



Carnegie Mellon University
Electrical & Computer Engineering

THE CIRCUIT

January 2016

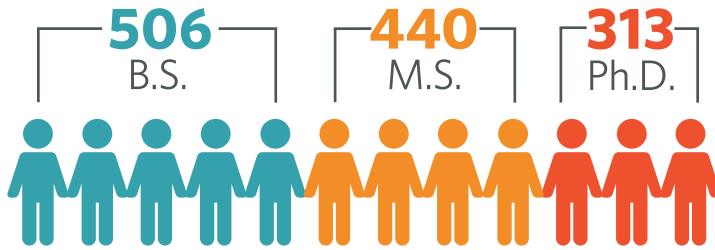
ECE FAST FACTS



Global ECE program locations

Pittsburgh
Silicon Valley
Portugal
Rwanda
China
Singapore

2015-16 student population: **1,259**



2014-15 degrees granted **409**



RANKINGS 2015

(U.S. News & World Report)

Undergraduate

Electrical: 11 | Computer: 3

Graduate

Electrical: 8 | Computer: 4

Research centers and facilities

Center for Nano-enabled Device and Energy Technologies
CyLab

Data Storage Systems Center

General Motors Collaborative Research Lab

Intel Science and Technology Center for Cloud Computing

Nanofabrication Facility

Parallel Data Lab

Research thrust areas

Theoretical & technological foundations • Beyond CMOS •
Compute/storage systems • Cyber-physical systems • Data/
network science systems • Secure systems • Energy • Healthcare
& quality of life • Mobile systems • Smart infrastructure

Corporate partnerships



Bombardier, Facebook, General Motors,

Google, HP Labs, Hitachi, IBM, Intel,

Microsoft, NetApp, Nokia, Northrop Grumman, Panasas,

Renault, Ricoh, Samsung, Seagate, Showa Denko, Smart

Wire Grid, Texas Instruments, Western Digital

Recent employers of our graduates

Amazon, Apple, Bank of America, Barclays Investment
Bank, Belvedere Trading, BlackRock, Boeing, Cisco, Citadel,
Citigroup, CMU, Comprehend Systems, Facebook,
Goldman Sachs, Google, IBM, Intel, JPMorgan Chase,
ManTech International, Lockheed Martin, Microsoft, MIT
Lincoln Labs, Northrop Grumman, NVIDIA, Oracle, Palantir,
Qualcomm, Raytheon, Salesforce, Sandia National Labs,
Susquehanna International Group, U.S. DoD, Yahoo



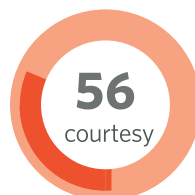
8,979
Active alumni

Sponsored research **FY15**

\$36M

Faculty members

159



80 disclosures filed and patents
issued in the last five years

THE CIRCUIT

Electrical & Computer
Engineering Magazine

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Leah Pileggi
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Carnegie Mellon University publishes an annual campus security and fire safety report describing the university's security, alcohol and drug, sexual assault, and fire safety policies and containing statistics about the number and type of crimes committed on the campus and the number and cause of fires in campus residence facilities during the preceding three years. You can obtain a copy by contacting the Carnegie Mellon Police Department at 412-268-2323. The annual security and fire safety report is also available online at www.cmu.edu/police/annualreports/.

Produced by Marketing & Communications, January, 2016, 16-154.

Dear friends of CMU ECE, welcome to our first annual issue of The Circuit!

This past year has been another exciting one; we have been busy working together to assess our strengths, identify areas for improvement, and create a strategic blueprint for our future. The process has been thorough and inclusive; we have used a number of venues to collect feedback and discuss. The result of this effort will serve as a guiding light for the next few years; we call this strategic plan **FIRE** (**F**oster, **I**mpact, **R**esearch, **E**ducate).

Our department has been a leader in both research and education for years; it is known for its innovative qualities, boldness of ideas, and unbridled enthusiasm. FIRE follows in these footsteps by putting pen to paper to articulate a vision shared by all that will propel us even farther on the road of scholarly excellence and societal impact; it is guided by our core values, which we hold to be intrinsically true:

We value scientific truth, creativity, quality, innovation, and engineering solutions, all within a diverse and inclusive community, guided by respect and joy of doing.

Our *vision* is our guiding light; it informs and propels us in the right direction:

To be a creative driving force within the university and worldwide, of highest scholarly and entrepreneurial quality.

Our *mission* is our "what, who, how"; it explains what we do, who we do it for, and how we do it so we engage the "hearts, heads, and hands" of all our people:

To inspire, educate, and produce electrical and computer engineers capable of tackling fundamental scientific problems and important societal challenges, and to do so with the highest commitment to quality, integrity, and respect for others.

We aim to be the best at what we do and the ECE department of choice for those who are willing to step off the beaten path, for the visionaries and dreamers. We are looking forward to sharing our dreams and accomplishments with you. Stay tuned...

Jelena
Jelena Kovačević

Schramm Professor and Head

Welcome to our world!
Enjoy the journey

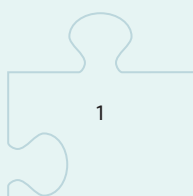



My puzzle pieces

ECE is proud to introduce a new campaign, **my puzzle pieces**, for students, faculty, staff, and alums to create their own story of their time and connection with CMU ECE.

The notion of a puzzle is a simple one — small pieces fit together to form a cohesive image. Just as a puzzle is only as good as the pieces it is made of, the Department of Electrical and Computer Engineering is only as good as the students, faculty, staff, and alumni that make it great.

Follow this campaign on Twitter using #mypuzzleIECE.



ECE students spend summer developing technology for underserved community in India

By Alexandra George

Electrical and computer engineering students Maya Lassiter and Erik Pintar had no ordinary summer internship — they spent nine weeks in Bangalore, India, developing technology for blind, deaf, and differently-abled children as part of the iSTEP summer internship.

“I said no to my dream internship to instead develop technology for the deaf, hard of hearing, and blind in India,” said Pintar, who will be a fifth-year scholar studying ECE and Human-Computer Interaction. “I thought I was crazy to do so — but it was worth it.”

iSTEP, or “innovative Student Technology ExPerience,” is a unique research internship started by TechBridgeWorld in 2009 designed to give CMU students the opportunity to conduct technology research projects in developing communities. The program took place in Bangalore with the Mathru Educational Trust, an organization that provides free education and programs for the blind and differently-abled. The Mathru Educational Trust consists of a residential school for the blind and a residential school for the deaf and differently-abled.



Carnegie Mellon iSTEP interns visiting the 12th century temples in Belur, Karnataka.

“Coming out of a liberal arts high school where my interest in technology was uncommon, I had yet to see a connection between my technical future and my humanitarian background,” said Lassiter, a junior studying ECE. “iSTEP was the first program to show me this connection.”

The team, made up of Lassiter, Pintar, and fellow CMU students Amal Nanavati (Computer Science) and Minnar Xie (Art, Psychology, and Human-Computer Interaction), worked directly with the Mathru School for the Deaf to develop a digital sign language dictionary creation tool called Signbook, and Speak Up!: a suite of voice-powered sound games for preverbal children. They also observed the blind school’s use of braille tutoring technology developed by past iSTEP teams.

Signbook, Pintar’s primary project, allows the teachers to create entries for words and common phrases. Because sign language is not universal, Signbook is able to create a digital repository for American, Hindi, or Kannada (the local language) sign language. Development of the application involved intricate knowledge of video formats for efficient processing speed. “With my background in ECE, I was really able to get down to the zeroes and ones behind the technology,” said Pintar.

From left to right: Erik Pintar (ECE), Minnar XIE (BHA), Maya Lassiter (ECE), and Amal Nanavati (CS) are the 2015 iSTEP interns from Carnegie Mellon.

Lassiter primarily worked on the speech and sound games, which were created to help hearing-impaired students learn pitch and volume through interactive gameplay. "The process often seemed cyclical and was difficult across our time constraints and language barriers," said Lassiter. "Learning how [the Mathru School] was using and forming our ideas into ones of their own gave me experience in something I have been wanting to understand for years."

While there, the students were visited by Professor Gowri Srinivasa, a former CMU Ph.D. student who worked under the supervision of Professor Jelena Kovačević, department head of ECE. Srinivasa, head of the PES Center for Pattern Recognition and professor of information science and engineering at PES Institute of Technology, also invited the students to give a presentation at PESIT.

"Looking at the CMU students' enthusiasm, spirit of innovation, commitment to the cause, and efficiency in getting so much work done in such a short time sure made an impact," said Srinivasa. "PES students have been inspired to reach out to work on such projects."

This year marked the last of the iSTEP program, but its effects are long-lasting. "The program definitely changed my outlook on my career," said Pintar. "I am more cognizant of others who don't have access to technology and am now asking myself, how can my work benefit them?"

"However disparate their stories and training, they were united in their cause to make a difference for the better," said Srinivasa. "The passion for this work that each of them exuded, the commitment to follow this through, and the way they worked beautifully together truly exemplifies the spirit of collaboration and multidisciplinary research that is the hallmark of CMU."

ECE student organizations

Build18

This annual "Freestyle Tinkering" festival serves as an intellectual playground for the brightest and most creative Carnegie Mellon students. Taking place at the beginning of the spring semester, Build18 (named after the ECE course number prefix) is open to all CMU students who are interested in tinkering for fun.



www.build18.org

EGO: ECE Graduate Organization

The ECE Graduate Organization promotes networking and social events for graduate students. EGO sponsors many events throughout the year, including a fall picnic and a winter gala. All ECE graduate students are automatically members of this organization.



www.ece.cmu.edu/~ego

ECE Outreach

ECE Outreach aims to provide grade school, middle school, and high school students with opportunities to learn about engineering and figure out whether it is a good career choice for them.



eceoutreach.ece.cmu.edu

Eta Kappa Nu

Eta Kappa Nu (HKN) is the CMU student chapter of the national ECE honor society. HKN's goal is to provide Carnegie Mellon ECE students with opportunities to meaningfully interact with faculty members, industry leaders, and their peers.



hkn.ece.cmu.edu

The Institute of Electrical and Electronics Engineers

The student chapter of the Institute of Electrical and Electronics Engineers (IEEE) provides a social, technical, and professional community to the ECE student body. IEEE hosts weekly Tech/Career Talks, social and sporting events, as well as an ECE Day barbecue.



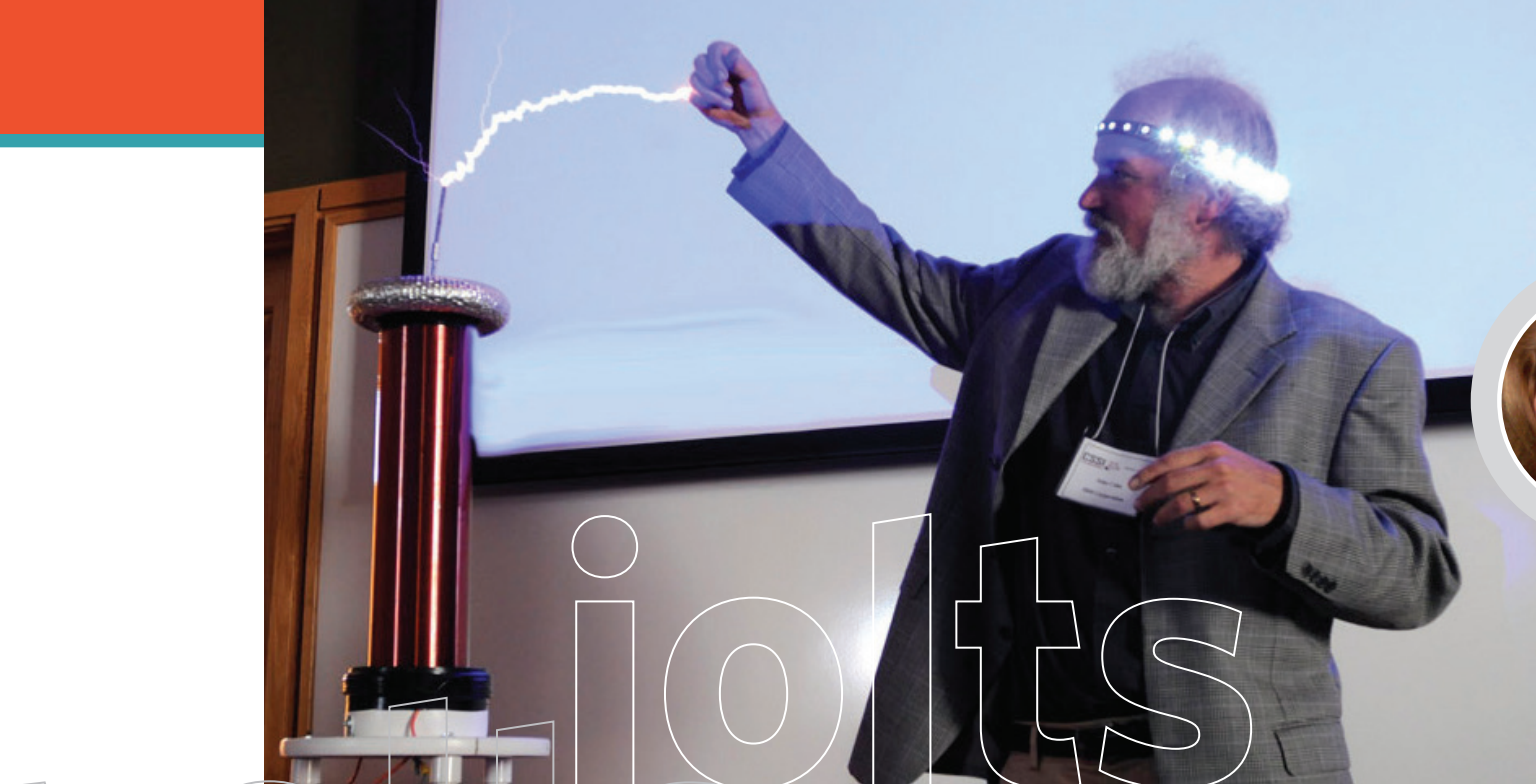
www.ece.cmu.edu/~ieeee

WinECE

WinECE is an organization dedicated to building a sense of community among the women in ECE. It is open to bachelor's, master's, and doctoral students. Mentoring, outreach events, social/professional gatherings, and semester dinners are just a few of the events WinECE plans every year.



winece.ece.cmu.edu



VOITS

Jolts and volts

By Leah Pileggi

John Cohn graduated with his Ph.D. in ECE from Carnegie Mellon in 1991 and returned to Burlington, Vermont, where he worked for IBM. In the fall of 1992, a friend of his was scheduled to do a science presentation at a local middle school. His friend couldn't make it, and he didn't want to cancel. Could John fill in for him? Not only did John fill in, that last-minute presentation was the start of what would eventually come to be called "Jolts 'n' Volts," a far-outside-the-box science show for kids that grew to include more equipment than he could fit into his car.

"It's based on the senses," says John. "Experiencing electricity through taste, touch, hearing, smell." The show is geared mostly toward grades 2-7, but he sometimes does the show for high school-aged kids where he can use "more colorful language" to go along with his tie-dyed lab coat.

With experiments from a millionth of a volt to a million volts, his show might include rice cereal explosions, comparing the conductivity of a student's tongue to a piece of steel wool, making a lightbulb out of a pickle, or firing a paper towel cannon.

John likes to work on diverse projects and has been a huge supporter of the "maker" movement since its earliest days. He was a co-creator of "Vermont Makers," and he started Vermont's first makerspace called "Vermont FabLab," located at the University of Vermont where he is an adjunct faculty member. As to the maker movement, "I'm glad to help push that," he says.

John is included in the company of "Bill Nye the Science Guy" and Beakman (from the 1990s TV science show for kids called "Beakman's World") helping kids discover that science is not boring. A few years ago, he met Paul Zaloom, the actor who plays Beakman. Zaloom's alter ego on "Beakman's World" is still hugely popular via reruns of his show. John said, "People have said that they went on to study science because they saw him when they were kids." It stands to reason that since more than 50,000 kids have seen John's show, some of them are scientists now, too.

What made it so easy for John to take on the role of geeky science guru? "When I was at CMU, I did some work with Brian Rogers (at that time, head of the School of Art at CMU). He was an interesting performance art guy. I helped him with some techie stuff." In keeping with the collaborative environment at CMU, John says, "CMU is where I learned about making tech consumerable, about the intersection of tech and art and society."

John was the winner of the CMU Alumni Distinguished Achievement Award for 2014.

Alumni council member highlight: Jane Rudolph



Jane Rudolph

Why did you choose to attend CMU?

I chose CMU because of its excellent reputation as an engineering school, as well as its size. I thought that its size would allow me to have a much more personal and individualized experience versus a larger university.

How has an ECE degree from CMU prepared you for a successful career?

My ECE degree prepared me for a successful career by providing me the fundamental background in engineering; giving me the confidence in my technical ability; and providing me the foundation that encouraged continual learning throughout my career. Another aspect of my CMU experience that helped me in my career was the collaboration across disciplines, which were highlighted in the project courses from my double major in Engineering and Public Policy.

What attributes are important for women engineers to have in the work force?

I believe that both male and female engineers need the same attributes to be successful in the

work force. I also believe that those attributes will vary dependent on your position and type of company. The attributes of a successful technical expert are different than a successful business leader, just like those of a successful startup entrepreneur are different than a successful executive of an established company. If I were to generalize, the common attributes that contribute to success are dedication, self-awareness, and environmental awareness.

What words of wisdom do you have for our women engineers? Especially those who are about to graduate?

First, I'd like to congratulate them on achieving their degree. My first words of wisdom would be to encourage them to be flexible and open to what the future will give them. When I graduated, I never would have guessed that my career would have gone in the direction it did. By being open to different opportunities, I could explore different areas, which gave me a broader perspective and allowed me to contribute more to the success of my employer. I'd also encourage them to not be afraid to share their thoughts and opinions.

ECE and SCS collaborate on new external relations efforts

The Department of Electrical and Computer Engineering and the School of Computer Science (SCS) are excited to announce two new external relation partnerships. ECE and SCS will collaborate through the Office of Industrial Relations and the Office of Engagement and Annual Giving.

The Office of Industrial Relations will focus on building and evolving relationships with current and potential employers for our graduates. Catherine Copetas, assistant dean for industrial relations in SCS, will lead this effort, partnering with the Corporate and Institutional Partnerships team, which includes members from the College of Engineering and SCS.

The Office of Engagement and Annual Giving will focus on engagement with students, alumni, faculty, staff, parents, and friends. Ashley Patton, director of engagement, and Niccole Atwell, senior associate director, will create and execute new strategies for building and deepening relationships with every audience, as well as finding additional opportunities for these groups to philanthropically support both ECE and SCS.

The collaboration between ECE and SCS is a natural fit. Many ECE students enroll in computer science courses, while a number of faculty members have joint or courtesy appointments.

"We're excited to be partnering with SCS on these external relations efforts," says Jelena Kovačević, department head of ECE. "The Office of Industrial Relations will solidify and expand ECE and SCS' rapport with employers, providing our students with a number of exciting opportunities, while the Office of Engagement and Annual Giving will help us engage and serve our students, alumni, faculty, staff, parents, and friends of ECE. Both offices will work closely with each other and our staff in Industrial and Corporate Partnerships, Student Activities, and Career Services, among others."



Niccole Atwell



Ashley Patton

ECE alumni council

The ECE Alumni Council comprises a group of highly accomplished alumni who meet twice a year to discuss ECE's educational, research, and external activities. The Council provides input and insight regarding the department's programs and strategic goals. Council members also engage with ECE to help mentor students and provide opportunities for networking as well as expand relationships between faculty and industry. For more information on the ECE Alumni Council, visit www.ece.cmu.edu/alumni/council.html

- Nikhil Balram
- Ray Betler
- Gloria Chen
- Anirudh Devgan
- Evan Indianer
- Kevin Kettler
- Oleg Khaykin
- Sanjay Kumar
- Garrett Long
- Kimon Michaels
- Drew Perkins
- Mark Re
- Roger Rosner
- Jane Rudolph
- Archana Sathaye
- Shirish Sathaye
- Han-Ping D. Shieh

Can microchips be trusted?

By Krista Burns

Technology. We're immersed in it every day. Your cell phone, computer, television, and automobile are all pieces of technology — hardware designed with software for practical purposes. We've all been warned about

the implications of malicious software: viruses, data breaches, and identity theft. But what about the hardware? How can you be sure the hardware in your device is trustworthy?

We assume the microchips in our devices were made under strict guidelines and will perform as intended. Unfortunately, that is not always the case.

As the global leader in manufacturing, China produces the majority of microchips used in electronics. However, the production of microchips is not currently regulated in China. Without adhering to strict guidelines, factories can manufacture counterfeit microchips, resulting in underperformance and shorter life spans. Counterfeiting microchips can take many forms; improper recycling,

unauthorized production and cloning, introducing hardware Trojans, and illegally brand-stamping are all ways counterfeit microchips are making their way into technology we use.

In 2010, the United States Navy unknowingly purchased 59,000 counterfeit Chinese computer microchips to be used aboard warships, fighter planes, and anti-missile systems. Robert Ernst, head of research for the Naval Air Systems Command's Aging Aircraft Program, estimates that as many as 15 percent of all the spare and replacement microchips the Pentagon buys are counterfeit. A 2012 Defense Science Board survey estimated that one in three deployed military systems have counterfeit chips in them.

While these statistics are worrying, the future is hopeful. Researchers in ECE are training people and creating the



Ken Mai



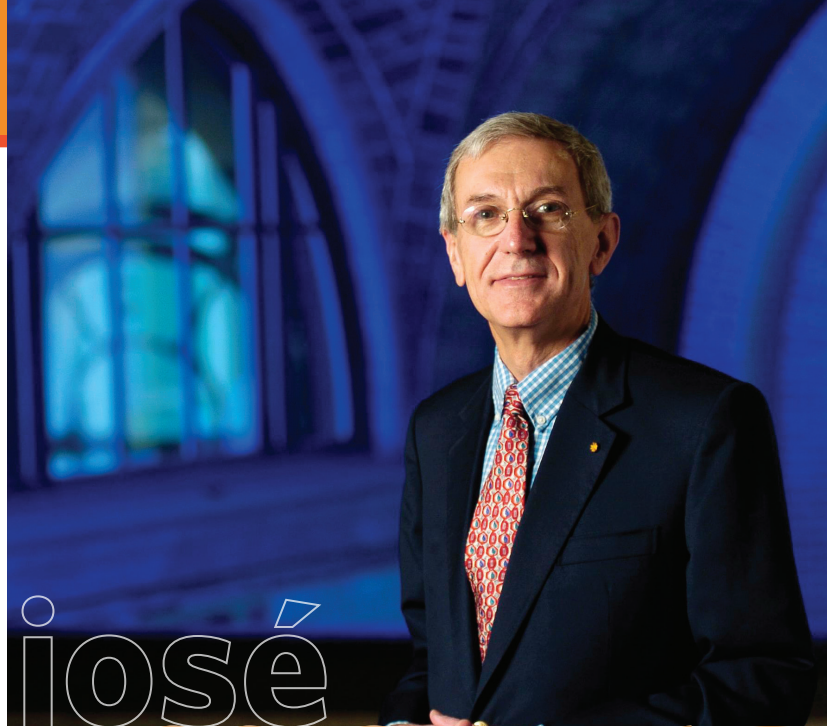
technology needed to combat hardware security threats. Ken Mai, a principal systems scientist in ECE, is developing new, low-cost, hardware-level methods of securing electronic systems against illegal counterfeiting.

Imagine if each microchip were produced with a unique fingerprint, or a secure chip odometer, that would allow it to be tracked from production to installation. The secure chip odometer would gauge authentication of provenance to enable differentiation between genuine and counterfeit parts. Much like a vehicle identification number, the secure chip odometer would allow users to track if a microchip is new or used, when it was manufactured, how long it has been in operation, and whether it has been tampered with.

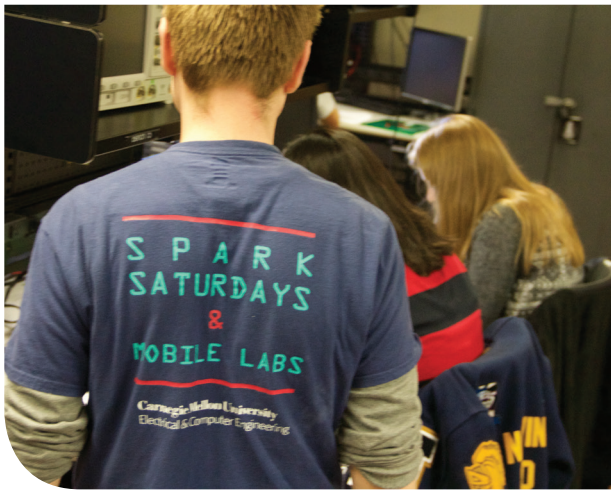
To support his research in combating microchip counterfeiting, Mai received one of nine awards given by the National Science Foundation (NSF) and the Semiconductor Research Corporation (SRC) under the Secure, Trustworthy, Assured, and Resilient Semiconductors and Systems program (STARSS).

Mai and the rest of the ECE department have a unique angle for approaching the topic of hardware security. "We saw an opportunity to approach hardware security from a hardware design perspective versus a security perspective," says Mai. "Most of the people working in the space are security people trying to do hardware. We are hardware people applying our skill set to provide security."

Mai believes we could be using the secure chip odometer in a few years. And in the meantime? "Be smart about the hardware you use," says Mai. "Purchase hardware from trusted sources and recycle properly. Common sense goes a long way toward protection."



José M. F. Moura is the Philip L. and Marsha Dowd University Professor and associate department head of research and strategic initiatives in Carnegie Mellon University's Department of Electrical and Computer Engineering. He was born and raised in Mozambique and went to college in Portugal and the U.S., with degrees from IST (Portugal) and MIT. Moura directs the CMU Portugal Program, co-founded SpiralGen, and holds 13 U.S. patents in signal/image/video processing, several of which have been adopted by industry. The recipient of numerous awards and recognitions from professional organizations, Moura is a member of the National Academy of Engineering, a fellow of the National Academy of Inventors, a corresponding member of the Portugal Academy of Sciences, an IEEE fellow, and a fellow of the AAAS. He is the 2016 vice president for technical activities and 2016 member of the Board of Directors of the IEEE, was an IEEE board director, president of the IEEE Signal Processing Society, and editor-in-chief for the Transactions on Signal Processing.



ECE outreach: bringing ECE to middle and high school

By Emily Durham

Nearly three years ago, a group of precocious high school students convened on Carnegie Mellon's campus for the first-ever SPARK Saturday, voluntarily choosing to spend their Saturday morning in a college classroom programming in Python, learning Boolean logic, coding in binary, and designing circuits. The successful event, hosted by ECE Outreach — a student-run organization that introduces middle and high schoolers to basic concepts in electrical and computer engineering — forecasted a bright future for the group. In just three years, ECE Outreach has expanded tremendously, with no sign of slowing down.

SPARK Saturdays was launched in the spring of 2013 by the group's former president, Niharika Singh (E 2014). The program is spread out over four two-hour Saturday sessions per semester, a different topic showcased each lesson.

"The idea was to have one lab from each of the four sections of ECE," explains Singh. "As ECE undergraduate sophomores, we are required to take four 200-level courses, and we wanted to give the kids a more basic version of each of those 200-level courses to get them exposed to everything."

In addition to SPARK Saturdays, ECE Outreach now offers two new programs: Snap Circuits and Mobile Labs. Snap Circuits is a simpler circuitry-focused program geared towards middle school students, and the Mobile Labs are a modification of the SPARK Saturdays curriculum designed to take directly to participating high school locations.

"My dream has been to kind of do an engineering road show," says Professor Tom Sullivan, ECE Outreach's faculty adviser. "What I've been envisioning is putting together a portable lab we could bring to schools that can't come here. The Saturday program is great if the parents can get their kids here, but in some of these areas, parents have to work, or they're single-parent homes, or transportation isn't available to get these kids to campus. So if we can make these things small enough, portable enough, we could go to any school, set up a table and run our programs remotely."

With five kids of his own, Sullivan strongly believes in the importance of bringing this exposure to primary school classrooms.

"Once my kids got into school, we started to get requests for parents to come in and talk about their careers," says Sullivan. "I would bring these little robots into their elementary schools, and some of the kids were really excited about it. I also brought a bunch of robot parts that I would let them play with. I remember this one girl putting together this imagined robot using the parts. Of course, she didn't know what parts went together with what — it didn't matter — but she was fascinated with the pile of parts and constructing something out of them, having the ability to just build something."

For more information, visit: eceoutreach.ece.cmu.edu.



Jeff Weldon

A fractured eye socket. A broken hand. Blood in the water. “But it was fun,” said Jeff Weldon, a member of UC Berkeley’s water polo team from 1989-1992. “It’s a brutal sport.” How brutal? “Once, I was guarding a guy who was 6’7”, the best player in the country at the time who went on to play on many Olympic teams, and he said that if I didn’t quit being so physical, he would punch me in the face.” Jeff didn’t let up and the guy took a swing at him, but missed. A brawl broke out, and that other player was kicked out. The guy was a teammate, and he was kicked out of practice!

In Jeff’s senior year, he was a starter. In the final game against Stanford, Berkeley was behind. Jeff scored the goal that tied the game and sent it into overtime. Berkeley not only won the game but went on to win the national championship, their third time in his four-year water polo career.

After graduation, Jeff would have had a good chance of making one of the two national teams comprised of the elite players from which the U.S. Olympic team is chosen. “I was starting grad school,” he said, and as far as having water polo in his life at that point, “I was done.”



Priya Narasimhan

“Can yinz see anything from up there?” We’re sure every sports fan (at least in Pittsburgh) has uttered this phrase while watching their favorite team take the field. Thanks to Priya Narasimhan, fans across the nation, especially in peanut heaven, are able to watch their favorite sports teams up close and personal using the YinzCam app.

“The technology provides instant action and real-time action replays from any of four unique camera angles at Heinz Field during a Steelers game, including the NFL’s Red Zone Channel,” said Narasimhan, YinzCam Inc.’s founder.

Narasimhan, who developed the idea of YinzCam after teaching a novel sports technology class at Carnegie Mellon, predicted that the NFL’s use of technology will continue to benefit the game and its fans. For more than two years, YinzCam Inc. has focused on mobile live streaming and experiential technologies for live events.

“Because football is a game of inches, it is extremely important that fans get instant visualization of the entire game and can stay in touch with the real-time game action, anytime, anywhere,” said Narasimhan, an avid Steelers fan. “The new technology also gives Steelers fans access to player bios, a depth chart, and real-time stats, player by player, drive by drive,” she said.

YinzCam has been adopted by the National Football League and National Basketball Association.



Pulkit Grover

Lots of kids in America fly kites. In Jaipur, India, where Pulkit Grover grew up, kids also fly kites. But unlike their American counterparts, Indian kids fly kites — called “patang” — that use string coated with colorful crushed glass. The dangerously sharp string, called “manjha,” is used in kite fighting to cut through the string of other kites.

Imagine hundreds of people on adjacent rooftops skillfully flying kites that dip and soar, aiming to slice through the string of other kites. The goal is to be the last kite flying. The prize? “Nothing,” says Pulkit. The reward is just the knowledge that your kite has lasted the longest. The peak time for kite fighting is during Makar Sankranti, the Hindu harvest festival that marks the arrival of spring on or near January 14. Pulkit explains, “We would be up on the roof throughout the day. That’s a good day to fly usually because it’s not too hot and the winds are good. But really, kids fly kites starting six months before and ending six months after.”

Because the strings are so sharp that they can cut, do the kite flyers wear gloves? “No,” says Pulkit. “They wear Band-Aids. Lots of them.”

kumar

New faculty members

lucia

lucia



Brandon Lucia

Q. What excites you most about teaching at CMU?

A. The students! Since I have arrived at CMU, I have been totally blown away by the creativity and initiative of the students here. Being surrounded by brilliant people who cannot wait to go and contribute something to science, engineering, and society is what really gets me excited to be at CMU.

Q. What can future students look forward to as they interact with you as a faculty member?

A. My main interests are in computer architecture and computer system design. I am especially interested in energy-harvesting computer systems, which extract their operating power from their environment and novel parallel computer systems, which are becoming increasingly heterogeneous and unreliable.

Q. What is a fun fact about you that would surprise your students?

A. My experimental music trio, 'netcat,' released our album in 2014. To make the album, we wrote thousands of lines of code, implementing, amongst other things, the Chango, a synthesizer that interprets patterns of light and generates sound. In addition to doing a cassette and digital download release, we also did what we believe is the first-ever album release in the form of a loadable Linux kernel module. And some people actually built and used it!



Maysam Chamanzar

Q. What excites you most about teaching at CMU?

A. CMU has an amazing blend of world-class researchers and highly talented students. I am excited to work with the faculty and explore new areas and interested in fostering new collaborations within the department and across campus.

Q. What can future students look forward to as they interact with you as a faculty member?

A. I enjoy working closely with students and taking their research ideas into fruition. I have found that many interesting innovations in my projects often stemmed from brainstorming with students over a cup of coffee.

Q. What is a fun fact about you that would surprise your students?

A. One of my most favorite hobbies is writing poetry. As a kid, I used to write a poem nearly every day and still keep multiple books of my old poetry. I was very particular about making every poem rhyme. When I couldn't find a word that rhymes, I didn't give up... I would just invent one!

Q. What excites you most about teaching at CMU?

A. I found CMU a vibrant, friendly, and collaborative environment. The strong body of students and experienced faculty at CMU, especially in ECE, convinced me that CMU is the place where I can achieve my scientific goals.

Q. What can future students look forward to as they interact with you as a faculty member?

A. I am very good at teaching and explaining the most sophisticated concepts in a very simple and easy way. I believe ECE students are in the best position to devise next-generation neuro-technologies and address the biggest challenge of our era: understanding brain function. I am committed to paving the way for the students in my lab and in my classes to learn the fundamental concepts of applied physics as they relate to neuro-technology and to become pioneers in this field.

Q. What is a fun fact about you that would surprise your students?

A. I love gardening. I collect and grow exotic plants. When I travel to new places, I always try to visit botanical gardens.



Swarun Kumar

Chamanzar

Enhancing learning experiences

The educational landscape is undergoing a revolution; discussions about educational techniques touch on a number of topics from affordability of college and value of college education to democratizing education through smart use of technology. While the appearance of technologies such as massive open online courses (MOOCs) has brought many such issues to the forefront, there are more products of these discussions.

Physical campuses are here to stay; that much is undeniable. The benefits of “minds rubbing against minds” are impossible to ignore: learning in physical environments encourages and enhances both inside- and outside-of-the-classroom student participation. Quality of education is the driving force in these environments, with a clear and sustainable, evidence-based model to support a superior quality of education. Institutions such as Carnegie Mellon have been striving to adapt their educational offerings to students’ needs, and ECE has been developing a suite of technological learning options to offer superior quality education and integrate our global locations.

For the past few years, ECE has offered online, for-credit courses in its curriculum using a number of platforms, from broadcast to flipped classrooms, involving both residential and remote students. Jelena Kovačević, ECE professor and department head, was one of the first in the department to offer a flipped classroom.

“Flipping a classroom means prerecording lectures and using face-to-face time for interactive activities, where I feel I bring the most to the students and can adapt my teaching to their particular needs,” says Kovačević. “My students have to come to class prepared; they then spend the time in small groups working on specific problems that they share with the rest of the class. I find that the conversations we have in this environment outweigh anything I could teach in a traditional classroom setting. For my class and several others, we partnered with Acatar, a Carnegie Mellon startup, to seamlessly integrate technology-enhanced learning into courses.”

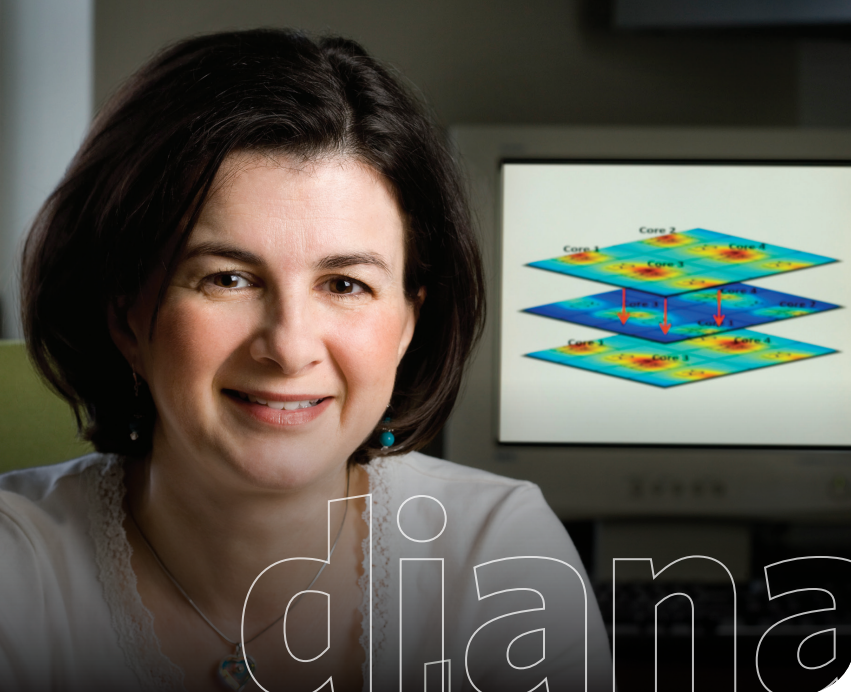
Acatar, acquired by The Learning House, Inc., is one of the cutting-edge online education technology companies that incorporate the latest advances in the science of learning. Headquartered in Pittsburgh, Pa., Acatar provides an easily customizable approach for professors to create technology-enhanced courses.



ECE takes a flexible approach to using technology. Some classes are offered or developed using the Acatar platform, but the videos may be hosted on various websites such as YouTube or Blackboard. Still others are broadcast to create a true global campus, connecting the Pittsburgh campus to locations in Silicon Valley, Rwanda, China, and Portugal. This year, 14 courses are being offered in this manner, and 23 ECE faculty members incorporate some type of technology into their teaching.

In an effort to encourage ECE faculty to create teaching videos and make recording easier, the department offers incentives to faculty (teaching release/summer support) and has invested in a media room. Purposely staged as a relaxed environment, the media room is a welcoming and user-friendly space equipped for recording lectures. “This room allows us to record and then broadcast lectures globally, while providing technical support to anyone using the room,” says Meighan Harding, director of operations in ECE.

“Our ultimate driver is quality; we use technology only when it improves teaching,” says Kovačević. “Our aim is to enhance traditional residential learning and adapt to individual learning styles, backgrounds, and individual teaching styles of faculty. By using these technologies, we are able to integrate our locations around the globe and extend the reach of the CMU name.”



diana marculescu

Diana Marculescu is the associate department head for academic affairs in Carnegie Mellon University's Department of Electrical and Computer Engineering and the founding director of the College of Engineering's Center for Faculty Success. She holds degrees from the Polytechnic University of Bucharest (Romania) and the University of Southern California, Los Angeles. Her current research interests include energy- and reliability-aware computing and CAD for non-silicon applications, including e-textiles, computational biology, and sustainability. Marculescu has received numerous best paper awards, has been honored with the National Science Foundation Faculty Career Award, and has been named IEEE Fellow; ACM Distinguished Scientist; IEEE Circuits and Systems Society Distinguished Lecturer; chair of the Association for Computing Machinery, Special Interest Group on Design Automation; and Australian Research Council Future Fellow. She served as the Technical Program Chair of the IEEE/ACM International Symposium on Networks-on-Chip in 2012, the IEEE/ACM International Conference on Computer-Aided Design in 2013, and is currently the general chair for the same conferences.

The sophomore slump

By Krista Burns

Freshman year of college is exciting; first-year students meet new people, join fun clubs, live on their own for the first time, and begin navigating the waters of independence. They are eased into college by a weeklong orientation where they talk about their feelings and expectations. Mid-semester seminars boost morale, and pre-finals lectures encourage students to finish strong.

Then sophomore year hits — hard. Second-level courses are more demanding. Words like “research” and “internships” weave their way into daily conversations. Students often feel like they are expected to have the rest of their lives figured out. Known as the “sophomore slump,” this depressive phenomenon occurs when a student's second year of college fails to live up to the first year of college; the novelty of freshman year has worn off, and the stress of being an upperclassman sets in.

“Sophomore year is the first time electrical and computer engineering students are taking major-specific classes,” says Janet Peters, manager of ECE undergraduate advising. “They start to realize just how academically challenging the major is and could begin to question if this is the right field for them.”

As it turns out, the sophomore slump experience is common among undergraduate students nationwide. In a 2013 report by Ruffalo Noel-Levitz, nine percent of second-year students across all four-year private institutions reported that they were either undecided about continuing their enrollment or planned to transfer to another institution.

“We wanted to find a way for students, especially sophomores, to relieve stress and stay motivated throughout the academic year,” says Katie Costa, ECE student organizations and activities advisor. “Research indicates that informal student-faculty contact outside the classroom correlates positively with student retention, so we developed the Faculty Social Event initiative.”

Throughout the academic year, sophomore students are encouraged to sign up for events led by faculty members. Professor Limin Jia recently took a group of students on a tour of the Nationality Rooms at the University of Pittsburgh. Professor Bill Nace hosted a friendly board game night. Professor and ECE Department Head Jelena Kovačević hosted a jigsaw puzzle night with dinner.

“Not only do these events show professors in a different light, they allow students to take a break from studying and socially integrate into the ECE community,” says Costa. “Social integration is an important factor when it comes to retaining students, and establishing a personal connection with a faculty member can help strengthen a student’s commitment to our department.”

Faculty members who are interested in participating in a social event: please email Katie Costa at kcosta@andrew.cmu.edu.



Limin Jia, assistant research professor, took a group of ECE students to the Nationality Rooms at the University of Pittsburgh for a guided tour.

“Sophomore year is the first time electrical and computer engineering students are taking major-specific classes. They start to realize just how academically challenging the major is and could begin to question if this is the right field for them.”

Janet Peters, manager of ECE undergraduate advising

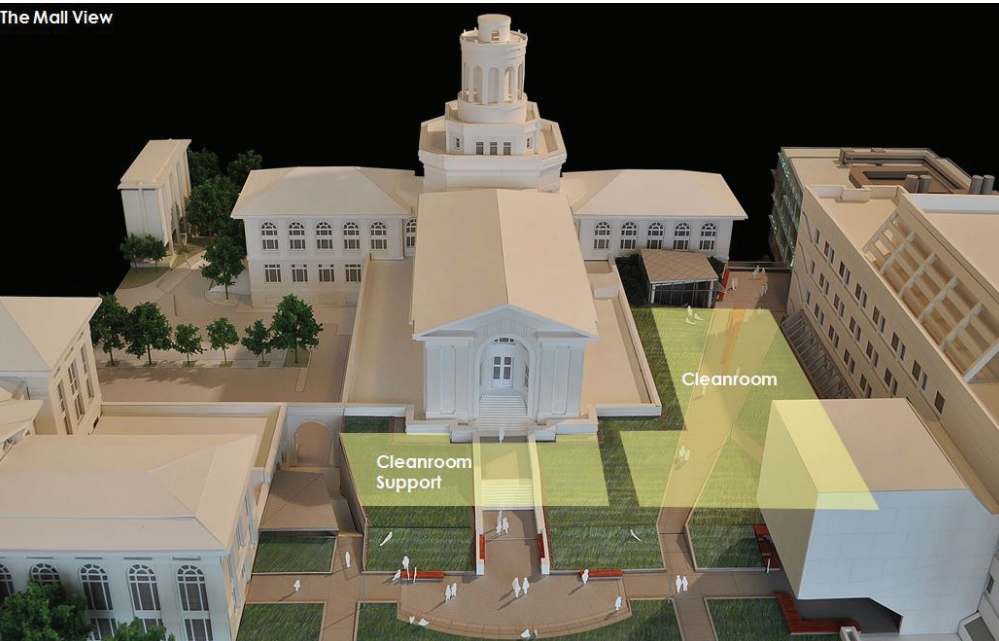


Jelena Kovačević hosts a jigsaw puzzle night in her conference room.

nanofabrication

Scott Hall to add new nanofabrication facility

The Mall View



A premier research laboratory in ECE and the College of Engineering, the Carnegie Mellon Nanofabrication Facility, or Nanofab, is currently located on the F-level of Hamerschlag Hall and centers around three thin film labs, as well as a 2,600 square foot cleanroom of class 100 space and a 1,200 square foot cleanroom of class 10 space. The new Nanofab, located below the new Courtyard, will encompass almost 11,000 square feet of total space, including approximately 8,500 square feet of both class 100 and class 10 space.

Originally constructed by the university to support thin film and solid-state

electronic research, the Carnegie Mellon Nanofab has grown in size and is now known as one of the most well-equipped, university-based facilities for thin film and nano/micro-device development in the United States.

“The creation of this new nanofabrication facility will transform the way we serve CMU affiliated faculty and students, members of other institutions, and industry partners,” said Gianluca Piazza, ECE professor and director of the Nanofab. “The added capabilities in this new space will revolutionize nanoscale science and engineering at Carnegie Mellon and ensure we become one of the premier nanofabrication labs in the country.”

Although the Nanofab is a self-supporting facility managed by the Department of Electrical & Computer Engineering, research requiring the use of the facility is inherently multidisciplinary. Faculty, staff, and students access the labs and collaborate on projects originating from all departments within the College of Engineering, Physics, Robotics, Biology, Chemistry, numerous labs, and industry.

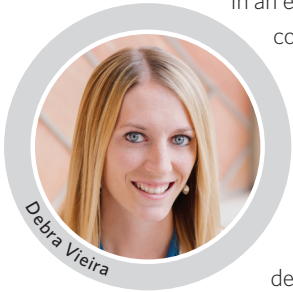
For more information on and funding opportunities for the new nanofabrication facility, please visit www.cmu.edu/cfd/scott-hall.

In true Carnegie Mellon style, the university is fusing hands-on learning experiences with high-impact, solutions-based research in one multidisciplinary hub — The Sherman and Joyce Bowie Scott Hall.

Scott Hall will consist of two unique components, the North Wing and the Courtyard. The North Wing will be an elevated multi-story structure built on the hillside between Wean and Roberts Halls, while the Courtyard will be a surface level structure built in the service space between Hamerschlag, Porter, and Wean Halls.

The Courtyard structure will incorporate a green roof and walkway, which will extend the historic Hornbostel Mall to the North Wing. The Courtyard will also sit on top of the new nanofabrication facility.

Communication is key



Debra Vieira

In an effort to increase internal and external communications, the Department of Electrical and Computer Engineering has invested in establishing a communications team. The three-member team consists of Krista Burns, communications manager; Debra Vieira, senior multimedia designer; and Leah Pileggi, senior writer.

The team's focus is to enhance the visibility of ECE to both internal and external audiences through print and digital communications. By strategically communicating with identified audiences, ECE will maintain its identity as a tier-one department of highest scholarly and innovative quality. This reputation will not only attract prospective students and faculty, but potential donors and employers as well. Strategic communication will also have a positive impact on ECE's national rankings, ultimately affecting the reputation and ranking of Carnegie Mellon University.



Leah Pileggi

"ECE has a great story to tell," says Krista Burns. "It's our job to make sure the world knows the impact our students and faculty have on society."



Krista Burns

This past year was spent on establishing a presence on multiple communication mediums, including the following social media outlets:

Connect with us!



/CarnegieMellonECE



@CMU_ECE #CMUECE



+cmuece



/cmuece

Meet the new staff members

ECE welcomes the following staff members who started within this past year.



Nicole Cook Atwell

Senior Associate Director of Engagement and Annual Giving



Krista Burns

Communications Manager



Zara Collier

Academic Services Coordinator



Katie Costa

Student Organizations and Activities Advisor



Lauren Hildesheim

Director of Career Services
Silicon Valley campus



Tomissa Kareis

Research Administrator



Shobha Kumar

Financial and Research Administrator
Silicon Valley campus



Nesli Ozdoganlar

Advisor for Professional Masters Programs



Ashley Patton

Director of Engagement and Annual Giving



Shelley Phelps

Administrative Coordinator



Anna Poteete

Campus Administrative Coordinator
Silicon Valley campus



Sari Smith

Director of Student Affairs
Silicon Valley campus



Nathan Snizaski

Advisor of Doctoral Programs



Dave Stevens

Facilities Assistant



Mark Weiler

Nanofabrication Equipment Manager

Wireless innovators come in loud and clear at national amateur radio event

By Hannah Diorio-Toth

Camped out in the foothills of the picturesque Santa Cruz Mountains, Electrical and Computer Engineering students in Silicon Valley took turns operating their radio transceiver as they attempted to contact as many other amateur radio operators across the country as possible. The annual event, called Field Day, is designed to promote emergency communications preparedness. It is organized by the American Radio Relay League (ARRL) and takes place each June. Field Day has become the biggest amateur radio operating event in North America, with more than 35,000 participants.

All amateur radio operators, or “hams,” as they are called, are trained and licensed to operate in a personal capacity. Ham radio is a way to communicate nationally or even internationally without landlines or the internet. It’s a growing hobby across the world and one that Bob Iannucci, distinguished service professor of ECE and faculty advisor for the CMU-SV Wireless Innovators, says has important real-world applications.

“What many people don’t realize is that our society’s communications systems are fragile,” explains Iannucci. “Disasters of all sorts, including earthquakes, threaten

our normal communications systems. Failures can and do happen, and we have to be prepared. Amateur radio works when all else fails.”

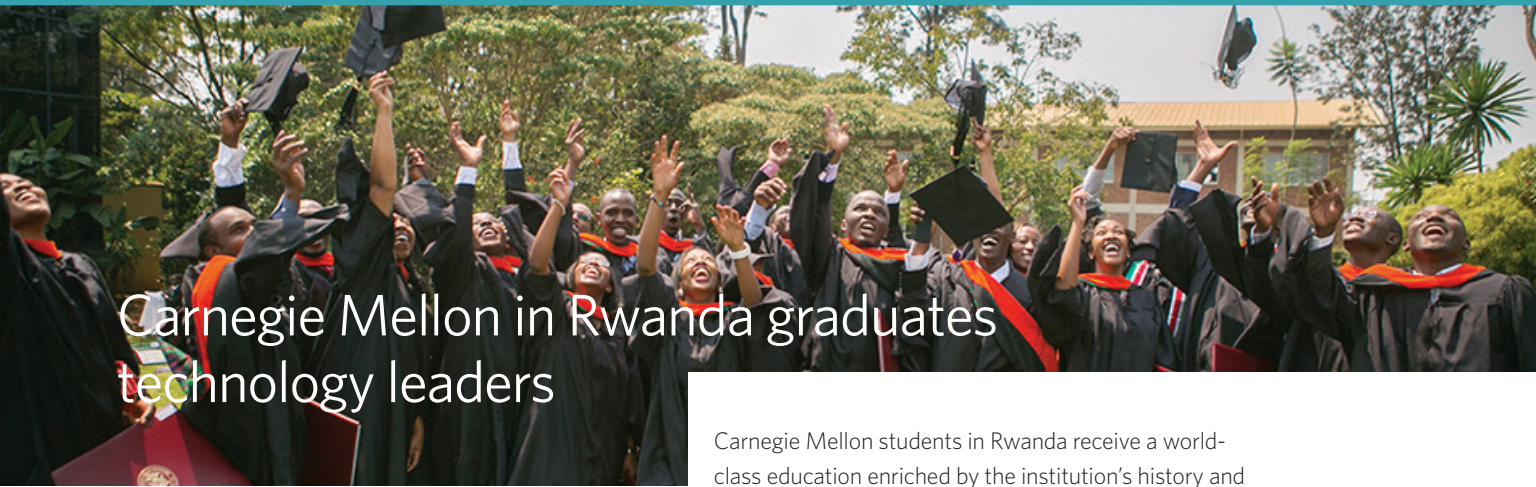
Hams are encouraged to use emergency and alternative power sources to simulate this type of emergency situation during the Field Day event. This is where the CMU-SV Wireless Innovators had a particular advantage. The group used the CROSSMobile van, a former ambulance converted into a mobile radio research laboratory. They prepared the van for emergency communications, taking advantage of its ability to work on a standalone power supply.

In preparation for Field Day, the group spent several weeks assembling and testing an impressive antenna — 32 feet from front to back and weighing in at 100 pounds. The antenna was fitted atop the CROSSMobile van on a pneumatic mast which uses pressurized air to raise and lower. The antenna allowed the group to make connections from Hawaii to Puerto Rico. The technology also enabled the group to reach a significant number of operators, totaling more than 200 different contacts by the end of the event.

One of the goals of the CMU-SV Wireless Innovators is to promote understanding of the fundamentals of radio and wireless communications. “This event really translates theory to practice. It reinforces what students have learned. Designing a radio or antenna in the lab is one thing, but matching the performance of their system against the best of the best in a real-world setting is a whole new challenge,” says Iannucci.

Professors Iannucci and Tague and students stand in front of the CROSSMobile van.





Carnegie Mellon in Rwanda graduates technology leaders

Carnegie Mellon University in Rwanda (CMU-R) celebrated its second graduation of technology innovators this past summer at a ceremony at the Serena Hotel in Kigali, Rwanda. The 21 men and women of the Class of 2015 received master's degrees in Information Technology (IT).

CMU-R is fostering the commercialization of information and communication technology in the world's fastest growing economic region. More than 70 percent of the Class of 2015 has secured employment while other students may join fellow alumni in creating startup ventures.

The graduation underscores Carnegie Mellon University and the Government of Rwanda's commitment to educating engineers and entrepreneurs who are striving to make an economic impact in Africa. All alumni from the Class of 2014 now have technical careers in East Africa and continue to play a part in ushering the region's economic and social growth into the future.

Motivated to elevate global intellectual and economic vitality, Carnegie Mellon University became the first U.S. university to offer a master's degree program taught by full-time faculty residents in Africa.

"Being present in Africa is the only way to understand technology needs on the continent," said Bruce Krogh, ECE professor and director of CMU-R. "Creating a long-term education program is critical, because it gives students time to analyze problems and develop solutions in the context in which they occur."

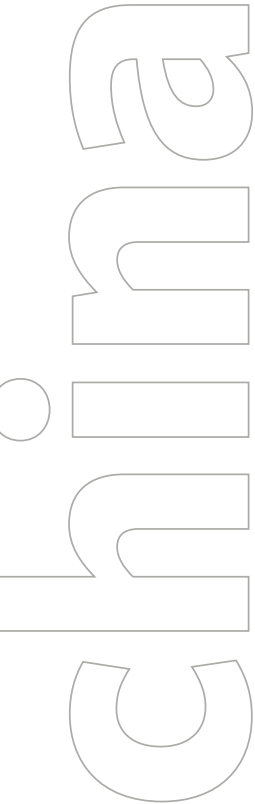
Carnegie Mellon students in Rwanda receive a world-class education enriched by the institution's history and tradition of excellence that began in the United States in 1900. Rigorous coursework, practicums, and internships provide students with the critical skills valued by industry throughout Africa. In addition, our curriculum includes courses on a wide range of business topics and soft skills giving our graduates the confidence to launch their own ventures.

To ensure that Carnegie Mellon University's research and curriculum in Rwanda remain relevant to Africa, the faculty and students engage with local companies and multinational corporations on a continual basis. Companies that have recruited Carnegie Mellon students for internships in East Africa include General Electric, IBM, Microsoft, and Visa.

At CMU-R, African students remain steeped in the region's rapidly evolving technical and business networks. Beyond the advantage of staying local in terms of professional development, studies in Rwanda enhance our students' learning experience. Our top students are funded to study for a semester in Pittsburgh, and our alumni highlight the communal study experience in Kigali as a major advantage for their learning, as compared with studies in the U.S.

In Africa, Carnegie Mellon University offers two graduate degree programs: the M.S. in Information Technology and the M.S. in Electrical and Computer Engineering. Faculty research areas include energy systems and IT for healthcare and business.

RWANDA



Blanton named new associate director of SYSU-CMU Joint Institute of Engineering

Shawn Blanton, professor of electrical and computer engineering, has been announced as the new associate director of the SYSU-CMU Joint Institute of Engineering (JIE).

As the associate director, Professor Blanton will significantly strengthen the JIE program by helping with faculty recruiting, mentoring, and nurturing, as well as student admission. "I look forward to working closely with Professor Blanton on this exciting international education/research collaboration," says Jimmy Zhu, ABB Professor of Engineering and co-director of the SYSU-CMU JIE.

The JIE was formally established in November 2012. This joint effort between Carnegie Mellon University and Sun Yat-sen University (SYSU) in Guangzhou, China, is to build a brand new engineering school at SYSU. The JIE takes a global approach to providing engineering education at



the graduate level by building upon the strengths of the two universities. Students pursuing the ECE double-degree option at either the master's or doctoral levels will have the opportunity to study at both institutions, enabling a rich cultural learning experience between China and the United States of America.

The JIE is continuing its efforts in faculty recruiting and mentoring during its expansion into new disciplinary areas of electrical and computer engineering, while strengthening the existing areas. After over two years of effort, the program has established a body of 13 faculty members in various areas of electrical and computer engineering. The first cohort of 30+ dual-degree M.S. students in ECE enrolled in Fall 2014.

For more information on JIE, please visit jie.cmu.edu.

JIE building located on SYSU's East Campus in the city of Guangzhou.





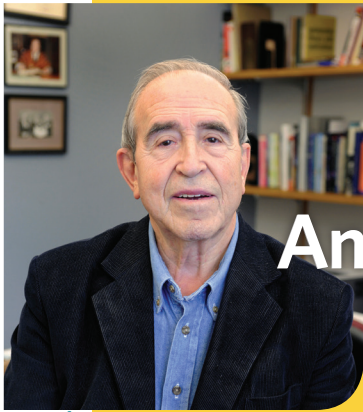
#myECEgoal

In an effort to help motivate students at the beginning of the academic year, we asked them to write down a personal goal on a Post-it note and stick it on the wall in Hamerschlag Hall. The result was inspiring.

Students not only thought about their academic goals, like achieving a certain GPA and graduating, but many took the time to think about personal ambitions, like staying healthy, sleeping more, and making friends.

"We wanted students to start thinking about their goals from the start," says Krista Burns, communications manager for ECE. "Seeing everyone's goals on the wall was really motivating. Faculty and staff started to put their goals on Post-it notes, too!"





Angel Jordan

Faculty Recognition Fund

Angel Jordan is an icon at Carnegie Mellon University. Dedicating his entire career to the university, he was one of the leaders who transformed Carnegie Mellon into a prominent world-class educational and research institution. The university's momentous growth is largely due to the work and dedication of individuals who have spent years working to advance academic excellence and technology. Angel is one of these individuals. To thank him for his commitment, we hope to create a professorship in his name as an enduring tribute.

Why professorships are important

A professorship is one of the most prestigious academic awards a university can bestow on a faculty member. When an outstanding faculty member receives an endowed professorship, it helps the college retain that professor, and it recognizes the person for whom the professorship is named.

Why we need your support

We believe those who emulate Angel Jordan's passion for Carnegie Mellon can have an impact on enhancing his legacy. By contributing to the Angel Jordan Faculty Recognition Fund, alumni have the opportunity to honor a figure who has inspired generations of students and faculty. It is important for our society that we continue creating exceptional engineers and educators. We need to enable top faculty to follow Angel's lead and make ECE their home.

Professorships bring many benefits to the department, college, and the university. They attract exceptional faculty who are pioneers in research and engaging in the classroom. This in turn impacts student enrollment and university rankings. Students attend a university to be taught by the best professors. Honoring a faculty member with a professorship indicates to students the caliber of their instructors.

Our goal

It is our goal to grow the Angel Jordan Faculty Recognition Fund to the full professorship level of \$2.5 million. Many College of Engineering alumni have contributed towards the Angel Jordan Faculty Recognition Fund, including a grateful mentee of Angel's who stepped forward with a \$500,000 lead gift. It is heartening to know that Carnegie Mellon has dedicated alumni who are so committed to the university's success.

For more information on the Angel Jordan Faculty Fund, please visit:
www.ece.cmu.edu/giving/angeljordan.

Event calendar

JANUARY 11: Spring 2016 semester classes begin

JANUARY 11-15: Build18

MARCH 7-11: Spring break

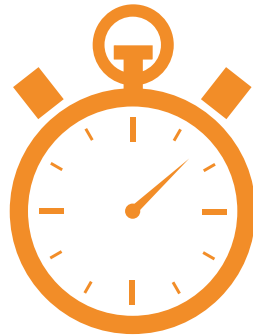
APRIL 14-16: Spring Carnival

APRIL 29: Last day of classes and ECE Day

MAY 14-15: Commencement Weekend



70+
CREATIVE
TEAMS



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TINKERING
HOURS



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STUDENTS

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www.build18.org

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