

# THE ECE CURRENT

UC Santa Barbara  
Electrical & Computer Engineering  
Fall 2017



**PAGE 10 | RESEARCH INITIATIVE | KEN ROSE**  
Enabling Interactive and Immersive Applications

# A Letter from the Chair

This has been a year of many changes. First of all, we had a leadership change. Joao Hespanha stepped down as the department chair after four years of excellent service in managing and guiding the department. B.S. Manjunath also stepped down after many years as vice chair in charge of the undergraduate program. They leave us in great shape and their dedicated service and leadership are very much appreciated. I was appointed department chair as of July 1st. I view this leadership appointment as a privilege to serve the department I have been a member of for over 30 years. I am also pleased to announce that Clint Schow accepted the positions of vice chair and graduate program director, and Luke Theogarajan agreed to fill the vice chair and undergraduate program director positions.



In the meantime, we had several retirements. Tim Cheng, Larry Coldren, Margaret Marek-Sadowska, Larry Rabiner, and John Shynk all retired after a combined total of over 90 years on the department faculty. Their departure is a great loss for us. Larry Coldren will continue as a research professor, which will somewhat soften the significant loss of talent.

On the other hand, we are very happy to announce the recruitment of very talented young faculty. We welcome Mahnoosh Alizadeh, Ramtin Pedarsani, and Zheng Zhang to the department. We are also fortunate to have two permanent lecturers: Ilan Ben-Yaacov and Yogananda Isukapalli to direct ECE and CE capstone projects as well as contribute to teaching.

Overall, the department continues to do very well. Our national and international rankings are high. ECE ranked 22nd in the nation (13th among public universities) by U.S. News & World Report's 2018 Best Graduate Schools. Our faculty keep getting recognized for their contributions, applications to our graduate program has been over 1,200 for many years, and the GPA of incoming freshmen holds very high.

We are also very grateful for the gifts from alumni and friends of our department. These gifts enable us to make many improvements to our laboratories, student life, and the department in general. We are very thankful for this.

*Nadir Dagli*

Nadir Dagli  
ECE Department Chair



John G Skalnik in front of Engineering I (Harold Frank Hall), September 1971  
Photo courtesy of UCSB Library Special Collections

# IN MEMORIAM

## John G. Skalnik, ECE Professor Emeritus

John G. Skalnik, Professor Emeritus in the Department of Electrical and Computer Engineering, passed away at his care facility in Mission Viejo from natural causes on July 11, 2017. He was born in Medford, Oklahoma on May 30, 1923. Dr. Skalnik received his BS in electrical engineering from Oklahoma State University and his MS and PhD degrees from Yale University, and he was an Associate Professor there before coming to UCSB. Dr. Skalnik was a faculty member in the ECE department for 21 years, from July 1, 1965 until he retired on June 30, 1986. He was one of the founders of the UCSB Electrical Engineering Department and helped the transition to Electrical and Computer Engineering in 1972. He also supervised the development of the Solid-State Laboratory. Dr. Skalnik co-authored many books, papers, reviews, and technical reports, including *Theory and Applications of Active Devices* (with H.J. Reichard H.L. Krauss). He was highly regarded by his students and received the Academic Senate Distinguished Teaching Award in 1986. Dr. Skalnik served as the EE Department Chair from 1968-71. In addition, he also served as the second Dean in the College of Engineering for five years from 1971-1976. Professor Skalnik is survived by his wife of 70 years (Dianne), two sons (Bob and David), and two grandchildren (Christopher and Allison). Our campus flag was lowered on Thursday, August 3, in honor of his memory and his many contributions.



## Grad Student Spotlight:

# Q&A

with Carlos Torres

### Why did you choose UCSB's Electrical Engineering Program?

I was interested in controls and UCSB has some of the best controls faculty. I wanted to stay in California. I was expecting to only do a Master's and apply somewhere else for PhD... but I fell in love with the place and stayed.

### How did you learn about the program?

From my undergraduate research advisor group (Prof. D. K. Eggers) at San Jose State University. He was familiar with UCSB and mentioned it a few times, so I looked into it to learn more.

### What is campus life like for EE students?

Campus is beautiful, the location is amazing, and the administrators really care about students. However, it can also be torturous to be on such a beautiful campus and not be able to enjoy it due to the high demands and expectations of the EE program.

### Students and parents often ask, what can you do with an electrical engineering degree?

I only know what I have done. With a BS in EE, I worked as a Digital Circuit designer, as a tester for HP Labs. With a Master's in EE, I worked for Caugmate, a small startup in augmented reality. And most recently, as a PhD candidate, I worked for SI as a Data Scientist, and for Procore Tech designing and deploying Machine Learning systems.

### What prepared you the most for studying engineering in college?

I believe what helped me prepare to study engineering in college was programming, math, and physics courses. I wished my school had offered more statistics and higher level math and programming classes. I was lucky to have role models (my older siblings and teachers were either engineers or were in the processes of becoming engineers). I believe that having someone to relate to culturally and ethnically was essential to my preparation.

### What were some challenges you faced as a student/researcher?

The hours are extremely long, the work is very difficult, expectations are often unrealistic, and work-life balance does not really exist. However, with a lot of determination and focus "things pan out." Eventually, I started publishing and presenting my research in conferences, which meant travelling to new countries and cities.

## MESH: Multimodal Eye-CU Sensor Network for Healthcare

By Carlos Torres

Although hospitals are places people go to to get well, often secondary infections or wounds are the result of an extended hospital stay. To combat these issues, an objective monitoring system is necessary. Whether analyzing the hand-sanitizing habits of hospital staff or recording the length of time between patients changing position in their beds, MESH can help address these issues. MESH is a non-intrusive non-disruptive sensor network to monitor healthcare environments. MESH was developed by Carlos Torres, a PhD student at the Vision Research Lab (VRL), in collaboration with members of the VRL at UCSB under Professor Manjunath's supervision and Dr. Jeffrey C. Fried, Medical ICU Director at Santa Barbara Cottage Hospital. MESH provides automated and unobtrusive tools for data collection and analysis of patient motion behavior in healthcare and assistive-care environments. Mr. Torres is developing machine learning and computer vision algorithms to analyze patient motion from visual, depth, and infrared sensors, in order to provide predictive analyses of decubitus ulcerations (bed sores), sleep disorders, and hospital acquired infections by touch (e.g., hand washing and sanitization

events). These methods will allow medical practitioners to design and evaluate techniques and therapies based on quantifiable patient motion metrics and will allow pathologists to analyze the spread of tactile pathogens and address contaminated surfaces and equipment in a timely manner.

MESH is currently deployed in the ICU room at Santa Barbara Cottage Hospital. The elements of MESH include RGB-Depth and thermal cameras, illumination, humidity, and audio sensors. The currently deployed network at Santa Barbara Cottage Hospital is composed of three nodes, each with an RGB-Depth camera sensor for data collection and an inexpensive Raspberry Pi3 device for basic decentralized data pre-processing, sensor control, and synchronization and communication protocols.

The MESH effort introduces a multimodal and multiview sensor network to subtly monitor healthcare environments. The objective is to autonomously classify patient poses, quantify and summarize patient motion, and analyze workflows. The network uses multiple complementary modalities and observes healthcare spaces, such as an ICU room, from



Jeff Fried (left), Carlos Torres (middle), and B.S. Manjanuth in the Mock ICU room. // Photo by Scott Condon

multiple views to deal with the challenges of natural scenes, which include illumination variations and partial occlusions. The primary goal is to facilitate a better understanding of disorders such as sleep deprivation and sleep hygiene; understand and prevent decubitus ulcerations (bed sores); and understand and combat the transmission of hospital-acquired-infections. These healthcare objectives can be achieved by autonomously detecting and monitoring patient poses, quantifying and summarizing patient motion, and analyzing and logging healthcare workflows (e.g., object and patient interactions).

### Classification of Patient Poses

Manual analysis of body poses of bed-ridden patients requires caretakers to continuously track and record patient poses. Two major limitations in the dissemination of pose-related therapies are scarce human resources and unreliable automated systems. The VRL and SBCH researchers address these issues by introducing a new method and a new system for robust automated classification of sleep poses in an Intensive Care Unit (ICU) environment. The new method, coupled-constrained Least-Squares (cc-LS), uses multimodal and multiview (mm) data and finds the set of modality trust values that minimizes the difference between expected and estimated patient pose labels. In essence, cc-LS is used to weight the contribution of each modality for accurate pose label classification under various ICU room conditions (e.g., illumination and occlusions). This is important for cases where the individual labels estimated from the various modalities and views conflict.

### Patient Motion Monitoring

Healthcare professionals speculate about the effects of poses and pose manipulation in healthcare. Anecdotal observations by medical professionals indicate that patient poses and motion affect recovery. Motion analysis using human observers puts strain on already taxed healthcare workforce requiring staff to record motion. The researchers at the VRL introduced a two-part framework, which tackles the problem of autonomous unobtrusive

monitoring of patient motion in an ICU. Human poses are represented using features extracted using deep neural networks. From the multimodal multiview video data, representative keyframes for pseudo-poses are identified using a Markovian model. These keyframes represent the elements that allow MESH to identify when patients transition between poses and to identify the initial and final poses along with the direction or rotation (when possible). The objective is to summarize patient motion by detecting the direction and range of motion, while differentiating between poses and transitions.

### Analysis of Healthcare Interactions and Workflows

In addition to classifying sleep poses and monitoring motion, the current MESH system is being extended to monitor the actions and events in the ICU. For this, contextual cues are used to identify human actions and sanitation events. Contextual cues include, for example, the person's location within the room, role (nurse, doctor or visitor), orientations and distance to the various dominant objects (sink, computer, etc.), and time spent by the person at that location (short, medium, long). These cues are used to identify actions such as food delivery and patient auscultation and to detect sanitation events such as a hand washing and hand sanitizing (or not) before and after interacting with ICU objects and patients.

The long-term goal of this computational infrastructure is to autonomously monitor the ICU space towards improving the quality of care provided to patients. MESH will enable medical professionals to design new therapies and care protocols based on patient positioning, evaluate therapies from objective and quantifiable observable data to analyze and prevent sleep deprivation (sleep hygiene), bedsores, and tactile hospital acquired/transmitted infections (HAIs).

# OPEN TO POSSIBILITIES

As an entrepreneur running his own company, CoE alumnus Sun Choe has found his engineering education to be useful in many unexpected ways.



Perhaps surprisingly for someone who founded his own company and has operated it successfully for more than twenty years, Sun Choe (BS '86) never saw himself as a born entrepreneur. It was only while studying for his degree at UCSB that he realized, "I wanted to apply my technical education and experience in the business world."

Choe grew up in Los Altos as the son of a Silicon Valley electrical engineer, but he entered the UCSB College of Engineering only after doing well in a few engineering classes. Even then, he recalls, "I chose ECE as my major not necessarily thinking about future jobs or what was the hot field at the time. I didn't know much about engineering."

He chose UCSB because it was far enough from home to allow a degree of independence — in that pre-cell phone era he would speak to his parents only every couple of weeks on a pay phone in the dorm hallway. He also thought that at UCSB, he could balance the social and academic aspects of school. Finally, he said, "You can't beat the weather."

After graduating from UCSB he worked on the Maverick missile at Hughes Aircraft. He then spent time in semiconductor sales at Integrated Device Technology, and in sales and sales management at several semiconductor companies. He started Norcomp Southern California in 1996, inspired by an industry trend at the time.

"Semiconductor suppliers were moving toward using independent sales organizations or manufacturers reps," he recalled, "but very few reps were technically driven or had an engineering sales team. All of my sales team are engineers, mostly with some kind of design experience, so they can relate to the engineers who are their customers."

Members of his sales team help companies solve technical challenges or provide solutions for them — perhaps a smaller footprint, reducing power use, decreasing cost, or achieving better integration,

enhanced firmware/software, or advanced functionality. "Sales engineers have to quickly and efficiently ascertain their customers' challenges and how they can provide value in the product development process," Choe said.

He said that his experience studying ECE supplied him with many skills and tools to succeed in business. "It provided me with the base knowledge to deal with my own employees and manufacturers we work with — so, the ability to understand the products, not only the products we're selling, but also the ones our customers are building today. That's essential in our business."

Specifically at UCSB, he developed public speaking skills through class participation, clubs, and social activities. "People might think that they need those skills only in sales and marketing positions, but in every area of engineering, you are involved with group projects, with representatives from other companies, with people in your own company, and with your customers. So, you have to be able to convey technical thoughts, concepts, and ideas clearly. That skill can take you a long way."

He found that his student internships "provided valuable exposure to personal likes and dislikes in terms of work environment and job functions," and that team project work helped him develop his ability to work effectively in a collaborative group. "There can be multiple mutual co-dependencies in business, as there are with partners in completing a lab assignment," he said. "The most successful people in sales and business possess leadership skills; their ability to convey their strategic direction can make huge differences between winning and losing."

He advises ECE students who want to pursue careers in the industry to take chances and develop multiple skills. And during visits to UCSB to speak to students about engineering careers, he said, "I try to instill in them the idea that an engineering degree does not limit you to a technical position, but allows you the latitude to explore other interests as well."

FOR AN EXTENDED VIDEO INTERVIEW, PLEASE VISIT  
**[ECE.UCSB.EDU/PROFILES/SUN-CHOE](http://ECE.UCSB.EDU/PROFILES/SUN-CHOE)**

# FACULTY MENTORSHIP

## Professor Jason Marden



Photos by Matt Perko

### **What does mentoring mean to you and why is it important in your profession?**

Mentoring is all about helping young individuals find the path that best suits them. It's less about giving them advice and more about just listening and encouraging them on the path that they choose. From a rewarding perspective, seeing students fulfill their potential, whatever that is, is the pinnacle of what we do here.

### **As a student did you have a faculty mentor that you looked up to?**

My faculty mentor was my advisor Jeff Shama. He educated me on a technical front, but it was more about the friendship that we developed over the years. That's what I found most rewarding through my graduate school experience. And that's something that I try and build with all my students nowadays.

### **Do you think it's helpful for undergraduate students to start finding a mentor at that level to help them with moving forward and on to graduate studies? If you didn't have an undergraduate mentor, do you think that would've been helpful to you?**

Yes, having mentorship at the undergraduate level is huge. Learning how things transition as you go from an undergraduate, where it's very course intensive, to a

graduate, where it's more about the relationships, the community, and just learning about a new area that you haven't probed before. So, yes, I think it's an invaluable experience to have some mentorship.



### **Do you have any general advice for ECE students?**

Yes, I do. And that's to follow your passion. Whether that's in ECE or on the outside. I truly believe that the success that you experience, not necessarily 5 years down the road but 20 years down the road, will be more about whether or not you're following something you're passionate about rather than something that you're good at. Passion will keep you in the game for the long time. I was a mechanical engineer, when I saw the movie Beautiful Mind, and I was fascinated by this idea of Nash Equilibrium. I then took my first game theory course, which obviously is in the Math Department not in the Mechanical Engineering Department, and then I just found what I was interested in and just kept going. So, always follow your passion. Never be afraid

to voice your opinion. This is your graduate school experience, or your undergraduate school experience. Make of it what you will. Don't be in one area or another because of outside pressure. Follow what you want.

**Do most students come to you with a clearly defined path and goal? If not, how do you help them get there? And if they do, how do you push them to grow in ways they had not considered?**

Actually, the students that come here and that interview here with a well-defined goal are usually the students that I steer away from. And the reason for that is: going into graduate school, it's hard to know what to expect as an undergraduate. And for students that have the next 5 or 6 years of their lives mapped out for them, of here's where they want to be, I think it's hard. At least I find that, personally, it's hard to mentor them because I think graduate school is more about the process than the destination. And if they are very destination focused, it detracts from what the process can give you. I entered as an undergraduate with an emphasis in economics and I switched to engineering – maybe I shouldn't be saying this but – largely because there wasn't a foreign language requirement associated with engineering. I knew that I enjoyed mathematics, but things happen for a reason and I think that when people are so focused on the destination sometimes they don't let those little things happen where they evolve according to how things are supposed to go.

**What aspects of an academic career do you find most rewarding?**

The relationships. I mean, both from my colleagues that I get to do research with and, to a large part, the students. Developing relationships with the students, helping them reach their potential, whatever that is and in whatever direction, and just developing these lifelong friendships. I think that is definitely the most rewarding.

**What do you hope your students take away from their time in your lab?**

I hope they take away that sense of community. Whatever direction they choose to go in, whether it's academics or industry, it's really to make a focus on nurturing those relationships. Because those relationships are ultimately going to make or break you. And obviously, you've got to be skilled at whatever you're doing, but relationships can take an average working environment to a wonderful one.

**Mentoring is all about helping young individuals find the path that best suits them.**

**Do you keep in touch with your former students?**

Yeah. I pretty much keep in touch with almost all of them. In fact, we had a recent conference in Seattle – the American Control Conference – and one of my old students flew up there for the day just to meet with me because I was presenting some of his work. So, I got to spend some time with him. That's definitely something that I try really hard to do.

**How do you measure your success as a teacher?**

You can look in the audience and see whether the kids are enthusiastic and somehow what you've said has inspired them. If I can make them think about a problem in a different way or if I can make them say, "Hey this is really interesting, how does this apply to X, Y & Z?" that's when I know that I've had success. And you're not always able to

touch every student like that, but if you can touch a few that means the world.

**Try to name or explain 3 things students are guaranteed to experience in your lab – or things they'd take away from working in your lab.**

One of the things I hope they leave with is the sense that it's about their process, not about mine. That's something that I truly try to get across in my mentorship to them. I try to minimize the impact of – from grants to proposals to the funding source – and make that my burden. My goal is to somehow set the table so that they can follow the path that works for them. Another is the sense of community. And that's not just with me but with the other students in their labs. So, we try and do a lot of social-style activities, like going for happy hour to foster that sense of community because ultimately that's the reason why they're here. And the reason why UCSB is the way it is, is not totally because of the faculty, but it's mostly because of the quality of the colleagues that they have. Building those relationships amongst themselves – whatever I can do to help foster that is something that I try and do. And the third one is boba. If you're going to be in my lab, I'm going to drag you to a boba shop every now and then. That's just par for the course.

**What is the greatest thing a student has ever taught you?**

I think one of the greatest things is humility. You know when you get this faculty job, every year we're tasked with recruiting students. The first student that worked with me came in my office and gave me the "it's not you it's me" speech. It really impacted me, forcing me to reflect upon the process and whether or not working with me was really in the student's best interest. Now I try and remove myself from the equation. I mean, it always hurts when a student says, "Yeah I'm not interested in working with you," but now I do not try to discourage that. I want them to reach their potential. If it's with me, great. If it's with someone else, I fully and wholeheartedly support that. So, one of the greatest things – is humility.



## RESEARCH INITIATIVE Professor Kenneth Rose



Photo by Scott Condon

### COMPRESSION CHALLENGES IN ENABLING INTERACTIVE AND IMMERSIVE APPLICATIONS

The meteoric rise of the new sector of virtual and augmented reality (VR/AR) applications that provide users with a fully interactive and immersive experience, poses considerable new challenges in content acquisition, storage, transmission, and display/playback. In particular, such applications critically depend on the development of new capabilities to efficiently encode and stream VR/AR multimedia content at very low delay. Advances in this domain will enable a broad spectrum of applications ranging from general consumer level applications (entertainment, virtual travel, education, etc.), to highly specialized technical applications in science and engineering, defense, health, security, and more.

Creating a truly interactive and immersive experience within a three-dimensional (3D) space entails tracking the user's precise pose, position and motion, and adaptively rendering the multimedia content as it would be perceived in reality. This

requirement cannot be met by the traditional audio and video formats that assume a static user without need to adapt to variations in viewing/listening orientation. Thus, new approaches and formats are needed to represent multimedia content information in 3D space. For video, information is captured in all directions on a sphere enclosing the viewer position. This enables a user to dynamically change the viewing direction and observe any portion of the surrounding. For audio, the higher order ambisonics (HOA) format is employed, wherein the sound field is decomposed into spherical components of increasing order. This format not only provides good localization, spatial resolution, and sizable listening "sweet spot" but, most importantly, it enables flexible playback with any speaker configuration, allowing sound to be rendered based on user movement.

The extensive volumes of data generated by these new formats, which must be stored and/or transmitted, represent an existential threat to the practical feasibility of many interactive VR/AR

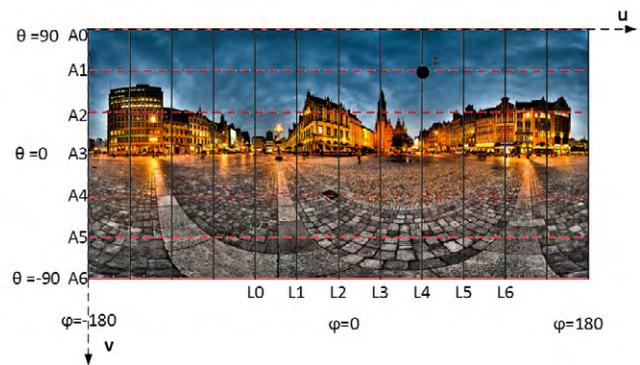
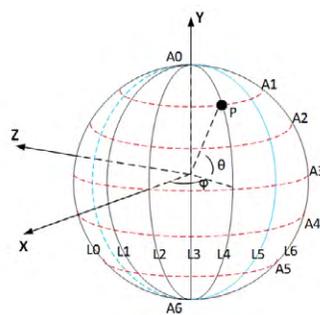


Fig. 1 Warping introduced by equirectangular projection that maps omnidirectional video from the sphere to a plane.

applications. A retina quality omnidirectional video contains over 33 million pixels per frame, instead of about 2 million pixels in standard high-definition video. Similarly, storing HOA components requires over 10 times the number of channels of standard audio.

# THE ECE CURRENT



Clearly, highly efficient compression must be the answer, but the new formats require complete rethinking of the compression methodology, due to the radically different data structure, characteristics and statistics.

To handle omnidirectional video, current methods simply project the video from the sphere to a plane (or to multiple planes) via one of several known projection maps (e.g., equirectangular, equiareal, cubemap) where standard (2D) video coding can be applied. However, this ad hoc approach suffers from severe shortcomings. One major source of suboptimality is in the impact on motion-compensated prediction, which is vital to video compression. The current video frame is predicted from a previous frame after accounting for motion, and only a small correction (prediction error) needs to be transmitted. However the motion models of standard coders are utterly incompatible with omnidirectional video that has been projected onto a plane, due to severe warping (see Fig. 1).

Instead, work in the Signal Compression Lab focuses on developing novel and effective motion estimation techniques that are applied prior to projection, where they capture natural motion, yield precise prediction and hence considerably improved compression performance.

On the audio front, HOA coding poses major challenges, including the high dimensionality of the data, preserving directionality information, and exploiting psychoacoustic redundancies across channels and frequencies. Here too, current methods apply a spatial transformation followed by standard (audio) coding. Specifically, they reduce the dimensionality by applying singular value decomposition (SVD) to extract a few principal components that capture directionality information, which are individually fed to a standard audio codec (MPEG-AAC) to optimize a psychoacoustic criterion in the frequency domain. This ad hoc approach introduces significant suboptimality due to conflicts between the separate operations performed in the spatial (ambisonic) and frequency domains.

Work in the Signal Compression Lab is focused on the

development of a new framework wherein all critical decisions (both spatial localization and psychoacoustic redundancy removal) are made directly in the frequency domain, which thereby circumvents significant degradation of the audio due to the above conflicts.

## SIGNAL COMPRESSION LAB

Research in Professor Rose's Signal Compression Lab (SCL) is focused on the confluence of theoretical foundations, and practical algorithms and applications. It covers a wide spectrum of topics in information theory, estimation theory, signal compression, non-convex optimization, and related areas, including rate-distortion theory, joint sourcechannel coding, distributed and scalable source coding and networking, image/video/audio compression and processing, pattern recognition and general optimization. Current SCL researchers include postdoc Tejaswi Nanjundaswamy, graduate students Mehdi Salehifar, Shunyao Li, Sina Zamani, Clint Greene, Bohan Li, Wei-Ting Lin, Bharath Vishwanath and Ahmed Elshafiy. The 3D audio and omnidirectional video compression projects are sponsored by Google and Inter-Digital, respectively. Collaboration has also been initiated with Media Arts and Technology at UCSB, and includes leveraging the unique capabilities of the Allosphere at UCSB for evaluating the performance in a real interactive and immersive space.



# FACULTY AWARDS & HONORS



**Kaustav Banerjee**

2016 Senior Fellow, DRESDEN - Erasmus Mundus Fellowship  
2016 Fellow, American Association for the Advancement of Science (AAAS)



**John Bowers**

2017 IEEE Photonics Award  
2017 Central Coast Innovation Award



**Larry Coldren**

2016 National Academy of Inventors  
2017 Nick Holonyak Award of the Optical Society of America (OSA)



**Joao Hespanha**

2017 Fellow of International Federation of Automatic Control Fellow (IFAC)



**Umesh Mishra**

2017 Distinguished Educator Award from IEEE's Microwave Theory and Techniques Society (MIT-S)



**Sanjit Mitra**

2017 IEEE Educational Activities Board Vice-President's Award



**Yasamin Mostofi**

2016 Antonio Ruberti Young Researcher Prize by the IEEE Control Systems Society (CSS)



**Dmitri Strukov**

2016 Google Faculty Research Award



**Andrew Teel**

2016 International Federation of Automatic Control (IFAC) Nonlinear Control Systems Technical Committee Achievement Award



**Yon Visell**

Hellman Family Faculty Fellowship



**Hua Lee**

COE Outstanding Faculty Award - EE



**Luke Theogarajan**

COE Outstanding Faculty Award - CE



**Forrest Brewer**

COE Outstanding Faculty Award - CE



# STUDENT AWARDS & FELLOWSHIPS

## **The Roger Wood Award Winners:**

In recognition of their strong academic records and exceptional commitment toward their education at UCSB the 2016-17 Roger Wood Award was presented to:

**Phanitta Chomsinsap (EE)**

**Rebecca Hwang (EE)**

**Yesh Ramesh (CE)**

## **The Kroemer Fellowship:**

Funded by Henry Chien in honor of Professor Herbert Kroemer to support a dissertation fellowship enabling PhD students to devote their full attention towards research in the final period of their PhD, the 2016-17 fellowship was awarded to:

**Anthony McFadden (ECE)**

## **Outstanding Teaching Assistant**

The following graduate students received "Outstanding Teaching Assistant (TA)" recognitions from the graduating seniors in their program:

**Vince Radzicki (EE)**

**Jenna Cryan (CE)**



## HELLO

## NEW FACULTY



**Mahnoosh Alizadeh** received her BS in electrical engineering from Sharif University of Technology in 2009, and her MSc (2013) and PhD (2014) in electrical and computer engineering from the University of California, Davis, where she was the recipient of the Richard C. Dorf award for outstanding research accomplishment. From 2014-2016, Mahnoosh was a postdoctoral scholar at Stanford University.

Mahnoosh's research focuses on designing real-time control algorithms for operating societal-scale infrastructure systems through the use of information technology and a more active role for humans in the control loop. Her objective is to improve sustainability, reliability, and efficiency, and propose new methods to address the challenges of rapid urbanization. Some main areas of current focus include electricity demand management systems, electric and driverless

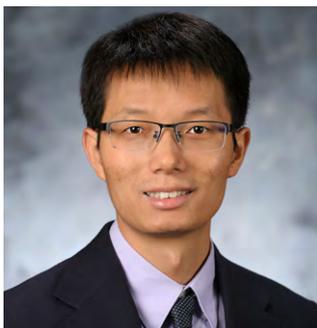
transportation systems, and smart cities.



**Ramtin Pedarsani** obtained his BSc at the University of Tehran in 2009, his MSc at EPFL in 2011, and his PhD in electrical engineering and computer sciences from the University of California, Berkeley in 2015 where he stayed as a postdoctoral scholar until 2016. He received the Rafael Rodriguez Fellowship from the University of California, Berkeley in 2011, and the best paper award in the IEEE International Conference on Communications (ICC) in 2014.

Ramtin has a wide range of research interests including applied probability, information and coding theory, networks, machine learning, and transportation systems. Specifically, using coding theoretic tools, he studies the fundamental trade-offs in distributed computation between latency of computation, redundancy in computation, communication bottlenecks and storage capacities. In another project, he develops models and algorithms for smart control of mixed traffic networks

where some fraction of vehicles are equipped with varying levels of autonomy and the remaining are manually driven.



**Zheng Zhang** obtained his PhD in electrical engineering and computer science (EECS) from MIT in 2015. He received the 2014 Best Paper Award from IEEE Transactions on CAD of Integrated Circuits and System, the 2015 Doctoral Dissertation Seminar Award from the Microsystems Technology Laboratory of MIT, and the 2016 ACM Outstanding PhD Dissertation Award in Electronic Design Automation. He is a TPC member of the Design Automation Conference (DAC) and International Conference on Computer-Aided Design (ICCAD).

His theoretical research is focused on uncertainty quantification, high-dimensional data analysis, and reduced-order modeling. Applications include variation-aware design automation of VLSI/MEMS/integrated photonics, uncertainty-aware modeling and control of robotic systems and autonomous vehicles, machine learning and MRI.



## NEW LECTURERS



**Dr. Ilan Ben-Yaacov** received his PhD in electrical and computer engineering from the University of California, Santa Barbara in 2004. Since 2004, he has served as a lecturer at the University of California, Santa Barbara in the ECE Department (2004-present), the College of Creative Studies Physics program (2006-2011), and the Technology Management Program (2011-present). He has headed up the undergraduate EE Capstone projects program at University of California, Santa Barbara since 2009, and teaches courses in semiconductor processing and IC design, semiconductor device physics, electromagnetism, circuits, and patents and intellectual property. He also works with a number of early- and mid-stage tech start-ups in helping to develop and maintain their intellectual property portfolios, primarily focusing on patent procurement, trade secrets, trademarks and branding, strategic IP planning, and general IP portfolio development.



**Yogananda Isukapalli** received his PhD in electrical and computer engineering from the University of California, San Diego in 2009. He worked as a postdoctoral scholar at Scripps Institution of Oceanography where he developed novel channel models for underwater wireless communications. He also was a staff scientist in the Wi-Fi division at Broadcom Limited, San Diego, from 2010 to 2017. At Broadcom, he was involved with the design and implementation of fast and power efficient 11n/11ac/11ax Wi-Fi chips. As part of the systems team at Broadcom he worked on all phases of Wi-Fi chip production from conceptual and algorithmic design to integration of the chip into customer products. His PhD research was on feedback based multi-antenna communication systems which resulted in several IEEE journal publications.





# GOODBYE

## RETIRING FACULTY



**Tim Cheng** arrived at the University of California, Santa Barbara with a lucid and entertaining on-campus talk describing a fundamentally new approach to logic synthesis optimization based on digital test redundancy. He joined the faculty shortly after, in 1993. A few years later (1999-2002), he served as Founding Director for the Computer Engineering Program. Tim's easy lecturing style earned him the UCSB College of Engineering Outstanding Teaching Faculty Award 2004-2005 and, from 2005-2008, he served as Chair of the Electrical and Computer Engineering Department. Tim has published over 400 technical papers, co-authored five books, and holds 12 US Patents. He is an IEEE Fellow (2000), has received best paper honors at several conferences, and has served as general and program chair for numerous international conferences on design, and design automation and testing. Tim also served as Associate Vice Chancellor for Research from 2013-2016. Upon retirement from UCSB, he accepted

the position as the Dean of Engineering and Chair Professor for the Department of Electronic and Computer Engineering at the Hong Kong University of Science and Technology.



**Larry Coldren** received his PhD in electrical engineering from Stanford University and spent 13 years in research at Bell Laboratories with a focus on surface-acoustic wave filters and tunable coupled-cavity lasers before joining the University of California, Santa Barbara in 1984. In 1990, he co-founded Optical Concepts to develop novel vertical-cavity surface-emitting laser technology; and, in 1998, he co-founded Agility Communications to develop widely-tunable integrated transmitters. Larry has authored or co-authored over a thousand journal and conference papers, a number of book chapters, two textbooks, and has been issued 63 patents. He is a member of the National Academy of Engineering and a Fellow of the Institute of Electrical and Electronics Engineers, the Optical Society of America, the Institute of Electronics Engineers (UK), and the National Academy of Inventors. He is a recipient of the 2004 John Tyndall, 2009 Aron Kressel, and 2014 David Sarnoff Awards, and the 2017 Nick Holonyak, Jr. Award. Larry was UCSB's Acting Dean of Engineering from 2009-2011. He is the Fred Kavli

Professor of Optoelectronics and Sensors, the Director of the Optoelectronics Technology Center, and holds appointments in Materials and Electrical & Computer Engineering. His research, design, and contributions in the field of laser technology continue to be implemented in practical devices and are used in numerous commercial products. Although retiring from teaching positions, Larry will continue research at UCSB as a research professor.



**Lawrence Rabiner** worked at AT&T Bell Labs from 1967-1995 in various capacities such as a Research Vice President. He joined the newly created AT&T Labs in 1996 as Director of the Speech and Image Processing Services Research Lab and was promoted to Vice President of Research in 1998. He retired from AT&T Laboratories in March 2002 and joined the ECE Departments at the University of California, Santa Barbara, for one-quarter, and Rutgers University for the remaining 9 months. Larry is a pioneer and one of the leading researchers in a number of areas such as digital signal processing, digital speech processing, speech recognition, multimedia communications, multimodal processing (fusion of sound, vision, tactile inputs), and shared reality systems. Larry has published about 350 papers in these areas and holds 30 patents. He is co-author of the book "Theory and Application of Digital Signal Processing" (Prentice-Hall, 1975), "Digital Processing of Speech Signals" (Prentice-Hall, 1978), "Multirate Digital Signal Processing" (Prentice-Hall, 1983), "Fundamentals of Speech Recognition" (Prentice-Hall, 1993) and "Theory and Applications of Digital Speech Processing" (Prentice-Hall, 2011). At UCSB, Larry taught graduate courses on digital speech processing and speech recognition in alternate years. Larry is a member of the National Academy of Engineering and the National Academy of Sciences. He has also received many other honors and awards for his contributions to the field, such as the IEEE Piore Award and the IEEE Kilby Medal.



**John Shynk** has retired after 31 years of teaching, research, and service, both to the university and to the profession. Joining the University of California, Santa Barbara in 1986, John was a member of the faculty during its transformative period when it first appeared in the rankings of the top 20 departments in the nation. John was a stalwart teacher in the department with a full range of courses over his career, including the sophomore Circuits, Devices and Systems course, the junior linear systems and probability classes, senior classes in communications, and graduate classes in communications, stochastic processes and signal processing, resulting in three teaching awards. He published the books, "Mathematical Foundations for Linear Circuits and Systems in Engineering" (Wiley, 2016), and the definitive "Probability, Random Variables, and Random Processes: Theory and Signal Processing Applications" (Wiley, 2013), and over 200 other publications, receiving two best paper awards. Both in the profession and on campus, John served as a coordinator for the successful departmental accreditation visit (2012-2014).



**Malgorzata ("Margaret") Marek-Sadowska** began her career as an Assistant Professor at the Institute of Electron Technology at the Technical University of Warsaw in 1976. She entered the UC system in Berkeley in 1979 as a visiting professor in the Electrical Engineering Department. She stayed on as a Research Engineer at the Electronics Research Laboratory until 1990, when she joined the Electrical and Computer Engineering Department at the University of California, Santa Barbara as a professor. Her research includes computer-aided design with an emphasis on layout and logic synthesis of VLSI circuits and systems, as well as emerging technologies in energy efficient computing. Margaret has been a member of numerous technical committees, including the International Conference on Computer Aided Design, the Design Automation Conference, and the International Workshop on Placement and Routing. She served as Associate Editor (1989-1993) and Editor-in-Chief (1993-1995) of the IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems. Since 1990, she has been Associate

Editor for the Journal of Circuits, Systems, and Computers and serves as a reviewer for numerous technical journals.



## Invest in the Department of Electrical and Computer Engineering

The goal of the Department of Electrical and Computer Engineering at UC Santa Barbara has always been to provide our students with the best possible opportunities to learn and develop. The faculty, students, and administration have created an atmosphere of interdisciplinary and collaborative research that is renowned throughout the nation and is the cornerstone of our success. Your investment in the Department of Electrical and Computer Engineering plays a critical role in our ability to fulfill our mission and provides essential support of ECE's teaching program and research enterprise.

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- **Unrestricted support** allocated to the highest priority needs of the Department.
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- **Endowed chair establishment** honors, encourages, and supports the professors whose brilliant minds and commitment to education and research promote the University's mission.
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- **Capstone Senior Project** gives Electrical and Computer Engineering students the opportunity to put their education into practice.

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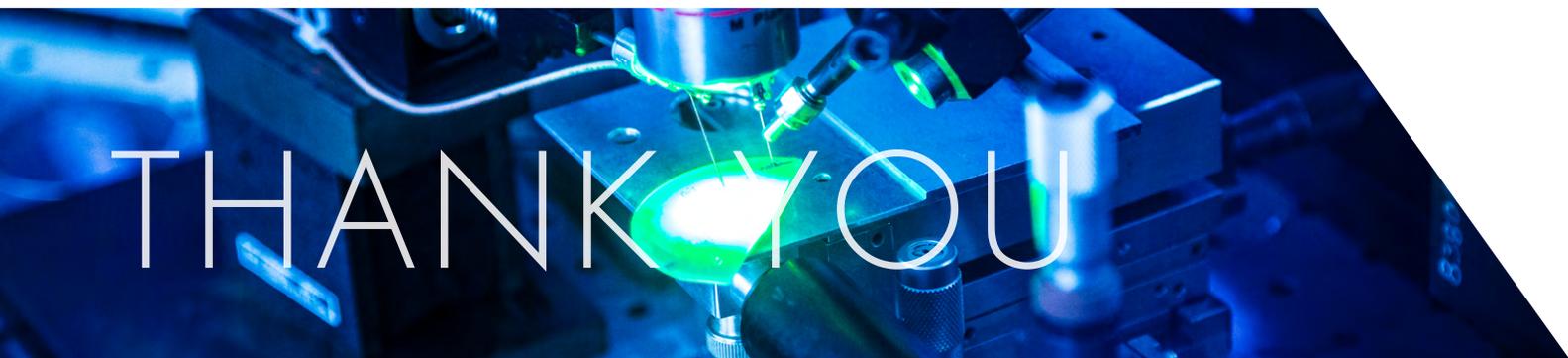


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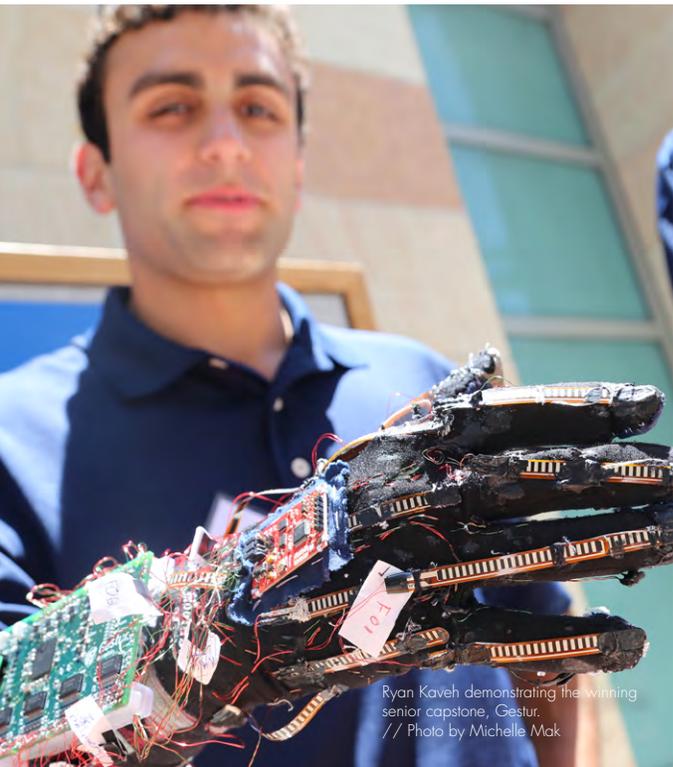


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Ryan Kaveh demonstrating the winning senior capstone, Gestur.  
// Photo by Michelle Mak

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