people must be at the center of information technology creation. ICS researchers look

beyond the next new technology, studying the interactions between information technology and people, and exploring the impact — positive or negative — through a socially conscious lens.

Through its multiple centers and institutes, ICS fosters diverse collaborations with campus and community stakeholders, reshaping domains as far-reaching as education, art and entertainment, business and law, the environment and biological systems, and healthcare and medicine.

Technology will drive solutions for our increasingly digitized world well into the 21st century. A new phase of investment will enable us to expand our School's strengths in areas of critical importance to the nation and the globe as we:

1. Research, educate and practice socially beneficial AI;
2. Create solutions for a safer digital world;
3. Advance digital wellness and learning media for youth; and
4. Expand, support and diversify the country's next generation of tech leaders.

We invite you to join us in our endeavor to transform our world for the better through innovation in computing technology!

Learn more about the ICS Brilliant Future campaign at
www.ics.uci.edu/BrilliantFuture

ICS Brilliant Future Funding Priorities



DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Using data to advance business, commerce, healthcare and science must be done responsibly and equitably. That is why ICS has made a major investment in big data. Our faculty and students act as the connective tissue that draws together so many other areas of research on campus, including artificial intelligence, biosciences, health sciences and bioinformatics. Establishing the UCI Data Science and AI Institutes will further expand our trailblazing work and significantly impact all of these areas across campus.



CYBERSECURITY

In a world where everything is connected, everyone faces unprecedented vulnerabilities when it comes to privacy and security. High-profile breaches in both the public and private sectors underscore the magnitude of this crisis. As a founding partner of the UCI Cybersecurity Policy and Research Institute, we are committed to addressing the problem from both a technical and a human perspective. We seek to deepen our investment and focus on high-impact, multidisciplinary research to combat cyber threats and protect individual privacy and civil liberties.



DIGITAL MEDIA AND LEARNING

Together with the School of Education, we have formed the Connected Learning Laboratory, which studies and designs learning technologies that are equitable, innovative and learner-centered. Our researchers are in K-12 schools, working with educators and students, reinventing camps, designing games and other educational tools, and evaluating how to bring in others to build supportive learning environments for young people of all backgrounds.



INCLUSIVE EXCELLENCE AND THE STUDENT EXPERIENCE

One of our top priorities is to further inclusivity at all levels – among students, staff and faculty – to be a model for other institutions to emulate. We hope to expand our extensive outreach into elementary and middle schools, high schools and community colleges, promoting computing in accessible, fun and interactive ways as taught by our own students. By positioning ourselves as welcoming to students of all backgrounds and income levels, we will raise the level of all.

ADDRESS SERVICE REQUESTED

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Uncharted Waters

Informatics Ph.D. candidate Mark Baldwin has partnered with the Makapo Aquatics Project to develop a steering system for blind and low-vision individuals to experience paddling alone on the open water. The system, called the Cooperative Outrigger Paddling system, or CoOP, is designed as a shared assistive technology that enables a sighted coach and visually impaired paddler to work together. A software consultant for 10 years before arriving at UCI, Baldwin uses do-it-yourself prototyping techniques like 3D printing to design and build low-cost assistive technologies. His research focuses on how tangible forms of interaction can be used to reduce the overreliance on audio in assistive technologies designed for the visually impaired community. Baldwin's dissertation work explores how both natural and artificial auditory information affect the day-to-day activities of people with visual impairments.

Baldwin's motivation is to see how his research and innovations can have a lasting, lifelong impact on the communities who have been ignored and underserved by a technology-driven world that often advances without them in mind. He admits this has given his research efforts a greater sense of purpose – it's not only about creating technological advances, but about advancing technology for all, including those with disabilities. "The disability community is frequently overlooked in our society, so I think the investment in our success by the paddling community, and others, is a testament to the value of designing and developing assistive technology in diverse collaborative environments," says Baldwin.



Read the full story online:
<http://bit.ly/UCIBaldwin-rowers>