M|EECS

Department of Electrical Engineering and Computer Science

THE UNIVERSITY OF MICHIGAN

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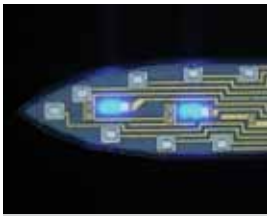

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First glimpse of the newly renovated diag on North Campus, called the Eda U. Gerstacker Grove, or simply, the Grove. Dedication: October 21, 2016, 2-4 pm.

Message from the Chairs

Khalil Najafi, Chair
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Marios Papaefthymiou, Chair
Computer Science and Engineering

Dear Alumni, Students, and Friends,

The ever-changing world of EECS is more exciting and relevant than ever. As we write this letter, EECS faculty and students, in conjunction with colleagues at U-M Flint, are leveraging big data sources to predict sources of drinking water contamination in the city of Flint. Other predictive data science techniques being developed at EECS are reducing instances of infections in hospitals, creating interventions for patients with psychiatric disorders, and determining which companies will best protect your personal data.

Exciting new technologies in the area of robotics are emerging from EECS labs as demonstrated by our growing collection of walking, crawling, and rolling robots. MARLO, the free-standing bipedal robot that uses control algorithms to maintain balance, continues to amaze. Other robotic innovations include an intelligent trip planning wheelchair, insect-inspired robots, assistive robots, and many more. Our faculty look forward to collaborating more closely with researchers from industry and across the College at the newly approved Robotics facility.

Self-driving vehicles are here, and making their way into the real world faster than anyone expected. Thanks to partnerships with Toyota and Ford and an active first year for the Mcity testing ground, EECS involvement in this booming field has captured national attention.

Vital to these cars and to many other fields are small, accurate sensors and antennas. Researchers in remote sensing have made some of the smallest, most sensitive components for these devices and are deploying them far and wide – including in outer space. Attached to satellites, these sensors will provide us with critical data on the progress of climate change and its effects.

As sensing technology continues to shrink, so to do computers and their components. The team responsible for the world's smallest computer, the Michigan Micro Mote, has adapted their technology to function inside the human body, carrying radios that can reach through human tissue, offering less invasive insights into health conditions.

Intelligent cognitive systems being developed at EECS will make it easy to interface to technology through the use of natural language. In a project funded by IBM, researchers are creating a digital student advisor that will provide advice in multi-turn, goal-driven conversations.

Our own minds are still shrouded in mystery. EECS is home to the International Program for the Advancement of Neurotechnology (IPAN), formed to help us understand the complexity and mysteries of the brain, one of the biggest scientific challenges of this century.

EECS researchers have also made a number of important contributions to clean energy technology in the past year, including some very crafty bendable solar cells that take after the Japanese art of paper folding to track the sun. These cells may get cheaper to deploy thanks to nano-structured solar concentrators. To put it all to use, we'll need a power grid that can handle the quirks of renewable power supplies, something our researchers are actively working on

Finally, 2016 is an election year, and security concerns raised by EECS researchers regarding the country's aging and patchwork network of electronic voting systems are getting new attention. At the same time, a non-profit company spun out of EECS is issuing free security certificates for all websites, changing the Internet security landscape for the benefit of all.

As you can see, our faculty are tackling nearly every buzzworthy new technology that has filled headlines this year. Here to join them are eleven new tenure-track faculty, as well as several new lecturers and research scientists.

We are always excited to welcome our new and returning students in September. This Fall, we have a record 1800+ declared EECS undergraduates. These ambitious innovators bring with them a host of fresh ideas and perspectives, with many participating in our world-class teams and organizations. The past year has seen the six-time national championship Solar Car Team successfully defend their title, wins by other student teams, and a creative new organization that gives students an outlet for their musical muse. Other students are excelling as student teachers and mentors, and are bringing their passion and skills to those in need around the world.

Our alumni embody the best of what an EECS education can bring to the world. Some alums highlighted in this publication have helped lower the cost of cochlear implants, given new freedoms to patients with diabetes, and taken on leadership positions for one of the biggest online retailers in the world.

Thank you for your support and interest in the work we do here in EECS. Together, we will continue to shape the future into a bright and exciting place.

Digital Student Adviser to be Powered by Michigan + IBM

To become less frequent: With the launch of a new digital academic adviser, CS students will be able to access routine advising information from anywhere, not just in a prescribed setting.

Getting access to program information and referrals for more help – from course selection to career advice – is about to get a lot easier for computer science students.

A team of EECS researchers, in a $4.5 millon collaboration with IBM, are developing a cognitive system that will interact with people in multi-turn, goal-driven dialogues. As a test case for exploring the subject, the researchers will deploy a "digital academic adviser" for undergraduate computer science majors at the university in the near future.

It's an ambitious project that attempts to tackle one of the "grand challenges" of artificial intelligence: the creation of an intelligent system that can follow the flow of conversation and make appropriate suggestions, enabling people to interact more naturally and effectively with computing systems and to get value from those interactions. The EECS researchers, led by Prof. Satinder Singh Baveja, include Profs. Walter Lasecki, Honglak Lee, Jason Mars, Rada Mihalcea, Emily Mower Provost, Dragomir Radev, and Lingjia Tang.

In building the digital adviser, the team has captured and is annotating large volumes of approved recorded human-to-human conversations between undergraduates and their advisers on topics such as course selection, career advice, extracurricular recommendations, and homework resources. These will be used to train the system on how to respond to interactions with students, and ultimately to learn how to automatically navigate and successfully reply in conversations with those using the system.

Fully conversational systems involve multiple turns of a conversation with responses that can be imprecise and unclear. Understanding, contextualizing, and navigating these steps is one of the central challenges of the project. For this reason, the researchers are employing a combination of deep learning, machine learning, reinforcement learning, natural language understanding, knowledge representation, emotion analysis, and software technologies as they develop and train the system.

Even with all this powerful AI, the digital adviser isn't meant to replace human professionals who guide students along the academic and emotional journey that is college. Instead, students will be able to choose to talk to it for simple or routine questions, or to use it to plan for or complement a meeting with a human. For example, students might tell the system their preferences and receive course recommendations that advance them toward their degree. They could define broad career goals and get a good list of electives. They could hear an estimate of how many homework hours their class load might require, or be directed to extracurriculars that might help them land the kind of job they're after. The system will record conversations and at any point, it will be able to hand the session over to a human.

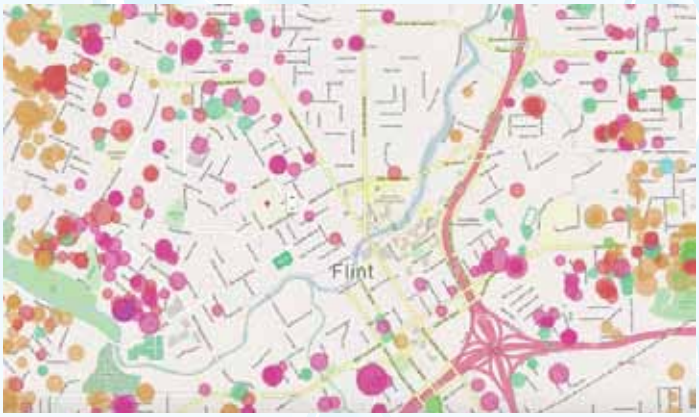
Prof. Satinder Singh Baveja, principal investigator, speaks with students about an artificial intelligence project.

The researchers anticipate that the innovations from the digital adviser could be embedded into cognitive systems across many industries to improve how they learn and codify human expertise, understand a user's intent and context, and deliver appropriate responses that direct conversations towards a stated goal. "What we are building has the potential to revolutionize how we interact with our computers and other devices such as our cars and our appliances," according to Prof. Baveja.

Full story: eecs.umich.edu/n/ibm

Digital Tools Developed to Help Manage Flint Water Crisis

In April 2014, Flint's drinking water source was changed from Lake Huron via Detroit's water system to the Flint River. The water supply was not properly monitored and treated for corrosion control which caused lead to leach from service lines into the city's drinking water, leading to the now well publicized Flint water crisis. Though the city has since switched its water supply back to the Detroit water system, residents are still dealing with the effects of this water crisis.



The tools pull from multiple datasets to provide new insights for mitigation of the water contamination.

To help inform recovery and mitigation decisions by the city of Flint, Google and the University of Michigan's Ann Arbor and Flint campuses partnered in early 2016 to identify and predict points of contamination and to create a smartphone app and other digital tools for use by Flint residents.

A student team at U-M-Flint developed a prototype smartphone app for use by Flint residents. Google and U-M Ann Arbor worked with the students through the spring and summer to add mapping features that use predictive analytics from U-M Ann Arbor's Michigan Data Science Team, which is advised by Prof. Jacob Abernethy. The team is also developing an improved user interface with assistance from Google.

"There's a lot of data on the water crisis, but it's scattered over many different agencies and places," said Prof. Abernethy. "By organizing it in one place and analyzing it, we can predict which areas are likely to be at risk and which infrastructure repairs will benefit residents the most."

The app and other tools help to predict where lead levels are highest in the city's water, and they pull together information and resources to make the crisis easier to navigate for those affected. The project has been made possible by a $150,000 grant from Google.

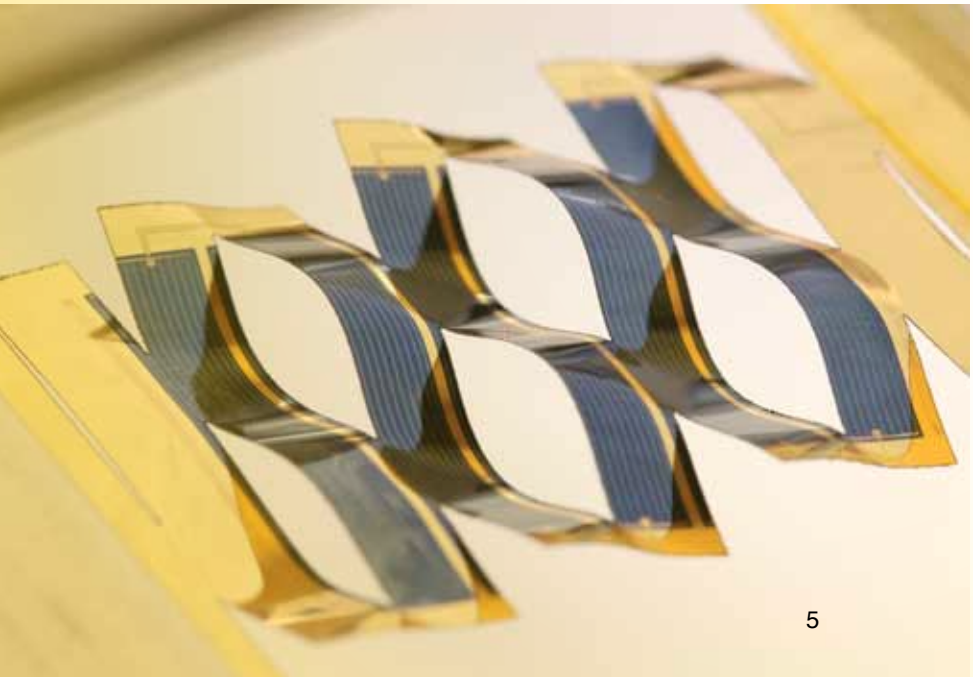
Full story: eecs.umich.edu/n/flint

ART-INSPIRED SOLAR CELLS TRACK THE SUN

Solar cells capture up to 40 percent more energy when they can track the sun across the sky, but conventional, motorized trackers are too heavy and bulky for pitched rooftops and vehicle surfaces. Residential rooftops make up about 85 percent of solar panel installations in the U.S., but these roofs would need significant reinforcing to support the weight of conventional sun-tracking systems.

Now, by borrowing from kirigami, the ancient Japanese art of paper cutting, Steve Forrest, Peter A. Franken Distinguished University Professor, Max Shtein (Materials Science and Engineering Dept.) and collaborators have developed lightweight solar cells that can flex and track the sun on their own. The cells take the functionality of a large, motorized solar cell and condense it into a flat device.

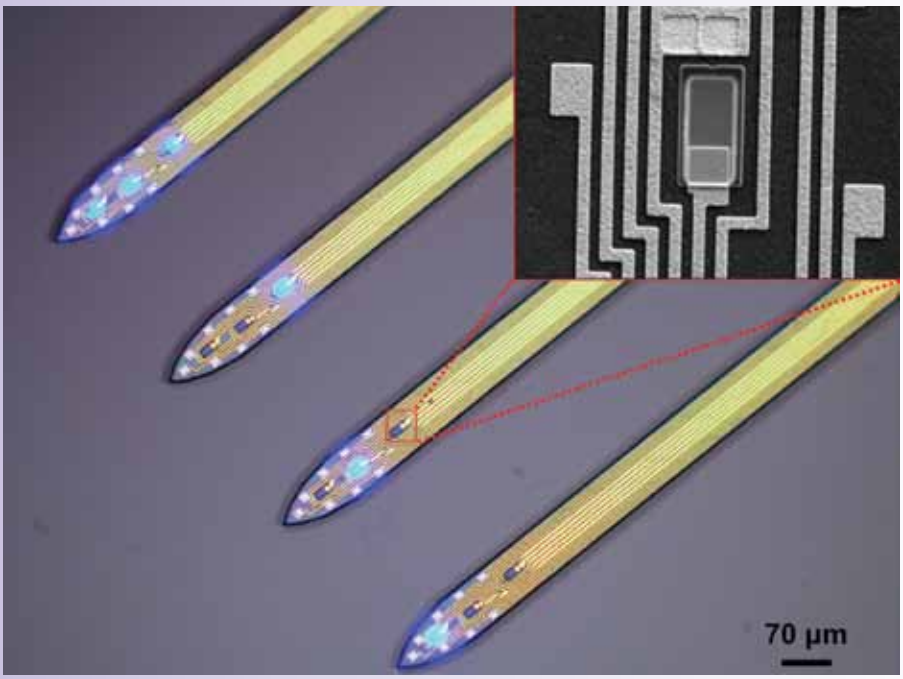
The kirigami cells are made of flexible, thin-film gallium arsenide strips that have been cut in a simple, two-dimensional pattern. When the cells are stretched, the pattern pops out and allows them to become three-dimensional, tracking the sun over a radius of about 120 degrees. The design is effective because it stretches easily, allowing a lot of tilt without losing much width. According to the team's simulations, it is almost as good as a conventional motorized tracker, offering a 36 percent improvement over a stationary panel.

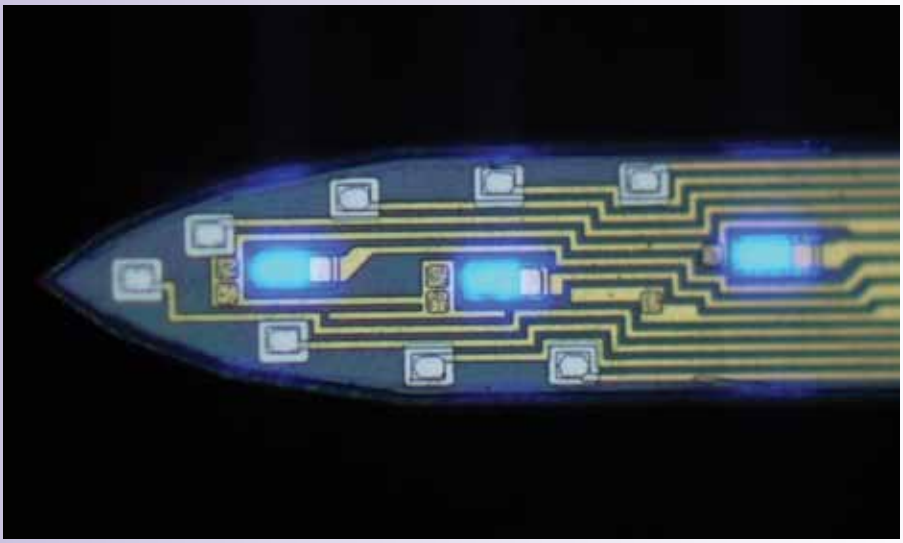


This technology could enable vast new deployment of efficient roof-top solar cells in the future, as well as aboard satellites and other aerospace applications.

Full story: eecs.umich.edu/n/kirigami

The Brain





Mapping the Brain With Neural Probes

With the help of light-emitting diodes as small as neurons, researchers are unlocking the secrets of neural pathways in the brain. The team, including Profs. Euisik Yoon, P.C. Ku, and Ken Wise from Michigan and Gÿorgy Buzsáki from New York University School of Medicine, anticipates that experiments using probes based on their design could lead to breakthroughs in understanding and treating neurological diseases such as Alzheimer's. That's a long-term goal. Before that can happen, there is much information about the workings of the brain that needs to be unraveled.

The researchers built neural probes that hold what are believed to be the smallest implantable LEDs ever made, and have already tested them in mice. The light of the LEDs is used to turn the neurons on and off – a process known as optogenetics. The new probes not only help reveal which regions of the brain are responsible for which behaviors, they also reveal how the neurons communicate with one another – a breakthrough in this technology.

"Hundreds of millions of people suffer from neurological diseases, but treatment methods and drugs are currently very limited because scientific understanding of the brain is lacking," said Fan Wu, a postdoctoral researcher. "We have developed a tool that is needed to better understand how the brain works—and why it doesn't work—to try to solve these problems."

The research was described in the paper, "Monolithically Integrated µLEDs on Silicon Neural Probes for High-Resolution Optogenetic Studies in Behaving Animals," *Neuron.*

Full story: eecs.umich.edu/n/brain-probe

A Dream Team for Brain Research and Education

Michigan is leading a "dream team" of experts in sensors, electronics, data analysis, and neuroscience to help unravel the mysteries of the brain and cross-train an international group of neuroscientists and engineers. Funding for this International Program for the Advancement of Neurotechnology (IPAN) is provided under the Partnerships for International Research and Education program.

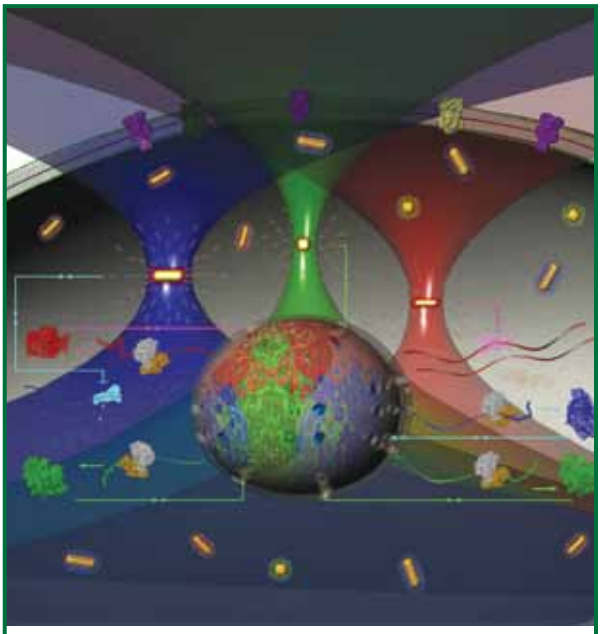
"The goal of all of this is better health care," said Kensall Wise, William Gould Dow Distinguished University Professor Emeritus of EECS and co-leader of IPAN. "By bringing together people with different approaches and expertise, the result could be a quantum leap forward in neuroscience and our understanding of the brain."

Leading this dream team are Prof. Euisik Yoon (Director), Prof. Wise (Neurotechnology Lead), Prof. György Busáki of New York University (Neuroscience Lead), Dr. Edward Stuenkel, professor of Molecular & Integrative Physiology and Director of the Neuroscience Graduate Program (Education and Outreach Director), and Dr. John Seymour (Infrastructure and Prototyping). Eight institutions within the U.S. and around the world are partners in the educational initiative: University of Michigan, New York University School of Medicine, Janelia Farm Research Campus, University of Freiburg, University of Hamburg-Eppendorf, Korea Institute of Science and Technology, Institute for Microelectronics in Singapore, and University College in England.

By the end of the five-year project, neuroscientists should regularly be able to stimulate and measure a thousand neurons at a time using the new technology. In the process, they'll better understand how memories are stored and retrieved, how fear is learned and evolves over time, how signals from nerves are processed for sensing, and how activity patterns in early life affect adult brain activity.

Profs. Yoon and Busáki are also part of a pilot program at Michigan, funded by the Kavli Foundation, that will regularly bring together researchers with complementary expertise from different universities to collaborate on advancing research to better understand the human brain and the diseases that affect it.

Full story: eecs.umich.edu/n/brain-ed

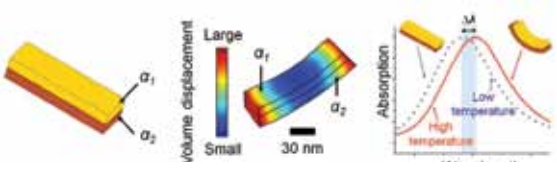


Understanding the Building Blocks of Life With Bioplasmonics

Prof. Somin Lee is working to better our understanding of how tissues form distinct shapes and structures to become organs, such as lungs, salivary glands, and mammary glands. This understanding will ultimately facilitate new strategies to engineer replacement tissues. Specifically, she is developing novel tools, including an optomechanical plasmonic nanoantenna, to measure the temperature of proteins in cells.

As Director of the Bioplasmonics Group, Prof. Lee works at the interface between life science, physical science and engineering, drawing from a combination of bottom-up and top-down nanofabrication approaches, to design and develop smart biophotonic technologies and uncover biological complexities in the development of tissues and in cancer.

Prof. Lee received a Young Investigator Award from the Air Force Office of Scientific Research (AFOSR) to support this research.



This image is taken from the article, "Thermo-responsive mechano-optical plasmonic nano-antenna," by Yunbo Liu, Younggeun Park, and Prof. Somin Eunice Lee, published in Applied Physics Letters. It is a concept drawing for a mechano-optical plasmonic nano-antenna for temperature mapping.

MARLO'S on the Move

After a series of setbacks including mechanical and technical failures, Michigan's bipedal robot called MARLO is navigating steep slopes, snow, and uneven terrains with her 3D walking, with no signs of stopping. She has the elegant feedback control algorithms developed by her handlers to thank, algorithms that should be able to help other two-legged robots, as well as powered prosthetic legs, gain similar capabilities.

MARLO's taking over for MABEL, her older "sister" that required a lateral boom for stability. MABEL is retired, and still on tour with the Chicago Field Museum.

MARLO is controlled with two 2D algorithms developed by doctoral student Xingye (Dennis) Da. The main controller handles the forward and backward motion and balance, while a second controller handles side-to-side balance. An Xbox controller tells MARLO how quickly to walk and in what direction, but the rest is up to her. MARLO demonstrated this algorithm in tests walking through snow, down a steep hill, and on randomly stacked plywood squares covered in astroturf and littered with more obstacles.

Before graduating, Brent Griffin (PhD EE:Systems 2016) had been developing a fully 3D controller to make MARLO more agile.

The code that Prof. Grizzle's team developed to make MARLO walk on flat ground serves as the basis for algorithms developed in other robotic labs. For example, Robert Gregg, an assistant professor of mechanical engineering and bioengineering at the University of Texas, Dallas, adapted the algorithm to control a prosthetic lower leg. When an amputee tried out Gregg's robotic prosthetic leg on a treadmill, he was able to walk naturally.

Next on the horizon for MARLO may be the incorporation of computer vision to increase her ability to navigate changing terrain, and possibly even a new robot. Prof. Grizzle says with his "wickedly creative" team, "we'll just try to keep up with all the action."

"The major product of our research is a recipe for legged locomotion. We try to write it precisely and generally enough that others can use it, and they don't have to call us up and say, 'What's the special sauce?'"

— Jessy Grizzle, Elmer G. Gilbert Distinguished University Professor and Jerry W. and Carol L. Levin Professor of Engineering

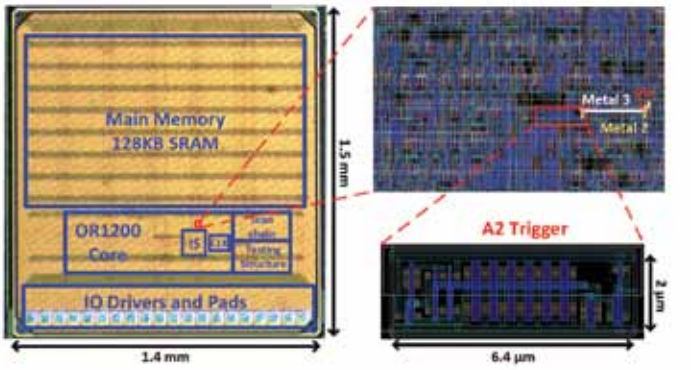
Everyone Loves MARLO

Two-legged robot Marlo robot handles uneven terrain

11 May 2016 Last updated at 13:09 BST

The story of MARLO navigating the U-M Wave Field started out on popular tech blogs and magazines like *Engadget, Popular Science, VICE Motherboard, Gizmag* and *CNET.* It was also covered by international English language publications such as the *Daily Mail, International Business Times*, the *BBC*, and the *Canadian Discovery Channel (Daily Planet show)*. Other international coverage included French, Danish, and Czech sites.

Full story: eecs.umich.edu/n/marlo2



Undetectable Backdoor Can Be Hidden in Computer Chips

The research team of Profs. Todd Austin and Dennis Sylvester, Dr. Matthew Hicks, and graduate students Kaiyuan Yang and Qing Dong has demonstrated that undetectable malicious modifications can be made to a new chip design during post-fabrication testing, and that the resultant "backdoor" circuit can later be activated to gain access to the operating system. As a demonstration, they built a chip containing just such a circuit.

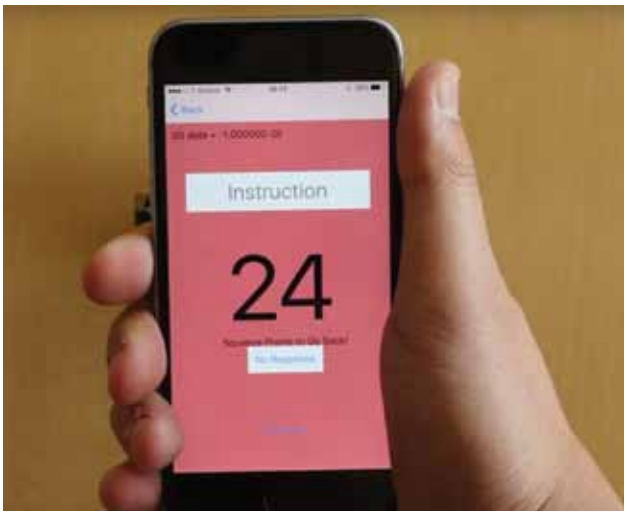
While the move to smaller transistors and increased density has boosted performance, it has dramatically increased the cost to fabricate chips using those smaller transistors. This has forced the majority of chip design companies to trust a third party to fabricate their design. To guard against shipping chips with errors (intentional or otherwise), chip design companies rely on post-fabrication testing. However, the researchers show how a rogue employee could insert a single, unremarkable circuit into a chip's design during test that will not initially do anything and therefore will not be detected.

The attack leverages analog circuits to create a hardware attack that is small, requiring as little as one gate; and stealthy, requiring an unlikely trigger sequence before effecting a chip's functionality. Their malicious circuit is designed to act as a capacitor, and each time a malicious program runs a certain, obscure command, that capacitor stores a very small amount of electric charge and stores it in the circuit's wires without otherwise affecting the chip's operation. After a number of such commands, the circuit eventually charges and flips a bit, allowing a malicious program to take control.

The researchers implemented this attack in an OR1200 processor and fabricated it on a chip. Their experimental results show that the attacks work, show that the attacks elude activation by a diverse set of benchmarks, and suggest that the attacks evade known defenses.

The researchers received a distinguished practical paper award for their paper on the subject, "A2: Analog Malicious Hardware," at the *2016 IEEE Security and Privacy Conference*.

Full story: eecs.umich.edu/n/chip



ForcePhone Software Enables Mobile Devices to Respond to Pressure

Researchers led by Kang G. Shin, Kevin and Nancy O'Connor Professor of Computer Science, and graduate student Yu-Chih Tung have developed ForcePhone, a new software-only technology that allows smartphones without special screens or sensors to gain the ability to react to force and pressure.

The software could enable users to call 911 by squeezing the body of a phone, or to push a bit harder on a screen button to unlock a menu of additional options, similar to right-clicking with a mouse. The developers envision these and many other uses for their technology.

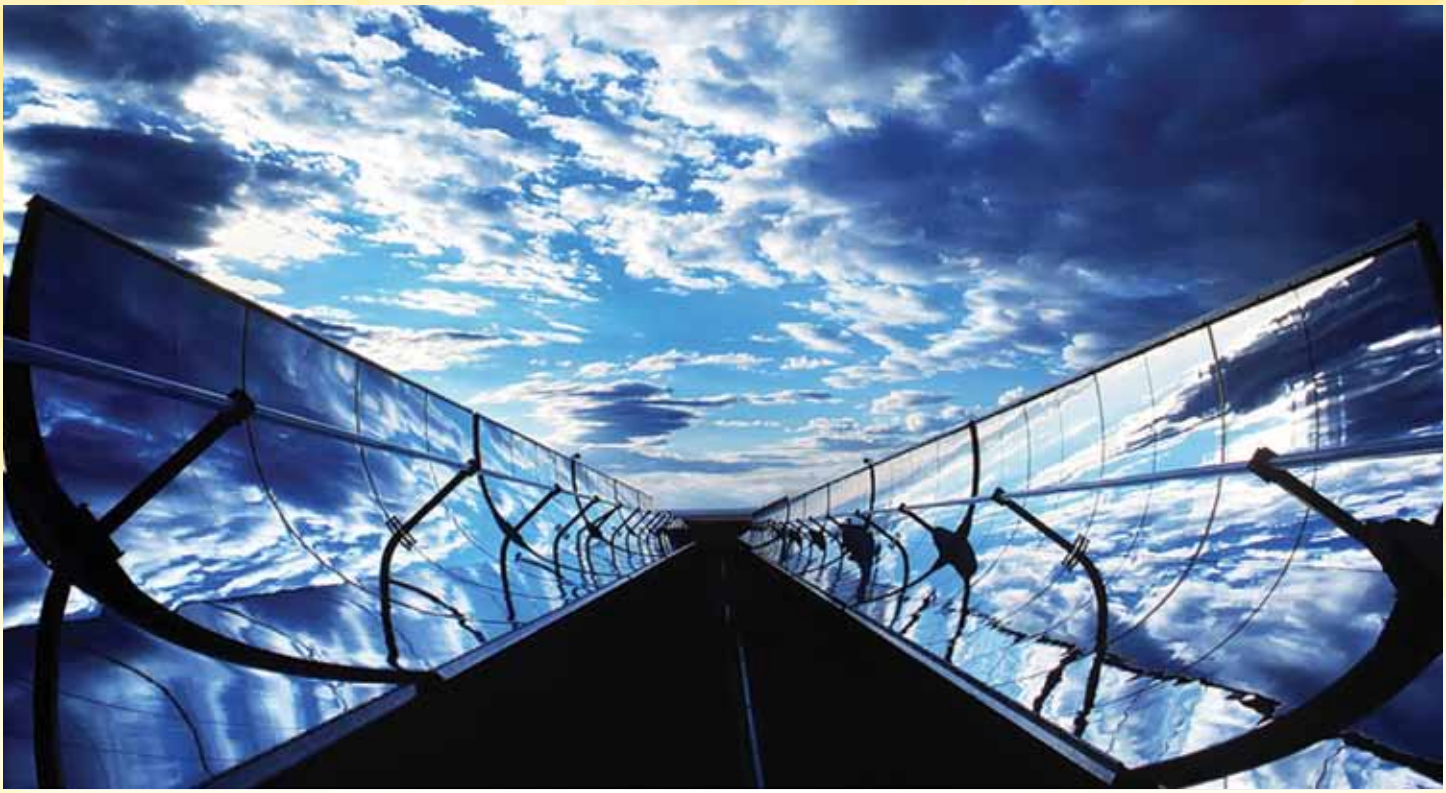
ForcePhone works by causing the phone's speaker to emit an inaudible tone at a frequency higher than 18 kHz, which is outside the range of human hearing. The phone's mic picks up the vibration caused by the sound. When a user presses on the screen or squeezes the phone's body, that force changes the tone, and the software translates any tone changes into commands.

"Having expensive and bulky sensors installed into smartphones can solve every problem we have solved, but the added cost and laborious installation prevent phone manufacturers from doing it," Tung said. "Our sound-based solution can fill this gap, providing the functionality without making any hardware modification. Everything is just software."

ForcePhone is the third piece of software based on the idea of using sound. Previously, Shin and Tung created BumpAlert, an Android application designed to warn distracted pedestrians of objects in their path, and EchoTag, which let phones tag and remember specific indoor locations and associate those places with certain modes or tasks.

Full story: eecs.umich.edu/n/forcephone

Cheap Solar Power With Nano-Structured Solar Concentrators



A solar thermal field at Sandia National Laboratory. Image credit: Randy Montoya

Nanotechnology could reduce the cost of the most expensive part of a solar thermal power plant by roughly 75 percent.

Prof. Jay Guo is collaborating on a project with the University of Illinois Urbana-Champagne and the National Renewable Energy Laboratory to develop new solar concentrators that will control sunlight in a way that's not currently possible by developing a specially created metasurface. This metasurface will be used to develop a planar focusing collector (PFC) as a lower cost alternative to conventional methods.

The researchers plan to concentrate sunlight with a flat, nanostructured surface. By patterning this metasurface with features on the scale of the light waves themselves, the team will be able to control the light in a way that isn't possible with natural crystals or reflective surfaces. The flat light concentrator will also be significantly lighter and more wind resistant than current mirrors.

Critical to the work will be the scalability of the designed PFC to large-area structures. The team intends to prove that they can be mass-produced with a printing-press-like manufacturing technique, pioneered by Prof. Guo.

"Our manufacturing process has gained much attention in recent years as it promises fast, low-cost production of nano-structured surfaces," said Prof. Guo. "It is 10 to 100 times faster than conventional nano-patterning methods, yet it has an equally high resolution. If we print metasurfaces over large areas, we can produce very inexpensive solar concentrators."

The research, led by Prof. Kimani Toussaint at UIUC, is funded by the U.S. Department of Energy Solar Energy Technologies Office, whose ultimate goal is to make solar energy cost-competitive with other forms of electricity by the end of the decade.

Full story: eecs.umich.edu/n/cheap-solar

Proxy Optimizes Webpage Loading for Better User Experience

Though the use of smartphones to access the web has skyrocketed, loading a web page even on state-of-the-art devices remains painfully slow. Despite constant improvements in smartphone technology and cellular network bandwidth, this problem is unlikely to go away in the near future due to two conflicting trends. On one hand, user tolerance of web page load times continue to decrease, e.g., 71% of smartphone users expect websites to load as quickly as on their desktops. On the other hand, users expect richer content on the websites they access, and as a result, the amount of content on the average web page has increased from 700 KB in 2011 to 2.3 MB in 2016.

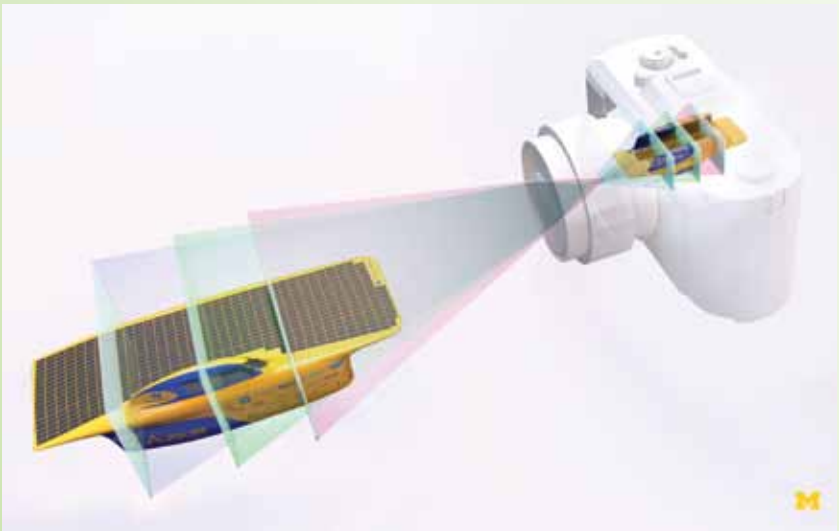
To address these two conflicting trends without having to redesign the web from scratch, Prof. Harsha V. Madhyastha's research group has developed a new web proxy called Klotski. The key insight is that, since a typical web page cannot be loaded completely within a time that users consider reasonable – after all, the time within which all the bytes on a page can be fetched is constrained by the latency and bandwidth of the network – Klotski instead seeks to improve users' perception of how quickly a page loads by maximizing the amount of important content on the page that is fetched and displayed within the user's attention span, where importance is determined based on user preferences. To achieve this goal, Klotski continually loads web pages in the background, building a compact per-page fingerprint which summarizes the content on the page. Then, when a user loads a web page via Klotski, it modifies the order in which resources on the page are fetched and delivered to the client; Klotski uses the previously computed fingerprint for the page to selectively fetch resources important to the user before others. Klotski is compatible with legacy browsers and websites, and experimental results show that Klotski increases the fraction of important resources delivered within 2 seconds – a typical user's attention span – from 25% to 60% on the median web page.

Full story: eecs.umich.edu/n/web-proxy

A Better 3D Camera With the Power of Graphene

Faculty are developing a camera that can record 3D images and video better than anything currently on the market. 3D cameras are useful for a variety of applications including imaging of cells and tissues for accurate diagnoses, 3D movie filming and, eventually, virtual reality. While 3D films are currently made using multiple cameras to reconstruct each frame, this new type of camera could record in 3D on its own.

The secret to the improved technology involves doing away with traditional micro-lenses in favor of a series of transparent light detectors. This method works because objects at different distances from the lens will come into focus at different points inside the camera. Thus, objects will appear brightest where they are most in focus. Using this principle, it is much easier for the computer to reconstruct the images. This faster processing also makes it possible to produce high speed and high-resolution video.



The challenge is making the transparent light detectors. Typically, the detector needs to absorb as much light as possible to give the most detailed image. However, a material called graphene, which is a single layer of carbon atoms, can be fashioned into a highly sensitive light detector that allows much of the light to pass through.

The team, consisting of Ted Norris, Gérard A. Mourou Professor of EECS, Prof. Zhaohui Zhong, and Jeffrey Fessler, William L. Root Professor of EECS, is considering an SLR-sized camera to begin with, but it may be possible to one day squeeze 3D-camera capability into a smartphone.

Full story: eecs.umich.edu/n/3dcamera

Plug and Play Cyber-Physical Systems Make Testing Cheap

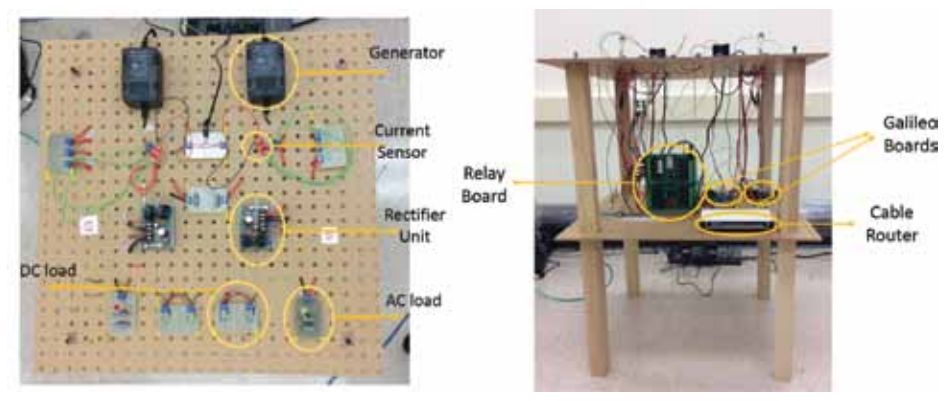
Cyber-physical systems (CPS) are smart, networked systems with embedded sensors, processors, and actuators that are designed to interact with the physical world. Complex, networked, distributed CPS are emerging in many safety-critical areas, such as aerospace and automotive.

Extensive testing and fine-tuning of these systems is required to ensure that the final product satisfies the design objectives. This testing is time-consuming and expensive, and systems are only becoming more complex.

Prof. Necmiye Ozay plans to develop a “plug and play” integration framework for CPS supported by automated design tools, where one can replace a subsystem with another one or perform upgrades to subsystems without the need for lengthy, expensive tests afterwards. If successful, this method of designing CPS will cut down the testing pipeline and transform industries that rely on them.

This research will affect a wide variety of safety-critical and autonomous systems, including next generation air vehicles, automotive systems, robotics and smart manufacturing. Prof. Ozay earned an NSF CAREER award for her work, titled “A Compositional Approach to Modular Cyber-Physical Control System Design.”

Full story: eecs.umich.edu/n/cps-ozay



Aircraft electric power system testbed developed in Prof. Ozay’s lab.

Building a Uniform Approach to Cyber-Physical Systems

Today’s design tools that handle the demands for safety, security, performance, and certification of many critical systems are inadequate, and rely on case-by-case solutions. Prof. Stéphane Lafortune and doctoral student Xiang Yin have developed a uniform approach to controlling these systems that can be applied to a variety of requirements while accounting for sensor noise, environmental disturbances, and other limitations.

This project focuses on discrete-event systems, an important class of cyber-physical systems (CPS) where the system’s behavior is driven by events over time. These CPS involve physical elements, like cars, aircraft, or power plants, that are controlled by computers on a network.

This project has already solved a problem of controller synthesis that has remained open in the field for more than 25 years. The next step is to develop an approach to optimizing sensor use based on energy, bandwidth, and security constraints. Prof. Lafortune and Yin also propose methods to deal with large-scale networked systems, where the information structure is decentralized and physical components widely distributed. A software tool that implements the algorithms developed in this project is under development and will be made publicly available.

Full story: eecs.umich.edu/n/cps

Security Flaws Found in SmartThings Connected Home System

Prof. Atul Prakash and CSE graduate student Earlence Fernandes have demonstrated that the emerging field of smart home automation contains potentially serious security pitfalls. The researchers were able to hack into an experimental set-up Samsung's SmartThings – a top-selling Internet of Things platform for consumers that includes controls for door locks, lights, window shades, motion sensors, fire alarms, entertainment systems, and more – and gain complete control of the system. The work is believed to be the first platform-wide study of a real-world connected home system.

Is this smart home secure... or vulnerable?

The researchers performed a security analysis of the SmartThings' programming framework and to show the impact of the flaws they found, they conducted four successful proof-of-concept attacks, allowing them to steal and reset door lock PINs, create "spare keys" for locks, turn off "vacation mode," and set off a fire alarm.

One common problem the researchers uncovered was that the platform grants its SmartApps too much access to devices and to the messages those devices generate. The researchers call this "over-privilege." More than 40 percent of the nearly 500 apps they examined were granted capabilities the developers did not specify in their code. The researchers also found that it is possible for app developers to deploy OAuth authentication incorrectly, which allowed them to program a secret spare key for door locks. Finally, the event subsystem on the platform is insecure, which allowed the researchers to inject erroneous events to trick devices.

These results have implications for all smart home systems, and even the broader Internet of Things. "The bottom line is that it's not easy to secure these systems," said Prakash. "There are multiple layers in the software stack and we found vulnerabilities across them, making fixes difficult."

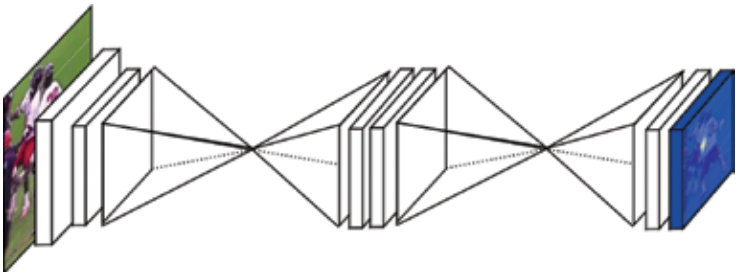
The researchers received a distinguished practical paper award for their paper on the subject, "Security Analysis of Emerging Smart Home Applications," at the *2016 IEEE Security and Privacy Conference*.

Full story: eecs.umich.edu/n/smartthings

Researchers Make Strides Toward Improving Image Understanding

Researchers led by Prof. Jia Deng are working on a number of challenges related to visual recognition. Two recent projects have related to human pose estimation and recovering depth information from single images.

Human pose estimation is useful for higher level tasks like action recognition, and it serves as a fundamental tool in diverse fields from human-computer interaction to animation. To accurately identify pose, the researchers developed a "stacked hourglass" architecture that employs successive steps of pooling and upsampling to produce a final set of estimates. In doing so, they use Convolutional Neural Networks to achieve a significant improvement on the state-of-the-art for two standard pose estimation benchmarks, FLIC and MPII Human Pose. On FLIC, the error rate of the elbow is reduced from 4.7% to 1.8%. Using MPII, the new technique renders a 2-3% improvement across difficult joints up from the most recently available results. There are still difficulties that the network does not handle perfectly, though it shows robust performance for people in close proximity and in heavy occlusion.



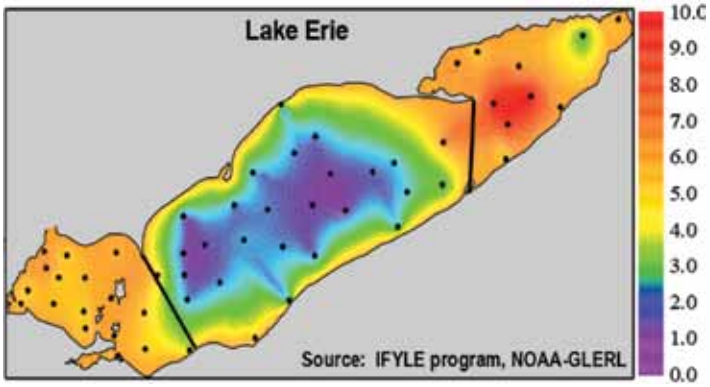
The researchers' network for pose estimation consists of two stacked hourglass models which allow repeated bottom-up, top-down inference.

The second project aims to recover depth from a single RGB image taken in unconstrained settings, which is a fundamental challenge for vision systems. To do so, the researchers introduced a new dataset called "Depth in the Wild" which consists of 495,000 images in the wild annotated with relative depth between pairs of random points for use as an evaluation benchmark. Next, they developed a new algorithm that learns to estimate metric depth using annotations of relative depth. The algorithm consists of a single deep network that directly predicts pixel-wise depth. The network takes an entire image as input and consists of off-the-shelf components (convolution, max pooling, downsampling, upsampling). Its novelty lies in the combination of two ingredients: a multiscale deep network that produces pixel-wise prediction of metric depth and a loss function using relative depth.

Compared to the prior state of the art, the new algorithm is simpler and performs better. A number of documented experiments show that, when combined with existing RGB-D data and the new relative depth annotations, the new algorithm significantly improves single-image depth perception in the wild.

Patching the Holes in Big Data

As the world generates more and more data, researchers, healthcare workers, economists, and others are faced with the daunting challenge of finding meaning in the noise. Prof. Laura Balzano's research is focused on this area of "big data," developing new algorithms for learning simple structure from large and complex datasets with applications in network monitoring, sensor networks, and collaborative filtering.



Prof. Balzano's lab is working to determine the best places to monitor Lake Erie's water quality in order to provide accurate data for the entire lake.

Traditional tools for data analysis often require that the data be carefully cleaned first by a domain expert. The work done by Prof. Balzano and her lab will allow us to make predictions and inferences from data in real time – despite any outliers, faulty measurements, and missing data.

One application of this work is in creating a 3D model for objects using only 2D images (photographs) of the object from different angles. This is done by automatically finding points on the object that are visible in many different images. Another application is in environmental engineering, where the lab has demonstrated algorithms to automatically calibrate large networks of sensors that are monitoring a lake environment.

Prof. Balzano earned an Intel Early Career Faculty Honor Program award for this work. Intel is one of many organizations collecting more and more data using sensors that have been deployed in mobile and hand-held devices, including data collected in harsh environments in real-time.

Full story: eecs.umich.edu/n/dataholes

Improving Human Transcription Latency With Automated Speech Recognition

A team of four researchers, including Prof. Walter Lasecki, has explored the effects of automated speech recognition (ASR) quality on its utility as a starting point for human transcription.

Transcription makes speech accessible to deaf and hard of hearing people. Despite high cost, converting speech to text is still done manually by human experts in most real-world settings because the quality of automated speech recognition (ASR) is still too low. Manual conversion can require more than 5 times the original audio time, which also introduces significant latency. Giving transcriptionists ASR output as a starting point seems like a reasonable approach to making humans more efficient and thereby reducing this cost, but the effectiveness of this approach is related to the quality of the speech recognition output. At high error rates, fixing inaccurate speech recognition output may take longer than producing the transcription from scratch, and transcriptionists may not always realize when transcription output is too inaccurate to be useful.

The transcription interface used in the study. The text-box is pre-populated with ASR captions. Participants could use shortcut keys to control the audio playback.

Their results matched their expectations that ASR is most useful as a starting point when it is fairly accurate. By examining worker behavior, they identified common strategies that workers use with transcription starting points of different qualities. Insight into how workers correct transcript will enable them to design captioning interface to aid their productivity.

The researchers' work was recognized with a Best Paper Award at the *2016 Web for All Conference*.

Full story: eecs.umich.edu/n/asr

Significant New Collaboration With Toyota on Autonomous Vehicle Technologies

The University of Michigan is collaborating with Toyota as the company establishes a major autonomous vehicle research base in Ann Arbor. Part of a $1 billion investment by TRI, the Ann Arbor facility opened in June with 50 employees and is Toyota's third U.S. location. It joins others established recently in Palo Alto working with Stanford and in Cambridge with MIT.

Through TRI, Toyota will fund research in artificial intelligence and robotics to support fully autonomous and chauffeured driving.

Profs. Edwin Olson (EECS) and Ryan Eustice (NAME, with an appointment in EECS) have joined TRI as area leads, where Olson is leading the perception team and Eustice the mapping/localization team. Both are now based at TRI's Ann Arbor office and retain U-M faculty appointments. The two researchers have collaborated for years on autonomous driving systems.

"Sensor hardware and algorithms are improving at a tremendous pace," according to Olson. "TRI will push the frontier even further, resulting in safer vehicles on the road and more helpful robots in the home."

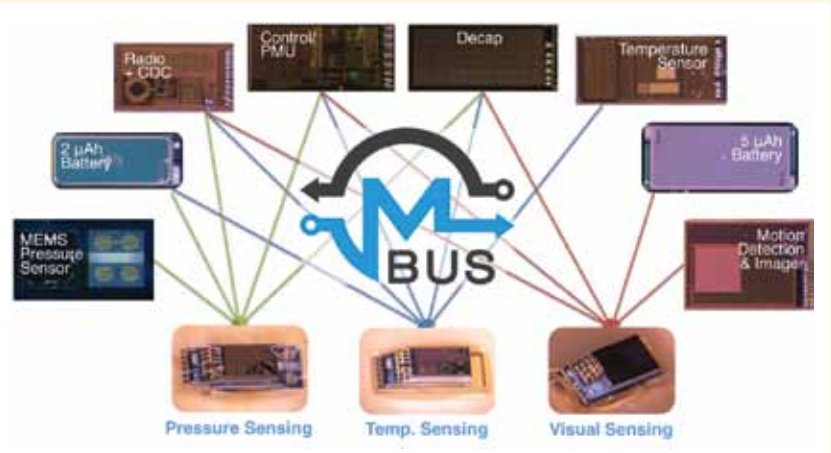
Adds Eustice, "Ann Arbor is a fantastic location for TRI to expand its autonomous driving efforts. We will benefit from Toyota's existing team and U-M's research talent and facilities, where we can perform extreme-limit testing in a wide variety of environments, including at Mcity."

Full story: eecs.umich.edu/n/toyota

MBus is the Missing Interconnect for Millimeter-Scale Systems

Researchers including Profs. David Blaauw, Ron Dreslinski, and Prabal Dutta; graduate students Patrick Pannuto and Benjamin Kempke; research scientist Ye-Sheng Kuo and others have introduced MBus, a chip-to-chip interconnect that facilitates ultra-low power (10's of uW active) system operation for ultra-constrained systems. MBus has been designed to work with millimeter-scale systems such as the Michigan Micro Mote (M^3), the world's smallest computer that was designed in EECS. The M^3 measures less than a half a centimeter and is a fully autonomous computing system.

Unlike current devices such as laptops and smartphones that put components into a low-power standby state to save energy, so-called "dark silicon," M^3 systems power off components completely – "pitch black silicon" – so that no energy is wasted. Unfortunately, this makes it challenging for components to boot up and reliably talk to each other. MBus addresses this by acting as a "power-aware" interconnect, taking over the power management of components. Since MBus controls the power state of each component, it can provide the appearance that components are always on by waking them before delivering messages. By offloading power management to the interconnect, it also enables traditional components that are not power aware to benefit from the energy efficiency of ultra-low power chips. MBus is a multi-master bus supporting an arbitrary number of nodes, priority arbitration, efficient acknowledgements, and extensible addressing, with only four wires and consuming only 3.5 pJ/bit/chip.



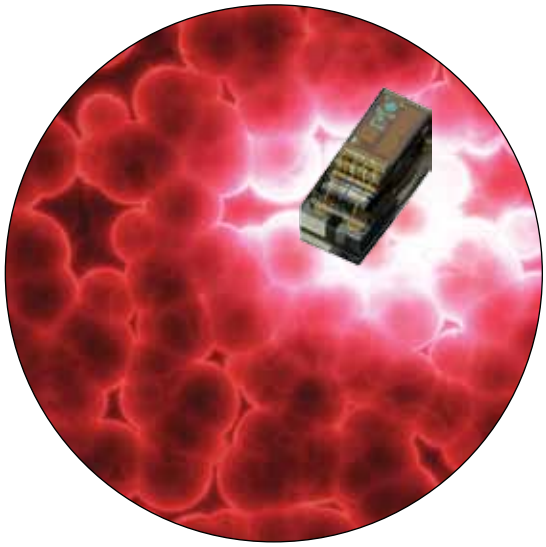
The M^3 project now implements MBus frontends in all its chips – over a dozen different designs that can mix and match into a diverse and growing ecosystem of microscale systems. MBus has proven itself as a viable interconnect for the next class of computing devices.

The researchers' paper on MBus, "MBus: An Ultra-Low Power Interconnect Bus for Next Generation Nanopower Systems," was selected as one of *IEEE Micro's* Top Picks for 2016.

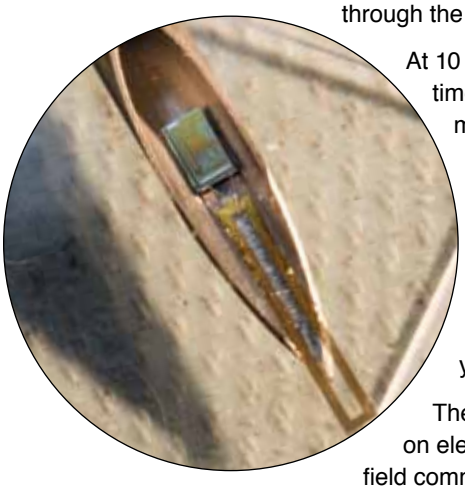
Full story: eecs.umich.edu/n/mbus

World's Smallest Computer Curing the Body From the Inside Out

When a team of Michigan engineers achieved the long-awaited "smart dust" with their millimeter-scale computer sensing systems, known as the Michigan Micro Mote (M^3), they knew it would take an entire scientific community to explore the many ways it could be incorporated into our world. One of its first intended applications was as an intraocular pressure sensor, and the team is continuing on a fantastic voyage of discovering new medical uses for these miniature devices.



Profs. David Blaauw, David Wenzloff, and Hun-Seok Kim are designing millimeter-scale ultra-low-power sensing systems that can be injected into the body through a syringe. Unlike other radios of this size, these new devices are able to broadcast through the human body to an external receiver.



At 10 cubic millimeters, the computer is 100 times smaller than typical implantable medical devices like pacemakers. Pacemakers require surgery to be put in place. This system might one day be deployable with a simple shot.

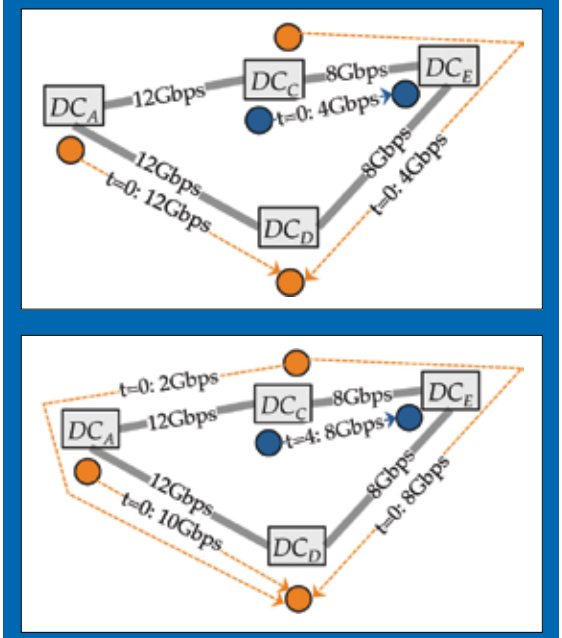
Its key innovation is an ultra-small two-way radio that can broadcast through muscle tissue to a receiver nearly 20 inches away — far enough to send signals to a cell phone in your pocket or a nightstand while you sleep.

The radio was specifically designed to talk through tissue, said Prof. Wentzloff. It doesn't rely on electromagnetic radiation, as typical radios do. It uses magnetic signals. "It's similar to near-field communications, like what's used in Apple Pay," Wentzloff said.

A typical radio would need an antenna larger than the computer itself to transmit more than a few centimeters, and more power than could be generated from the tiny battery alone. To achieve the burst of power needed to transmit the data, the team integrated a capacitor into the device that is able to gradually build up a sufficient amount of power from the tiny battery before passing it along to the antenna, enabling data transmission in periodic bursts.

The computer is one of a class of computers known as the Michigan Micro Mote (M^3), developed by researchers in the Michigan Integrated Circuits Lab. The M^3 is currently the world's smallest computer. This platform has enabled a variety of sensors that can fit inside the human body, made possible by several breakthroughs in ultra-low-power computing.

This research was presented at the *2016 International Solid-State Circuits Conference (ISSCC)*. The researchers envision a host of medical applications.



Developing Improved Analytics for Geo-Distributed Datasets

Prof. Mosharaf Chowdhury and his collaborator Prof. Aditya Akella from the Dept. of Computer Sciences at the University of Wisconsin-Madison aim to create a new software stack for analytics over geo-distributed datasets.

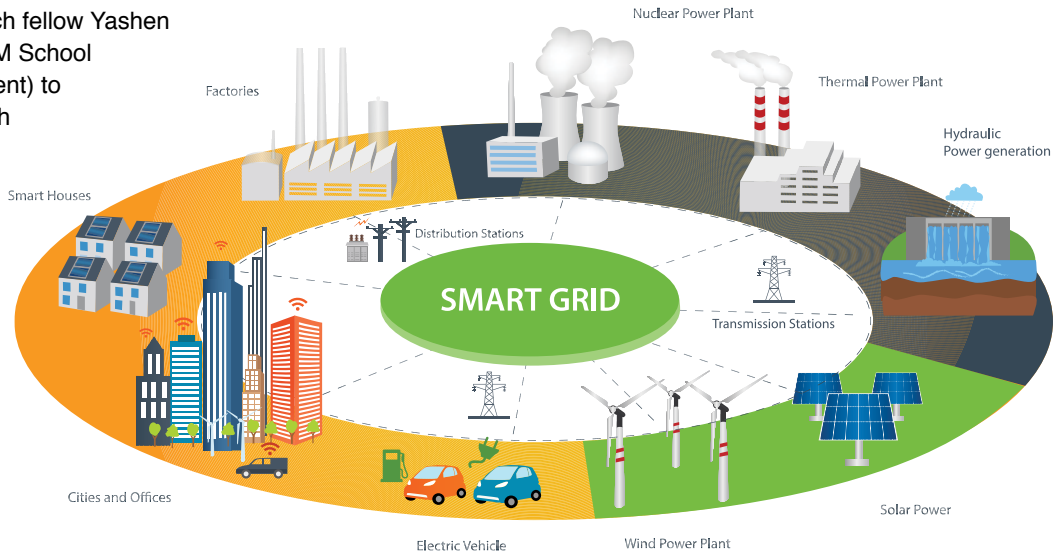
To ensure high performance in the face of potential data movement constraints, limited wide area network (WAN) bandwidth, and high WAN latencies, the authors advocate application-network symbiosis wherein query optimizers are aware of WAN bottlenecks and variance in WAN capacity, and the network routes and schedules data transfers to directly improve application-level performance.

The researchers' approach represents an improvement over existing techniques, which focus on improving individual layers of big data stacks to meet specific objectives such as minimizing bandwidth usage. In such systems, different layers of the analytics stack act independently and can take contradictory decisions, canceling each other out. This work is funded by Google.

Full story: eecs.umich.edu/n/geo

Storing Energy in an Environmentally Friendly Way

As more and more renewable energy sources are introduced to the power grid, new measures are needed to make sure the system can remain balanced. One option to help counter the unreliability of solar and wind power is distributed energy storage. However, Prof. Johanna Mathieu has discovered that adding storage to the existing power grid does not necessarily result in net environmental benefits. She is working with research fellow Yashen Lin and Prof. Jeremiah Johnson (U-M School of Natural Resources and Environment) to determine the conditions under which adding storage decreases or increases greenhouse gas emissions.



Many technologies can be used as distributed energy storage, such as batteries. Because energy storage systems typically don't produce any emissions, like CO_2, while they're being operated users often assume that they're a clean option. But the use of these systems can alter the grid operation, for example, by changing the mix of coal and natural gas power plants dispatched to provide energy. Prof. Mathieu and Dr. Lin are using optimal power flow analysis and life cycle assessment to determine what the extent of these consequences may be, and developing operational algorithms to ensure that adding distributed energy storage to grids doesn't increase emissions.

The results of this research can help us better understand how distributed energy storage affects the environmental impact of a power system. The ultimate goal is to develop methods that ensure environmentally-friendly integration of renewable power and storage.

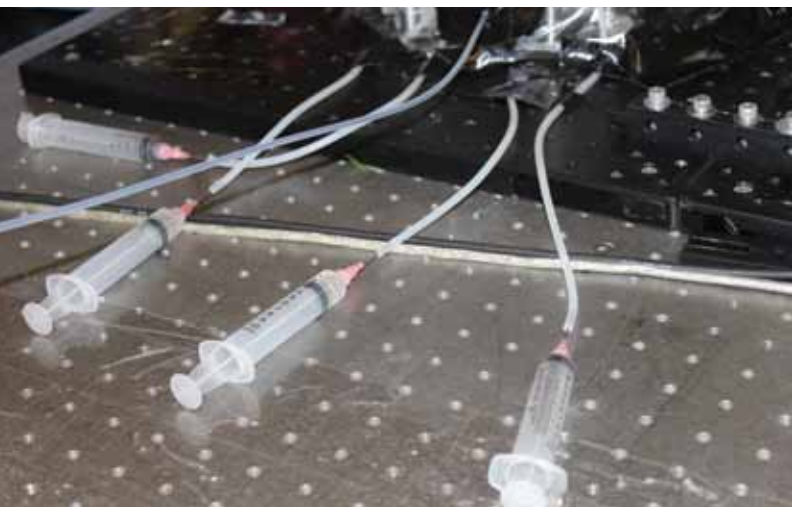
Full story: eecs.umich.edu/n/des

Glucose Monitoring With Lasers

An estimated 200 million people with diabetes might one day utilize laser research from ECE to painlessly read their glucose levels. Prof. Mohammed Islam is repurposing powerful super continuum lasers to measure the trace amounts of glucose in the bloodstream.

Previously designed to aid the military in detecting explosives and camouflage nets, these lasers can make drawing blood samples a thing of the past for diabetic patients. While previous light-based techniques to collect these measurements non-invasively relied on tungsten halogen lamps, these bright lasers provide a signal several orders of magnitude more powerful. Eventually, Prof. Islam envisions replacing the lasers with LEDs attached to an easy to use headset. These light sensors would be placed near the ears, where heavy bloodflow would allow for easier and more accurate measurements.

Full story + video: eecs.umich.edu/n/glucose



Security on the Internet

Prof. J. Alex Halderman has led a number of efforts in the past year aimed at exposing notable security shortcomings on the Internet – and mitigating them.

Vulnerabilities in Diffie-Hellman Key Exchange Lead to Logjam

In one study, a research team including graduate students Zakir Durumeric, David Adrian, Drew Springall, Benjamin VanderSloot, and Eric Wustrow reported on a security flaw in the way Diffie-Hellman cryptographic key exchange is implemented on some Internet servers. Diffe-Hellman is used for encrypted communications, including emails VPNs, HTTPS, and other protocols where a client and server negotiate a shared secret key for communication.

The researchers discovered that the algorithm can be much less secure than believed due to the use of standardized or hard-coded prime numbers to negotiate keys, rather than random prime numbers. As a consequence, they identified a vulnerability called Logjam, which most likely accounts for the NSA's mass interception of encrypted communications, and a related attack that left tens of thousands of HTTPS-protected websites, mail servers, and other widely used Internet services open to less sophisticated eavesdroppers.

The researchers' paper, "Imperfect Forward Secrecy: How Diffie-Hellman Fails in Practice," won the best paper award at the *2015 ACM Conference on Computer and Communications Security (CCS*). It also won a Pwnie Award at the *2015 Black Hat Security Conference* in the category of "Most Innovative Research."

Full story: eecs.umich.edu/n/key

Eavesdropping Attack DROWN Exposed

Halderman and a research team that included graduate student David Adrian identified the DROWN vulnerability, which affects HTTPS and other services that rely on SSL and TLS, some of the essential cryptographic protocols for Internet security. These protocols allow everyone on the Internet to browse the web, use email, shop online, and send instant messages without third-parties being able to read the communication.

DROWN allows attackers to break the encryption and read or steal sensitive communications, including passwords, credit card numbers, trade secrets, or financial data by decrypting intercepted TLS connections by making specially crafted connections to an SSLv2 server that uses the same private key. In March 2016, when DROWN was announced, about a quarter of popular websites were vulnerable.

Full story: eecs.umich.edu/n/drown

censys

Censys Enables Fast Searching of Actionable Internet Data

Halderman and graduate student Zakir Durumeric have introduced Censys, a search engine that uses data collected every 24 hours from about 4 billion IP addresses connected to the Internet. Researchers can interact with this data through Censys' search interface, report builder, and SQL engine to rapidly identify and quantify emerging Internet threats.

Full story: eecs.umich.edu/n/censys

Email Security is Better... But Not Bulletproof Yet

In a third study, Halderman and graduate students Zakir Durumeric, David Adrian, James Kasten, and CS undergraduate Ariana Mirian collaborated with researchers at Google and the University of Illinois to perform the first analysis of global adoption rates of SMTP email security extensions, including: STARTTLS, SPF, DKIM, and DMARC. These security extensions are used by consumers to authenticate senders or to encrypt mail in transit. They found that, despite improvements in practice over the past few years, significant security risks exist.

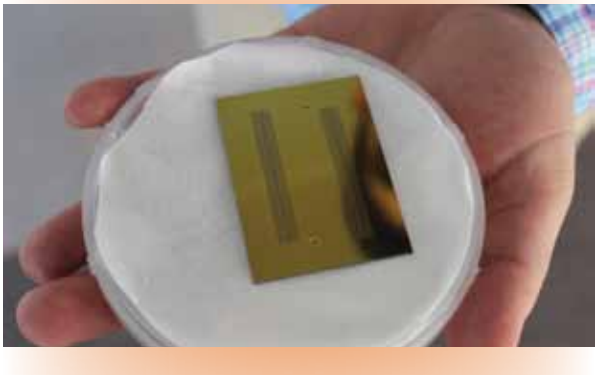
Their data is presented from SMTP server configurations from the Alexa Top million domains and from SMTP connections to and from Gmail. The researchers found that only 82% of the 700,000 SMTP servers support TLS, that only 35% are configured properly to allow server authentication. They show evidence of attacks, and highlight seven countries where more than 20% of inbound Gmail messages arrive in cleartext due to network attackers.

Their paper, "Neither Snow Nor Rain Nor MITM... An Empirical Analysis of Email Delivery Security," received The Applied Networking Research Prize (ANRP) from the Internet Research Task Force in 2015.

Full story: eecs.umich.edu/n/es

Antennas, Autonomy, and More

Three different research projects related to antenna design that have applications in autonomous navigation, detection of hidden objects, and long-distance imaging have led to individual honors for the doctoral students involved, all of whom work with Kamal Sarabandi, Rufus S. Teesdale Professor of Engineering.



The first project deals with antennas in the high millimeter wave frequency range (240 GHz). This research was undertaken in response to an increasing demand for high-resolution imaging radars in outdoor environments. These antenna systems have applications in autonomous navigation for cars and planes as well as detection of hidden objects such as illicit drugs and explosives. The resolution of these systems compares to that offered by optical imaging, but is not affected by adverse weather conditions and other interference. Amr Ibrahim received a Rackham Predoctoral Fellowship to pursue research in this area.

A second project is related to sub-millimeter-wave radar systems for next-generation navigation and imaging sensors. Radar that operates at these wavelengths allows for very small, yet powerful, sensing devices. Such devices will have very high detection resolutions and wide fields of view, while achieving size and weight 100 times smaller than current state-of-the-art sensors, and a 10x reduction in power consumption. Armin Jam built a quarter-sized antenna weighing only 5 grams that will be part of a radar system 100 times smaller than is standard in today's industry. These systems are ideal for self-driving cars, and can be implemented on drones for long-distance imaging in hazardous areas. His paper was selected as a finalist in the *2016 IEEE International Symposium on Antennas and Propagation (AP-S)*.

In the third project, Jihun Choi devised a new technique to test low frequency antennas, which typically require either large anechoic chambers or a larger outdoor range completely free from interference. His technique relies on very-near-field measurements and a newly-developed, high-precision formula to compute the antenna's radiation fields. This approach has proven to be very effective and time-efficient, and allows the measurements to take place in a small, non-metallic indoor space. He earned an honorable mention for his paper describing this research in the *2016 IEEE AP-S Symposium* student paper competition.

Full story: eecs.umich.edu/n/antennas

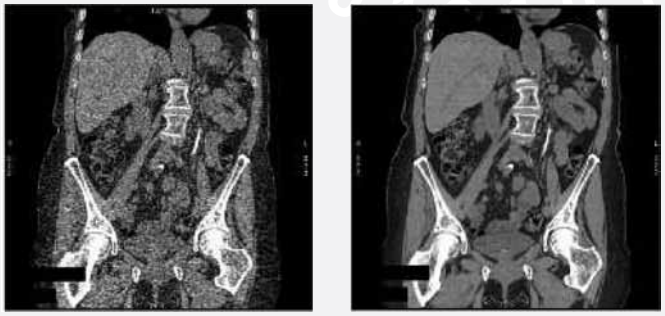
Using Data Science to Achieve Ultra-Low Dose CT Image Reconstruction

Prof. Jeff Fessler and Prof. Yong Long (PhD EE:Systems '11) of the University of Michigan-Shanghai Jiao Tong University (UM-SJTU) Joint Institute are collaborating on a project to dramatically improve low-dose X-ray Computed Tomography (CT) image formation. Their timely approach involves taking advantage of an existing big-data corpus of regular dose X-ray CT images.

Extracting information from big data collections of CT images from patients with similar ailments are expected to lead to dramatic improvements in reconstructing high-quality images from ultra-low dose CT (ULDCT) measurements. New MBIR methods are expected to provide high image quality while further reducing the X-ray radiation dose to an ultra-low level.

The research is funded through the U-M/SJTU Collaborative Research Programs for Energy and Biomedical Technology, which funds projects that have future commercial potential.

Full story: eecs.umich.edu/n/ct



A 3D helical X-ray CT scan is reconstructed by: (L) the conventional FBP method; and (R) by an MBIR method (patient identifiers were removed).

Researchers Seek to Help the Disabled With Intelligent Robotic Wheelchair

Vulcan, the Roman god of fire, is believed to be the only Roman god with a disability. He was depicted as having crippled feet and some myths say that he built a wheelchair to help him move around and overcome the burdens of his disability. Vulcan, the intelligent robotic wheelchair, has a similar goal in mind, which is to help the elderly and those with disabilities effortlessly move around their environment.

Prof. Benjamin Kuipers

Prof. Ben Kuipers created Vulcan a number of years ago, and most recently CSE graduate student Collin Johnson and researcher Dr. Jong Jin Park have been working to improve the wheelchair by adding more innovative capabilities.

Those innovative capabilities include: the ability to learn the spatial structure of the environment, which allows the robot to efficiently represent its opportunities for travel in the environment; the ability to plan and carry out motion in the environment, avoiding both static and dynamic obstacles; and using its perceptual capabilities to handle the kinds of perceptual problems that arise in natural human built environments.

When it comes to the spatial structure, the robot continually builds and updates an accurate geometric model of the local space around it, and maintains accurate knowledge of where it is located and how it is orientated in that geometric space.

The wheelchair's motion must be safe, comfortable, and graceful, and must be customizable to the travel preferences of the specific driver. The researchers created a general method using model-predictive control that guarantees safe motion among static obstacles and it does a great job of avoiding dynamic pedestrians.

With human built environments, there can be glass barriers, walls, doors, windows, etc. that are invisible to typical robot sensors such as lidar and vision. Kuipers, Johnson, and Park developed methods for using lidar to perceive glass barriers, as well as methods for using computer vision to build 3D models of the robot's immediate surroundings.

Vulcan's knowledge and control systems help make it more effective for the 2-4 million people in the United States who need more than just a wheelchair. The goal of these advances in technology is to help people with disabilities to gain new independence and life experiences.

Full story: eecs.umich.edu/n/vulcan

Tracking and Mitigating Tail Latency in Data Centers

Researchers led by Profs. Jason Mars and Lingjia Tang have developed Treadmill, a modular load tester platform for data centers which is designed to help measure and mitigate tail latency. High tail latency has been identified as one of the key challenges facing modern data center design as it results in poor user experiences, particularly for interactive services such as web search and social networks.

Mitigating tail latency is extremely challenging in part because accurately measuring tail latency without disrupting the production system is highly desirable but particularly challenging to achieve due to the number of systems and resources involved for large-scale Internet service workloads (e.g., distributed server-side software, network connections, etc.) than traditional single-server workloads. Current state-of-the-art load testing systems have several pitfalls in their designs that often result in misleading conclusions and can result in unnecessary resource over-provisioning and unexplained performance regressions.

In addition to accurately measuring tail latency, attributing the source of tail latency to different hardware and software causes is also challenging. Treadmill addresses both of these challenges, overcoming the pitfalls of existing tools. The researchers used their methodology to evaluate the impact of common server hardware features with Facebook production workloads on production hardware, producing superior results, particularly in capturing complicated and counter-intuitive performance behaviors. By tuning the hardware features as suggested by the attribution, they reduced the 99th-percentile latency by 43% and its variance by 93%.

Treadmill is now deployed and widely used in Facebook's production services. Treadmill is also open-sourced and available to the general public and industry practitioners.

Full story: eecs.umich.edu/n/treadmill

Name Collision Vulnerability Could Be Bad News for Enterprise Users

Prof. Z. Morley Mao and CSE graduate student Qi Alfred Chen, together with collaborators at Verisign Labs, have demonstrated that security ramifications exist when devices configured for enterprise systems are used outside the enterprise in the realm of the wider web.

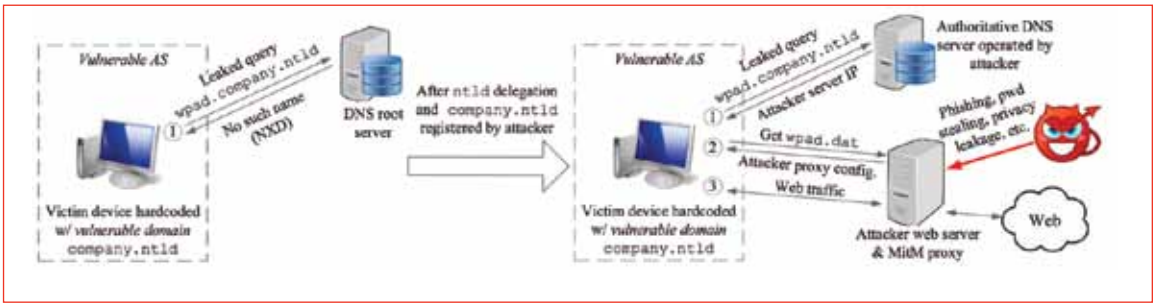


Illustration of the WPAD name collision attack

Many enterprises have begun configuring their internal networks to use generic top-level domains (gTLDs), such as .school or .network, as a way of making it easier for employees to access and manage internal systems. At the same time, the Internet Corporation for Assigned Names and Numbers (ICANN) has approved over 900 gTLDs for public use as part of an expansion effort, potentially allowing for the use of the same domain names and setting the stage for what is known as "name collision."

When used outside the enterprise, systems using the Web Proxy Auto-Discovery (WPAD) protocol to automatically discover web proxy settings can reach a public DNS server where attackers have registered the same domain names and host rogue proxy configuration files, routing the user's web traffic through a server controlled by the attackers a Man in the Middle (MitM) attack and placing the system at risk.

The researchers' study shows that millions of WPAD queries are leaking to the public DNS namespace every day. They also identified "highly-vulnerable domains," which are domains routinely exposing many potential victims. As of September 2015, they found that 10% of these highly-vulnerable domains had already been registered publicly, making the corresponding users immediately vulnerable to the exploit at any time. A US-CERT alert based on this work was issued on May 23, 2016 (TA16-144A). It applies to all computers that are using WPAD including Windows, OS X, and Linux systems, and web browsers that are WPAD enabled.

Full story: eecs.umich.edu/n/wpad

The Future of Remote Sensing

Researchers are exploring the fundamental capabilities of remote sensing through a program that aims to create theoretical models and tools for future remote sensing of ice and snow. This research, directed by Kamal Sarabandi, Rufus S. Teesdale Professor of Engineering, could feed into the development of new sensors for a variety of remote sensing applications.

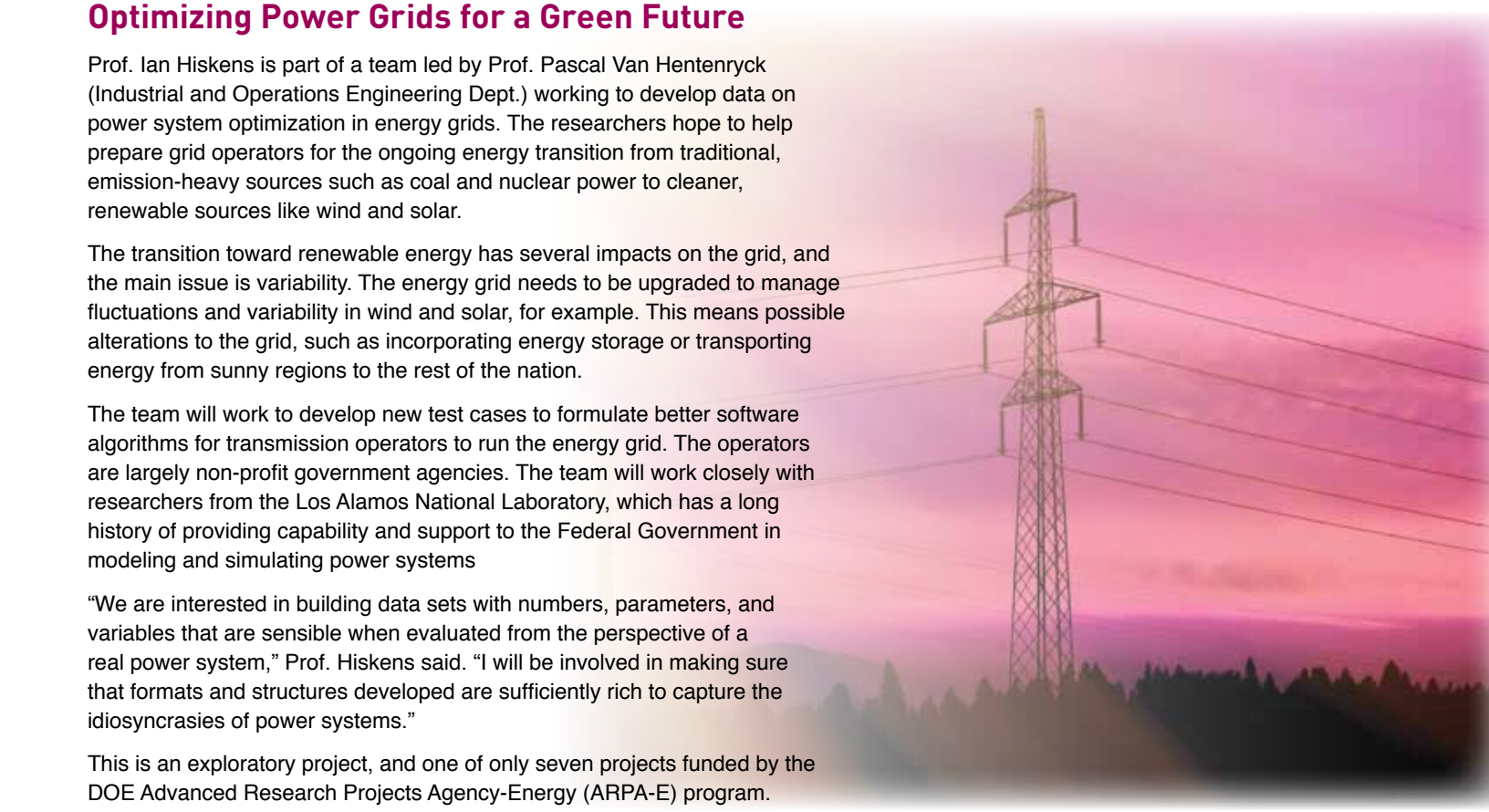
"The idea of this program is to look into the future," said Prof. Sarabandi, "determine what new types of measurement can be done remotely, and develop the science and theory for what is and isn't possible." Based on the theory, researchers can determine the best ways to monitor the earth, particularly ice and snow levels which have serious ecological consequences.

Prof. Sarabandi has long been a strong proponent for pursuing this type of theoretical research. "Everything we know now was begun 10-20 years ago," he explained. "You have to first figure out what can and can't be done before you develop the sensors and tools for measurement."

The research is funded by NASA as part of their Remote Sensing Theory for Earth Science program.

Full story: eecs.umich.edu/n/sensing

Optimizing Power Grids for a Green Future



Prof. Ian Hiskens is part of a team led by Prof. Pascal Van Hentenryck (Industrial and Operations Engineering Dept.) working to develop data on power system optimization in energy grids. The researchers hope to help prepare grid operators for the ongoing energy transition from traditional, emission-heavy sources such as coal and nuclear power to cleaner, renewable sources like wind and solar.

The transition toward renewable energy has several impacts on the grid, and the main issue is variability. The energy grid needs to be upgraded to manage fluctuations and variability in wind and solar, for example. This means possible alterations to the grid, such as incorporating energy storage or transporting energy from sunny regions to the rest of the nation.

The team will work to develop new test cases to formulate better software algorithms for transmission operators to run the energy grid. The operators are largely non-profit government agencies. The team will work closely with researchers from the Los Alamos National Laboratory, which has a long history of providing capability and support to the Federal Government in modeling and simulating power systems

"We are interested in building data sets with numbers, parameters, and variables that are sensible when evaluated from the perspective of a real power system," Prof. Hiskens said. "I will be involved in making sure that formats and structures developed are sufficiently rich to capture the idiosyncrasies of power systems."

This is an exploratory project, and one of only seven projects funded by the DOE Advanced Research Projects Agency-Energy (ARPA-E) program.

Full story: eecs.umich.edu/n/grid

One captionless cartoon from the study.

Researchers Employ Unsupervised Funniness Detection in *The New Yorker* Cartoon Caption Contest

Prof. Dragomir Radev and his former student Rahul Jha (CSE PhD 2015), together with colleagues from Yahoo Labs and Columbia University, teamed up with *The New Yorker* Cartoon Editor Bob Mankoff to take a computational approach to understanding humor. Their paper, "Humor in Collective Discourse: Unsupervised Funniness Detection in the New Yorker Cartoon Caption Contest," describes their findings.

The New Yorker's weekly Cartoon Caption Contest has run for more than 10 years. Each week, the editors post a cartoon and ask readers to come up with a funny caption for it. They pick the top three submitted captions and ask the readers to pick the weekly winner. The contest has become a cultural phenomenon and has generated a lot of discussion as to what makes a cartoon funny.

The researchers developed a set of unsupervised methods for ranking captions based on features such as originality, centrality, sentiment, concreteness, grammatically, human-centeredness, etc. and used these to independently rank all captions from *The New Yorker's* corpus of cartoons and selected the top captions for each method. Then, they performed Amazon Mechanical Turk experiments in which they asked Turkers to judge which of the selected captions is funnier.

The researchers were able to show that negative sentiment, human-centeredness, and lexical centrality most strongly match the funniest captions, followed by positive sentiment. These results are useful for understanding humor and also in the design of more engaging conversational agents in text and multimodal (vision+text) systems. As part of this work, a large set of cartoons and captions is being made available to the community so that other researchers may experiment further.

Full story: eecs.umich.edu/n/cartoon

Economic Reasoning and Artificial Intelligence

Michael Wellman, Lynn A. Conway Professor of Computer Science and Engineering, and David Parkes, George F. Colony Professor and Area Dean of Computer Science at Harvard, have studied how artificial intelligence is changing economic theory. Economics models the behavior of people to shape the pattern of activities that produce value and satisfy needs.

Homo economicus, or economic man, is the concept of a perfectly rational agent who will pursue its subjectively-defined ends optimally – a concept not realized in actual humans. AI researchers have been working to construct *machina economica*, a synthetic *homo economicus*, and these systems are already impacting commerce, making decisions about on-line trading and advertising.

In their paper published in *Science*, "Economic Reasoning and Artificial Intelligence," the researchers review progress toward creating this new species of machine and discuss challenges in designing AIs that can reason effectively in economic contexts. Supposing that AI succeeds in this quest, or at least comes close enough that it is useful to think about AIs in rationalistic terms, they examine the design of the rules of interaction in multi-agent systems that come to represent an economy of AIs.

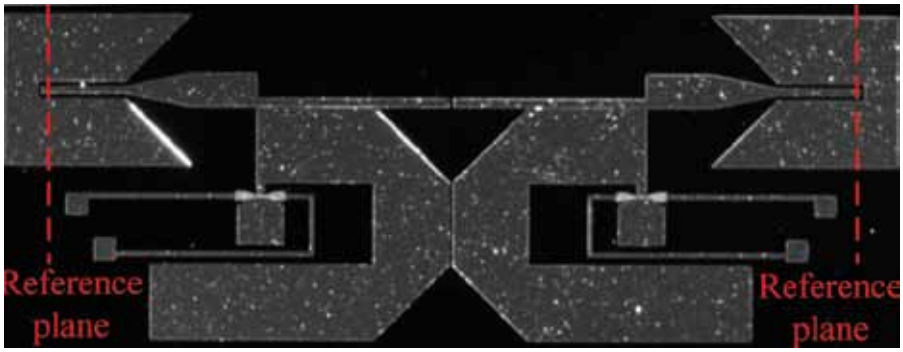
Science

The researchers note that theories of normative design from economics may prove more relevant for artificial agents than human agents, with AIs that better respect idealized assumptions of rationality than people, interacting through novel rules and incentive systems quite distinct from those tailored for people.

Full story: eecs.umich.edu/n/machine

A New Tunable Filter for Wireless Communication

Compact and low-loss tunable filters are used in many wireless communication devices, including cognitive radios, anti-jamming systems, and advanced transducers. Currently, solid-state or RF MEMS switches are among the most popular options for the tunable components in wireless modules. Prof. Mina Rais-Zadeh and doctoral student Muzhi Wang developed a filter using a new material that demonstrates competitive performance in a number of factors, while being easier to fabricate.

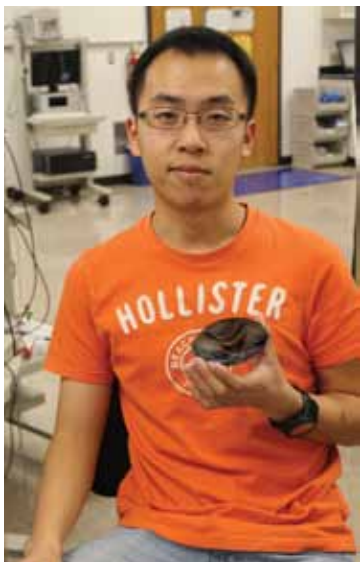


An image of the fabricated phase change X-band filter.

The filter operates in the x-band frequency range and uses germanium-telluride (GeTe) phase change switches. This is the first implementation of a tunable filter to use GeTe switches. Their performance, power handling, switching speed, and ease of integration into different circuits was comparable to MEMS switches, with the added bonus of a simpler fabrication process. The GeTe switch also had a faster response time and required smaller voltage pulses for actuation than some existing MEMS tunable filters.

Muzhi earned a Best Paper Award at the *2016 IEEE Topical Meeting on Silicon Monolithic Integrated Circuits in RF Systems (SiRF)*, part of Radio & Wireless Week, for the paper, "An X-Band Reconfigurable Bandpass Filter Using Phase Change RF Switches."

Full story: eecs.umich.edu/n/mems-filter



Muzhi holds a sample of his tunable filter, which is the first implementation using germanium-telluride based phase change switches.

Next Generation Laser Plasma Accelerator

Michigan is part of a multi-institution collaboration to develop key laser technology that will enable the design of a high-power, ultra-short-pulse laser system which is expected to enable new low-cost, compact accelerator-based light sources for a wide variety of biological, chemical, materials science, and security applications.

One of the most promising avenues for achieving new target levels of high peak intensity and high average power in an ultrafast laser system is to turn to fiber lasers. Fiber lasers are efficient, generate quality beams, are able to emit high average power, and can be monolithically integrated.

The current roadblock with fiber lasers, however, is their low repetition rate at high intensities. Prof. Galvanauskas is leading the effort at Michigan to get to a higher repetition rate. He is a recognized leader in the field who has already demonstrated several record-breaking achievements in the performance of fiber lasers.

"If we're successful here," said Almantas, "we may actually change the paradigm in lasers. We will no longer use just one aperture and a crystal to achieve high energy, but we will use multiple apertures which we multiplex in space and time, and replace the crystal with multiple integrated circuits. The resulting system will be practical, and have a huge impact on existing applications while leading to many new applications."

Full story: eecs.umich.edu/n/laser-plasma

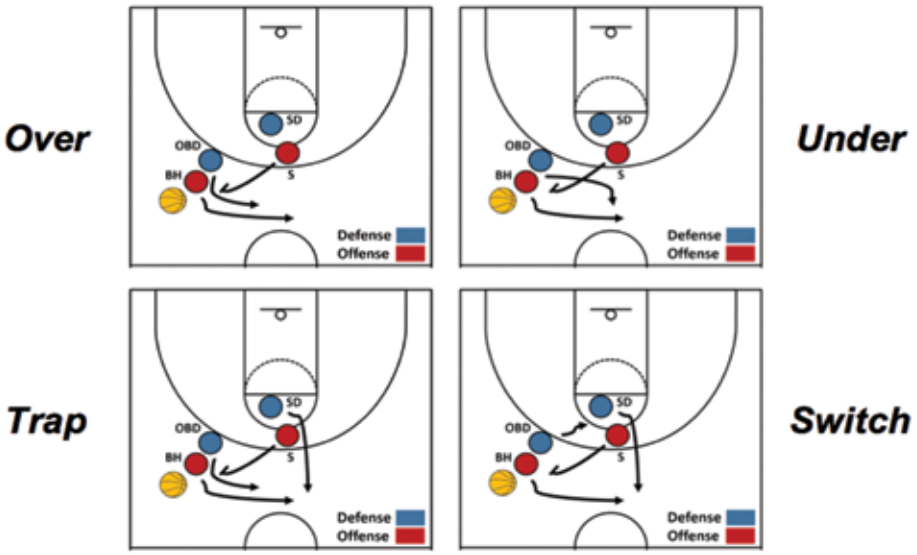
Machine Learning Proves Useful for Analyzing NBA Ball Screen Defense

Prof. Jenna Wiens and her former student Avery McIntyre (CS BS 2015) have used machine learning to extract information from NBA sports data for automatically recognizing common defense strategies to ball screens. They shared their findings at the *10th MIT Sloan Sports Analytics Conference* in Boston, MA, which took place on March 11-12, 2016.

The researchers' paper, "Recognizing and Analyzing Ball Screen Defense in the NBA," was selected as the top paper in the "Basketball track" of the research paper competition. Using data from multiple seasons and supervised machine learning techniques, the researchers were able to categorize the defense of the NBA's most popular offensive action in four ways: over, under, switch, and trap.

They presented observations and trends at both the team and player levels and state that "Our work is a step towards the construction of a coaching assistance tool for analyzing one of the game's most important actions." News of the paper's findings was reported on by media including in articles by *ESPN* and *Sports Illustrated.*

Full story: eecs.umich.edu/n/sports



Getting the Light Out of OLEDs

Two recent advances led by Stephen Forrest, the Peter A. Franken Distinguished University Professor of Engineering and Paul G. Goebel Professor of Engineering, are bringing phosphorescent organic light emitting diodes (PHOLEDs) into the mainstream of lighting with unprecedented efficiencies and lifetimes for displays and OLED lighting.

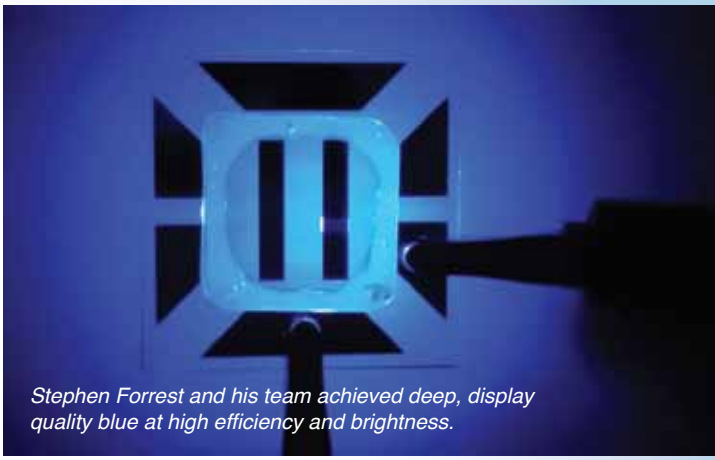
Yue Qu, doctoral student in the lab, helped develop a new grid layer that increases OLED efficiency to 60%.

In the first project, his group has developed a way to get 50% more light out of PHOLEDs, and improved the brightness of blue PHOLEDs to approach the stringent brightness requirements of the National Television Systems Committee.

PHOLEDs have the potential to use a quarter of the electricity required for organic LEDs, saving battery life and electric bills.

OLEDs make it possible to have extremely thin, small, and flexible displays – as seen in the Samsung Galaxy or LG OLED TVs. The PHOLEDs being developed by Prof. Forrest's group have the advantage of being able to reach 100% internal quantum efficiency (IQE), or at least 4 times the potential of a fluorescent OLEDs. This means that for every electron you put in, you get one photon out. However, much of that light remains trapped inside the device, resulting in a lower external quantum efficiency (EQE).

In previous work, Prof. Forrest designed PHOLEDS that reached 40% in EQE. His team has now increased that relatively 50% further by redirecting light that was previously lost. Prof. Forrest believes it'll be possible to reach as high as about 80% EQE with PHOLEDs. With efficiency this high, PHOLEDs could become a highly viable option for sustainable lighting.



Stephen Forrest and his team achieved deep, display quality blue at high efficiency and brightness.

In the second project, Prof. Forrest's group has achieved blue PHOLEDs with enough brightness to have big-screen potential. Bright, deep blue, phosphorescent emitters have been very elusive. While green and red PHOLEDs are already used in Samsung and LG displays, the blue still comes from regular OLEDs.

The researchers developed a new molecule comprised of an iridium complex that produces a deep blue color through phosphorescence. The molecule achieves its exceptional brightness partly through multitasking. It acts as the light emitter while also conducting positive charges into the light emitting layer and keeping the negatively charged electrons from leaving it, preventing wasted electricity. The group's work has resulted in deep, display quality blue at very high efficiency and extremely high brightness.

Full stories: eecs.umich.edu/n/oleds
eecs.umich.edu/n/phosphorous

Developing Visual Recognition System for Wearable Devices

Profs. Jia Deng, Jason Mars, Kevin Pipe, Lingjia Tang, Thomas Wenisch, and CSE Chair Marios Papaefthymiou are finding a solution to implement state-of-the-art vision systems in wearable devices where there is little heat dissipation.

They will be developing artificial intelligence systems that efficiently manage the resources most crucial for high-performance wearable-based visual recognition. The systems will put out computations that are thermally managed by materials in the wearable device that will melt during heaving heating and solidify between bursts.

The goal of the project is to enable encyclopedic, real-time visual recognition through seamless integration of visual computing on wearable devices and in the cloud. The researchers hope to create this wearable visual recognition system that captures live video input while providing intelligent, real-time assistance through automatic or on-demand visual recognition. They will address the challenges of creating such a systems through interdisciplinary approach integrating computer vision, hardware architecture, VLSI design, and heat transfer. This work is funded by a joint grant from NSF and Intel.

Full story: eecs.umich.edu/n/wearable

Layered Graphene Beats the Heat

Graphene, a one-atom-thick sheet of carbon, has been hailed as the future of electronics because of its outstanding electrical conductivity. But a number of challenges stand between its promise and its adoption in commercial devices. An international team of researchers, led by Ted Norris, Gérard A. Mourou Professor of EECS, have found that a layered form of graphene can expel heat efficiently, which is an important feature for its potential applications in building small and powerful electronics.

Unlike heat in a 3D chunk of silicon, the material of choice for most electronics, heat building up in the electrons of graphene was not expected to travel well between layers, since graphene layers tend not to interact with each other very strongly. However, Prof. Norris and the group have shown that the electrons in graphene can transmit heat efficiently between layers, enabling it to rapidly dissipate out of the 3D graphene.

They discovered that although the electrons in different layers can't mechanically run into one another, they can still interact through their electrical charges. The researchers believe this cooling mechanism will be important in many new, layered nanomaterials still under development.

The research was published in the paper "Electronic Cooling via Interlayer Coulomb Coupling in Multilayer Epitaxial Graphene," *Nature Communications 6 (2015)*.

Full story: eecs.umich.edu/n/graphene

Using Big Data to Better Manage Bipolar Disorder

Bipolar disorder is a chronic psychiatric illness characterized by pathological swings of mood and energy between euthymic (healthy) and pathological states of mania and depression. It results in profound disruptions in personal, social, and vocational functioning. Suicidal behavior is common and up to 20% of bipolar disorder patients die by suicide.

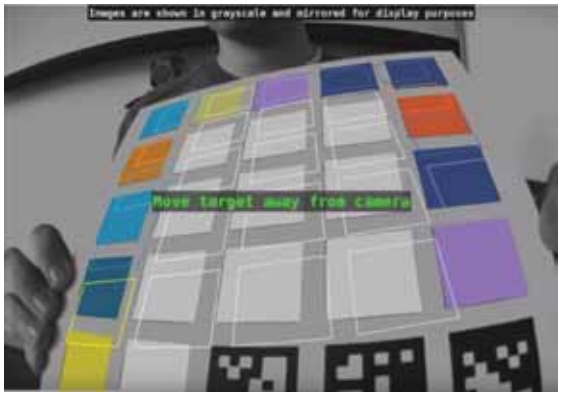
Prof. Emily Mower Provost

Prof. Emily Mower Provost is collaborating with researchers at the University of Michigan Depression Center to develop new technologies that provide individuals and their caregivers with insight into how the disease changes over time. The long-term goal of this program is to automatically learn personalized early warning signs associated with mobile phone usage.

The team, supported by the Prechter Bipolar Research Fund at U-M and the National Institute of Mental Health, have collected speech data from 51 patients with bipolar disorder and nine healthy controls. This includes 42,731 and 5,215 calls from the two groups, respectively, totaling over 3,600 hours of speech.

Research on this unique dataset is ongoing. Results have shown that mood can be recognized automatically from conversational speech data and have highlighted both the benefit and importance of personalization.

Full story: eecs.umich.edu/n/bd



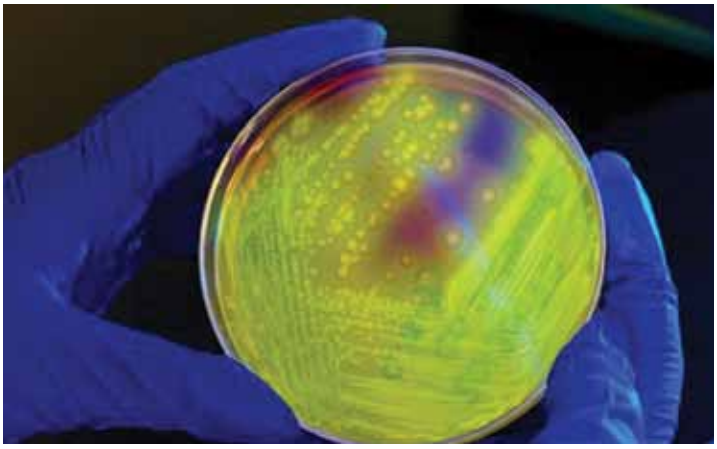
Patented Camera Calibration Tool Automates Calibration Target Acquisition

Obtaining a reliable and accurate camera calibration typically requires a significant amount of expertise as users must manually capture a set of calibration images that sufficiently constrain all of the parameters in the camera model. As a result, vision sensors prove challenging to work with, especially for novices who may lack intuition for how to collect such a calibration image set.

Prof. Edwin Olson and two former students and U-M graduates, Johannes Strom and Andrew Richardson, have recently been awarded a United States Patent for AprilCal, an interactive camera calibration tool that automates the challenging task of calibration image acquisition. This innovative software guides users through the process of collecting a set of images of a calibration target. The AprilCal tool provides live feedback to users on the state of the calibration and suggests future target positions to maximally constrain the camera model parameters. In a series of human trials, this system has been shown to yield more accurate camera calibrations than standard tools while simultaneously decreasing the knowledge burden on users. AprilCal promises to lower the barrier-to-entry for applying vision sensors to robotics, virtual reality, and more.

Full story: eecs.umich.edu/n/camera

Researchers Launch Fight Against *C. difficile* Under New Grant



A team of U-M researchers, including Prof. Jenna Wiens, has been awarded a $9.2 million grant to tackle Clostridium difficile. Clostridium difficile, also called *C. difficile* or *C. diff*, is a bacterium that can cause symptoms ranging from diarrhea to life-threatening inflammation of the colon. *C. difficile* is difficult to eradicate and is often transmitted to patients in hospital environments.

The researchers were awarded the grant from the National Institutes of Health as a government backed effort to attack antibiotic resistant bacteria. They will spend the next five years studying this pathogen that kills over 14,000 each year. The Centers for Disease Control and Prevention has identified *C. diff* as an urgent threat requiring immediate and aggressive action.

Using data from their lab and from actual *C. diff* patients, the researchers will take a system biology approach in which they use information from *C. diff* patient records, blood samples and detailed studies of the mix of microbes living in patients' guts to create computational models of the diseases.

Prof. Wiens will use machine learning techniques to study the disease, and over the next five years the researchers, including team leaders Vincent Young MD, PhD and Patrick Schloss, PhD (Microbiology and Immunology), will use patient record information and genomic data pertaining to the host and pathogen to get a better understanding of how patients become colonized and infected with the disease. They will also perform tests on laboratory mice to better study the risk factors associated with making patients susceptible to the infection.

Their findings will be communicated to medical physicians to help prevent *C. difficile* infections and treat those who are already infected.

Full story: eecs.umich.edu/n/cdiff

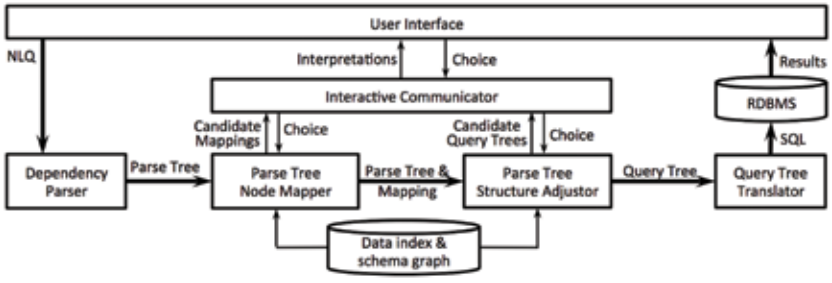
Natural Language Interface Opens Power of Databases

Natural language has been the holy grail of database query interface designers, but has generally been considered too hard to work with, except in limited specific circumstances.

Prof. H.V. Jagadish, Bernard A. Galler Collegiate Professor of EECS, and graduate student Fei Li have taken a hard look at this problem and have defined an interactive natural language interface that correctly translates logically complex English language sentences into an SQL query.

Their interactive natural language interface for relational databases enables beginner users to easily construct complex queries. It also improves the utility of a relational database management system (RDBMS), as it enables anyone to ask questions of a database system.

For a query executed via natural language processing (NLP), the system interacts with the user in several steps to determine query semantics and subsequently generates the corresponding SQL. At each step, the system incrementally presents to the user its own understanding of the query through alternatives, instead of providing only a final proposed query. The authors rely on a query tree structure to represent the interpretation of an NLP query from the database's perspective, which facilitates verification by users, and translation in SQL.



System architecture for the NLP-based query system

The researchers implemented the system following the component-based approach, where each component can be independently constructed, optimized, or substituted. Their experiments involved real users and verified the feasibility of the approach while also illustrating the strengths of the system/approach. This research won a Best Paper Award at the *41st International Conference on Very Large Data Bases.*

Full story: eecs.umich.edu/n/sql

Your Phone Can Monitor the Power Grid in its Spare Time

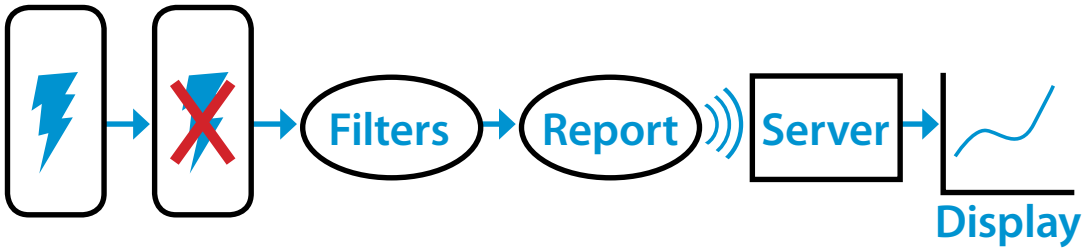
The power grid is one of humanity's most significant engineering undertakings, and it is essential to both developed and developing nations alike. Currently, transparency into the power grid relies on utility companies and more fine-grained insight is provided by costly smart meter deployments. GridWatch, a system for monitoring the state of the power grid using smartphones, is intended to be an inexpensive and crowd-sourced means of learning about power grid status independent of utility companies.

GridWatch is a collaboration between researchers at University of Michigan and the University of California, Berkeley. The Michigan researchers include Prof. Prabal Dutta and graduate students Noah Klugman, Pat Pannuto, and William Huang.

GridWatch collects input via a smartphone app that runs in the background and which detects power outages by monitoring changes to its own power state, locally verifying these outages using a variety of sensors that reduce the likelihood of false power outage reports, and corroborating actual reports with other phones through data aggregation in the cloud. This approach enables a decentralized system that can scale, potentially providing researchers and concerned citizens with a powerful new tool to analyze the power grid and hold utility companies accountable for poor power quality.

GridWatch was selected as one of eight finalists in the Vodafone Americas Foundation's 2016 Wireless Innovation Project competition. The GridWatch team is now working with major multinational corporations and utilities in developing regions to provide visibility into grid conditions for researchers, ratepayers, and regulators.

Full story: eecs.umich.edu/n/gw

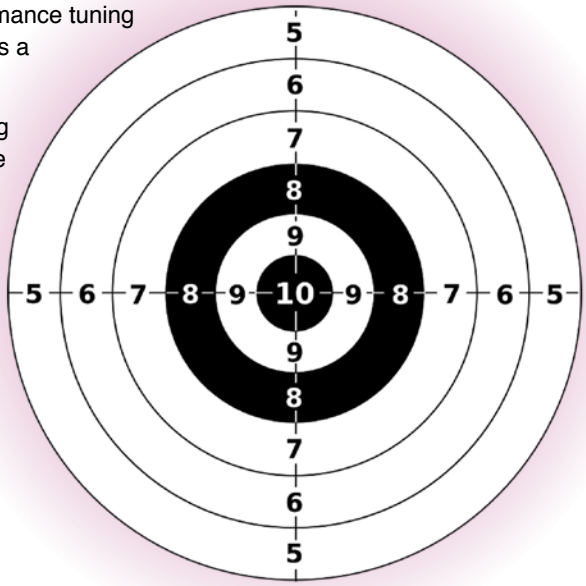


A plugged-in phone changes from a powered state to an unpowered state with grid failure. GridWatch registers this event, verifies that it is not a likely false positive, and reports the event to a central service for analysis, export, and visualization.

Improving the Predictability of Database Systems

Prof. Barzan Mozafari is exploring means for building more predictable database systems, with predictability being, in his words, a "missing virtue" after four decades of work by researchers has focused primarily on the improvement of average raw performance.

As database systems have become more complex, their erratic and unpredictable performance has become a major challenge facing database users and administrators alike. With the increasing reliance of mission-critical business applications on their databases, maintaining high levels of database performance (i.e., service level guarantees) is now more important than ever. Cloud users find it challenging to provision and tune their database instances, due to the highly non-linear and unpredictable nature of today's databases. Even for deployed databases, performance tuning has become somewhat of a black art, rendering qualified database administrators a scarce resource.



Under this project, Prof. Mozafari aims to take a number of steps toward restoring predictability. First, he will quantify the major sources of uncertainty in a database in a principled manner. Then, by rethinking the traditional design of a database system, he will architect a new generation of databases that treat predictability as a first-class citizen in their various stages of query processing, from physical design to memory management and query scheduling. Moreover, to accommodate existing database systems (which are not predictable by design), he will develop tools and methodologies for predicting their performance more accurately.

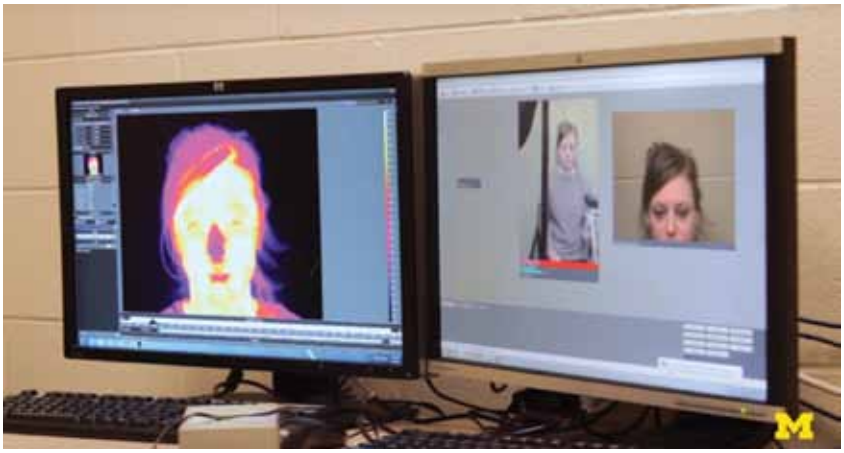
Prof. Mozafari's work on this project is funded by his NSF CAREER grant entitled, "CAREER: Designing a Predictable Database – An Overlooked Virtue."

Full story: eecs.umich.edu/n/database

Lie-Detecting Software Uses Real Court Case Data

Prof. Rada Mihalcea and Prof. Mihai Burzo (U-M Flint) have led a study on the detection of deception. By studying videos from high-stakes court cases, the researchers have built unique lie-detecting software based on real-world data that is better at predicting deception than a human observer.

Their system considers both a speaker's words and gestures, and unlike a polygraph, it doesn't need to touch the subject in order to work. In experiments, it was up to 75 percent accurate in identifying who was being deceptive (as defined by trial outcomes) compared with humans' scores of just more than 50 percent. The system might one day be a helpful tool for security agents, juries, and even mental health professionals, the researchers say.



With the software, the researchers say they've identified several tells. Lying individuals moved their hands more. They tried to sound more certain. And, somewhat counterintuitively, they looked their questioners in the eye a bit more often than those presumed to be telling the truth, among other behaviors.

To develop the software, the team used machine-learning techniques to train it on a set of 120 video clips from media coverage of actual trials. They got some of their clips from the website of The Innocence Project, a national organization that works to exonerate the wrongfully convicted. The videos include testimony from both defendants and witnesses. In half of the clips, the subject is deemed to be lying. To determine who was telling the truth, the researchers compared their testimony with trial verdicts.

To conduct the study, the team transcribed the audio, including vocal fill such as "um", "ah", and "uh." Researchers then analyzed how often subjects used various words or categories of words. They also counted the gestures in the videos using a standard coding scheme for interpersonal interactions that scores nine different motions of the head, eyes, brow, mouth, and hands. In the clips of people lying, the researchers found common behaviors:

- Scowling or grimacing of the whole face occurred in 30 percent of lying videos vs. 10 percent of truthful ones.
- Looking directly at the questioner occurred in 70 percent of deceptive clips vs. 60 percent of truthful.
- Gesturing with both hands occurred in 40 percent of lying clips, compared with 25 percent of the truthful.
- Speaking with more vocal fill such as "um." This was more common during deception.
- Distancing themselves from the action with words such as "he" or "she," rather than "I" or "we," and using phrases that reflected certainty.

A paper on the findings titled "Deception Detection Using Real-life Trial Data" was presented at the *International Conference on Multimodal Interaction* and is published in the 2015 conference proceedings. The work was funded by the National Science Foundation, the John Templeton Foundation, and the Defense Advanced Research Projects Agency.

Full story: eecs.umich.edu/n/lie

Solving a Fundamental Control Problem

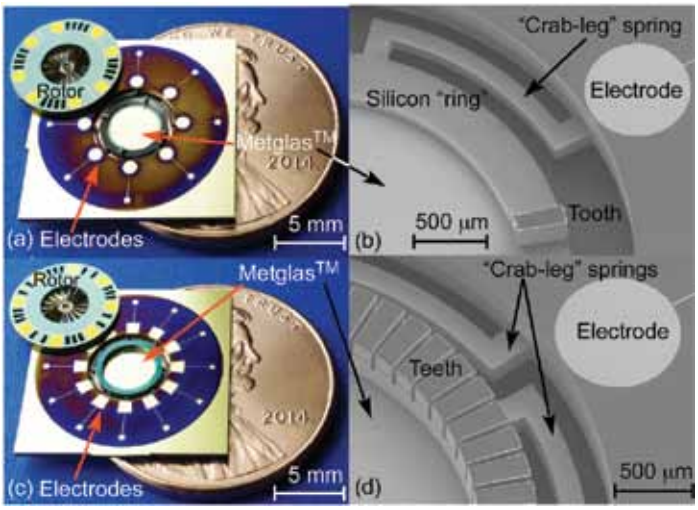
Prof. Demosthenis Teneketzis and former students Dr. Ashutosh Nayyar (assistant professor at University of Southern California) and Dr. Aditya Mahajan (associate professor at McGill University) developed a new methodology that achieves the optimal solution to a very broad class of previously unsolved stochastic control problems. One of these problems is a 40-year-old conjecture on a class of decentralized stochastic control problems, posed by Hans Witsenhausen in 1971.

Their paper on the work, "Decentralized Stochastic Control With Partial History Sharing: A Common Information Approach," earned the IEEE Control Systems Society's George S. Axelby Outstanding Paper Award.

Full story: eecs.umich.edu/n/axelby

Magnetoelastic MEMS Devices for Wireless Sensing, Actuation, and Biomedical Applications

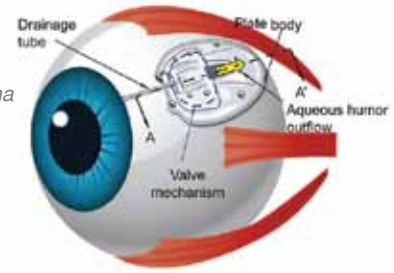
Research describing a microfabrication process that can be used for specific types of MEMS motors used in wireless sensing systems on a silicon substrate was selected as a 2015 Highlight of the *Journal of Micromechanics and Microengineering*. The paper was titled "A Fabrication Process for the Monolithic Integration of Magnetoelastic Actuators and Silicon Sensors."



Optical and SEM images of the fabricated standing wave motors and traveling wave motors

Magnetoelastic materials have had a large impact in wireless sensing systems, and this study represented the first measurements of magnetoelastically generated traveling waves at the micro scale. The research was conducted by Prof. Yogesh Gianchandani, research scientist Dr. Scott Green, and former student Dr. Jun Tang (MEMS designer at NXP Semiconductors).

Different types of fabricated actuators

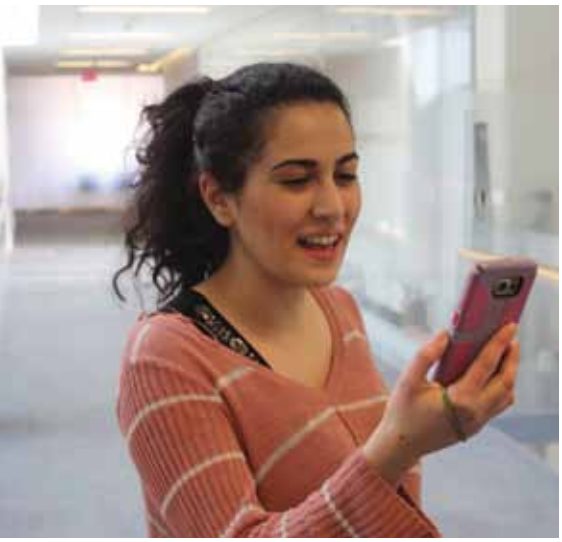


Graphic showing the implantation of a glaucoma drainage device

Research in the application of magnetoelastic wireless MEMS actuators for the treatment of glaucoma was selected as a featured article in the journal, *Microsystems & Nanoengineering*. The researchers, led by Prof. Gianchandani, created wireless MEMS actuators to facilitate the flow of fluids on the surface of implantable glaucoma drainage devices. These integrated actuators have the potential to greatly enhance the effectiveness of glaucoma drainage devices at lowering eye pressure and may also be useful in other areas of medicine. The paper was titled "Resonant Magnetoelastic Microstructures for Wireless Actuation of Liquid Flow on 3D Surfaces and Use in Glaucoma Drainage Implants," by former student Dr. Venkatram Pepakayala, Joshua Stein (Edward T. and Ellen K. Dryer Career Development Professor of Ophthalmology and Visual Sciences), and Prof. Gianchandani.

An invited conference paper on the topic of magnetoelastic MEMS devices, titled "Microfabricated Magnetoelastic Sensors and Actuators: Opportunities and Challenges," by Scott Green and Yogesh Gianchandani, was published in the proceedings of the *2015 IEEE Sensors Conference*.

This research was conducted as part of the Center for Wireless Integrated MicroSensing & Systems (WIMS^2). For more info, see wims2.org.



Advancing System Architectures for Artificially Intelligent Systems

Prof. Jason Mars is researching how future cloud and mobile systems should be designed to support increasing demand from users of intelligent assistants. Intelligent assistants require sophisticated machine learning and computer visions algorithms, and he proposes to make the current computing platforms more efficient and expand systems to make them more intelligent.

His proposed work will advance both the efficiency of current computing platforms to reduce their energy, cost, and environmental footprint, and he will expand open end-to-end systems with state-of-the-art algorithmic capabilities to enable new, more sophisticated, intelligent technologies and usher in future research and inquiry.

His work will impact national interests, economic advancement, technology, as well as, innovation in undergraduate and graduate education. This work is funded by an NSF CAREER Award.

Full story: eecs.umich.edu/n/ais

Tech Transfer/Commercialization

Silicon60 X 2

Three startup companies co-founded by ECE faculty and alumni made the *EE Times* Silicon 60 List of tech startups to watch. Ambiq Micro (Prof. David Blaauw, Prof. Dennis Sylvester, and alumnus Dr. Scott Hanson), Crossbar, Inc. (Prof. Wei Lu), and PsiKick (Prof. David Wentzloff), are leading the way in ultra-low power chip design, pioneering computer memory, and ultra-low power wireless sensor platforms for the Internet of Things.

The three startups first appeared on the *EE Times* list in 2014. The companies were judged on technology, intended market, financial position, investment profile, maturity, and executive leadership. To make way for new additions to this year's updated list, 30 companies were cut. The ECE startups were judged to be worth watching for a second year in a row.

Full story: eecs.umich.edu/n/silicon60

With a focus on startup companies spun-off from technology developed by faculty and students in the EECS Department.

ambiq micro Crossbar psikick Ultra-Low-Power Wireless

PsiKick Raises $16.5M

In Series B Round funding, the company that aims to power the Internet of Things raised $16.5M, led by Osage University Partners and joined by existing investors New Enterprise Associates (NEA) and the University of Michigan Investment in New Technologies Fund (MINTS), as well as individual angels.

"My dream for PsiKick is that we basically become the next Google of the sensed environment," says company co-founder David Wentzloff. "Imagine the ability to locate anything, and get environmental information anywhere, wirelessly, with no batteries. Imagine a Google of the physical world."

In 2012, he and longtime collaborator Ben Calhoun went commercial with PsiKick, a fabless semiconductor company that makes small power its business with batteryless, wireless systems-on-chips (SoCs). By the end of 2016, Prof. Wentzloff hopes to deliver a full wireless system of batteryless sensor nodes. This means an entire real-world sensing system – outfitting 2-3 different applications with multiple chips, packaged and operational, to show off what batteryless, wireless sensors can look like in practice. Some of these battery-free applications may include agricultural, pipeline, and industrial monitoring.

Xtera Communications (XCOM) on NASDAQ

Xtera Communications, founded by Prof. Mohammed Islam in 1998, went public in November 2015. Xtera is a leading provider of high-capacity, cost-effective optical transport solutions. The company sells its high-capacity optical transport solutions to telecommunications service providers, content service providers, enterprises and government entities worldwide to support their deployments of long-haul terrestrial and submarine optical cable networks.

Crossbar

Crossbar, Inc., the Resistive RAM (RRAM) technology startup co-founded by Prof. Wei Lu and former student Dr. Sung Hyun Jo, has entered the China memory market and is opening a new office in Shanghai, China. Crossbar is now partnering with Semiconductor Manufacturing International Corporation ("SMIC", NYSE: SMI; SEHK: 981), China's largest and most advanced semiconductor foundry and one of the world's largest foundries, to develop and produce non-volatile RRAM.

Crossbar, Inc. was created to tackle the physical limitations of conventional memory technology. With the company's take on RRAM, a growing alternative to industry-standard Flash, Crossbar developed a solution that scales to the needs of shrinking technology without sacrificing speed and capacity. It promises to write much faster than Flash, and can fit at least 1TB of storage into the space of a postage stamp at very low cost.

Crossbar expects to market its first product and have a working prototype of standalone memory by the end of 2016. Their technology promises 20-100x improved performance over NAND Flash, up to 1TB of data storage on a single chip, and compatibility with existing semiconductor fabs, all while requiring 20X less power than conventional NAND.

With specs like this, Crossbar's RRAM could put 250 hours of HD video on a cell phone in the not-too-distant future. It makes possible high-speed access to massive quantities of data in low-power storage centers. It also enables smarter industrial and medical devices, provides faster access to cloud storage, facilitates powerful wearable devices and embedded sensors that can communicate rapidly, and adds one more vital piece to the Internet of Things puzzle.

Full story: eecs.umich.edu/n/crossbar

Clinc Funded to Develop Systems Based on Intelligent Personal Assistant Technology

Artificial Intelligence startup Clinc, founded by Profs. Jason Mars and Lingjia Tang along with research fellow Michael Laurenzano and graduate student Johann Hauswald, is off and running in downtown Ann Arbor. On August 4, 2016, the company announced a $225,000 NSF grant and closure of a $1.2 million round of seed funding.

Clinc has built Lucida, its state-of-the-art, open-source intelligent assistant and machine learning platform that allows developers and the open-source community to easily create and deploy personalized voice and vision-based intelligent assistants in applications beneficial to society – such as non-profit education and improving technological access for the disabled. The company will also focus on building scalable infrastructure to power the massive amounts of computation required to power deep learning intelligent assistant technologies.

The investments will help Clinc strengthen and increase the intelligent capabilities of Lucida, to build upon its research in machine learning, and to invest in the continued development of its deep learning platform and robust ecosystem of artificial intelligence engines.

Full story: eecs.umich.edu/n/clinc

Fighting CyberCrime With Data Analytics Just Got a Little Easier

Quadmetrics, a cyber risk security startup co-founded by Prof. Mingyan Liu in 2014, was acquired by FICO, an analytic software company based in California. Prof. Liu had served as Chief Science Officer for Quadmetrics, and will continue to work with FICO in the coming year as part of FICO's analytic science team focusing on cyber security.

Prof. Liu said her team "built a system using state-of-the-art Internet measurement and predictive analytics techniques to enable quantitative security risk assessment as well as proactive measures." They built the only predictive solution then on the market, with funding from the Department of Homeland Security and the National Science Foundation.

Doug Clare, vice president of cyber security solutions at FICO, said: "We're excited to have the QuadMetrics team—and their deep expertise—joining us in our efforts to fight cyber crime and help all organizations improve their visibility and insights into cyber risk. Just as the FICO Score gave credit markets a single metric for understanding credit risk, this product will give the industry a common view of enterprise cyber security risk."

Full story: eecs.umich.edu/n/quadmetrics

FICO™ ACQUIRED QuadMetrics

Cyclos Semiconductor

Cyclos Semiconductor Provides Technology for Use in IBM Computers

Cyclos Semiconductor, the Resonant Clock Mesh (RCM) technology company co-founded by CSE Chair Marios Papaefthymiou, has partnered with IBM to supply the RCM technology that is found in IBM's 5 GHz Z13 high-performance server chip. RCM technology allows electrical energy to be reclaimed and recycled in digital semiconductors, much in the same way that kinetic energy is reclaimed and recycled in hybrid-engine automobiles. Cyclos' licensable technology contributes toward allowing IBM's high-performance processors to run at higher speed while dissipating less heat.

With Over 10 Million Certificates Issued, Let's Encrypt Aims to Secure the Entire Web

Let's Encrypt

Let's Encrypt, the website security non-profit begun by Prof. J. Alex Halderman, is on a mission to secure the entire web by bringing HTTPS, an encrypted and authenticated version of HTTP commonly associated with a green lock icon in the address bar of the browser, to everyone. However, adopting HTTPS has remained too complicated and expensive for the vast majority of smaller websites.

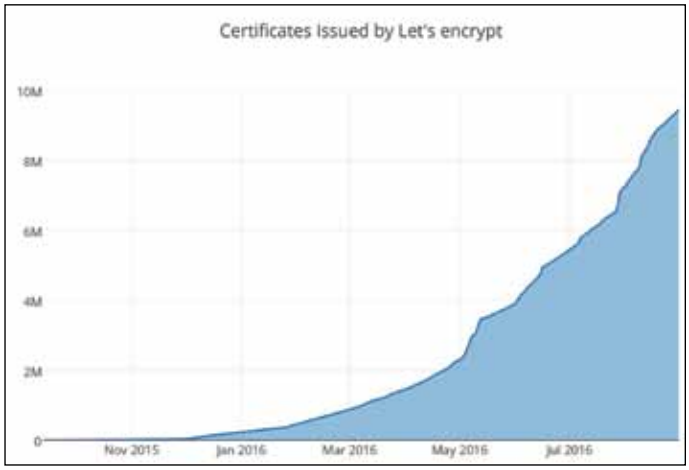
To facilitate moving to HTTPS, Prof. Halderman joined forces in 2012 with colleagues at Mozilla and the Electronic Frontier Foundation to found Let's Encrypt, a non-profit certificate authority with the mission of making the switch to HTTPS vastly easier. Prof. Halderman and his then-student James Kasten (MS PhD CSE '12 '15) developed technology that automates the entire process, allowing a website operator to deploy HTTPS in seconds with only a single command.

Since its public launch in December 2015, Let's Encrypt has grown to have a significant impact on the security of the web. By March 2016, the service had issued one million certificates. As of September 9, 2016, it had grown to become by some measures the world's largest certificate authority, having issued more than 10 million certificates.

This includes large-scale deployments from companies such as Akamai,WordPress.com, Dreamhost, and Bitly.

Thanks to funding support from over 35 industry sponsors, including Cisco, Akamai, and Facebook, Let's Encrypt provides the entire service for free.

Full story: eecs.umich.edu/n/er



Let's Encrypt had issued over 9.25 million certificates by the last week of August 2016. By September 9, 10 million had been issued.

New Venture is on the Path to Build Continual Learning AIs

Prof. Satinder Singh Baveja and his co-founders Mark Ring and Peter Stone (UT Austin) started the artificial intelligence company Cogitai in September 2015 with the aim of developing AI technology that empowers machines to learn continually from interaction with the real world, enabling everyday things that sense and act to get smarter, more skilled, and more knowledgeable with experience.

The company got a big boost when Sony announced on May 17, 2016 that it was investing an undisclosed amount of money to partner with Cognitai to collaborate towards the development of novel AI technologies using deep reinforcement learning with prediction technology that could be used as the basis for the next generation of AI applications and products.

"Cognitai will build upon decades of research in the fields of Reinforcement Learning and Deep Learning, harnessing recent progress, but going well beyond current technology to create systems that learn for themselves how the world works in ways reminiscent of how human children do," according to Prof. Baveja, who serves as Chief Scientist at Cogitai. "Our goal is for our systems to develop an understanding of the real world well beyond that of existing AI systems. Once a continual-learning system can begin to explore the world and build up knowledge on its own, it will discover, by itself, many of the same concepts and skills that we as humans have also learned. The potential for commercial application – from games to robotics to space exploration – is truly extraordinary."

Full story: eecs.umich.edu/n/cogitai

VIRTA LABS™

Virta Laboratories Awarded $750K NSF SBIR Grant; Introduces BlueFlow™

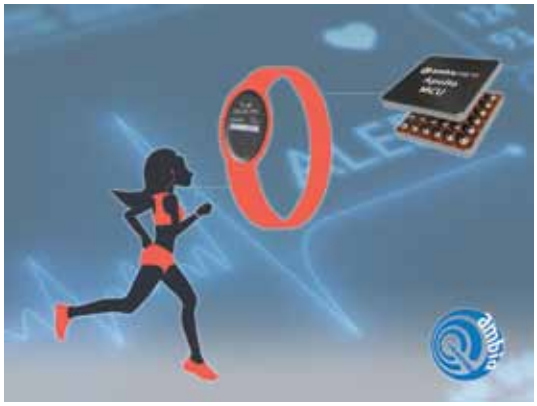
Healthcare security company Virta Laboratories, Inc. received a $750,000 grant from the National Science Foundation Small Business Innovation Research (SBIR) program in early 2016. Co-founded by Prof. Kevin Fu, U-M engineering alumnus Denis Foo Kune, and computer scientist Ben Ransford, Virta Labs is using the funding to expand its product offerings, which are designed to protect hospitals from malware.

The funding arrives as hospitals around the world have been disrupted by ransomware. Hollywood Presbyterian Medical Center paid a $17,000 ransom in February of this year to recover from a week-long attack against its hospital IT systems. Malware has also disrupted hospitals in California, Kentucky, West Virginia, Germany, and Australia.

Virta has used the funding in part to launch BlueFlow™, a software program that automatically fingerprints hospital assets to continuously measure the effectiveness of security risk mitigation controls. *Full story: eecs.umich.edu/n/virta*

Ambiq Micro Hits the Market With New Products and Partners

Since its founding in 2010 by Dr. Scott Hanson (BSE EE '04, MSE EE '06, PhD EE '09), Prof. Blaauw and Prof. Sylvester, Ambiq Micro has been closely followed by the semiconductor industry. Founded on the idea that extremely low-power semiconductors are the key to the future of electronics, their patented Subthreshold Power Optimized Technology (SPOT™) platform dramatically reduces the amount of power consumed by semiconductors, making their integrated circuits (ICs) an ideal solution for energy critical applications.



The latest of Ambiq's hotly anticipated new products is a super-low-power optical heart-rate-monitoring solution for next-generation wearables. The technology is the result of a partnership with PixArt Imaging Inc., which provides Optical CMOS sensors for human-machine interface (HMI) solutions. The two companies combined their strengths to create an "always on" device that can continuously sense and monitor one's heart rate, crucial for health and wellness applications that move way beyond fitness applications.

This device incorporates Ambiq's history-making Apollo MCU (microcontroller unit), in volume production as of November 2015, which consumes less than half the energy of any other microcontroller on the market when tested to the industry-standard EEMBC ULPBench benchmark.

In more recent news, Ambiq announced a partnership with Fujitsu, which will market the Apollo family of ARM Cortex MCUs as well as real-time clocks in Japan, Asia, and Europe. Dr. Hanson leads the company as Chief Technology Officer.

The Future of Data Science: Kicking Off U-M's Proactive Step Into an Exploding Field

Researchers from around the nation gathered at the University of Michigan to celebrate the official launch of Michigan's $100M Data Science Initiative. Central to this program is the new Michigan Institute for Data Science (MIDAS), which aims to make sense of the massive datasets researchers in every field now have at their disposal. The symposium, titled "The Future of Data Science: A Convergence of Academia, Industry, and Government," was an all-day event featuring representatives of many major industries and academic institutions. Their presentations were recorded and available at: *eecs.umich.edu/n/midas*

EECS Faculty Involved in MIDAS

Jacob Abernethy
Laura Balzano, Education and Training
Satinder Singh Baveja, Management
Michael Cafarella
Jason Corso
Jia Deng
Jeff Fessler
Al Hero, Co-Director and Management
H.V. Jagadish, Distinguished Scientist and Management
Danai Koutra
Walter Lasecki
Honglak Lee, Education and Training
Mingyan Liu
Jason Mars
Eric Michielssen, Management
Rada Mihalcea, Management
Emily Mower Provost
Barzan Mozafari
Raj Rao Nadakuditi
Necmiye Ozay
Atul Prakash, Faculty Engagement and Recruitment
Dragomir Radev, Faculty Engagement and Recruitment
Clayton Scott
Quentin Stout
Vijay Subramanian
Jenna Wiens

Celebrating Maxwell's Equations: 150 Years

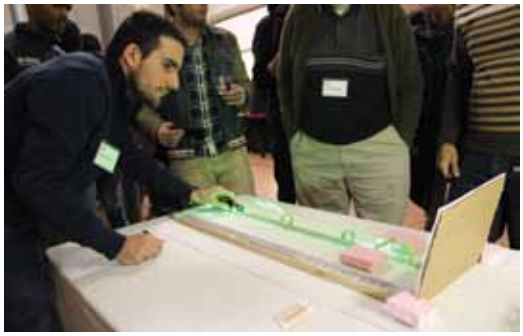
Joining the worldwide celebration of 150 years of Maxwell's Equations, ECE held an event that brought together more than 100 students, faculty, industry experts, and guests from around the nation to enjoy keynote talks, student demonstrations, and an industry panel.

In 1865, James Clerk Maxwell (1831-1879) published *A Dynamical Theory of the Electrodynamic Field*, which featured the original set of what is now referred to as Maxwell's equations. Through these equations, Maxwell described scientifically the propagation of light and electromagnetic waves travelling through space at the speed of light. His equations have been called the "second great unification in physics," following Isaac Newton's formulation of the laws of motion and gravity, and his contributions to science and impact on society have been likened to those of Albert Einstein. He is considered the founder of the field of electromagnetic theory.

The event was co-sponsored by IEEE, Optical Society of America, International Society for Optics and Photonics, Electron Devices Society, Antennas and Propagation Society, Microwave Theory and Techniques Society, the National Science Foundation, IEEE Photonics Society, Optics Society at the University of Michigan, and the Student Chapter of IEEE/Eta Kappa Nu.

Full story: eecs.umich.edu/n/maxwell

The event's panelists, speakers, and organizers. (L): Prof. Somin Eunice Lee, ECE; Sue Dean, EOTech, L-3 Communications; Dr. Jim Rautio, Sonnet Software, Inc.; Dr. Deanna McMillen, EOTech, L-3 Communications; Dr. Arthur Yaghjian, electromagnetics consultant; Dr. Lora Schulwitz, MDA Information Systems



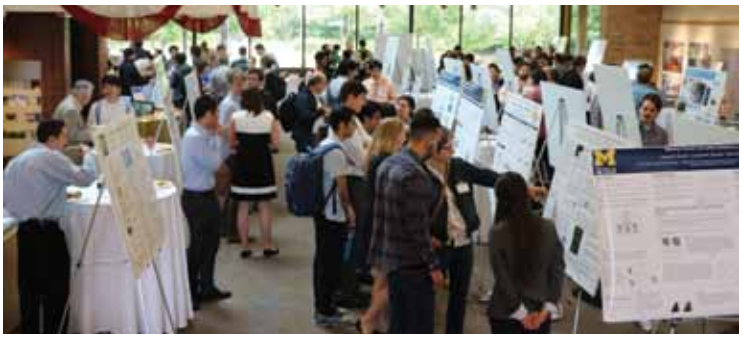
Leaders in Neuroscience Look to the Future

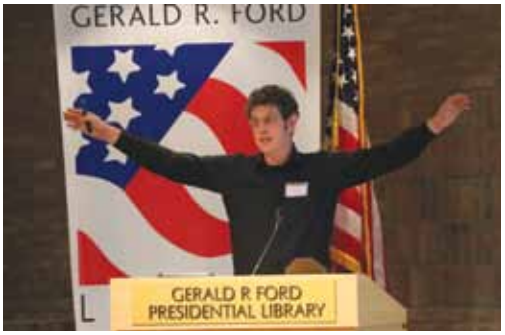
Understanding the complexity and mysteries of the brain is one of the biggest scientific challenges of this century. Engineers and neuroscientists from around the globe discussed the future of this research at the inaugural *International Conference for Advanced Neurotechnology (ICAN)*, held at the Gerald R. Ford Presidential Library at U-M.

The goal of ICAN is to review the recent advancement in neurotechnology and neuroscience, define the need for next-generation tools to move neuroscience forward, and enhance the translation of technology to the scientific community.

ICAN was organized by the International Program for the Advancement of Neurotechnology (IPAN). Directed by Prof. Euisik Yoon, the program supports a “dream team of researchers” from eight universities around the world with the goal of simplifying the ability of a neuroscientist to map neural networks in the brain. This research could lead to better prosthetics and treatments for conditions like Parkinson’s disease, deafness, blindness, paralysis, and depression.

Story, photos, and videos of the talks at: eecs.umich.edu/n/ican





The Future of Transportation

With a focus on driverless and connected vehicles, the National Academy of Engineering held a regional meeting at Michigan Engineering in May. NAE members comprise the nation’s most influential engineers. Autonomous and connected vehicles are expected on U.S. roads within a decade, so it’s a pivotal time for the technologies. Prof. Al Hero led a panel discussion of big data’s impact on transportation, and Prof. Kang Shing discussed the importance of cybersecurity in cars of the future. The participants were treated to a tour of Mcity.

Full story: eecs.umich.edu/n/nae2

Fourth Archimedes Workshop Encourages Thought, Action on Medical Device Security

On May 15-17, 2016, experts in medical device manufacturing and computer security gathered on campus at an invitation-only workshop to discuss effective ways to improve medical information security and the new FDA guidance on cybersecurity.

The agenda included remarks by health delivery organization CISOs, product security officers from medical device manufacturers, officials from the White House and the FDA, forensics experts, hardware security experts, international partners, and speakers who chose to remain anonymous. The workshop was organized by Prof. Kevin Fu through his Archimedes Research Center for Medical Device Security.

EECS-Related Projects Showcased at South by Southwest Conference

Each year, U-M participates in the *South by Southwest Conference*, which takes place in Austin, TX. Michigan's booth at the expo showcases a number of tech-related projects, and this year three of the projects highlighted were associated with EECS.

One project shown was a four-wheeled robot from Prof. Edwin Olson's lab, demoed by graduate student Rob Goeddel, which was shown as an example of mobility transformation. The robot is a platform that senses the environment around it and shares data – tasks related to autonomous transportation networks.

Students from Michigan Hackers were on hand to talk about MHacks, the student-run hackathon at Michigan that attracts about 1200 students from around the country twice a year.

A third display was on a collaboration between Dr. David Chesney and Prof. Sean Ahlquist of Architecture. Called Social Sensory Surfaces, it is hands-on fabric structure that allows children on the autism spectrum to perceive how much pressure they are putting on objects. By pressing and rubbing, the children can color in virtual coloring books. The students who demoed this project at the conference were CS undergraduates Anna Dai and Si Long Tou, and architecture undergraduates Taylor Boes and Oliver Popadich.

Full story: eecs.umich.edu/n/sxsw

CS and Architecture students showcasing the Tactile Coloring Book at SXSW.

Quora Knowledge Prize Winner Igor Markov Presents Winning Answer to Packed House at MLConf

Prof. Igor Markov was a featured speaker at the *Machine Learning Conference,* which took place May 20, 2016 in Seattle. His talk, entitled "Can AI Become a Dystopian Threat to Humanity? A Hardware Perspective," expanded on his answer to a Quora question on preventing AI from becoming a dystopian threat to humanity that won a Knowledge Prize and another answer regarding how to identify chatbots. In his talk, Prof. Markov suggested a series of measures to partition and contain the power of AI, from introducing boundaries between different levels of intelligence to limiting self-improvement or self-replication.

Prof. Markov is a top contributor to Quora, where his entries cover subjects ranging from computer science to geopolitical affairs. He has over 35,000 followers.

Full story: eecs.umich.edu/n/quora

Prof. Koushil Sreenath (Asst. Professor at Carnegie Mellon University, Robotics Institute, and Michigan alumnus), Prof. Aaron Ames (Assoc. Prof. at Georgia Tech, AMBER Robotics Lab), and Prof. Jessy Grizzle display one of their robotic legs at the expo.

Michigan Shines at the National Robotics Initiative 5-Year Anniversary

Prof. Jessy Grizzle helped celebrate the fifth anniversary of the *National Robotics Initiative (NRI)*, held June 9, 2016 in Washington, DC. The NRI is a multi-agency effort to accelerate the development of robots that cooperate with people.

"It was very exciting to meet fellow robotics researchers and to share our work with members of Congress," said Prof. Grizzle, who appreciates all that the NRI has done for the field. However, he said that the actual robots are expensive, and the funding of the robots themselves, in addition to research and student support, is critical.

Prof. Jason Corso, who also has received funding from the initiative, said, "The NRI program has let my research group focus on problems at the boundary of perception and language with the freedom to explore innovative methods that have strong potential to revolutionize the way robots and humans work together in spatially oriented tasks." *Full story: eecs.umich.edu/n/nri*

Ryan Schrader was the first person to graduate with a degree in Data Science from the College of Engineering.

New Undergraduate Program in Data Science Grows Rapidly, Graduates First Student

In Fall 2015, the EECS Department and the Department of Statistics in LSA launched a joint undergraduate program in Data Science. As of Fall 2016, the program had grown to 96 declared majors, 45 in engineering and 51 in LSA.

The first engineering student to graduate with a degree in data science was Ryan Schrader, a dual DS/CS major who matriculated in December 2015. Ryan, who is now a Software Developer on the Predictive Analytics team at healthcare software firm Epic near Madison, Wisconsin, says that until the announcement of the data science major, he was unsure whether he would be fully prepared to work in the field of data science.

"Through the major, I was exposed to statistics courses and capstone projects that served to deepen my understanding of statistical theory and application, which has since proved essential in my ongoing learning and projects post-graduation, said Ryan. "At Epic, I use the skills I learned on a daily basis, whether it is exploring and visualizing a new dataset or building and testing new predictive models."

Full story: eecs.umich.edu/n/datascience

Prof. Alan Taub, Gary Peters, Prof. Stephen Forrest

Senate Effort to Reauthorize America COMPETES Act

Prof. Stephen Forrest and Prof. Alan Taub (Materials Science and Engineering) participated in a U.S. Senate roundtable discussion on reauthorizing the America COMPETES Act. Members of the Senate Commerce, Science, and Transportation Committee, which includes Gary Peters, U.S. Senator from Michigan, have held three roundtable discussions to solicit input from leading science and technology policy experts as the committee works to reauthorize the Act.

Full story: eecs.umich.edu/n/compete

Beth Lawson Receives CoE Excellence in Staff Service Award

Beth Lawson, Senior Research Administrator for Electrical and Computer Engineering, received a 2016 College of Engineering Excellence in Staff Service Award for her 18 years of sustained excellence serving the faculty in the Systems area. Faculty praised Beth's willingness to provide a high level of support to new and senior faculty alike, her ability to work well with other departments and institutions, and her unflappable calm in the face of sometimes dramatic changes in budgets and entire proposals.

Full story: eecs.umich.edu/n/beth

First Fairy Door at Michigan Appears in Beyster Building

Fairies have for the first time ventured onto a U-M campus and have taken up residence in the Bob and Betty Beyster Building.

The fairies have made their home inside a computer stationed on the building's main floor. Their dwelling is complete with doors, windows (OK, not *that* Windows), and lights.

Fairy doors have been sighted around town for years, with the fairies choosing iconic Ann Arbor landmarks in which to site their homes. The doors first appeared in the baseboards of the 100+-year-old home of Jonathan and Kathleen Wright in 1993. On April 7, 2005, the first was seen in public on the exterior of Sweetwaters Coffee and Tea. Just a few other fairy doors have gradually appeared at bookstores and shops downtown. Welcome, fairies!

Full story: eecs.umich.edu/n/fairy

Kimberly Mann: CoE Excellence in Staff Service Award Recipient

Kimberly Mann, AI Lab Research Administrator, was selected for a 2016 College of Engineering Excellence in Staff Service Award. Kimberly manages all aspects of the research process for the AI lab, including proposals, grant management, personnel appointments, and always has chocolate handy for anyone needing a little pick-me-up. She has participated in several college and university committees to identify improvements to policy and procedures on a variety of issues pertaining to research administration.

Full story: eecs.umich.edu/n/mann

Michigan Hosts the 2016 Robotics: Science and Systems Conference

The University of Michigan hosted the *2016 Robotics: Science and Systems Conference*, which took place June 18-22, 2016. The conference, which was co-chaired by Profs. Edwin Olson (EECS) and Ryan Eustice (NAME), brought together researchers working on algorithmic or mathematical foundations of robotics, robotics applications, and analysis of robotic systems.

The event gave attendees the opportunity to see the best research in all areas of robotics, as well as to attend invited talks, oral and interactive presentations of refereed papers, workshops, tutorials, and lab presentations.

EECS Profs. Jessy Grizzle (Elmer G. Gilbert Distinguished University Professor and Director of the Dynamic Legged Locomotion Lab), Chad Jenkins (The Laboratory for Progress), Ben Kuipers (Intelligent Robotics Lab), Edwin Olson (APRIL Robotics Lab), and Shai Revzen (BIRDS Lab) demonstrated some of their labs' robotics projects during facilities visits.

Full story: eecs.umich.edu/n/robotics

Researchers from the APRIL Lab demonstrated their autonomous, cooperative robots.

Students from Prof. Shai Revzen's lab demonstrated their robot, Bigant, who was able to walk even with a broken leg.

Workshop on Information, Decisions, and Networks: In Honor of Demos Teneketzis' 65th Birthday

Friends and former students of Prof. Demos Teneketzis celebrated his 65th birthday at the Workshop on Information, Decisions, and Networks, held in his honor. Attendees came from around the world to celebrate his friendship and mentorship, as well as to learn from 15 invited speakers who gave talks ranging from trusting self-driving cars to strategic information transmission, game theory, control, and more.

Prof. Teneketzis has made fundamental contributions to information structures in decentralized stochastic control, decentralized sequential detection, multi-armed bandits, scheduling resource allocation and routing in networks, diagnosability in discrete event systems, real-time communication and information theory, mechanism design, energy markets, and cyber-physical security.

The talks and photos are available online at: eecs.umich.edu/n/demos

Prof. Kevin Fu Talks Medical Device Security at NAE Frontiers of Computing

Prof. Kevin Fu was selected to speak at the *2015 U.S. Frontiers of Engineering Symposium*, which was hosted by the National Academy of Engineering (NAE). Prof. Fu was one of only 15 speakers who presented at the symposium.

The NAE invites roughly 100 of the top engineers under the age of 45 from around the country to participate in its *Frontiers of Engineering Symposium*, a two-and-a-half day event focused on cutting-edge research in four areas: Cybersecurity and Privacy, Engineering the Search for Earth-like Exoplanets, Optical and Mechanical Metamaterials, and Forecasting Natural Disasters.

Prof. Fu's presentation, "On the Technical Debt of Medical Device Security," focused on how a number of innovations including computer networking, wireless communication, wireless power, and the Internet, combined with electronic health records and re-engineering of clinical workflow have enabled innovative therapeutics and diagnostics, but at the cost of technical debt for information security and privacy.

Full story: eecs.umich.edu/n/nae

Computer Science Grows to Become 2nd Largest Major at Michigan

It's no secret that computer science is a hot field, and here at Michigan the number of undergraduate students declaring CS as a major has more than doubled between the Winter term of 2012 and Winter 2016.

According to the Office of the Registrar, with 940 CS undergrads from Engineering and 295 from LSA in Winter 2016, CS is the second largest undergraduate major at Michigan, with only Business Administration having more declares.

Dragomir Radev Coaches U.S. Linguistics Teams to Wins for Tenth Year

Prof. Dragomir Radev has coached U.S. high school students to successful competition at the *14th International Linguistics Olympiad (IOL)*, which was held at the Infosys campus in Mysore, India from July 25-29, 2016. This is the tenth year that Radev has coached the U.S. teams.

The IOL consists of individual and team contests with unique problems each year. This year's individual contest focused on Aralle-Tabulahan, Luwian, Kunuz Nubian, Iatmül, and Jaqaru languages. For the team contest, the teams were tasked with matching the pronunciation of 114 Taa words with their transcriptions. Problem solving at the IOL stresses the ability of contestants to decipher the mechanisms of languages by using logic and reasoning to explore a wide range of hypotheses.

Under Radev's coaching, the U.S. teams won one gold, three silver, and two bronze medals in individual competition. Team USA Red received the highest combined scores on the individual event.

The U.S. and Canadian team members were selected from more than 1,700 students who competed in the *North American Computational Linguistics Olympiad (NACLO)*. Profs. Radev and Lori Levin of Carnegie Mellon University are the founders of NACLO.

Team Canada, Team USA Red, and Team USA Blue. Prof. Radev appears in the back row, second from the left.

Full story: eecs.umich.edu/n/naclo16

JASPRIT SINGH

Seeking a Better Life Through Engineering – Even in Retirement

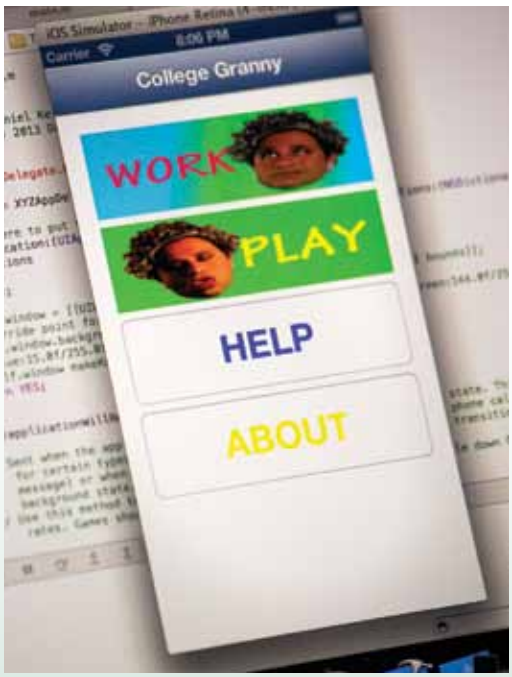
Prof. Jasprit Singh retired in 2015 after 30 years at the University of Michigan to embark on his second career as president and co-founder of Gurmentor, Inc., a software application company. During his time at Michigan, he experienced the thrill of scientific discovery, enlightening students into the physics and mysteries of electrical engineering, and sharing his belief that technology can enhance healthy and peaceful living.

Prof. Singh's research focused on theoretical studies of semiconductor structures for intelligent devices. His group has developed simulators to understand electronic and optoelectronic properties of devices such as high-speed transistors, lasers, modulators, and LEDs.

In 1988, Prof. Singh, in collaboration with Prof. Pallab Bhattacharya, accomplished the first self-organized growth of InGaAs quantum dots. It was one of those types of discoveries so far ahead of its time, it took years for the research community to jump on board. The following years of investigation into these structures, with an expanded group that included Profs. Ted Norris and Rachel Goldman, had a tremendous impact on the entire field of nanophotonics.

In his later research, he focused on semiconductor devices for high-powered RADAR, electric vehicles, smart grids, and solid-state lighting.

In addition to his work on science and technology, Prof. Singh maintained a deep interest in the use of yoga and mindfulness to enhance personal and social well-being. He has taught courses on Mindful Wellness integrating yoga and modern technology, and developed the course, Imagine, Innovate, Act! in which students from engineering, art, music, health fields, and a variety of other backgrounds designed mobile apps to help users set and meet wellness milestones. The definition of "wellness" was broad, encompassing creativity and learning in addition to physical and mental health. The class was taught with former doctoral student Dr. John Hinckley (BS Physics 1983; BSE MSE PhD EE '85 '86 '90), who also a co-founder of Gurmentor.



An app created in Prof. Singh's course, "Imagine, Innovate, Act!

In 2012, Prof. Singh delivered a series of six lectures available online called *Sustainable Good Life and Technology*. *[Available on the EECS YouTube channel]*

Prof. Singh's passion for education was perhaps most clearly expressed in the ten books he wrote for students and professionals, including *Semiconductor Device Physics and Design*, *Smart Electronic Materials*, and *Electronic and Optoelectronic Properties of Semiconductor Structures*. Another three included a children's book and books on family history and how to create a good life.

Asked if he would like to share some words about his career as a faculty member, Prof. Singh said:

My 30 years at Michigan were most delightful. The University, the city of Ann Arbor, and its Public Schools not only nourished me but also allowed me to raise two wonderful sons, one who now has a PhD in Chemical Engineering and one who is at UC Santa Barbara in the Computer Science program. The U-M cancer center also provided my wife Teresa the most amazing treatment when she needed it 20 years ago and she is now totally healthy. My company Gurmentor, Inc. formed with one of my outstanding students, Dr. John Hinckley, is now providing me an exciting experience. We are building technology with the primary function of "lowering the threshold to creating new habits and pleasure sources." I have always wanted to bring the word "pleasure" into the field of engineering and now I can.

Jasprit Singh wrote more than 13 books. Though primarily technical subject matter, they also touched on personal well being and he even wrote a book for children.

Prof. Singh received his BS degree from the University of Delhi in 1973, and his MS and PhD from The University of Chicago in 1976 and 1980, respectively. From 1980-83, he pursued postdoctoral training as a research associate at the University of Southern California, Los Angeles, and from 1983-85, he was a scientist in the Avionics Laboratory at Wright Patterson Air Force Base. He joined the University of Michigan as assistant professor in electrical engineering and computer science in 1985, and was promoted to associate professor in 1987 and professor in 1991. He was a visiting professor and NTT Telecommunications Chair at the University of Tokyo (1991-92) and visiting professor at the University of California Santa Barbara (1999-2000).

As Professor Emeritus, Jasprit Singh is continuing his pursuit of The Good Life, and sharing what he's learned with the world.

Full story: eecs.umich.edu/n/jasprit

Researchers Visit Michigan for C-FAR Semi-annual Meeting

University researchers and corporate sponsors from across the nation met at Michigan's Palmer Commons on May 3-4 for the *Semi-annual Meeting of the Center for Future Architectures Research (C-FAR)*. This twice-yearly meeting is an opportunity for C-FAR faculty and students to share their research results and network with the center's sponsors and with each other. Workshops were held on topics such as data scaling, heterogeneous systems, secure system design, and hardware/software interfaces.

For the first time, C-FAR invited students to present live demonstrations of their research projects at the meeting. Over 30 demos were presented, and faculty and sponsors in attendance voted for the top 3 winners. Winning projects were "Frankencamera 4 - A Heterogenous Platform for Computational Photography," "End-to-end Demonstration of an Approximate Computing System," and "Cold Boot Attacks on DDR3 Systems."

WOMEN IN COMPUTING AT MICHIGAN

The field of computing is redefining our world in real-time, but it is also one in which women have historically been underrepresented. EECS strives to expand opportunities for women in computing through outreach, education, and through connection to resources. Here are a few initiatives that are currently taking place in the Department.

Computing CARES: A Plan to Boost the Retention of Women in Computing

Prof. Valeria Bertacco and Dr. Mary Lou Dorf have received a grant under the University's Third Century initiative for the purpose of engaging and retaining female students in computer science and computer engineering. Their project is called "Computing CARES – Climate and Retention Engagement for Success" and includes a number of initiatives to improve gender diversity in the CS and CE undergraduate programs.

Joining them in implementing the effort are a team of faculty and staff in the CSE Division, including Chris Firlik, undergraduate advising; Prof. Edwin Olson; Dr. Jeff Ringenberg; and Prof. Michael Wellman. The group is working to implement engaged learning and positive climate experiences throughout the computing curriculum in the freshman and sophomore years. *Full story: eecs.umich.edu/n/cares*

U-M Receives Pacesetters Awards to Attract More Women to Computer Science

EECS has received a grant from the National Center of Women and Information Technology (NCWIT)'s Pacesetters program, which is sponsored by the National Science Foundation (NSF), Google, and Qualcomm. Pacesetters is a 2-year program under which participating institutions develop aggressive and measurable goals for increasing the number of women in the U.S. computing and technology workforce.

There is a high level of enthusiasm in the Department for the Pacesetters program. "In my view, Pacesetters is a great way for academic institutions to collaborate and arrive at an aggressive plan to accomplish a 50/50 (female/male) representation within four years," says Dr. Mary Lou Dorf, who led the effort for the pacesetters award. "Female computer science majors at U-M have increased from 12 to 18 percent in the last five years, even as the overall number of CS majors has more than doubled to over 1,000 in that time period. I believe that with a continued focus on this issue, we will ultimately achieve 50/50 representation." *Full story: eecs.umich.edu/n/pace*

Ensemble of CSE Ladies Provides Support to Women Graduate Students

The Ensemble of CSE Ladies (ECSEL) is a student group founded in 2015 to support female students in the the Department's CSE graduate programs. The group's goals are to foster a sense of community amongst graduate women, to support members' academic and career development, to help incoming graduate students adapt and thrive in CSE, and to generally enable a great graduate experience for their members. One year later, the group is going strong and organizing events. *Full story: eecs.umich.ecu/n/ecsel*

Women in Computing Lecture Series

LYDIA E. KAVRAKI
Noah Harding Professor of Computer Science and Professor of Bioengineering, Rice University
Computing for Robots and Biomolecules (AY15-16)
September 17, 2015

DR. BONNIE DORR
Associate Director and Senior Research Scientist
Florida Institute for Human and Machine Cognition
Human-Centered Language Processing and Extended Ambient Intelligence at IHMC (AY15-16)
September 29, 2015

NADIA HENINGER
Assistant Professor
University of Pennsylvania
How Cryptography Fails in Practice (AY15-16)
December 14, 2015

DR. MARY LOU SOFFA
Owens R. Cheatham Professor
The University of Virginia
Addressing Processor Over-Provisioning on Large Scale NUMA Machines (AY15-16)
February 15, 2016

MAJA MATARIĆ
Professor
University of Southern California
Robots That (Provide) Care (AY15-16)
June 20, 2016

Celebrating Cultural Diversity

ECE continued its new tradition of celebrating the different cultures of its student body with celebrations of Diwali, the Lunar New Year, and Iftar.

Diwali

Diwali is an ancient Hindu festival that signifies the victory of light over darkness, knowledge over ignorance, good over evil, and hope over despair. The event included Indian music, dance, cuisine, and other Diwali traditions.

Lunar New Year Celebration

Chinese students had the chance to celebrate their nation's biggest and longest holiday, featuring regional music, dance, cuisine, and even calligraphy.

Iftar Dinner

Iftar is the evening meal when Muslims end their daily Ramadan fast at sunset. Ramadan is the 9th month of the Islamic calendar, and is celebrated by Muslims worldwide. Attendees feasted in traditional style and enjoyed live music.

MiBytes Summer Computer Camps Held in Ann Arbor, Downtown Detroit

MiBytes, the annual series of summer computer camps run by the CSE Division, was held for a third summer on North Campus, and in a first for this year the camp was also run in downtown Detroit.

On campus, all three popular camps from the previous year were run again: Tinkering with Mobile Apps (5 days), Game Design and Development (5 days), and Hacking in a Digital World (10 days).

In Detroit, a new 4-day camp was launched, entitled Explore Computer Science, which took place at the Michigan Engineering Zone, a U-M facility. This camp was made possible through the support of Ford and provided students with an introduction to mobile app development. This year's camps were run by faculty members Jeremy Bond, Marcus Darden, and Dr. Jeff Ringenberg. All four camps were hands-on and immersive, and each ended with a showcase at which students were able to demo their projects.

Full story: eecs.umich.edu/n/cc

High School Students Get a Look at Power, Sensors, and Nanotech

In ECE's second year of Electrify Tech Camps, visiting high school students got to experience real lab work in three five-day sessions. From designing tiny computer chips to building batteries for race cars, the attendees got their hands on all the cool projects that make ECE exciting.

Students could choose between Power Up, led by Heath Hofmann; Sense It, with Jamie Phillips; or Nano-Size It, with P.C. Ku. Power Up camp had students learning the basics of circuit design and motors, as well as how to use different types of energy. Students assembled their own batteries for remote control cars and built a solar-powered chip. Sense It gave students a look at the tiny components that make their phones and other wireless technology work, and had them building a wireless system of their own invention. Nano-Size It, in its first year, gave students the chance to work in the Lurie Nanofabrication Facility, designing and fabricating their own nano-structures. Each session focused on hands-on lab work and group projects, wrapped up in a good time around North Campus.

Full story: eecs.umich.edu/n/electrify

Outreach

Summer Bootcamp Prepares Undergraduates for Work With Big Data

Students working in the Data Mining group at the bootcamp

Datasets of enormous complexity and size are being generated in the diverse areas of genomics, imaging, electronic health records, social media, and environmental monitoring. The insights obtained from these massive data sources will inform the prevention and treatment of human diseases and play a major role in biology, medicine, and public health in the coming decade. But more training is needed to prepare the next generation of leaders to tackle these challenges.

The 2016 Big Data Summer Bootcamp was a six-week interdisciplinary training and research program, co-designed by Prof. Barzan Mozafari and his collaborators from other departments to introduce undergraduate students to the growing number of approaches to big data.

Over the course of the camp, students gained a comprehensive overview of the field of big data by attending a variety of lectures in the mornings and working on research projects in the afternoons. Each Friday, the students took part in professional preparation activities and attended journey lectures, which showcased the academic journeys of researchers at different stages of their careers in data science, at lunch.

At the conclusion of the bootcamp, the students presented their work and learned about other student projects at a research symposium and attended a professional development workshop. Throughout the program, the students had the unique opportunity to interact with distinguished faculty and graduate students from the U-M departments of biostatistics, information science, statistics, and electrical engineering and computer science.

Full story: eecs.umich.edu/n/bootcamp

The Fun Side of Data: MIDAS Camp

The Michigan Institute for Data Science (MIDAS) hosted a summer camp for high schoolers, teaching them how to create art, diagnose disease, and play detective with math.

Prof. Al Hero, co-director of MIDAS, gave an introduction to how signal processing is used in the field. Prof. Jenna Wiens discussed machine learning and data mining and their applications in the healthcare field.

Take Our Sons and Daughters to Work Day 2016

This year EECS participated in Take Our Daughters and Sons to Work Day. Faculty and staff brought their children to work to enjoy a day filled with fun activities in both the EECS and Beyster Buildings. The day started with an opportunity to see MARLO, Prof. Jessy Grizzle's freestanding bipedal robot.

The children then had the opportunity to visit numerous event stations, including seeing a portion of the 1940s era ENIAC, one of the world's first programmable general-purpose computing systems, getting their picture taken with a robot, and experiencing virtual reality with GameStart, an Ann Arbor-based company that teaches students how to program. At the end of the day, the children and parents enjoyed a pizza party.

Outreach

Having Fun With ECE

Alumni, faculty, staff, families, and local high school students had a blast at the first-ever ECE Family Fun Night, where 500 attendees of all ages brought the EECS atrium to life in an evening of lasers, science, games, and more.

Supporting Young People in STEM

The CSE Division sponsored TechTwilight, which took place May 20, 2016 at the Ann Arbor Hands-On Museum. TechTwilight provides companies and student groups with the opportunity to celebrate and share their innovations in a festive environment of discovery. The event hosted over 30 companies who demonstrated their advanced interactive technologies or science-based achievements.

Student groups also had the opportunity to showcase their scientific knowledge and accomplishments through demonstrations, inventions, and activities.

Full story: eecs.umich.edu/n/stem

Girls Encoded Motivates Students to Study CS

For the second year in a row, over 100 high school girls and their parents attended Girls Encoded, an all-day event designed to educate and encourage girls to study computer science. The event took place Saturday, April 9, 2016, and was co-directed by Prof. Rada Mihalcea, CSE research fellow Veronica Perez-Rosas, and CS undergraduate student Lauren Molley. The day consisted of hands-on activities, a panel discussion, and lab tours to show students the different aspects of CS.

Full story: eecs.umich.edu/n/encoded

New Courses in EECS

As technology changes and advances, so does our coursework. In addition to constant upgrades to core courses, the following new courses have been introduced over the past year.

Advanced Topics in Electric Drives
Nonlinear modeling of electric machines, discrete-time implementations of control techniques, real-time estimation for online monitoring of electric machines.

Computing for Computer Scientists
An introduction to the tools that every computer scientist should know: Shells, Scripting, Makefiles, Version Control, Compilers, Text Editors, Debugging. Designed for early-career EECS students.

Electric Distribution Systems
Electric power distribution systems and electric loads, including power flow in distribution grids, distribution transformers, fundamentals of electric loads, and electric load modeling.

Fundamentals of the Internet
Look under the hood of the Internet. Gain a better appreciation of how computer networks work and how computers communicate online.

Information Retrieval and Web Search
Traditional material, as well as recent advances in Information Retrieval (IR), the study of indexing, processing, querying, and classifying data. Basic retrieval models, algorithms, and IR system implementations are covered.

Intelligent Interactive Systems
Examines methods for studying explicit and implicit interactions with automated systems and how these can be developed for modern computing platforms.

Introduction to Autonomous Robots
Covers the essentials of robot modeling and autonomy.

Introduction to Networks
How modern networks are connected, how they form, how processes and transactions take place on them, and how they are being transformed and interconnected in the modern world.

Learn to be a Software Consultant
Provides the opportunity for students to act as software consultants to other students in entrepreneurial ventures.

Mining Large-Scale Graph Data
Scalable and practical methods and algorithms for analyzing large-scale graphs, as well as applications in various domains; students have the chance to analyze large-scale datasets.

Quantum Nanotechnology
Basic concepts in quantum physics relevant to novel device concepts, including the new properties of nano-vibrators, quantum LC circuits, quantum entanglement, and light, one photon at a time.

Randomness and Computation
Organized around the main tools and techniques (linearity of expectation, the second moment method, Chernoff bounds, martingales, Lovasz-Local Lemma, Monte Carlo Markov Chain, etc.) used in probabilistic analysis of algorithms.

Social Computing Systems
The study of the interplay between social processes and the computation that supports and augments them. Covers topics including social media, systems for supporting collective action, data mining and analysis, crowdsourcing, human computation, and peer production.

coursera

Dragomir Radev Teaches Courses on NLP Through Coursera

In the Summer of 2016, Prof. Dragomir Radev launched a new course offering on the online education platform Coursera. The first session of the 12-week course, “Introduction to Natural Language Processing,” began July 4. Additional sessions began August 1, September 1, and October 3.

The course provides an introduction to the field of Natural Language Processing and included background material in Linguistics, Mathematics, Probabilities, and Computer Science. Some of the topics covered in the class are Text Similarity, Part of Speech Tagging, Parsing, Semantics, Question Answering, Sentiment Analysis, and Text Summarization. The course made use of pre-recorded material and includes quizzes, programming assignments in Python, and a final exam.

Full story: eecs.umich.edu/n/coursera

Pioneering Engineering Education Research

A new initiative at the College of Engineering has brought U-M into the spotlight in the field of Engineering Education Research (EER). Spearheaded by Prof. David C. Munson, Jr. while he was Dean, the College is taking a unique approach to EER by embedding faculty directly into traditional engineering departments. A few other institutions had already developed standalone departments or schools for EER with their own sets of faculty and PhD students, but U-M's approach is the first of its kind.

Prof. Finelli was the first faculty member hired into the effort in 2015. She had established U-M's Center for Research on Learning and Teaching in Engineering in 2003 and served as founding director for 12 years. Now, as a tenured, associate professor, she teaches courses in EECS, including an introductory circuits course for undergraduate students.

Engineering Education Research is a broad field, and it is different from traditional education research. Engineering students have unique characteristics, according to Prof. Finelli. "They learn differently, they think differently, they're trying to engage differently in materials, and the professional work they'll be doing is different," she said.

Prof. Finelli's interests include how faculty make decisions about what they're doing in the classroom, how students understand engineering concepts, institutional change, teamwork in the classroom, and engineering ethics. Her next major goal is to help establish a graduate program in EER.

Full story: eecs.umich.edu/n/eer

The College of Engineering hired four new faculty in the field of Engineering Education Research. From left: Aileen Huang-Saad (Biomedical Engineering), Shanna Daly (Mechanical Engineering), Joi Mondisa (Industrial and Operations Engineering), and Cindy Finelli (Electrical and Computer Engineering)

James Freudenberg Takes Embedded Control Systems Abroad

Prof. James Freudenberg taught his course, Embedded Control Systems, as a guest at the Swiss Federal Institute of Technology in Zurich, Switzerland. The school prepared a video highlighting the course, which provides a comprehensive overview of embedded control systems.

Video: eecs.umich.edu/n/zurich

Prof. James Freudenberg teaches students in Zurich, Switzerland

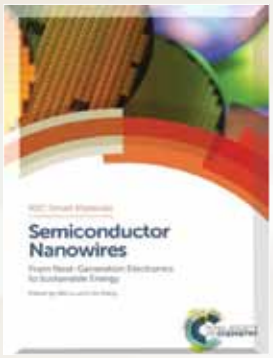
Steve Rand: Expanding Technical Education in India

Prof. Stephen Rand recently visited India to learn about the country's ongoing expansion in higher education as an Optical Society of America (OSA) Fellow Lecturer. His observations from the trip were featured in *Optics and Photonics News*.

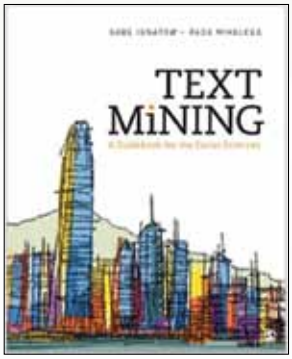
Full story: eecs.umich.edu/n/rand

(L) Prof. Prasanta Datta, Indian Institute of Technology, Kharagpur, and Prof. Stephen Rand

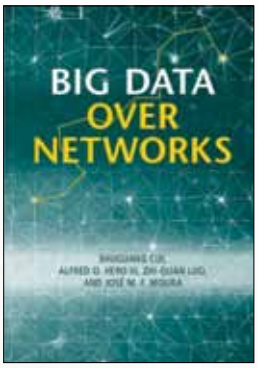
New Books



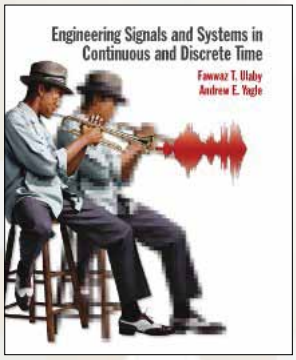
Prof. **Wei Lu** co-edited the book, *Semiconductor Nanowires: From Next-Generation Electronics to Sustainable Energy*, along with Prof. **Jie Xiang** (UC San Diego). Part of the Royal Society of Chemistry's Smart Materials series, it is the first book dedicated to Semiconductor Nanowires and provides a resource for researchers working in the area, those new to the field, and for individuals interested in commercial applications.



Prof. **Rada Mihalcea** co-authored the book, *Text Mining: A Guidebook for the Social Sciences*, along with her collaborator Gabe Ignatow. The book brings together a broad range of contemporary qualitative and quantitative methods to provide strategic and practical guidance on analyzing large text collections. Written by a sociologist and a computer scientist, this accessible book surveys the fast-changing landscape of data sources, programming languages, software packages, and methods of analysis available today.



Prof. **Al Hero** co-edited the book, *Big Data over Networks*, published by Cambridge University Press, along with Prof. Shuguang Cui (Texas A&M), Prof. Zhi-Quan Luo (U. Minnesota), and Prof. José Moura (CMU). The book explores the principles underpinning large-scale information processing over networks and examines the crucial interaction between big data and its associated communication, social, and biological networks.

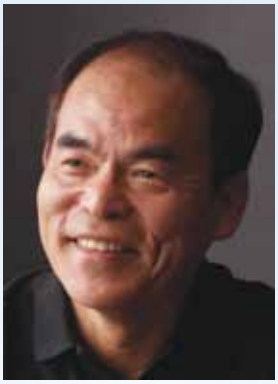


Profs. **Fawwaz Ulaby** and **Andrew Yagle** authored the 2nd edition of the book, *Engineering Signals and Systems in Continuous and Discrete Time*, published by National Technology & Science Press. This edition includes two additional chapters, new concepts throughout the book, and additional problem sets. Seventeen schools in the U.S. are using the first edition in their courses. The book serves as an interactive self-study supplement to the text.

Prof. **Igor Markov** and his co-editors Luciano Lavagno, Grant E. Martin, and Louis K. Scheffer have published the second edition of the *Electronic Design Automation for Integrated Circuits Handbook*. Comprised of two volumes, the second edition addresses all major areas of EDA for integrated circuits. Chapters contributed by leading experts authoritatively discuss an array of topics ranging from system design to physical implementation.

William Gould Dow Distinguished Lectureship

This lectureship is the highest honor bestowed on a guest speaker by the Department, and honors William Gould Dow (1895–1999), former faculty member, Department Chair, and pioneer in electrical engineering education.



PROF. SHUJI NAKAMURA
2014 Nobel Laureate in Physics
University of California, Santa Barbara
Road Toward the New Light: The Invention of High Efficient Blue LEDs and Future Lighting
April 5, 2016

Prof. Shuji Nakamura received the 2014 Nobel Prize in Physics for the invention of efficient blue light-emitting diodes, which enabled bright and energy-saving white light sources. With about 25% of the world's electricity used for lighting, the impact of his work is global, and not just for highly industrialized countries. LEDs are so energy-efficient, they can be powered by cheap local solar power, which brings the possibility of light to the 1.5 billion people who live and work off the energy grid.

In his talk, Prof. Nakamura described how he came to accomplish what no one thought possible – which was to develop highly-efficient blue LEDs from III-nitride alloys, a material abandoned by "serious" scientists.

In 1993, he commercialized the first highly efficient blue LEDs from this material. These LEDs have become the most widely used light source in many applications. LED light bulbs are more than ten times as efficient as incandescent bulbs, and they last for 50 years. At their current adoption rates, LEDs can reduce the world's need for electricity by the equivalent of nearly 60 nuclear power plants by 2020.

Prof. Nakamura is the Research Director of the Solid State Lighting & Energy Electronics Center and The Cree Chair in Solid State Lighting & Displays. He holds more than 200 U.S. and 300 Japanese patents, and has published more than 550 articles. He co-founded Soraa, Inc. in 2008, which operates vertically integrated fabrication facilities in Silicon Valley and Santa Barbara, CA.

Full story and video: eecs.umich.edu/n/nakamura

PROF. MICHAEL STONEBRAKER
Co-Director, Intel Science
and Technology Center
Massachusetts Institute of Technology
Big Data is (at least) Four Different Problems
December 2, 2015

Michael Stonebraker (MS EE 1966, PhD CICE 1971) has been a pioneer of database research and technology for more than a quarter of a century. He was the main architect of the INGRES relational DBMS, and the object-relational DBMS, POSTGRES. These prototypes were developed at the University of California, Berkeley where Stonebraker was a Professor of Computer Science for twenty-five years. More recently at MIT, he was a co-architect of the Aurora/Borealis stream processing engine, the C-Store column-oriented DBMS, the H-Store transaction processing engine, the SciDB array DBMS, and the Data Tamer data curation system. He presently serves as Chief Technology Officer of Paradigm4 and Tamr, Inc.

Stonebraker was awarded the ACM System Software Award in 1992 for his work on INGRES. Additionally, he was awarded the first annual SIGMOD Innovation Award in 1994, and was elected to the National Academy of Engineering in 1997. He was awarded the IEEE John Von Neumann Award in 2005, and the ACM AM Turing Award - the "Nobel Prize of computing" in 2014. He is presently an Adjunct Professor of Computer Science at MIT, where he is Co-director of the Intel Science and Technology Center focused on big data.

Video: eecs.umich.edu/n/stonebraker

Distinguished Lectures in Computer Science and Engineering

MICHAEL P. WELLMAN
Lynn A. Conway Collegiate Professor of Computer Science and Engineering
University of Michigan
Autonomous Agents: Threat or Menace?
May 5, 2016

GREGORY ABOWD
Regents' Professor and J.Z. Liang Chair
School of Interactive Computing
Georgia Institute of Technology
On Being an Applied Computer Scientist
April 19, 2016

ALI SEBT
President
Renesas Electronics America
Era of Platforms
April 13, 2016

JOSEPH PARADISO
Alexander W. Dreyfoos Professor of Media Arts and Sciences
Massachusetts Institute of Technology
Connecting With the Emerging Nervous System of Ubiquitous Sensing
November 6, 2015

RICHARD LIPTON
Storey Chair of Computer Science
Georgia Institute of Technology
The Story Behind the Result
September 30, 2015

Many of these lectures have been videotaped and are available on the EECS website.

Distinguished Lectures in Electrical and Computer Engineering

ERIC MICHIELSSEN
Louise Ganiard Johnson Professor of Engineering, gave a special lecture to commemorate his professorship.
The Future of Scientific Computing
May 12, 2016

JEFFREY FESSLER
William L. Root Collegiate Professor of Electrical Engineering and Computer Science, gave a special lecture to commemorate his professorship.
Signal Processing Methods for Improving Medical Imaging
March 25, 2016

STEPHEN FORREST
Peter A. Franken Distinguished University Professor and Paul G. Goebel Professor of Engineering, gave a special lecture to commemorate his professorship.
The End of Moore's Law: Are We Facing the Creation or the Apocalypse?
December 9, 2015

SARATH GUNAPALA
Director, Center for Infrared Photonics, Jet Propulsion Lab
III-V Quantum Structures for Infrared Detection
November 30, 2015

RICK WALLACE
CEO and President, KLA-Tencor
Out of Control
October 9, 2015

GARLIN GILCHRIST II
Deputy Technology Director for Civic Community Engagement, City of Detroit
Unavailable Innovation: Why You Must Make Your Ideas Accessible
October 6, 2015

New Faculty

EHSAN AFSHARI
Associate Professor
PhD, Electrical Engineering, 2006
California Institute of Technology

Ehsan conducts research in the area of high frequency (mm-Wave and Terahertz) circuits and systems for imaging, bio-sensing, and high data rate communication. He also works on low noise RF systems, non-Boolean image processing, and Spin-based circuits. Ehsan joined Michigan from Cornell University, where he directed the Ultra-high-speed Nonlinear Integrated Circuit lab focusing on next generation ultra-high performance analog circuits and systems. He is also Chair of Cornell Highly Integrated Physical Systems (CHIPS). Prof. Afshari received an NSF CAREER Award, a DARPA Young Faculty Award, and a Cornell Excellence in Teaching Award. Ehsan will join the faculty September 2016.

WILLIAM ARTHUR
Lecturer
PhD, Computer Science and Engineering, 2016
University of Michigan

William recently received his PhD from Michigan, where he was advised by Prof. Todd Austin. His research has been in the areas of computer architecture and security. William has taught as both a graduate student instructor and a primary instructor while at Michigan. Through a partnership between Michigan and Addis Ababa Institute of Technology in Ethiopia, he taught a course on Fault-Tolerant Computing to AAIT's PhD cohort during the summer of 2015. He has served as a teaching consultant and orientation facilitator for student instructors and has led seminars on teaching at the College of Engineering. He joined CSE in September 2016.

AL-THADDEUS AVESTRUZ
Assistant Professor
PhD, Electrical Engineering, 2015
Massachusetts Institute of Technology

Al's research specialty is in the area of high performance power electronics, with complementary interests in circuits and systems for sensing, electromagnetic systems, feedback and controls, renewable energy, automotive, biomedical devices, and wireless power transfer technology. He is author of 7 U.S. patents. He has over a decade of industry and entrepreneurial experience and is currently a member of the Laboratory for Electromagnetic and Electronic Systems at MIT. Al joined the faculty January 2016.

DMITRY BERENSON
Assistant Professor
PhD, Robotics, 2011
Carnegie Mellon University

Dmitry's research focuses on creating algorithms that allow robots to interact with the world and collaborate efficiently with people. These general-purpose motion planning and manipulation algorithms can be applied to robots that work in homes, factories, and operating rooms. Prof. Berenson was a postdoctoral researcher at University of California, Berkeley before joining Worcester Polytechnic Institute as an Assistant Professor in the Robotics Engineering Program and Computer Science Department (2012-2016). At WPI, he founded the Autonomous Robotic Collaboration Lab. He received the IEEE Robotics and Automation Society Early Career award in 2016. Dmitry joined the faculty September 2016. .

PARAG B. DEOTARE
Assistant Professor
PhD, Electrical Engineering, 2012
Harvard University

Parag's research interest lies in understanding and engineering light-matter interaction in nanoscale systems to develop low energy photonic and excitonic devices, for applications in data communication and life sciences. His background broadly spans the area of nanophotonics, excitonics, molecular solids, spectroscopy, and nanofabrication. Before joining the faculty in January 2016, Prof. Deotare was a postdoctoral researcher working with Prof. Vladimir Bulovic at the Organic and Nanostructured Electronics Laboratory at MIT. Parag joined the faculty Winter 2016.

HÉCTOR GARCÍA
Lecturer
PhD, Computer Science and Engineering, 2013
University of Michigan

Héctor received his PhD from Michigan, where he was advised by Prof. Igor Markov. His research has been centered on the design of tools to identify and analyze potential advantages and pitfalls in emergent computing technologies such as quantum computers. While at Michigan, Héctor taught as a graduate student instructor. Prior to joining the faculty, he worked as a software developer for Amazon and as software development manager for TD Ameritrade's thinkorswim financial trading tools platform. He joined CSE in September 2016.

New Faculty

MANOS KAPRITSOS

Assistant Professor

PhD, Computer Science, 2014
University of Texas, Austin

Manos' research interests are in the area of software systems, with a focus on fault-tolerant distributed systems. In his dissertation research, Manos reconciled replication with multithreaded execution by rethinking the 40-year-old architecture of replicated systems to enable the performance benefits of parallel execution. In postdoctoral work, he has worked to bring formal verification to distributed systems, proposing a new way of reasoning about complex distributed systems through a combination of reduction and multilevel refinement to partition them into smaller, manageable components. Manos is currently a postdoctoral researcher at Microsoft Research; he will join CSE in January 2017.

BARIS KASIKCI

Assistant Professor

PhD, Computer Science, 2015
École Polytechnique Fédérale de Lausanne

Baris' research interests are in the area of software systems, with a focus on techniques, tools, and environments for building reliable and secure software. In his dissertation research, Baris proposed and investigated techniques for the detection, classification, and root cause diagnosis of bugs, with a particular emphasis on concurrency bugs. He was the recipient of the 2016 Roger Needham PhD Award for the best PhD thesis in computer systems in Europe and the 2016 Patrick Denantes Memorial Prize for outstanding PhD thesis at the School of Information and Communication Sciences at EPFL. Baris is currently a researcher at Microsoft Research. He will join the faculty at CSE in September 2017.

HUN-SEOK KIM

Assistant Professor

PhD, Electrical Engineering, 2010
University of California, Los Angeles

Hun-Seok's research focuses on digital communication algorithms and systems, ultra low power/ultra high performance VLSI SoC architecture, computer vision and multimedia signal processing.

Before joining the University of Michigan as an assistant research scientist in 2014, Prof. Kim worked as a technical staff member at Texas Instruments Embedded Processing Systems R&D Lab. He also served as an industry liaison for multiple university projects funded by TI and the Semiconductor Research Corporation (SRC). He currently holds 8 patents and has more than 10 patents pending in the areas of digital communication, signal processing, and low power integrated circuits. Hun-Seok joined the faculty September 2016.

MACKILLO KIRA

Professor

PhD, Technical Physics and Theoretical and Computational Physics, 1996
Helsinki University of Technology, Finland

Mack's research focuses on semiconductor quantum optics, quantum optics, condensed-matter theory, terahertz spectroscopy, many-body interactions, photon correlations, coherent and ultrafast phenomena, and cluster-expansion approach (both formalism and computing). His interdisciplinary research has had an impact on engineering, physics, chemistry, and nanotechnology. Mack has written more than 100 publications, many of which have been highly cited in the literature. He joins Michigan from Philipps University of Marburg, Germany, where he was Professor of Physics. He received a Teacher of the Year Award, and is a Fellow of APS. He has graduated more than 40 PhD students, and co-authored the textbook, *Semiconductor Quantum Optics*. Mack joined the faculty September 2016.

ANDREW LUKEFAHR

Lecturer

PhD, Computer Science and Engineering, 2016
University of Michigan

Andrew recently received his PhD from Michigan, where he was advised by Prof. Scott Mahlke. His research has been focused on energy efficient mobile computing, embedded systems, and neural inspired computation. In 2013, he received recognition for the Best Hardware Presentation in the CSE Graduate Student Honors Competition. Andrew has taught as a primary instructor while at Michigan. He joined CSE in September 2016.

New Faculty

HESSAM MAHDAVIFAR

Assistant Professor

PhD, Electrical Engineering, 2012
University of California, San Diego

Hessam's research interests are in the areas of communications, networks, and signal processing. More specifically, his research has focused on applications related to coding theory, information theory, algorithms, and game theory. These applications include wireless communications, security, data storage, Internet of Things, and social networks. Most recently, Hessam was a staff research engineer at Samsung Electronics in the San Diego Mobile Solutions Lab. He was also a visiting research scholar and lecturer at UCSD. He received the Best Paper Award at the *2015 IEEE International Conference on RFID*, and holds 6 U.S. patents. He is also the winner of two silver medals of the International Mathematical Olympiad. Hessam will join the faculty January 2017.

ZETIAN MI

Professor

PhD, Applied Physics, 2006
University of Michigan

Zetian's research interests are in the areas of III-nitride semiconductors, low dimensional nanostructures, LEDs, lasers, Si photonics, and solar fuels. He has published 8 book chapters and over 170 journal papers on these topics. Prof. Mi received the Young Scientist Award from the *International Symposium on Compound Semiconductors* and the Young Investigator Award from the *27th North American Molecular Beam Epitaxy Conference*. Most recently, Prof. Mi was an Associate Professor of Electrical & Computer Engineering and Physics at McGill University, where he received several major awards including the Engineering Innovation Award. Prof. Mi served as the Program Chair of the *30th North American Conference on Molecular Beam Epitaxy* in 2013 and is the General Chair of 2016-2017 *IEEE Photonics Society Summer Topical Meeting*. Zetian joined the faculty September 2016.

MERT PILANCI

Assistant Professor

PhD, Electrical Engineering and Computer Science, 2016
University of California, Berkeley

Mert's research interests are in convex optimization, statistics and information theory. His work enhancing machine learning, statistical inference and signal processing capabilities have an impact on a wide range of problems, including big data analytics, wireless communications and ad optimization. He received a Best Paper Award at the *2010 IEEE Signal Processing and Communications Applications Conference* and has given several invited talks at professional conferences. He is currently a Math+X postdoctoral scholar at Stanford University. Mert will join the faculty September 2017.

NSF CAREER and Young Investigator Awards

SOMIN LEE

AFOSR Young Investigator Award, 2016

Project Title: Sub-Diffraction Temperature Mapping of Protein Interconversions

Prof. Lee is working to understand how tissues form distinct structures to become organs, such as lungs, salivary glands, and mammary glands. This understanding will facilitate new strategies to engineer replacement tissues.

NECMIYE OZAY

NSF CAREER Award, 2016

Project Title: A Compositional Approach to Modular Cyber-Physical Control System Design

Prof. Ozay plans to develop the scientific foundation and associated algorithmic tools for the design of modular cyber-physical systems. The goal is a "plug and play" integration framework for CPS supported by automated design tools, where one can replace a subsystem or perform upgrades without the need for lengthy testing afterwards.

NSF CAREER and Young Investigator Awards

JASON MARS

NSF CAREER Award, 2016

Project Title: Advancing the Frontier in System Architectures for Artificially Intelligent Services and Applications

Prof. Mars will seek to understand how future cloud and mobile systems should be designed to support increasing demand from users of intelligent assistants.

BARZAN MOZAFARI

NSF CAREER Award, 2016

Project Title: Designing a Predictable Database – An Overlooked Virtue

Prof. Mozafari aims to restore the missing virtue of predictability in the design of database systems. Through the process of building a predictable database in a bottom-up fashion and in a principled manner, he expects great insight into improving existing database products and can instigate a radical shift in the way that future databases are designed and implemented.

JENNA WIENS

NSF CAREER Award, 2016

Project Title: Adaptable, Intelligible, and Actionable Models: Increasing the Utility of Machine Learning in Clinical Care

Prof. Wiens aims to transform the larger realm of available data into actionable knowledge through the exploration of new fundamental research directions and approaches in machine learning. By targeting patients identified as high-risk through computational data-driven models, practitioners could reduce the burden of disease in a cost-effective manner.

DARPA Director's Fellowship

The DARPA Director's Fellowship is presented to faculty who have previously received DARPA Young Faculty Awards on the basis of exceptional performance. The following faculty received this fellowship:

REBECCA L. PETERSON

Project Title: Amorphous Oxide Thin Film Transistors for Switched-Mode Power Supplies.

Prof. Peterson will design and fabricate novel power rectifiers and switches using wide bandgap amorphous oxide semiconductors. These devices can be used for power supply and management in a wide variety of wireless sensing and actuation systems.

RAJ NADAKUDITI

Project Title: Fundamental Limits of Eigen-wavefront Based Imaging Through Highly Scattering Random Media

Prof. Nadakuditi will develop an imaging method that will mitigate the loss in image quality due to the multiple scattering of light in non-transparent media, which includes brain tissue. This research will impact the ability to investigate the structure of brain circuits through the use of optical imaging techniques.

NECMIYE OZAY

Project Title: Dynamics-based Information Extraction: A Hybrid Systems Approach

Prof. Ozay's research will draw from system theory to improve monitoring, diagnostics, anomaly and change detection in critical infrastructure systems. Her research will impact the safety and security of cyber-physical systems.

Sloan Research Fellowships

Sloan Research Fellowships are given by the Alfred P. Sloan Foundation to stimulate fundamental research by early-career scientists and scholars of outstanding promise.

MICHAEL CAFARELLA, for his work in mining and processing large and distributed datasets.

HONGLAK LEE, for his work in deep learning and representation learning.

EECS Outstanding Achievement Award

Khalil Najafi, Tony Grbic, Kamal Sarabandi, Marios Papaefthymiou

Anthony Grbic received the award for inspirational teaching, dedicated mentoring of graduate students, and innovative research in metamaterials and wireless power transfer.

Khalil Najafi, Mina Rais-Zadeh (in absentia), Dennis Sylvester, Marios Papaefthymiou

Mina Rais-Zadeh received the award for outstanding contributions to research in high frequency MEMS and piezoelectric semiconductor transducers, and for excellence in teaching and service.

This year, Abraham Lincoln showed up to check on the state of our democracy. Sigh.

Khalil Najafi, Mark Brehob, David Paoletti, Marios Papaefthymiou

David Paoletti received the award for excellence, inside and outside of the classroom, in teaching and inspiring the next generation of computer scientists.

Khalil Najafi, Trevor Mudge, Thomas Wenisch, Marios Papaefthymiou

Thomas Wenisch reeceived the award for extraordinary accomplishments in scholarly research, classroom teaching, and student mentoring, and for leadership in service.

College of Engineering Awards

VALERIA BERTACCO
Herbert Kopf Service Excellence Award

MARY LOU DORF
Thomas M. Sawyer Jr. Teaching Award

KAMAL SARABANDI
Stephen S. Attwood Award, for "extraordinary achievement in teaching, research, service, and other activities that have brought distinction to the College and University."

DAVID WENTZLOFF received the 2015 Joel and Ruth Spira Excellence in Teaching Award in acknowledgement of exceptional achievements in the education of our students.

University Awards

VALERIA BERTACCO
Sarah Goddard Power Award

DAVID CHESNEY
Provost's Teaching Innovation Prize

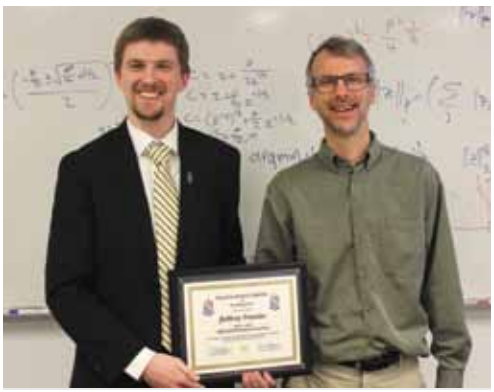
JEFF FESSLER
Distinguished Faculty Achievement Award

JASON FLINN
Faculty Recognition Award

HKN Professors of the Year

Each year, the U-M chapter of Eta Kappa Nu, the national honor society for electrical and computer engineers, selects two faculty for recognition, one from each division of EECS. The recipients are selected based on a vote by the students.

Jeff Fessler (ECE)



Prof. Jeff Fessler was surprised at his last class of the term to hear he was the recipient of this year's HKN Professor of the Year Award for ECE. Kyle Harman, former HKN president, presented him with the award.

Marcus Darden (CSE)

Marcus Darden received this year's HKN Professor of the Year Award in a surprise presentation on the last day of class. Presenting the award was Nathan Immerman, 2015 HKN President.

National and Professional Honors and Awards

LAURA BALZANO received an Intel Early Career Faculty Honor Program Award to support her research in the area of Big Data.

DAVID BLAAUW received the 2016 SIA-SRC University Researcher Award, established by the SIA to recognize lifetime research contributions to the U.S. semiconductor industry by university faculty.

MOSHARAF CHOWDHURY
ACM SIGCOMM Doctoral Dissertation Award, for his dissertation, *Coflow: A Networking Abstraction for Distributed Data-Parallel Applications*, which he completed while a student at UC Berkeley.

JEFF FESSLER received the 2016 IEEE Engineering in Medicine and Biology Society (EMBS) Technical Achievement Award for fundamental and pioneering contributions to the theory and algorithms of statistical reconstruction methods of the PET/ SPECT, CT and MRI medical imaging modalities.

CINDY FINELLI was presented with the Frontiers in Education (FIE) Helen Plants Award at the *45th Annual Frontiers in Education Conference (FIE 2015)*.

STEPHEN FORREST was elected to the National Academy of Sciences (NAS) in recognition of his distinguished and continuing achievements in original research.

ANTHONY GRBIC has been elected IEEE Fellow, "for contributions to the theory and design of electromagnetic metamaterials."

ALFRED HERO received the 2015 IEEE Signal Processing Society Award, "for contributions to the field of statistical signal and image processing and for sustained service to the Society."

DANAI KOUTRA received the ACM SIGKDD Dissertation Award for her dissertation, *Exploring and Making Sense of Large Graphs*, which she completed while a student at Carnegie Mellon University.

MARK KUSHNER received an Honorary Doctorate at Eindhoven University of Technology and has been appointed Distinguished Professor from the same university. He has also been appointed a 2016 Distinguished Lecturer for the Division of Plasma Physics of the American Physical Society.

STÉPHANE LAFORTUNE was named Fellow of the International Federation of Automatic Control (IFAC), "For contributions to control and diagnosis of discrete event systems."

DAVID MUNSON was honored with the Benjamin Garver Lamme Award from the American Society for Engineering Education (ASEE) for contributions to the art of teaching, research and technical literature, and achievements that contribute to the advancement of the profession of engineering college administration.

DRAGOMIR RADEV was elected a Fellow of the ACM, class of 2015, for "contributions to natural language processing and computational linguistics."

MINA RAIS-ZADEH received the IEEE Early Career Sensors Council Technical Achievement Award, "For pioneering research in sensors technology: adaptable nano/micro-electromechanical systems (N/MEMS)."

Wellman Professorships

MICHAEL CAFARELLA, for his work in mining and processing large and distributed datasets.

HONGLAK LEE, for his work in deep learning and representation learning.

Prof. Michael P. Wellman endowed the Morris Wellman Faculty Development Professorship in his grandfather's name. Morris Wellman was an engineer who worked for most of his career as a civil servant of the City of New York. The professorship is awarded to junior faculty members in recognition of outstanding contributions to teaching and research.

Professorships

JEFFREY FESSLER

William L. Root Collegiate Professor of Electrical Engineering and Computer Science

David C. Munson, Jr., Robert J. Vlasic Dean of Engineering; Jeff Fessler; Khalil Najafi, Peter and Evelyn Fuss Chair of Electrical and Computer Engineering

Jeff Fessler has been named the William L. Root Collegiate Professor of Electrical Engineering and Computer Science. In addition to being a professor of Electrical Engineering and Computer Science, he is a professor of Biomedical Engineering and Radiology.

Jeff is one of the most accomplished researchers of medical image reconstruction in the world. His group has produced breakthroughs in Magnetic Resonance Imaging (MRI), X-ray Computed Tomography (X-ray CT), and radionuclide imaging (PET/SPECT). His group's findings have helped make these technologies faster, and therefore safer and more cost effective, without sacrificing their image quality. He holds eight patents, and his research has been implemented in commercial products.

Jeff was one of the pioneers in open research, making his data and code widely available to the public. By doing so, other researchers can more easily build on his research, ultimately leading to better healthcare for all. He has received numerous education awards, twelve best paper awards, and recently received the Edward J. Hoffman Medical Imaging Scientist Award.

Watch a video of this talk: eecs.umich.edu/n/fessler

STEPHEN FORREST

Paul G. Goebel Professor of Engineering

David C. Munson, Jr., Robert J. Vlasic Dean of Engineering; Stephen Forrest, Peter A. Franken Distinguished University Professor; Khalil Najafi, Peter and Evelyn Fuss Chair of Electrical and Computer Engineering; Pallab Bhattacharya, Charles M. Vest Distinguished University Professor

Steve Forrest, Peter A. Franken Distinguished University Professor, was named Paul G. Goebel Professor of Engineering in 2014, an occasion commemorated with his talk December 2016. He is a professor of Electrical Engineering and Computer Science, Physics, and Materials Science and Engineering.

His groundbreaking research on photovoltaic cells, organic light emitting diodes, and lasers and optics span decades, and have resulted in 5 startup companies, 277 issued patents, and key technologies that are pervasive in the marketplace. In addition, he has graduated 54 PhD students.

Prof. Forrest is a Fellow of the APS, IEEE, OSA and, most recently, the National Academy of Inventors. He is a member of the National Academy of Engineering. He received numerous distinctions throughout his career, including the IEEE/LEOS Distinguished Lecturer Award, the IPO National Distinguished Inventor Award (co-recipient), the Thomas Alva Edison Award, the MRS Medal, the IEEE/LEOS William Streifer Scientific Achievement Award, the Jan Rajchman Prize from the Society for Information Display, and the 2007 IEEE Daniel Nobel Award.

Watch a video of this talk: eecs.umich.edu/n/forrest

Professorships

ERIC MICHIELSSEN

Louise Ganiard Johnson Professor of Engineering

David C. Munson, Jr., Robert J. Vlasic Dean of Engineering; Khalil Najafi, Peter and Evelyn Fuss Chair of Electrical and Computer Engineering; Eric Michielssen; Kamal Sarabandi, Rufus S. Teesdale Professor of Engineering

Eric Michielssen has been named the Louise Ganiard Johnson Professor of Engineering. Eric is an international leader in the field of computational electromagnetics (CEM), which involves the development and application of computer algorithms to simulate the generation, propagation, and interaction of electromagnetic radiation with matter. He has applied his techniques to the characterization of semiconductor and microelectronic devices, photonic crystals and optical phenomena, aircraft scattering, and terrain detection, to name but a few. Applications of his work have included communication between ground stations and satellites in space and non-invasive brain probing for the treatment of depression and other forms of mental illness.

Eric's research on fundamental algorithms is found in the codes and simulations of countless other researchers as well as commercially available simulators. His more than 500 journal and conference publications have been cited more than 10,500 times, with an h-index of 43. He received the 2014 IEEE Antenna and Propagation Society Chen-To Tai Distinguished Educator Award, "In recognition of being an outstanding educator, mentor and role model for the next generation of faculty members," Fourteen of his students and postdocs now hold faculty positions. Eric serves as Editor-in-Chief of the *International Journal of Numerical Modeling*. He is an IEEE Fellow.

Prof. Michielssen is also Associate Vice President for Advanced Research Computing and former founding Director of the Michigan Institute for Computational Discovery and Engineering (MICDE).

MICHAEL P. WELLMAN

Lynn A. Conway Collegiate Professor of Computer Science and Engineering

Marios Papaefthymiou, CSE Chair; Michael Wellman, Lynn A. Conway Professor of Computer Science and Engineering; Prof. Emerita Lynn Conway; David C. Munson, Jr., Robert J. Vlasic Dean of Engineering

Michael P. Wellman has been named the Lynn A. Conway Collegiate Professor of Computer Science and Engineering in recognition of his outstanding contributions in the areas of research, education, and leadership. This appointment was celebrated at a ceremony that took place on May 5, 2016.

Prof. Wellman has been with the Department since 1992, when he joined Michigan as an Assistant Professor in CSE after completing his studies at MIT and serving for four years as a research scientist at the United States Air Force Wright Laboratory. During his 24-year tenure at Michigan, he has made numerous contributions through his research, teaching, and service activities. Wellman is proud advisor of 20 graduated PhDs, and teacher of a multitude of undergraduate and graduate students.

Prof. Wellman has served the university and the research community in numerous leadership positions. He is a Fellow of the Association for the Advancement of Artificial Intelligence, as well as the Association for Computing Machinery. In 2012, his foundational work was recognized with the IFAAMAS Influential Paper Award for his 1993 paper describing a market-oriented programming approach to distributed problem solving, which was originally published in the *Journal of Artificial Intelligence Research*. In 2014, he was recognized by ACM/SIGAI with the Autonomous Agents Research Award. At the University of Michigan, Prof. Wellman has been a recipient of the Faculty Recognition Award, and of awards from the EECS Department for Teaching Excellence and Outstanding Achievement.

Watch a video of this talk: eecs.umich.edu/n/wellman

Faculty and Student Outstanding Paper Awards

2016 USENIX SECURITY TEST OF TIME AWARD

The USENIX Test of Time Awards recognizes papers that have had a lasting impact on their fields. "Preventing Privilege Escalation" was originally published in 2003 by **Niels Provos**, Markus Friedl, and **Prof. Peter Honeyman**.

2015 ACM SIGOPS HALL OF FAME AWARD

This award is given in recognition of the most influential Operating Systems papers that were published at least ten years in the past. "ReVirt: Enabling Intrusion Analysis Through Virtual-Machine Logging and Replay" was originally published in 2002 by **George W. Dunlap**, **Samuel T. King**, **Sukru Cinar**, **Murtaza A. Basrai**, and **Prof. Peter M. Chen**.

"A2: Analog Malicious Hardware," by **Kaiyuan Yang**, **Matthew Hicks**, **Qing Dong**, **Prof. Todd Austin**, **Prof. Dennis Sylvester**, Distinguished Paper Award, *37th IEEE Symposium on Security and Privacy*, May 2016.

"A Fabrication Process for the Monolithic Integration of Magnetoelastic Actuators and Silicon Sensors," by **Jun Tang**, **Dr. Scott Green**, and **Prof. Yogesh Gianchandani**, 2015 Highlights, *Journal of Micromechanics and Microengineering.*

"A Horizontally Polarized Beam-Steerable Antenna for Sub-millimeter-wave Polarimetric Imaging and Collision Avoidance Radars," by **Armin Jam** and **Prof. Kamal Sarabandi**, Best Paper Award Finalist, *2016 IEEE International Symposium on Antennas and Propagation (AP-S),* June 2016.

"An X-Band Reconfigurable Bandpass Filter Using Phase Change RF Switches," by **Muzhi Wang**, **Feng Lin**, and **Prof. Mina Rais-Zadeh**, Best Paper Award, *2016 Meeting on Silicon Monolithic Integrated Circuits in RF Systems (SiRF),* January 2016.

"Constructing an Interactive Natural Language Interface for Relational Databases," by **Fei Li** and **Prof. H.V. Jagadish**, Best Paper Award, *41st International Conference on Very Large Data Bases (VLDB 2015)*, September 2015.

"Decentralized Stochastic Control With Partial History Sharing: A Common Information Approach," by **Ashutosh Nayyar**, **Aditya Mahajan**, and **Prof. Demosthenis Teneketzis**, George S. Axelby Outstanding Paper Award, *2015 IEEE Conference on Decision and Control (CDC 2015),* December 2015.

"DROWN: Breaking TLS using SSL v2," by Nimrod Aviram, Sebastian Schinzel, Juraj Somorovsky, Nadia Heninger, Maik Dankel, Jens Steube, Luke Valenta, **David Adrian**, **Prof. J. Alex Halderman**, Viktor Dukhovni, Emilia Käsper, Shaanan Cohney, Susanne Engels, Christof Paar, and Yuval Shavitt, Pwnie for Best Cryptographic Attack*, Black Hat Conference*, August 2016.

"Elevation Angular Dependence of Wideband Autocorrelation Radiometric (WiBAR) Remote Sensing of Dry Snowpack and Lake Icepack," by **Mohammad Mousavi**, Roger De Roo, **Prof. Kamal Sarabandi**, and **Prof. Tony England**, Weisnet Medal, *Eastern Snow Conference 2016.*

"Full-Spherical Radiation Pattern Evaluation of Low Frequency Antennas Using a Novel Very-Near-Field Electro-Optical System," by **Jihun Choi** and **Prof. Kamal Sarabandi**, Best Paper Honorable Mention, *2016 IEEE Symposium on Antennas and Propagation (AP-S),* June 2016.

"Imperfect Forward Secrecy: How Diffie-Hellman Fails in Practice," by **David Adrian**, Karthikeyan Bhargavan, **Zakir Durumeric**, Pierrick Gaudry, Matthew Green, **Prof. J. Alex Halderman**, Nadia Heninger, Drew Springall, Emmanuel Thomé, Luke Valenta, **Benjamin VanderSloot**, **Eric Wustrow**, Santiago Zanella-Béguelink, and Paul Zimmermann, Best Paper Award, *ACM Conference on Computer and Communications Security (CCS 2015)*, October 2015.

"MBus: An Ultra-Low Power Interconnect Bus for Next Generation Nanopower Systems," by **Pat Pannuto**, **Yoonmyung Lee**, **Ye-Sheng Kuo**, **ZhiYoong Foo**, **Benjamin Kempke**, **Gyouho Kim**, **Prof. Ronald G. Dreslinski**, **Prof. David Blaauw**, and **Prof. Prabal Dutta**, IEEE Micro Top Pick from the *2015 Computer Architecture Conferences*, June 2016.

"Neither Snow Nor Rain Nor MITM... An Empirical Analysis of Email Delivery Security," by **Zakir Durumeric**, **David Adrian**, **Ariana Mirian**, **James Kasten**, Elie Bursztein, Nicolas Lidzborski, Kurt Thomas, Vijay Eranti, **Michael Bailey**, and **Prof. J. Alex Halderman**, Applied Networking Research Prize, December 2015.

"Resonant Magnetoelastic Microstructures for Wireless Actuation of Liquid Flow on 3D Surfaces and Use in Glaucoma Drainage Implants," by **Venkatram Pepakayala**, Joshua Stein, and **Prof. Yogesh Gianchandani**, Featured Article, *Microsystems & Nanoengineering.*

"Security Analysis of Emerging Smart Home Applications," by **Earlence Fernandes**, Jaeyeon Jung, and **Prof. Atul Prakash**, Distinguished Practical Paper Award, *37th IEEE Symposium on Security and Privacy*, May 2016.

"Sirius: An Open End-to-End Voice and Vision Personal Assistant and Its Implications for Future Warehouse Scale Computers," by **Johann Hauswald**, **Michael A. Laurenzano**, **Yunqi Zhang**, **Cheng Li**, **Austin Rovinski**, **Arjun Khurana**, **Prof. Ronald G. Dreslinski**, **Prof. Trevor Mudge**, Vinicius Petrucci, **Prof. Lingjia Tang**, and **Prof. Jason Mars**, IEEE Micro Top Pick from the *2015 Computer Architecture Conferences*, June 2016.

"The Effects of Automatic Speech Recognition Quality on Human Transcription Latency," by Yashesh Gaur, **Prof. Walter S. Lasecki**, Florian Metze, and Jeffrey P. Bigham, Best Paper Award, *13th Web for All (W4A) Conference*, April 2016.

Names in **bold** are researchers currently or formerly affiliated with the EECS Department.

Drones are Coming Soon to an Apple Orchard Near You, Farmers and Students Hope

Students were invited to a local orchard to explore how drones can help fruit growers maintain their harvest. From analyzing how sunlight hits the orchard, to giving temperature or pest readings, all agreed the technology could have a major impact on the business. EECS grad students Ivan Ma (CSE) and Haohuan Wang (ECE) offered drone demonstrations.

Full story: eecs.umich.edu/n/orchard

MHybrid Races On

The Michigan Hybrid Racing (MHybrid) team took their latest creation to the Formula Hybrid Competition at the New Hampshire Motor Speedway in May, led in part by seniors Gwynn Cunningham (team captain), Vicky Cheung, Jake Moline, Jeffrey Lu, and Guanlun He. This was a tough year, and the team didn't pass all the necessary inspections for entry in the races due to a problem with the battery management system. The team was missing their seniors the first day of competition due to a conflict with commencement, but with a few calls to Ann Arbor, the young team members passed the pre-electrical inspection ahead of time. "It was cool for us to know our mentoring paid off," said Jake, who was a member of the EV Powertrain team. "It was good to give them confidence for next year."

EE student Madison Warsaw helps with inspections at Formula Hybrid.

The seniors are looking forward to new careers at Ford, GM, and Boeing. **"I definitely think being on Hybrid helped me to get a job," said Vicky, the EV division lead. "It gave me a lot of first hand experiences to talk about during my interview with Boeing and at Career Fair. I know Boeing liked all of the hands-on experience I gained from the team, my experiences of working on a team, and the passion that I had for it."**

Full story: eecs.umich.edu/n/mhybrid

New Student Team Designs and Builds Unique New Instruments

ECE undergrads Sophia Mehdizadeh and Kiran Thawardas helped lead a new interdisciplinary student design team, Project Music, through its first initiative. The team designs and builds unique musical instruments, and gives its members the chance to make music together. The group's debut project was an electric bass made partly of LEGOs. Students in the group were responsible for building the circuit, which consisted of the pickups, potentiometers (volume and tone knobs), and the output jack. The instrument ended up working well enough for team members to play at several shows with their band, the Late Night Randalls.

Now they're planning an electric violin for next year. "An electric violin like this has never been created before, and our design is creative and unconventional," said Kiran, the group's president. The team hopes to take the finished violin to the Guthman Musical Instrument Competition at Georgia Tech. This annual event is aimed at identifying the world's next generation of musical instruments and unveiling the best new ideas in musicality, design, and engineering.

"This will be the first design team of its kind at the University of Michigan where engineers interested in the arts have a place to create something that has never been made before," Kiran says. "This project will show how artistic creativity and engineering go hand in hand."

Full story: eecs.umich.edu/n/music

Project Music's first working instrument, a LEGO bass, worked well enough to take on stage with the band, the Late Night Randalls.

M-Fly Team

MX-1 advanced aircraft

M-FLY Debuts Two Planes at SAE Competition, Finishes Top 10

M-FLY, an interdisciplinary student team dedicated to designing competitive aircraft, brought two new planes to the 2016 SAE Aero Design Competition East in Fort Worth, Texas. For the first time, the team entered both the regular and advanced class competitions with their M-8 and MX-1 aircrafts, respectively. EE students Jacob Gersh, Sophia Mehdizadeh, and Vaibhav Parashar helped the team finish in the top 10 in both categories, including a 5th place overall and 1st place oral competition finish for the MX-1.

"Entry in this [the advanced] class opened up a lot of opportunities for EE students on the team," said Sophia Mehdizadeh. Unlike the regular class aircraft, this plane was designed with an extensive system of electronics and sensors, such as a first person view camera, a payload drop mechanism, an altimeter, and an on-board radio and arduino for processing and sending data. The Sensors and Systems sub-team also coded a custom graphical user interface for the team to use as a ground station to read the altitude information sent from the aircraft.

Full story: eecs.umich.edu/n/mfly

M-8 regular aircraft

Baja Wins Big

The U-M Baja Racing Team made huge waves this season. Along with their second consecutive overall 1st place finish, they also received the season's highest honor, the Mike Schmidt Memorial Award. This award is given to the team with the highest cumulative points between three competitions. As if that wasn't enough, at the California race the team broke the record for the most points ever earned at a Baja SAE event, scoring 1007/1000.

This year, two EECS students served in leadership positions: Zechariah Schneider, treasurer, and Shivani Shah, electric lead. Both Zechariah and Shivani will be seniors this year and continuing as officers on the team – Zechariah as head of logistics, and Shivani as head of testing.

Full story: eecs.umich.edu/n/baja

"As soon as I saw us cross the finish line first, I was ecstatic."

– Zechariah Schneider, CS Senior

Strong Finish for UM::Autonomy

The UM::Autonomy team took 6th place in the world at this year's RoboNation RoboBoat Competition, where teams build autonomous, robotic boats to navigate and race through an aquatic obstacle course. The boat is completely designed and programmed by the students each year.

This year's team leadership came almost entirely from EECS students, including President Marisa Witcpalek, Vice President Parker Howard, electrical team leads Dan Snyder and Zach Shopshire, and artificial intelligence team leads Cyrus Anderson and Kunjan Singh.

Full story: eecs.umich.edu/n/autonomy

"We focused a lot on team building this year and becoming friends instead of just teammates."

– Dan Snyder, EE Senior

Solar Car Conquers Again

Despite nearly-sunless conditions in the final two days, the University of Michigan Solar Car team defended their decade-long reigning championship – winning the 2016 American Solar Challenge for the sixth consecutive time.

Their car, Aurum, was the only entry in the competition to make it to the finish on 100% solar power in spite of the race's cloudy conditions. As other cars began to drop out with no power, Aurum crept forward through the last two completely sunless race days.

The team crossed the finish line at 5:30 PM ET on August 6 in Wind Cave National Park in South Dakota. The race, which happens every other year on a different course, began in Ohio on July 30. Michigan raced against 23 other teams of college students that had built their own solar-powered electric vehicles. This is the ninth time that U-M has won the race.

Full story: eecs.umich.edu/n/solarcar

"We always talk about some of the great races in the past. To be part of one that's been different—to have a completely sunless last two days of the race—to go through something unique, it's going to add to the legacy of Michigan Solar car. "

– Shihaab Punia, team leader and junior in computer engineering

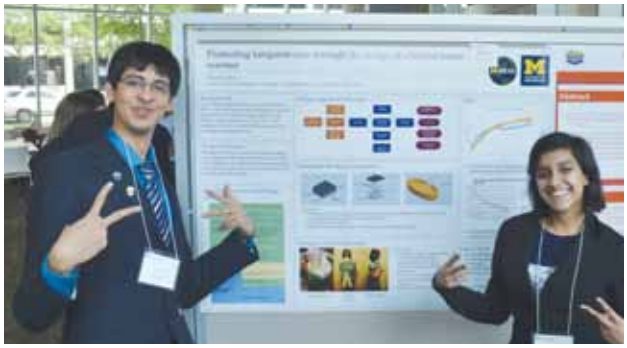
MHacks:Refactor Focused on Gender Inclusivity and Hacker Empowerment

MHacks completed its 7th hackathon, MHacks:Refactor, which took place February 19-21, 2016 on University of Michigan's North Campus. The hackathon is a 36-hour event that allows students, from technical and non-technical backgrounds, to create and collaborate on new projects.

The hackathon is known to be a big production, but this past semester the creators focused less on numbers and more on the experience. MHacks:Refactor revolved around gender inclusivity and hacker empowerment by establishing a 1:1 female to male hacker ratio and a 4:1 hacker to mentor ratio. The MHacks Director, Shayna Mehta, and Mentorship Coordinator Preeti Mohan, said, "By making public our decision to have a 50/50 male/female ratio we wanted to make it clear just how important inclusivity (in this case specifically, gender inclusivity) is to us."

Full story: eecs.umich.edu/n/mhacks

A Kangaroo Pack to Protect High Risk Infants



Meghna Menon, a sophomore in EE, and Mihir Sheth, graduate student in EE:Systems, designed a heated incubator to help keep low birth weight and premature infants in developing countries warm and healthy. Research has shown that maintaining the heart rate and body temperature of low birth weight and premature infants saves lives. Meghna and Mihir prototyped their design at the U-M Makeathon event, and worked with Dr. Jody Lori in the School of Nursing to define possible regions of interest where this device could be deployed. Preliminary countries being considered for trials are Ethiopia, Ghana, and India, where they could take advantage of U-M's existing relationships with regional universities and organizations.

Meghna and Mihir linked up with Michigan Health Engineered for All Lives (M-HEAL) as they moved forward with their design. "What drew me to M-HEAL over other groups is their global focus," says Meghna.

"A friend working as a doctor told me that he hopes to see more biomedical devices that are effective, sustainable, and friendly," says Mihir. "I came back to Michigan looking to get involved in that biomedical device space."

Full story: eecs.umich.edu/n/kangaroo

Serving Communities Around the World

Leila Syal, a sophomore in EE, organized an alternative spring break trip to Cusco, Peru to do medical volunteer work around the city. The trip was part of M-HEAL's Service Abroad and Needs Assessment (SANA) program, and included 15 students.

In addition to providing basic medical assistance to 600 community members, the trip also served as needs assessment for M-HEAL.

"It was such an incredible experience," said Leila. "I learned so much from the doctor, my team, and the people of the community. We had time to really engage with the families who visited the clinics."

Full story: eecs.umich.edu/n/peru

Students Seek the Secrets of the Brain

Eight undergrad students of various disciplines and institutions got the chance to work on cutting-edge brain research in Germany this summer through the International Program for the Advancement of Neurotechnology (see pg. 7 for more information).

Before leaving for Germany, the students spent a week at Michigan working in the cleanroom and other labs. Maxwell Li, an EE senior, worked on a project in Hamburg that sought to find a relationship between signals in the prefrontal cortex and hippocampus. All of the students experienced in-depth lab work on devices that are being designed to help us better understand the brain.

Full story: eecs.umich.edu/n/germany

(L) Dr. John Seymour, Co-PI of IPAN, Angelica Minier-Toribio, Indie Rice, Maxwell Li, Jalal Taleb, Mario Shammas, Mackenna Hill, Jenny Gong, Jean Rodriguez-Diaz, Prof. Ed Stuenkel (Molecular and Integrative Physiology), Director of Education for IPAN

Students Make Connections at NSBE National Convention

The 42nd Annual Convention of the National Society of Black Engineers (NSBE) brought members together in Boston, MA for career fairs, competitions, professional workshops, networking events, and elections. Forty-three U-M engineers, six from EECS, attended the convention, themed "Engineering a Cultural Change."

The U-M Chapter of NSBE earned a Chapter of the Year Award, and it won the Amazing Race competition for its region, based on active participation throughout the year.

"It really is an invaluable experience," said Mo Hussein, a senior CS student. "You get to interact with people from the entire spectrum of engineering – from college kids to industry professionals – who have been involved in NSBE throughout their career. Having that exposure, as well as the career fair and workshops, makes this extremely valuable."

Paul Scott, a freshman in CE, found a summer internship with USAA through the event. He was excited by the chance to encounter students from around the nation.

"You get to see how many other minority engineers there are," he said. "You're talking about thousands and thousands of people who look like you and are engineers."

Full story: eecs.umich.edu/n/nsbe16

ArborHacks Formed to Increase Access to and Participation in Computer Science

Computer science students have started a new U-M student organization aimed at increasing access to and participation in CS. Called ArborHacks, the group will hold a once-a-year hackathon for local high school students in addition to other events and will work with the CSE Division and other U-M entities to sponsor or support additional outreach activities.

The group's annual event, also called ArborHacks, was first held on December 19, 2015 at Pioneer High School in Ann Arbor, a little over a month after the ArborHacks group was formed. About 150 students attended from every high school in Ann Arbor Public Schools and from Washtenaw International High School.

Full story: eecs.umich.edu/n/arbor

High school students working on projects at the first ArborHacks event. Image credit: MLive

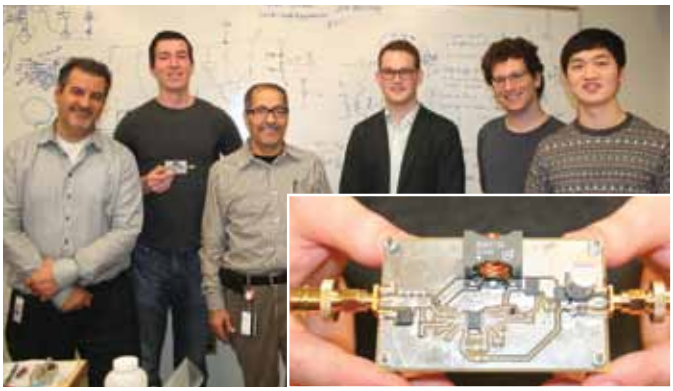
EECS Course News

Optimizing Auto Stop/Start Technology

Students in EECS 418, Prof. Heath Hofmann's Power Electronics course, competed to build the most efficient DC to DC converter that mimicked a voltage stabilizer module used in vehicle stop/start technology. Stop/start is a new system being introduced into the North American automobile market to improve fuel economy while cutting down on pollution. Students attempted to optimize a stabilization module that prevents light and sound system interruptions during this process. The competition and winning team prizes were sponsored by Fiat Chrysler Automobiles.

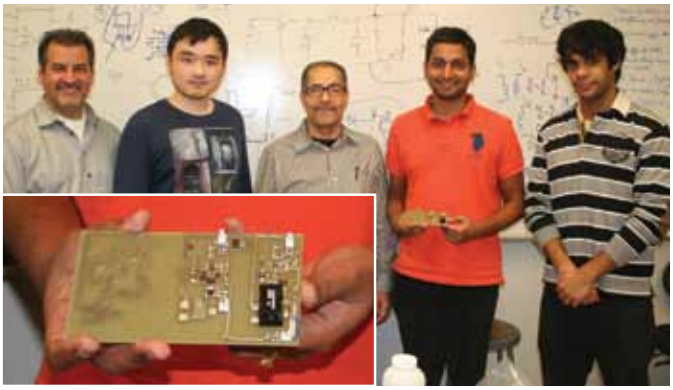
Full story: eecs.umich.edu/n/418

First Place



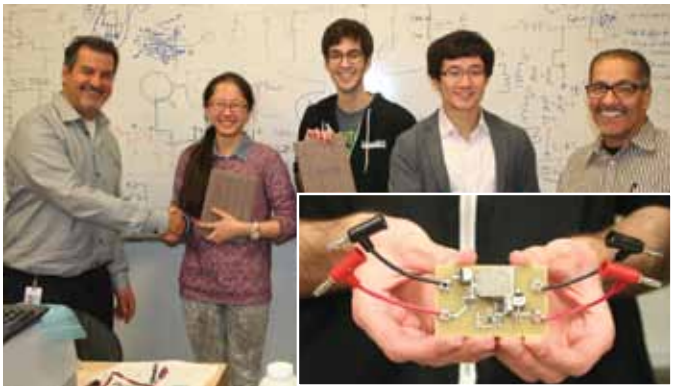
L-R: Ben Dicicco (judge), Nua Nicaj, Nazmi Sabi (judge), Matthew Schwendeman, Samuel Friedman, and Youngbae Son

Third Place



L-R: Ben Dicicco (judge), Yang Yang, Nazmi Sabi (judge), Pradeep Kodali, and Akshay Sarin

Second Place



L-R: Ben Dicicco (judge), Yuanying Wang, Maxime Lawton, Siqi Chen, and Nazmi Sabi (judge)

EECS Students Row Blue! to Victory

Four EECS students, Benjamin Rebertus, Ian McGraw, Alex Brown, and Mitchell Tyson, along with their teammates on the Michigan Men's Rowing team applied their muscle as well as a bit of their engineering prowess at the 2016 American Collegiate Rowing Association (ACRA)'s National Championships, where they pulled off top-three finishes in nearly every category.

In the competition's hottest category, the Varsity eight-man boat race, both of their Varsity 8 boats finished in first place, making this Michigan's fourth consecutive Varsity 8 title. These wins helped secure Michigan's ninth consecutive Men's Team Points Trophy.

Their national championship earned the two Varsity 8 teams the honor of competing in the Henley Royal Regatta's Temple Challenge Cup, held in the U.K. Both boats qualified for the race along with just 30 other teams from around the world. They were ultimately eliminated before the final round.

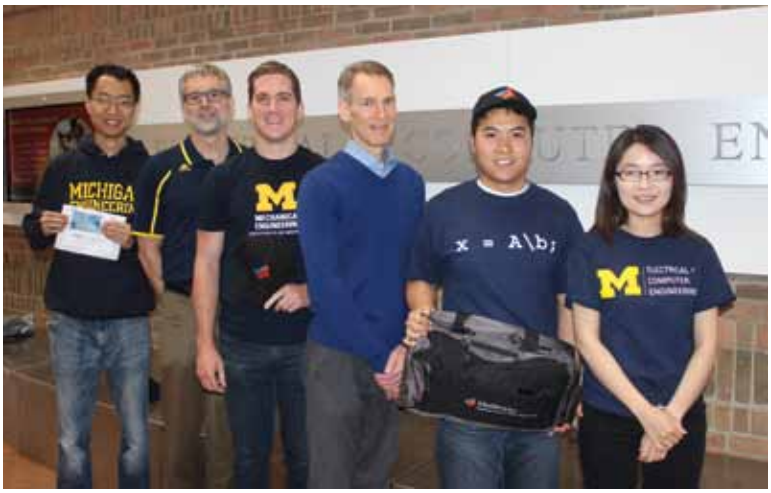
Alex Brown said the team's oars were designed by a career engineer with a rowing interest, and the team used a pressure sensor in the shaft to model the force being exerted at different parts of the boat to determine weak spots and who can fill it.

Full story: eecs.umich.edu/n/rowing

The Michigan Men's Rowing team rowing to victory at the 2016 American Collegiate Rowing Association National Championship

Alex Brown, Ian McGraw, Mitchell Tyson, and Benjamin Rebertus at the Henley Royal Regatta's Temple Challenge Cup

Simulating the Best Landing of a Rocket Booster



Nan Li (doctoral student in aerospace engineering and overall winner), Prof. Jessy Grizzle, Dan Bruder (doctoral student in mechanical engineering and fourth place overall winner), Jerry Brusher (MathWorks), Yan Zhao (doctoral student in mechanical engineering and third place overall winner), Connie Qin (graduate student instructor)

A NASA space shuttle (rocket and booster) launch
Credit: NASA

Students in EECS 562, Nonlinear Systems and Control, received prizes for calculating how to land a rocket booster with minimal damage after being detached during a rocket launch. They competed with students who were taking a similar class at Carnegie Mellon University. Prof. Jessy Grizzle's former PhD student and CMU professor, Koushil Sreenath (PhD EE:S 2011), designed the project last year, inspired by a real-world problem.

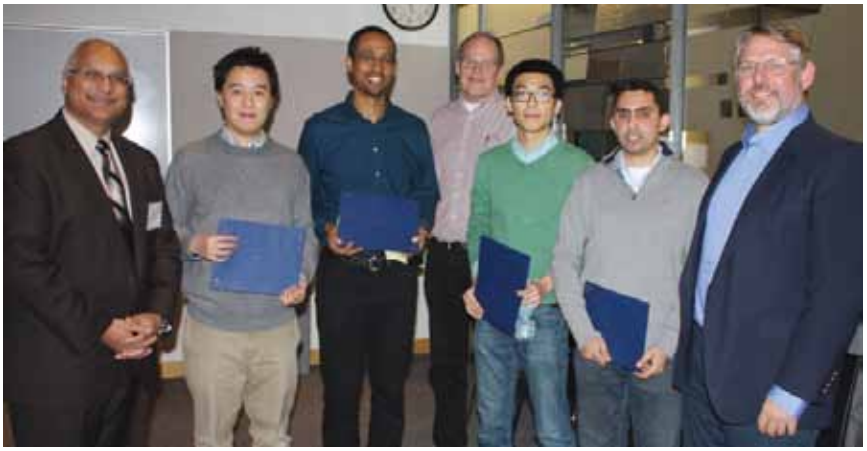
The goal of the class project was to control the safe landing of a rocket booster after it disengaged from the portion of the rocket that would continue into Space. These boosters are typically destroyed or lost at sea. Space companies such as Blue Origin and SpaceX have recently been able to safely land booster rockets, making these expensive components available for future missions.

According to Prof. Grizzle, students were tasked with landing a rocket on a small pad, inspired by Space-X landing their rocket on a floating platform in the ocean. "The students were presented with an increasingly difficult set of initial configurations of the rocket," said Prof. Grizzle, "until they were no longer able to land the rocket on the pad with sufficient accuracy and delicacy that it does not tip over, land with a bang, or run out of fuel! A perfect score is 1,000. Our winner racked up the impressive score of 612."

Full story: eecs.umich.edu/n/562

CSE Graduate Student Honors Competition

CSE held its twelfth annual CSE Graduate Student Honors Competition on November 23, 2015. The competition is the culmination of a process that narrows a field of entrants to four finalists, each of whom give a summary presentation on an area of their research. CSE faculty and industry sponsors from Northrop Grumman ranked the finalists' presentations.



L-R: Sam Shekar (Northrop Grumman), Nan Jiang, Biruk Mammo, Prof. John Laird, Chansoo Lee, Kassem Fawaz, and Cliff Frieler (Northrop Grumman)

1st Place: Biruk Mammo: "Getting Your Priorities Straight When Verifying Multicores"

2nd Place: Nan Jiang: "The Dependence of Effective Planning Horizon on Model Accuracy"

Honorable Mention: Kassem Fawaz: "Anatomization and Protection of Mobile Apps' Location Privacy Threats"

Honorable Mention: Chansoo Lee: "Perturbation Techniques in Sequential Prediction"

Full story: eecs.umich.edu/n/comp

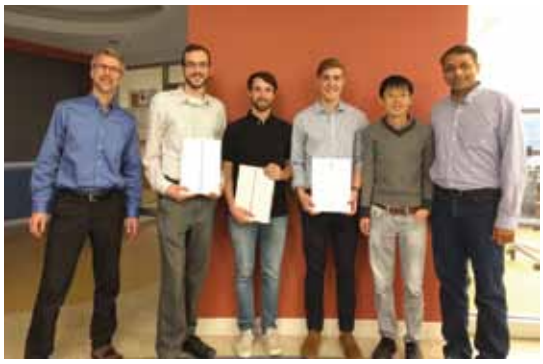
Improving Image Processing Techniques

Two teams earned prizes in the graduate level course EECS 556: Image Processing, thanks to the sponsorship of KLA-Tencor. The course, taught this past term by Prof. Jeff Fessler, covers the theory and application of digital image processing, with applications in biomedical images, time-varying imagery, robotics, and optics. The two winning teams improved methods for partitioning an image into meaningful segments and tone mapping images with high dynamic range.

Full story: eecs.umich.edu/n/image

EECS 556: Improving Image Processing Techniques

1st Place: *Fast Partitioning of Vector-Valued Images and 3D Volumes,* by Jon Macoskey, Steven Parkison, and Josiah Simeth



Prof. Jeff Fessler, Josiah Simeth, Steven Parkison, Jon Macoskey, and KLA-Tencor researchers Jing Zheng and Mohan Mahadevan

Before and After

2nd Place: *High Dynamic Range Image Tone Mapping Using a Local Edge-preserving Multiscale Decomposition*, by Hongki Lim and Wonhui Ki

Prof. Jeff Fessler, Wonhui Kim, Hongki Lim, and KLA-Tencor researchers Jing Zheng and Mohan Mahadevan

Before and After

EECS Graduate Students Organize Robo Café Demo at DARPA Tech Conference

CSE graduate students Brad Campbell and Pat Pannuto participated in the *Wait, What? A Future Technology Forum* that took place September 9-11 in St. Louis, Missouri. The forum was hosted by DARPA and focused on future technologies in conjunction with national security.

As part of the forum, Campbell and Pannuto organized a demonstration from the TerraSwarm team that integrated technologies from five universities (University of Michigan, University of Pennsylvania, UC-Berkeley, Carnegie Mellon University, and the University of Washington) to showcase the types of applications enabled by the TerraSwarm Research Center. The demo focused on a robot delivery service, called Robo Café, where a team of robots delivered snacks to attendees at the touch of a button. The user interface for the demo was a smartphone app, running on unmodified smartphones.

Full story: eecs.umich.edu/n/wait

Image Credit: TerraSwarm Research Center

Competitive Team in Data Science Launches at Michigan

A new competitive data science student team has been formed at Michigan to solve data prediction challenges in competitive venues. The Michigan Data Science Team (MDST) is one of the first collegiate teams of its kind, with a mission to compete against professional and amateur data scientists from around the world in online prediction challenges.

MDST formed in Fall 2015 and has been attracting dedicated students who are interested in taking part in data science competitions, according to Jonathan Stroud, CSE graduate student and MDST Organizational Chair. According to Stroud, students who are drawn to the team typically have some background in computer science, mathematics, or statistics, but all students with an interest are welcome to participate. MDST meets weekly to share strategies and give tutorials in preparation for challenges. The group offers internal prizes to members who achieve the highest performance in prediction challenges. In its first year, MDST participated in an unexpected but critical challenge: organizing and analyzing data to gain insight into the extent of Flint, MI's water crisis. See the related story on p. 5.

Full story: eecs.umich.edu/n/mdst

IEEE-HKN recognized the excellent work of Michigan's Beta Epsilon Chapter with the Outstanding Chapter Award.

Award-winning IEEE-HKN Beta Epsilon Chapter Hosts 2016 IEEE-HKN Student Leadership Conference

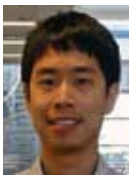
Our student chapter of IEEE-HKN is a well-oiled machine!

Along with winning an Outstanding Chapter Award from IEEE-HKN, the Beta Epsilon Chapter of IEEE-HKN hosted the *2016 Student Leadership Conference* here in Ann Arbor.

EECS graduate students Michael Benson and Kyle Lady co-chaired the conference. One of the guest speakers was our own Mitch Rohde (BSE MSE EE '94 '96; PhD BME '97 '00), pictured below. Co-founder and CEO of local company Quantum Signal, Mitch gave the talk, "Mobile Robotics, ANVEL, and the Pressing Need for Simulation."

Individual Honors and Awards

Joshua Adkins (BSE in CE) was selected for an NSF Graduate Research Fellowship to study ways of making embedded sensors and actuators work together to accomplish coordinated tasks.



Yu-Wei Chao (CSE graduate student) received a Google PhD Fellowship for his work in computer vision and machine learning.

Zakir Durumeric (CSE graduate student) was named one of MIT *Technology Review's* Innovators Under 35 for his co-invention of the ZMap scanning system. This open source tool is able to determine which machines are online at any given time, and whether they have security flaws - all in about 5 minutes.

Genevieve Flaspohler (BSE in CE) was selected for an NSF Graduate Research Fellowship to pursue research in autonomous naval vehicles.

Amr Ibrahim (ECE graduate student) earned a Rackham Predoctoral Fellowship for his research in sub-millimeterwave radar systems.

Nan Jiang (CSE graduate student) was awarded a Rackham Predoctoral Fellowship to support his research in batch reinforcement learning.

Avish Kosari (ECE graduate student) was selected as a Barbour Scholar for her research in low-power devices for the Internet of Things.

Doowon Lee (CSE graduate student) received a Rackham Predoctoral Fellowship to continue his research in the reliability of computing systems.

Yashen Lin (ECE graduate student) earned a Dow Sustainability Fellowship to research environmentally friendly energy storage.

Ryan Marcotte (CSE graduate student) was selected to receive a NSF Graduate Research Fellowship and an NDSEG Graduate Research Fellowship to support his research into multi-agent search algorithms for both known and unexplored environments.

Audrow Nash (ECE graduate student) earned an NSF Fellowship for his research in unmanned aerial vehicles and remote sensing.

Karl Winsor (CS undergraduate student) was named a Churchill Scholar by the Winston Churchill Foundation of the United States.

Xiang Yin (ECE graduate student) received a Rackham Predoctoral Fellowship to continue his research in cyber-physical systems.

Clark Zhang (BSE in CE) earned an NSF Fellowship to pursue research in data processing in MEMS networks.

EECS and CoE Awards

Undergraduate

CoE Distinguished Academic Achievement Award
Lauren Bilbo (EE)
Genevieve Flaspohler (CE)
Matthew Grossman (CS)

CoE Distinguished Leadership Award
Olena Huang (EE)
Breoshshala Martin (CE)
Neal Parikh (CS)

CoE Arlen R. Hellwarth Award
Alexandria Strother (EE)

CoE Cooley Writing Prize
Andong Luis Li Zhao (CS)

CoE Epeians Emerging Leadership Prize
Aidan Connolly (EE)

CoE Henry Ford II Prize
Maxwell Li (EE)

CoE Hugh G. Rumler Prize
Alexandria Strother (EE)

EECS Outstanding Achievement Award
Jiannan Huang (EE)
Benjamin Katz (CS)
Clark Zhang (CE)

EECS Outstanding Research Award
Neal Jackson (CE)
Austin Rovinski (EE)
Max Smith (CS)

EECS Outstanding Service Award
Kyle Harman (EE)
Maia Hoberman (CS)
Breoshshala Martin (CE)

EECS William L. Everitt Student Award of Excellence
Leah Bar-On Simmons (CS)
Genevieve Flaspohler (CE)
Andrew Wagenmaker (EE)
Stephen Zhu (CS)

EECS William Harvey Seeley Prize
Deondre Davis (EE)
Michael Toennies (EE)

EECS Richard K. Brown Memorial Scholarship
James Chapman (EE)

EECS Commercialization/ Entrepreneurship Award
Maxwell Li (EE)
Colin Szechy (CE)
Eric Yu (CS)

EECS and CoE Awards

Graduate

EECS GSI/IA Awards

Graduate Student Instructors (GSIs) and Instructor Aides (IAs) can be essential to the success of students in class. Their job begins when formal lectures end and includes assisting in lab and discussion sections, holding office hours, and answering questions online. They don't have to answer a desperate student's questions at 3:00 am, but students are grateful that some do that too.

Award Winners:

Maxim Aleksa
Leah Bar-On-Simmons
Catherine Culkin
Bradley Hecht
Collin Johnson
Doowon Lee
Amlan Nayak
Aaron Stein
Yunqi Zhang
Chumin Zhao

Honorable Mentions:

Jessi Aboukasm
Yitian Chen
John Connolly
Kyle Harmans
Mo Hussein
Jaeyoung Kim
Mehrdad Moradi
Nathan Sawicki

Actual Comments From Students

Is the best WOOT WOOT WOOT

Frequently added to the discussion with relevant real-world information about industry practices.

Deserves a medal.

Really kind and considerate.

My hero.

Incredibly chill, made it very fun.

Discussions planned out very thoroughly.

Saved my life in this class.

Richard and Eleanor Towner Prize for Outstanding PhD Research Award

Azadeh Ansari (ECE), for her dissertation, "Q-Enhanced Depletion-mediated AlGaN/GaN Resonators."

Cheng Zhang (ECE), for his dissertation, "Optical Properties and Optoelectronic Applications of Nano-size Metallic Films and Metamaterials."

Parinaz Naghizadeh (ECE), (Honorable Mention), for her dissertation, "Provision of Non-Excludable Goods on Networks: Incentives, Exit Equilibria, and Applications to Cyber-Security."

Richard F. and Eleanor A. Towner Prize for Outstanding GSIs

Vidal Borromeo (CSE) was the graduate student instructor for EECS 381: Object Oriented and Advanced Programming.

Congratulations to the following individuals who earned their Doctorate during the 2015-16 academic year!

Armin Alaghi, *The Logic of Random Pulses: Stochastic Computing* (Prof. John Patrick Hayes, Chair), Computer Science and Engineering

Nicholas Asendorf, *Informative Data Fusion: Beyond Canonical Correlation Analysis* (Prof. Raj Rao Nadakuditi, Chair), Electrical Engineering:Systems

Suyoung Bang, *Circuit Techniques for Power Management Unit and Switched Capacitor DC-DC Converter* (Prof. Dennis M. Sylvester, Chair), Electrical Engineering

Ian Burkley Beil, Fast-timescale Control Strategies for Demand Response in Power Systems (Prof. Ian Hiskens, Chair), Electrical Engineering:Systems

Iverson Bell, *A System Concept Study and Experimental Evaluation of Miniaturized Electrodynamic Tethers to Enhance Picosatellite and Femtosatellite Capabilities* (Prof. Brian E. Gilchrist, Chair), Electrical Engineering

Hatim Adnan Bukhari, *Antenna Bandwidth and Radiation Control by Topology and Use of Non-Conductive Materials* (Prof. Kamal Sarabandi, Chair), Electrical Engineering

Brian Buss, *Systematic Controller Design for Dynamic 3D Bipedal Robot Walking* (Profs. Kaveh Akbari Hamed and Jessy W. Grizzle, Co-Chairs), Electrical Engineering:Systems

Gaurav Chadha, *Energy-Efficient Acceleration of Asynchronous Programs* (Profs. Scott Mahlke and Satish Narayanasamy, Co-Chairs), Computer Science and Engineering

Lin Chen,*Vertical Integration of Germanium Nanowires on Silicon Substrates for Nanoelectronics* (Prof. Wei Lu, Chair), Electrical Engineering

Shirley Zhe Chen, *Information Extraction on Para-Relational Data* (Prof. Michael Cafarella, Chair), Computer Science and Engineering

Yu-Hui Chen, *Multimodal Image Fusion and Its Applications* (Prof. Alfred O. Hero III, Chair), Electrical Engineering:Systems

Shinhyun Choi, *Characteristics and Applications of Non-Volatile Resistive Switching (Memristor) Device* (Prof. Wei Lu, Chair), Electrical Engineering

Colin Ming Earn Chow, *Towards a Universal Two-Qubit Gate With Self-Assembled InAs Quantum Dot Molecules* (Prof. Duncan G. Steel, Chair), Electrical Engineering

Robert Cohn, *Maximizing Expected Value of Information in Decision Problems by Querying on a Wish-to-Know Basis* (Profs. Satinder Singh Baveja and Edmund H. Durfee, Co-Chairs), Computer Science and Engineering

Jakub Jerzy Czyz, *A Brave New World: Studies on the Deployment and Security of the Emerging IPv6 Internet* (Profs. Michael Bailey and J. Alex Halderman, Co-Chairs), Computer Science and Engineering

Daniel Georg Dietmar Egert, *Intracortical Neural Probes With Post-Implant Self-Deployed Electrodes for Improved Chronic Stability* (Prof. Khalil Najafi, Chair), Electrical Engineering

Hamed Firouzi, *High Dimensional Correlation Networks and Their Applications* (Prof. Alfred O. Hero III, Chair), Electrical Engineering:Systems

Jeffrey Alan Fredenburg, *Noise-Shaping SAR ADCs* (Prof. Michael Flynn, Chair), Electrical Engineering

Thomas Aaron Frost, *Red-Emitting III-Nitride Self-Assembled Quantum Dot Lasers* (Prof. Pallab K. Bhattacharya, Chair), Electrical Engineering

Mohammad Mahdi Ghahramani, *Techniques for Frequency Synthesizer-Based Transmitters* (Prof. Michael Flynn, Chair), Electrical Engineering

Michael Haines, *Ultrashort-Pulse Matter Interactions Using Compact Fiber CPA Technology* (Prof. Almantas Galvanauskas, Chair), Electrical Engineering

Xuejing He, *Energy Saving and Scavenging in Stand-alone and Large Scale Distributed Systems* (Prof. Robert Dick, Chair), Electrical Engineering

I-Ning Hu, *Study and Control of Nonlinearity in Large-Mode-Area Fibers* (Prof. Almantas Galvanauskas, Chair), Electrical Engineering

Jaehun Jeong, *F-Sampling Digital Beamforming With Bit-Stream Processing* (Prof. Michael Flynn, Chair), Electrical Engineering

Rahul Kumar Jha, *NLP Driven Models for Automatically Generating Survey Articles for Scientific Topics* (Prof. Dragomir Radev, Chair), Computer Science and Engineering

James Juett, *Using Program Visualization to Illuminate the Notional Machine* (Prof. Georg Essl, Chair), Computer Science and Engineering

Dae Yon Jung, *Feature Selection and Non-Euclidean Dimensionality Reduction: Application to Electrocardiology* (Prof. Alfred O. Hero III, Chair), Electrical Engineering:Systems

James Douglas Kasten Jr., *Server Authentication on the Past, Present, and Future Internet* (Prof. J. Alex Halderman, Chair), Computer Science and Engineering

Rawan Abdel Khalek, *Achieving Functional Correctness in Large Interconnect Systems* (Prof.Valeria M. Bertacco, Chair), Computer Science and Engineering

Daya Shanker Khudia, *Dependable Computing on Inexact Hardware Through Anomaly Detection* (Prof. Scott Mahlke, Chair), Computer Science and Engineering

Jung Kuk Kim, *Algorithm and Architecture Co-design for High-performance Digital Signal Processing* (Profs. Jeffrey A. Fessler and Zhengya Zhang, Co-Chairs), Electrical Engineering:Systems

Benjamin Philip King, *Practical Natural Language Processing for Low-Resource Languages* (Profs. Steven P. Abney and Dragomir Radev, Co-Chairs), Computer Science and Engineering

Phil Christopher Knag, *Hardware Considerations for Signal Processing Systems: A Step Toward the Unconventional* (Prof. Zhengya Zhang, Chair), Electrical Engineering

Heng Kuang, *Concurrent Design of Assembly Plans and Supply Chains: Models, Algorithms, and Strategies* (Profs. Jack Hu and Jeonghan Ko, Co-Chairs), Electrical Engineering:Systems

Michael Andrew Laurenzano, *Low-overhead Online Code Transformations* (Profs. Jason Mars and Lingjia Tang, Co-Chairs), Computer Science and Engineering

Janghaeng Lee, *Virtualizing Data Parallel Systems for Portability, Productivity, and Performance* (Prof. Scott Mahlke, Chair), Computer Science and Engineering

Kyunghoon Lee, *Graphene and Beyond: Electron Transport in Two Dimensional Materials* (Prof. Zhaohui Zhong, Chair), PhD Electrical Engineering

Kyu-Tae Lee, *Ultra-Thin Highly Absorbing Medium-Based Optical Nanocavity for Photonic and Optoelectronic Devices* (Prof. Jay L. Guo, Chair), Electrical Engineering

Justin Li, *The Goal Re-activation Problem in Cognitive Architectures* (Prof. John E. Laird, Chair), Computer Science and Engineering

Yang Liu, *Harnessing the Power of Multi-Source Data: an Exploration of Diversity and Similarity* (Prof. Mingyan Liu, Chair), Electrical Engineering:Systems

Yang Liu, *Solving Electrically Very Large Transient Electromagnetic Problems Using Plane-Wave Time-Domain Algorithms* (Prof. Eric Michielssen, Chair), Electrical Engineering

Yue Liu, *Supporting Large Scale Communication Systems on Infrastructureless Networks Composed of Commodity Mobile Devices: Practicality, Scalability, and Security* (Prof. Robert Dick, Chair), Electrical Engineering:Systems PhD

Madison McGaffin, *X-ray CT Image Reconstruction on Highly-Parallel Architectures* (Prof. Jeffrey A. Fessler, Chair), Electrical Engineering:Systems

Momchil Tsvetanov Mihnev, *Ultrafast Terahertz Response of Epitaxial and Chemical-Vapor-Deposited Graphene and of Germanium and Germanium/Silicon Core/Shell Nanowires* (Prof. Theodore B. Norris, Chair), Electrical Engineering

Tai-Chuan Ou, *Scalable Energy-Recovery Architectures* (Prof. Marios C. Papaefthymiou, Chair), Electrical Engineering

Yi Ouyang, *On the Interaction of Information and Decisions in Dynamic Networked Systems* (Prof. Demosthenis Teneketzis, Chair), Electrical Engineering:Systems

Paul Ozog, *Advances in Simultaneous Localization and Mapping in Confined Underwater Environments Using Sonar and Optical Imaging* (Prof. Ryan M. Eustice, Chair), Electrical Engineering:Systems

Venkatram Pepakayala, *Micromachined Magnetoelastic Sensors and Actuators for Biomedical Devices and Other Applications* (Prof. Yogesh B. Gianchandani, Chair), Electrical Engineering

Nathaniel Ross Pinckney, *Near-Threshold Computing: Past, Present, and Future* (Prof. David Blaauw, Chair), Electrical Engineering

Matthew Prelee, *Manhattan Cutset Sampling and Sensor Networks* (Prof. David L. Neuhoff, Chair), Electrical Engineering:Systems

Jason Pries, *Computationally Efficient Steady—State Simulation Algorithms for Finite-Element Models of Electric Machines* (Prof. Heath Hofmann, Chair), Electrical Engineering:Systems

Yutao Qin, *Integrated Micro Gas Chromatographs With High-Flow Knudsen Pumps* (Prof. Yogesh B. Gianchandani, Chair), Electrical Engineering

Pradeep Ranganathan, *Non-parametric Models of Distortion in Imaging Systems* (Prof. Edwin Olson, Chair), Computer Science and Engineering

Maruthi T. Ravichandran, *Resilient Monitoring and Control Systems: Design, Analysis, and Performance Evaluation (*Prof. Semyon M. Meerkov, Chair), Electrical Engineering:Systems

David Reed, *Identification and Adaptive Control for High-performance AC Drive Systems* (Profs. Heath Hofmann and Jing Sun, Co-Chairs), Electrical Engineering:Systems

Andrew Ross Richardson, *Learning and Searching Methods for Robust, Real-Time Visual Odometry* (Prof. Edwin Olson, Chair), Computer Science and Engineering

Brian Roberts, *Design of Metallic Nanostructures for Wavelength and Angle Selective Light Management* (Prof. Pei-Cheng Ku, Chair), Electrical Engineering

Sina Sadeghi Baghsorkhi, *Integration of Utility-Scale Variable Generation Into Resistive Networks* (Prof. Ian Hiskens, Chair), Electrical Engineering:Systems

Ankit Sethia, *Dynamic Hardware Resource Management for Efficient Throughput Processing* (Prof. Scott Mahlke, Chair), Computer Science and Engineering

Patrick Sheridan, *Neuromorphic Computing With Resistive Switching Devices* (Prof. Wei Lu, Chair), Electrical Engineering

Abhayendra Singh, *A Safety-First Approach to Memory Models* (Prof. Satish Narayanasamy, Chair), Computer Science and Engineering

Jason Lee Sleight, *Agent-Driven Representations, Algorithms, and Metrics for Automated Organizational Design* (Prof. Edmund H. Durfee, Chair), Computer Science and Engineering

Faissal Mohamad Sleiman, *Hybrid Designs for Caches and Cores* (Prof. Thomas F. Wenisch, Chair), Computer Science and Engineering

Kihyuk Sohn, *Improving Deep Representation Learning With Complex and Multimodal Data* (Prof. Honglak Lee, Chair), Electrical Engineering:Systems

Aaron Lievret-Farchaus Stein, *The Design and Effect Power Electronics on Vibration-Based Energy Harvesting Methods* (Prof. Heath Hofmann, Chair), Electrical Engineering:Systems

Johannes Strom, *Online Mapping and Perception Algorithms for Multi-robot Teams Operating in Urban Environments* (Prof. Edwin Olson, Chair), Computer Science and Engineering

Hsin-Hao Su, *Algorithms for Fundamental Problems in Computer Networks* (Prof. Seth Pettie, Chair), Computer Science and Engineering

Prateek Tandon, *Hardware Acceleration for Unstructured Big Data and Natural Language Processing* (Prof. Thomas F. Wenisch, Chair), Computer Science and Engineering

Chu-Hsiang Teng, *Strain Engineering of InGaN/GaN Nanopillars for Optoelectronic Applications* (Profs. Hui Deng and Pei-Cheng Ku, Co-Chairs), Electrical Engineering

Alan Teran, *Spectrum-Dependent Photovoltaic Energy Harvesting* (Prof. Jamie Dean Phillips, Chair), Electrical Engineering

Alexander Van Esbroeck, *Learning Better Clinical Risk Models* (Profs. Satinder Singh Baveja and Zeeshan Syed, Co-Chairs), Computer Science and Engineering

Elaine Wah, *Computational Models of Algorithmic Trading in Financial Markets* (Prof. Michael P. Wellman, Chair), Computer Science and Engineering

Bryce Wiedenbeck, *Approximate Analysis of Large Simulation-Based Games* (Prof. Michael P. Wellman, Chair), Computer Science and Engineering

Jiangfeng Wu, *Radar Sub-surface Sensing for Mapping the Extent of Hydraulic Fractures and for Monitoring Lake Ice and Design of Some Novel Antennas* (Prof. Kamal Sarabandi, Chair), Electrical Engineering

Eric Wustrow, *Security Hazards when Law is Code* (Prof. J. Alex Halderman, Chair), Computer Science and Engineering

Yu Xiang, *3D Object Representations for Recognition* (Profs. Alfred O. Hero III and Silvio Savarese, Co-Chairs), Electrical Engineering:Systems

Xin Xiao, *Small Molecule Heterojunction Solar Cells Employing Mixed Donor-Acceptor Active Regions and Buffer Layers* (Prof. Stephen R. Forrest, Chair), Electrical Engineering

Qi Yang, *Not All Gestures Are Created Equal: Gesture and Visual Feedback in Interaction Spaces* (Prof. Georg Essl, Chair), Computer Science and Engineering

Yuanhao Zhai, *Perceptual Image Similarity Metrics and Applications* (Prof. David L. Neuhoff, Chair), Electrical Engineering:Systems

Jing Zhang, *A Macroscopic Study of Network Security Threats at the Organizational Level* (Profs. Michael Bailey and Mingyan Liu, Co-Chairs), Computer Science and Engineering

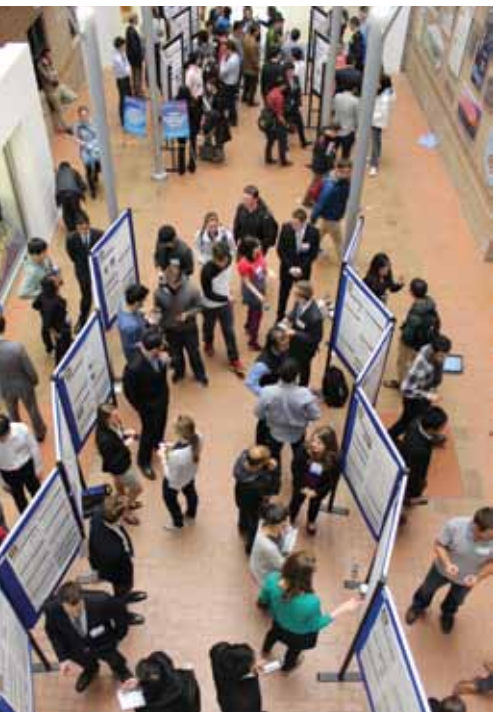
Yiting Zhang, *Low Temperature Plasma Etching Control Through Ion Energy Angular Distribution and 3-Dimensional Profile Simulation* (Prof. Mark Kushner, Chair), Electrical Engineering

Qi Zheng, *Datacenter Design for Future Cloud Radio Access Network* (Profs. Ronald Dreslinski, Jr. and Trevor N. Mudge, Co-Chairs), Computer Science and Engineering

Kan Zhou, *Computationally-efficient Finite-element-based Thermal and Electromagnetic Models of Electric Machines* (Prof. Heath Hofmann, Chair), Electrical Engineering:Systems

Tong Zhou, *Coherent Combining of Optical Pulses in Spatial, Spectral and Time Domains* (Prof. Almantas Galvanauskas, Chair), Electrical Engineering

Student-Alumni Connections

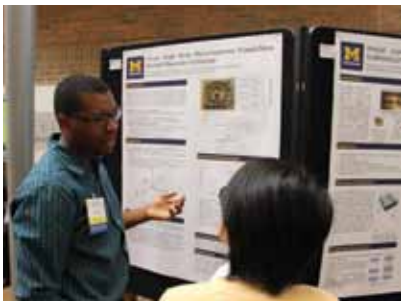


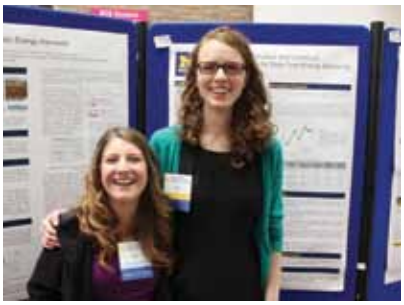
Students and Alumni Meet Over Research at the 2015 Graduate Symposium

Efficient phosphorescent OLEDs, autonomous safety systems for cars, audio-visual emotion recognition, multi-directional radar, graphene nanoelectronics, and groundbreaking resistive random access memory (RRAM) were just a few of the many projects presented by ECE students at the 2015 Engineering Graduate Symposium. About 80 graduate students presented their work to prospective and fellow students.

Posters and presentations were judged by faculty and 14 ECE alumni, and winners were chosen in each area of study. The following ECE students took first or second place in their areas of research.

Full story: eecs.umich.edu/n/gradsym





Automotive and Transportation Engineering

Zeng Qiu – 1st Place, for "Composite Adaptive Internal Model Control and its Application to Boost-Pressure Control of a Turbocharged Gasoline Engine." Advised by Jing Sung (NAME).

Gaurav Kumar Singh – 2nd Place, for "Constructing User Specific Probabilistic Models of Driver Input Via Maneuver Recognition." Advised by Ram Vasudevan (ME).

Integrated Circuits, VLSI, and Microsystems

Adam Peczalski – 1st Place, for "Temperature Compensated Fused Silica Resonators Using Embedded Nickel-Refilled Trenches." Advised by Mina Rais-Zadeh.

System and Communication Engineering

Farhad Shirani – 1st Place, for "New Lattice Codes for Multiple Descriptions." Advised by Sandeep Pradhan.

Signal and Image Processing, Computer Vision

Brian Moore – 1st Place, for "The Accuracy of Singular Vectors of Thresholded Low-rank Plus Noise Plus Outlier Matrices." Advised by Raj Rao Nadakuditi.

Kevin Moon – 2nd Place (tie), for "Meta Learning of Bounds on the Bayes Classifier Error." Advised by Al Hero.

Matthew Prelee – 2nd Place (tie), for "New Image Reconstruction Algorithm Guided by Local Gradient SVD." Advised by Dave Neuhoff.

Applied Electromagnetics and Plasma Science

Brian Tierney – 1st Place, for "Generating Arbitrary Radiation Patterns With Metasurfaces." Advised by Anthony Grbic.

Nikolaos Chiotellis – 2nd Place for "Towards the Analytical Design of Tensor Metasurfaces." Advised by Anthony Gbric.

Control, Dynamics, and Robotics

Erik Miehling – 1st Place, for "Optimal Defense Policies for Partially Observable Spreading Processes on Bayesian Attack Graphs." Advised by Demosthenis Teneketzis.

Optics, Photonics, and Solid-State Devices

Lin Chen – 1st Place (tie), for "Vertical Ge/Si Core/Shell Nanowire Juntionless Transistor." Advised by Wei Lu.

Jaesang Lee – 1st Place (tie), for "Current Progress in Blue Phosphorescent Organic Light-emitting Diodes (PHOLED)." Advised by Stephen Forrest.

Alan Teran – 1st Place (tie), for "High-efficiency AlGaAs Indoor Photovoltaics." Advised by Jamie Phillips.

Power and Energy

Michael Fisher – 1st Place (tie), for "Shooting Methods for Computation of Parameter Stability Boundaries in Fault Induced Delayed Voltage Recovery." Advised by Ian Hiskens.

Jonathan Martin – 1st Place (tie), for "Corrective Model-Predictive Control in Large Electric Power Systems." Advised by Ian Hiskens.

Inaugural ECE Career Fair Builds Student Careers and Alumni Connections

The ECE division hosted its very first career fair, welcoming local companies of all sizes and from many industries. Over 15 companies, many of them either founded or led by alumni, were there to recruit from among 200 registered graduate and undergraduate students. In addition to these were several large local companies representing the local automotive and energy sectors.

2016 Homecoming Award Winners in EECS

CoE Alumni Society Merit Award
Winner for CSE
Greg Joswiak
(BSE CE '86)
Vice President of Apple Product Marketing, Apple Inc.

EECS will be celebrating Homecoming in the Department on Friday, October 21, 2016

We hope you can join us.

Homecoming event and lecture schedules can be found at:
eecs.umich.edu/n/hc

CoE Alumni Society Merit Award
Winner for ECE
Meera Sampath
(PhD EE:S '95)
Vice President for Innovation and Business Transformation, Xerox

CoE Alumni Society Medal Award
Michael Stonebraker
(MSE EE '66; PhD CICE '71)
2014 Turing Award Winner

CoE Alumni Society Service Award
W. David Tarver
(BSE MSE EE '75 '76)
Entrepreneur, Author, Educator, Public Speaker

Eran Bashan: Engineering a Better Life for Diabetic Patients

Eran Bashan (PhD EE:S '08) is tackling a medical problem that affects over 29 million Americans, and accounts for more than 1 in 5 health care dollars spent in the U.S. Diabetes is one of the most prevalent chronic diseases in the world, and its treatment still relies heavily on careful blood sugar measurements and insulin doses, largely taken care of by the patients.

Bashan is CEO and co-founder of Hygieia, which seeks to assist patients in two ways. It provides medical devices that automatically evaluate and optimize insulin dosage, and patient consulting and training that is carried out by on-staff nurses, reducing the need for frequent trips to the doctor. Hygieia has patented a device called d-Nav®, short for "diabetes navigation," that acts like an "artificial physician." The device calculates the optimal insulin dosage based on what their body needs at that moment.

"What we hear over and over from patients is 'this changed my life,'" says Dr. Bashan. "It gives you confidence to do things that, previously, you didn't think you could do."

In 2012, Eran and Hygieia began testing their system in a hospital in Northern Ireland. Hundreds of patients provided Eran and his company with a mass of data and testimonies to bolster his product. Now, Eran is looking for opportunities to demonstrate the d-Nav service at home in the U.S. This country's vastly different healthcare system presents a host of new challenges, including developing relationships with insurance companies and securing FDA approval for his device. Hygieia is currently working with patients in Minneapolis, Des Moines, and Henry Ford Health System in Detroit.

Full story: eecs.umich.edu/n/eran

HYGIEIA
A BETTER WAY TO USE INSULIN

Many students wanted to capture a photo of Ashraf Dahod, pictured here (right) with his wife and former Dean, David C. Munson, Jr.

Ashraf Dahod: 2015 CoE Alumni Medal Award Winner

Ashraf Dahod (BSE EE '72), co-founder, Chairman, and CEO of Altiostar Networks, Inc., was awarded this year's College of Engineering Alumni Medal, the highest alumni award offered by the college.

Dahod has combined an understanding of technology with a knack for recognizing market opportunities on the horizon and built a string of successful technology companies.

Dahod, who earned five college degrees from five different universities, founded Applitek Corporation in 1981. The company went on to develop the first cable modem. After selling Applitek, he founded Sigma Network Systems, a leader in multi-layer, multi-protocol switching systems. Next came NetCore Systems, which produced large-scale, high-performance switching products for telecommunications carriers and ISPs. NetCore was acquired by Tellabs in 1999.

In 2000, he co-founded Starent Networks, which designs and develops equipment that's made wireless networks capable of things like sending email and streaming television. Starent was acquired by Cisco in 2009 for a reported $2.9B. His latest venture, Altiostar Networks, promises interesting days ahead for LTE communication.

Watch his acceptance speech: eecs.umich.edu/n/ashraf

Claude Gauthier: Connecting to the Ethernet Revolution

Claude Gauthier (MSE PhD EE '97 '99) has made connections around the world. A Canadian with two Michigan degrees, a Silicon Valley career, founder of international company OmniPhy, and customers across six continents, he's navigated his connections to destinations he never expected. According to Claude, his connections – to Michigan, to customers, to colleagues, to everybody – are the keys to success. He's CTO of a specialty semiconductor company that's about connections between computer chips. And with more than 100 patents to his name, he's also about innovation.

Dr. Gauthier is co-founder and CTO of the semiconductor interface intellectual property (IP) company, OmniPhy. He's kept a competitive edge in a crowded marketplace by listening to the needs of his customers, and to the pulse of the market. OmniPhy's niche is Ethernet, commonly used for Internet connections in personal computers and devices and now expanding into new industrial and automotive applications. Its Ethernet technology is already built into 70% of the world's smart TV market. The company's current key project is automotive Ethernet, connecting electronics within the automobile, as well as to the Internet of Things. In the next decade, Claude estimates that high-end cars may contain up to 200 Ethernet ports from just 2-3 today, turning automobiles into "smartphones on wheels."

Full story: eecs.umich.edu/n/omni

"We partner with our customers and big companies, and they trust our credibility," said Dr. Gauthier. "You get credibility from the University of Michigan – and then from creating successful products."

Garlin Gilchrist Received the CoE Outstanding Recent Alumni Award for 2015

Garlin Gilchrist II (BSE CE/CS '05) is on a lifelong mission to bring engineering solutions to communities in need. His career has taken him to big tech corporations, political campaigns, and his current position as Deputy Technology Director for Civic Community Engagement in his hometown, Detroit. Through all of it, Garlin has made it his mission to impact real people in meaningful ways with technology.

A high school job setting up custom PCs at community centers inspired Garlin to empower others through accessible technology. His first job out of college was as a software design engineer at Microsoft where he worked on SharePoint, one of the company's fastest growing products. But it didn't take long for Garlin to feel he wasn't doing enough to keep his dream of technology for the people alive. "I was working on amazing software that was really powerful and really important to a set of people," he says, "but in my heart it wasn't important to the right set of people."

So he quit his job and moved to Washington, D.C. as Director of New Media at the Center for Community Change. He later served as Social Media Manager for the 2008 Barack Obama campaign, and National Campaign Director at MoveOn.org.

In his current role as Detroit's first Deputy Technology Director for Civic Community Engagement, Garlin applies engineering problem solving to the challenges facing Detroit. In one project, he helped engineer the mobile app called Improve Detroit, which allows residents to report maintenance and security issues to the city directly and expect a reasonable response.

"The world needs as many problem solvers as possible," says Garlin Gilchrist. "It needs us to think about solving problems in a way that can be helpful and beneficial to people across the world."

Full story: eecs.umich.edu/n/gilchrist

Garlin Gilchrist chatting with members of the audience after his talk, "Unavailable Innovation: Why You Must Make Your Ideas Accessible"

"Being a graduate of U-M naturally gives you a leg up," Jimmy Hsiao says. "When you're looking for opportunities, consider staying. Ann Arbor has a lot to offer, and you'll find many exciting opportunities here."

Jimmy Hsiao: A Local Player in a Global Market

In 2015, Jimmy Hsiao (BSE EE '85, MSE CSE '87) celebrated 20 years as the founder and CEO of Logic Solutions, Inc., a consulting company offering website development, web and mobile applications, and other tech solutions to companies around the world. During that time, he led Logic from a local Ann Arbor startup to a global company boasting four international offices in China and Taiwan, a presence in California and Chicago, and over 200 employees, all the while headquartered just a short walk from North Campus.

Jimmy developed an early interest in fledgling Internet technology as an EE graduate student at U-M, where he worked with networked supercomputers. During his first job at a medical instruments company, he realized there was a future in networking devices to the Internet.

So he left his job and started his own company. After being approached by Ford Motor Company just two months later for a special consulting job, Logic became a consulting company focusing on Internet-related software. The company quickly expanded into the manufacturing, healthcare, and financial sectors.

Logic Solutions also made strategic acquisitions to expand into the mobile app market. The first, a tool to apply big data analysis to environmental health and safety (EHS) management tools, has taken off throughout their Asian market. Their second, developed in 2012, helps sales companies do order management on mobile devices.

Throughout its growth and development, Logic has always remained Michigan-centric. Jimmy employs many U-M grads, and encourages them to keep a local mindset when they graduate.

Extended story: www.ece.umich.edu/n/logic

Angelique Johnson: Cutting the Cost of Hearing

Founder and CEO of MEMStim and longtime researcher of implantable neural devices, Angelique Johnson (MSE PhD EE '07 '11) is committed to making radical improvements to medical technologies. With the power of microfabrication, MEMStim aims to provide cochlear implants at a fraction of the cost of current manufactured alternatives.

Angelique got her start in tech at a young age, raised by a chemical engineer and mathematician. She and almost all of her 10 siblings pursued work in the sciences, and it quickly became clear that a higher degree was in her future. Intent on finding a way to mesh computing with medical technology, she worked with Prof. Kensall Wise, a leader in the area of neural probes and cochlear implants.

"We're focusing on price right now because there is a huge humanitarian need for that price cut," Dr. Johnson says. "Cochlear implant companies are aware of this, and are very eager to adopt new technology on price point alone."

MEMStim took first prize in the Michigan Business Challenge in 2011, and since that time, Dr. Johnson has focused her research on packing more and improved features onto a device called a microelectrode array, which connects neurons with electronic circuitry. Of greatest interest to industry, however, was the microfabrication process itself.

The microelectrode arrays currently used in cochlear implants are manufactured partly by hand. The microfabrication process Dr. Johnson uses, on the other hand, is completely automated. She can offer the same array at better than one tenth the cost.

MEMStim's technology is already two phases into pre-clinical testing in preparation for FDA examination, one of only a few MEMS devices to have made it this far.

Full story: eecs.umich.edu/n/memstim

Twilio: "The Most Interesting Tech IPO of the Year"

The billion dollar cloud communications startup Twilio, founded by EECS alums, went public in late June, bringing in $150 million. Quartz called the move "the most interesting tech IPO of the year." Founded in 2007 by Jeff Lawson (BS CS '03), Evan Cooke (MS CSE '04, PhD CSE '07) and John Wolthuis (BS CS '98, BGS '98), the company's software lets developers easily add text, voice and video messaging to their apps.

Since its launch in 2007, Twilio has grown to serve more than 1 million developers across the globe. It now operates in 22 data centers in seven regions, and it claims to reach nearly every phone on the planet. Among their clients are such names as Uber, Airbnb, WhatsApp, Home Depot, and the Red Cross. In 2015, it became one of the rare startups to raise more than $1 billion.

The company's key innovation was to remove the complexity involved in interacting with public voice and text message networks. For a few dollars and a few minutes of effort, developers could now add voice or text functionality into their software, when previously it would require a lot of specialized knowledge.

"A business won't succeed without a great customer experience," says Jeff Lawson, "and we knew that the customer experience was primarily driven by communications."

The founders credit Michigan for setting them up for success, both emphasizing the importance of an education centered around projects and applications. Jeff took on his first small startup business while he was a student here, and John got his first taste of making a useful finished product in Prof. Elliot Soloway's software engineering course.

"The experience of being on a small team that took a product from nebulous idea to polished product was formative," says John Wolthuis. "It shaped my decision to make a career in startups."

Full story: eecs.umich.edu/n/twilio

Bob Muglia: Making a Mark in the World of Big Data

Bob Muglia (BS CCS '81), the CEO of Snowflake Computing, a startup that offers data warehouse systems in the cloud as a service, is changing the way companies handle big data.

Snowflake Computing solves the problems of a conventional data warehouse, which tends to be complex, costly, and inflexible for the increasing demand of data. So instead of using hardware to pull data, the startup allows companies to access everything from the cloud, which allows the end user to scale up or down to meet their needs. The product, which is called The Snowflake Elastic Warehouse, can provide answers to queries in as little as 15 minutes instead of hours or days with a conventional data warehouse.

The company is definitely trying to stand out in the world of cloud-based data warehouses because it was built with the cloud specifically in mind and they strive to give a complete solution for customers.

Recently, the startup acquired $45 million in Series C funding led by the investment firm Altimeter Capital, and before that, the company raised $26 million when it came out of stealth mode.

Before Bob Muglia started at the data warehouse company, he worked at Microsoft for 23 years, with his latest position being the head of the Servers and Tools division. After leaving the company and before joining Snowflake Computing, he worked briefly at Juniper Networks as the EVP of Software and Solutions.

RJ Pittman: Evolving eCommerce on the Web

RJ Pittman (BSE CE '91) is Chief Product Officer at eBay, Inc. where he is the driving force behind the look, feel, and functionality of the eBay Marketplace and is focused on unlocking the full potential of eBay's buyers and sellers. RJ joined eBay in 2013, with one of his goals being to help expand Marketplaces to developing and emerging markets overseas.

Prior to joining eBay, RJ headed up the design, product management, and development of Apple Inc.'s worldwide e-commerce platform, driving online stores in 38 countries. Before that, RJ led product management for Google's consumer search properties, including Google Images, News, Finance, Music Search, Video, Blog, Trends, and Labs. That portfolio of products grew over 200 percent during RJ's tenure, generating over two billion page views per day. RJ was a technology evangelist for Google who represented the company at conferences, panels, press events, and product launches.

A restless entrepreneur from the age of 15, RJ started many companies early in his career. He raised $50 million in venture capital for the companies he has founded or cofounded and completed two IPOs and the sale of two other companies.

While a student at Michigan, RJ worked for CAEN on North Campus for nearly four years. More recently, he has worked with the College of Engineering to bring more innovation and entrepreneurship to Ann Arbor and to help U-M to bridge industry, university research, venture capital and startups to foster a business and innovation ecosystem similar to Silicon Valley.

Jennifer Rexford: A Leader in Data Networking

Jennifer Rexford (MSE PhD CSE '93, '96) is the Gordon Y. S. Wu Professor of Engineering and Chair of the Department of Computer Science at Princeton. Her research has been focused on Internet routing, network measurement, and network management, where she has made numerous contributions, primary of which are her work in developing innovations that improved the efficiency of the Border Gateway Protocol (BGP) in routing Internet traffic, and for laying the groundwork for software-defined networks (SDNs) and for contributions in measuring and engineering IP networks.

Most recently, she was named the 2016-2017 Athena Lecturer by ACM for her contributions to BGP. "BGP is the 'glue' that binds the Internet together and Jennifer's innovations have vastly improved the BGP's effectiveness," said Judith Olson, who headed the ACM-W awards committee. "Her work played an important role as the Internet became a worldwide phenomenon, and she continues to pioneer work to address the growing challenges presented by issues such as scalability and security." BGP supports flexible policies for how traffic flows through the Internet, and most recently, Rexford has designed incrementally-deployable extensions to BGP to greatly improve both the security and the scalability of Internet routing.

In her seminal work, "Design and Implementation of a Routing Control Platform," Rexford proposed a way to separate a network's control software from its data functions. Her framework laid the groundwork for today's software-defined networking. More recently, Rexford's collaborations with programming languages researchers created powerful new abstractions for designing new network control applications. SDN enables new degrees of innovation within the network and has revolutionized networking research and industry.

Prior to joining the Princeton faculty, Rexford was employed at AT&T Labs from 1996 to 2005. For ACM, she served as Chair of the Special Interest Group on Data Communication (SIGCOMM) from 2003 to 2007. Rexford was also a co-founder of two ACM conferences: the *Internet Measurement Conference* started in 2001 and the *Symposium on SDN Research* started in 2012 as HotSDN. She has also received ACM's Grace Murray Hopper Award in 2004, given annually to an outstanding young computing professional, and was selected as an ACM Fellow in 2008.

Michael Rhodin: Transforming IBM's Watson Into Big Business

Michael Rhodin (BS CCS '84) is Senior Vice President, Watson Business Development at IBM. Watson, one of IBM's most significant innovations in the company's 100-year history, is accelerating a new class of software, services, and apps that think, learn, and will fuel a diverse cloud-based ecosystem of enterprises, tech companies, and entrepreneurs.

Mike has evolved Watson, which began as an artificial intelligence and machine learning project, into two thriving business units: Watson and Watson Health. He is now developing the next Watson Industry business units as IBM transforms into a Cognitive Solutions and Cloud Platform company.

Before heading up Watson, Mike led IBM's Software Solutions Group delivering industry-specific solutions in high-growth areas such as Business Analytics, Smarter Commerce, Smarter Cities, and Social Business. In his 30-year career at IBM, Mike held a number of general management positions including the Software business where he led the introduction of IBM's social business platform, which IDC has deemed #1 for four years in a row. Mike joined IBM in 1984 after graduating from Michigan. He currently serves on the CSE Advisory Board.

Richard Wallace: 2015 CoE Merit Award Winner in Electrical and Computer Engineering

Rick Wallace (BSE EE '82), CEO and President of KLA-Tencor Corporation as well as a member of the company's board of directors, returned to campus Homecoming weekend as the 2015 CoE Merit Award Winner in Electrical and Computer Engineering.

Wallace delivered a talk to students, faculty, and visiting alumni that described his career as a controls engineer. After graduating from Michigan, he worked as a controls engineer at Procter & Gamble's Paper plant in Cheboygan, Michigan, followed by the startup company Cypress Semiconductor in Silicon Valley. While at Cypress, he learned about a product from KLA Instruments, a company that specialized in semiconductor equipment, and became passionate about it. "It had optics, it had engineering, it had image processing – all things I was interested in," he said.

He also spent his mornings and evenings getting a master's degree from Santa Clara University – motivated by his desire to understand how semiconductors were really made. Once there he switched his major to engineering management, and upon graduation continued to teach a course in global competitiveness for five years.

He joined KLA in 1988, and by 2005 was president and CEO of KLA-Tencor, the $3B Silicon Valley market leader in process control in the semiconductor industry. KLA-Tencor was acquired by Lam Research in 2015.

Full story: eecs.umich.edu/n/rick

Rick Wallace and Khalil Najafi, Peter and Evelyn Fuss Chair of Electrical and Computer Engineering, showing off their Michigan ties during Homecoming.

Alumni Briefs

Most of these updates are taken from online news stories. Send your updates directly to us at: http://www.eecs.umich.edu/ece/alumni-updates.html

1940's

Dick Daniels (BSE EE '48) was honored with the newly created Dick Daniel Distinguished Citizen Award by the city of Rogers, AK. Recipients are those who contributed to the community over a long period of time. Mr. Daniels helped bring Daisy Manufacturing, and 500 new jobs, to Rogers. Though he meant to establish the business and return to Michigan, he stayed after seeing the dedication of the residents to their community.

[Full story by Becca Martin-Brown published online in Northwest Arkansas Democrat Gazette]

1980's

Image property of General Motors

Andy Farah (BSE CE '82, MS Electrical Science '84) did great things as lead designer of the Chevrolet Volt, the world's all-time best-selling plug-in hybrid vehicle. Now he's chief engineer for the Chevy Bolt, a concept all-electric car that will be capable of traveling 200 miles between charges and sell in the low $30,000 range. This could transform the prospects for widespread adoption of electric cars.

Shrenik Mehta (MSE CICE '84) is the recipient of the fifth annual Accellera Leadership Award. Accellera Systems Initiative (Accellera) is an electronics industry organization focused on the creation and adoption of electronic design automation (EDA) and intellectual property (IP) standards.

1970's

NATIONAL ACADEMY OF ENGINEERING

Mehdi Hatamian (MSE PHD EE '78 '82) has been elected to the National Academy of Engineering, class of 2016, "For contributions to development of integrated circuits for video, communications, and digital signal processing." Dr. Hatamian is Fellow and Chief Scientist – Central Engineering at Broadcom Ltd. Broadcom is a global leader in wired and wireless communication semiconductors.

Dr. Hatamian was part of the team at Broadcom that produced the very first gigabit transceiver to hit the market. He was elected IEEE Fellow for his contribution to the design of high-performance digital signal processors, now standard in networking electronics throughout the world. He is a recipient of the "#1 Patent Holder" award from Broadcom Corporation in 2005 and 2006, and holds 92 issued patents.

Dr. Hatamian received the College of Engineering Alumni Merit Award for Electrical and Computer Engineering in 2008.

Full story: eecs.umich.edu/n/mehdi

Steve Battel in a Michigan lab working on a device prototype that may one day land on Mars.

Steven J. Battel (BSE EE '79) has been elected to the National Academy of Engineering, class of 2016, "For engineering design and implementation of space flight systems." Mr. Battel is an expert on low-noise instrumentation power systems and is internationally recognized for his expertise in the design and development of space high-voltage systems, especially for operation in planetary environments.

His completed hardware development projects include the Gravity Probe-B, the HST-COS instrument, the Mars-Phoenix TEGA-MS sensor, the Mars Science Laboratory SAM Instrument, CRaTER detector electronics, AIM-CIP camera, and electronic systems for the LADEE and MAVEN projects.

Current projects include flight high-voltage and precision instrumentation work on the ExoMars MOMA electronics system, the Mars 2020 PIXL 28 kV high-voltage system, and the PICSPEC a-100 kV high-voltage demonstration prototype system for planetary pickup ion applications.

Full story: eecs.umich.edu/n/battel

Kathryn Ullrich (right) with her mother, Susan Ullrich

Kathryn Ullrich (BSE EE '86) was recognized as a Silicon Valley Business Journal Woman of Influence 2016 for promoting diversity and women in technology. She previously founded a Silicon Valley non-profit for women in technology and is a leader in diversity recruiting. Ullrich is an executive search consultant in the technology practice at Heidrick & Struggles.

Alumni Briefs

1980's cont.

Randy L. Haupt (PhD EE '87) received the 2016 ACES Technical Achievement Award from the Applied Computational Electromagnetics Society for "pioneering application of numerical and signal processing techniques to the analysis and design of antenna arrays." Prof. Haupt is a faculty member at the Colorado School of Mines EECS Department. He has authored books on antennas and genetic algorithms.

Howard Goldberg (MSE PhD EE '89 '93) has been appointed Executive Vice President of Operations for Pressure Profile Systems, Inc., the world-leader in distributed pressure sensing technologies for OEM products and instrumentation. Dr. Goldberg is the former President and COO of Interlink Electronics.

Jian-Ming Jin (PhD EE '89) received the 2016 ACES Computational Electromagnetics Award from the Applied Computational Electromagnetics Society for "pioneering work in the development of finite elements in electromagnetics." Prof. Jin is the Y. T. Lo Endowed Chair Professor of Electrical and Computer Engineering and Director of the Electromagnetics Laboratory and Center for Computational Electromagnetics at the University of Illinois at Urbana-Champaign.

1990's

Thomas J. Treutler (BSE CE '90) was named Chairman of the East Asia and Pacific Subcommittee on Famous and Well-Known Trademarks for the International Trademark Association (INTA) for the 2016-2017 term. He is Managing Director of the patent litigation firm Tilleke & Gibbins, which was named Vietnam Intellectual Property Firm of the Year by *Managing IP* magazine for the third year in a row.

Raja Sengupta (MSE PhD EE:S '91, '95), professor of civil and environmental engineering at UC-Berkeley, co-founded the company Responsible Robotics. The company is a spin-out of the Cal Unmanned Lab at UC-Berkeley. The company provides tools to enable responsible drone operations, and caters specifically to enterprises that operate drone fleets, individual drone operators, and local city, state, and national governments.

Babak Ziaie (MSE PhD EE '91 '94) headlined Science on Tap at Purdue University with a discussion on the untapped potential of everyday materials. Ziaie has done multiple kitchen-top experiments with Magic Tape, and has discovered intriguing properties that can be used to make inexpensive sensors and tiny robots.

Brian Shell (MSE EE '92) published a new book, *From Student to Engineer: A College Course and its Textbook that Gives Students an Overview for those Considering the Mission that Embarks on the Journey of the Engineer*. After graduating with his master's degree, Brian worked at Hughes Aircraft as a satellite antenna engineer for three years. Since that time he has been primarily an author, with more than a dozen published paperback and Kindle eBooks including: *Facebook Diaries*, *Daily Common Cents*, and the sci-fi novella *Attack of the Electronic Dust Bunnies*. Brian was born and raised in Detroit. He says he enjoys performing percussion and piano, art and painting, reading and writing, and listening and learning. You can find Brian at PassionHero.com.

Johnny Mendez (BSE EE '95), an engineer in the drinking water program at the Alaska Department of Environmental Conservation, is influenced by several cultures. Raised in his father's home country of Venezuela, Mendez moved to Canada while his father did postdoc studies and eventually made his way to South Carolina and Michigan for high school and college. Johnny Mendez was first taken by the idea of moving to Alaska while selling posters one summer in Michigan, and found himself in Fairbanks with his wife after graduation.
[Full story by David James published in newsminer.com]

Zhenqiang (Jack) Ma (MSE PhD EE '97 '01, MS Nuclear Science '97), Lynn H. Matthias Professor in Engineering and Vilas Distinguished Achievement Professor in ECE at the University of Wisconsin, reportedly fabricated the world's fastest silicon-based flexible transistor. He collaborated on this research with Prof. Jay Guo and alum Tao Ling (PhD EE 2011), now at TE Connectivity.

Sean Stetson (PhD EE '98) has been appointed director of product development at Seegrid. Seegrid is a developer of 3D vision navigation and automation technology, focused on turning pallet trucks and tow tractors into driverless vision guided vehicles. Sean previously worked at Google, where he served as the director for mobile imaging in the advanced technology and projects division.

Alumni Briefs

2000's

Todd Coleman (BSE EE CE '00), director of the Neural Interaction Lab and co-director of the Neural Interaction Lab at UC-San Diego, has been named one of 100 outstanding African American individuals for 2015 by *The Root.* Dr. Coleman leads a team in designing thin, flexible sensors that are placed directly onto human skin. These sensors have clinical applications from monitoring high-risk pregnancies, to Alzheimer's disease and seizures in premature babies.

Saeed Mohammadi (PhD EE '00) is working on a new, highly efficient power amplifier for electronics that could help make next-generation cell phones, low-cost collision-avoidance radar for cars, and lightweight microsatellites for communications possible. Saeed is an associate professor of electrical and computer engineering at Purdue University.

Douglas Densmore (BSE CE '01), Associate Professor of ECE at Boston University, will lead the Living Computing Project, an effort to create a toolbox of catalogued biological parts that can be used to engineer organisms with predictable results. These parts will allow the entire field to better understand what computing principles can be applied repeatedly and reliably to synthetic biology. The project is funded under a $10 million National Science Foundation (NSF) "Expeditions in Computing" grant.

Chris Deline (BSE MSE PhD EE '03 '05 '08), a research engineer in the National Renewable Energy Laboratory's photovoltaic performance and reliability group, has designed a concept to keep firefighters out of harm's way when they're called to a home with rooftop solar panels. Such panels are normally much more difficult to cut power to in emergency situations. Chris also led research into using a strain of cyanobacteria to produce bioethylene, which received *R&D Magazine's* R&D 100 award as well as an Editor's Choice award in the category of Mechanical Devices/Materials.

Oz Pearlman (BSE EE '03), professional magician, made it to the final round of *America's Got Talent*, performing live for an audience of millions. Following his success on the show, the mentalist and marathon runner appeared on *The Today Show*, *CNBC's Squawk Box*, and the *Meredith Vieira Show*. He was also featured in a *Wall Street Journal* video. Oz now continues his career as showman through corporate events and private parties, often with high-profile guests.

Nam Sung Kim (PhD CSE 04), an Associate Professor at the University of Illinois, Urbana-Champaign, has been named an IEEE Fellow, Class of 2016, for contributions to circuits and architectures for power-efficient microprocessors," which is a high honor for an associate professor. While at the University of Michigan, Kim was advised by Prof. Trevor Mudge.

Tzeno Galchev (BSE CE EE '04, MSE PhD EE '06 '10), Senior Sensor Platform Development Engineer at Analog Devices, is the 13th laureate of the presidential John Atanasoff Award, which he earned for outstanding achievements in the field of information technologies.

Benson Yeh (PhD EE:S '05) of the National Taiwan University competed in the 2014 Wharton-QS Stars: Reimagine Education Awards, earning a 1st Place Overall Award and E-Learning Award. Yeh's group created a multi-student social gaming platform called PaGamO, the first ever MOOC made in Chinese. This platform allows thousands of students to compete on the same map by occupying territory through problem solving.

David D. Harris (BSE EE 2006; also MS, Human Centered Design and Engineering, University of Washington) participated on a panel with the Center for Entrepreneurship called, "The Michigan Meetup for Seattle Startups" August 11, 2016. He is the Startup Advocate for the City of Seattle's Office of Economic Development, and a "Cultural Entrepreneur" who has been a lead organizer for the annual *Hack the Central District Cultural Innovation Conference*. In the past, David worked at Microsoft as a Software Design Engineer in Test and most recently as the STEM Integration Program Manager for TAF (Technology Access Foundation). He received the Best Tech Idea of 2015 from *Seattle Weekly*, the 2015 Making A Difference in Technology Award from the University of Michigan, and was named among the 51 Most Influential in Seattle in 2014.

Adriane Chapman (CSE MS PhD '06 '08) was recognized with the prestigious ACM SIGMOD Test of Time Award for her influential paper on techniques for recording provenance for data that is copied among databases. Now a research scientist at MITRE, Dr. Chapman published the paper while a PhD student at Michigan.

Alumni Briefs

Allan Evans (MSE PhD EE '07 '10) and **Ed Tang** (BSE EE '11), co-founders of Avegant, launched their company's first major product, the Glyph – a personal theater combining lightweight portability, rich audio, and precise video. *USA Today* called it the coolest gadget from the 2016 Consumer Electronics Show. The Glyph uses digital light processing, which uses a tiny array of MEMS micromirrors (one mirror per pixel) to give your eyes visual input in the most natural way possible, according to the company.

2010's

Franklin Dollar (MSE EE '10, PhD Applied Physics '12), Assistant Professor of Physics and Astronomy at UC-Irvine, was named a Sloan Research Fellow and Most Promising Scientist in 2016 by the American Indian Science and Engineering Society. Prof. Dollar directs the Dollar Lab of Ultrafast High Intensity Plasma Physics.

Arzucan Özgür (PhD CSE 2010) has been awarded a 2016 Science Academy Young Scientist Award (BAGEP 2016, Turkey). This award provides support to researchers under 40 in Turkey with the objective of rewarding the most brilliant and promising young academics with a prestigious grant that will help them further their research.

Hsin-Hao Su (PhD CSE 2015) received a Principles of Distributed Computing Dissertation Award for "Algorithms for Fundamental Problems in Computer Networks." Hsin-Hao's thesis provides efficient algorithms for fundamental graph problems that arise in networks, in both sequential and distributed settings.

ECE Alumni Meet at the 2016 Electrical and Computer Engineering Department Heads Association (ECEDHA)

This isn't all the ECE alumni that attended the 2016 ECEHDA meeting, but it's all we could round up at one time.

Front row: ***BILL SANDERS****, Department Head and Donald Biggar Willett Professor of Engineering, Department of Electrical and Computer Engineering, University of Illinois at Urbana-Champaign;* ***SHEILA HEMAMI****, Chair, Department of Electrical and Computer Engineering, Northeastern University;* ***JOHN BOOSKE,*** *Chair, Duane H. and Dorothy M. Bluemke Professor, Vilas Distinguished Achievement Professor, Department of Electrical and Computer Engineering, University of Wisconsin-Madison;* ***STEVEN MCLAUGHLIN****, Steve W. Chaddick School Chair, School of Electrical and Computer Engineering, Georgia Tech.*

Back row: ***KHALIL NAJAFI****, Peter and Evelyn Fuss Chair of Electrical and Computer Engineering and Schlumberger Professor of Engineering, Department of Electrical Engineering and Computer Science, University of Michigan;* ***RADHA POOVENDRAN****, Chair, Department of Electrical Engineering, University of Washington;* ***THOMAS WELLER****, Chair, Department of Electrical Engineering, University of South Florida;* ***JOHN PAPAPOLYMEROU****, Chair, MSU Foundation Professor, Department of Electrical and Computer Engineering, Michigan State University.*

Xploring EECS Engineering

The fourth annual College of Engineering Xplore Engineering camp introduced the families of alumni to the joy of engineering through a variety of hands-on experiences. EECS-led camps covered a variety of physical and computing topics.

Solar Solutions: Harnessing the Sun's Energy

Attendees of Prof. P.C. Ku's sessions got an inside look at how solar cells harness the sun's energy. Families made their own solar concentrators by cutting and folding CDs like origami.

Light, Pinholes, and Lenses! Camera and Computer Imaging

Prof. Jason Corso's workshop showed visitors how cameras combine new and old technology, the basics of light and image formation and distortion, and how to build their own camera out of a coffee cup.

Driverless Cars

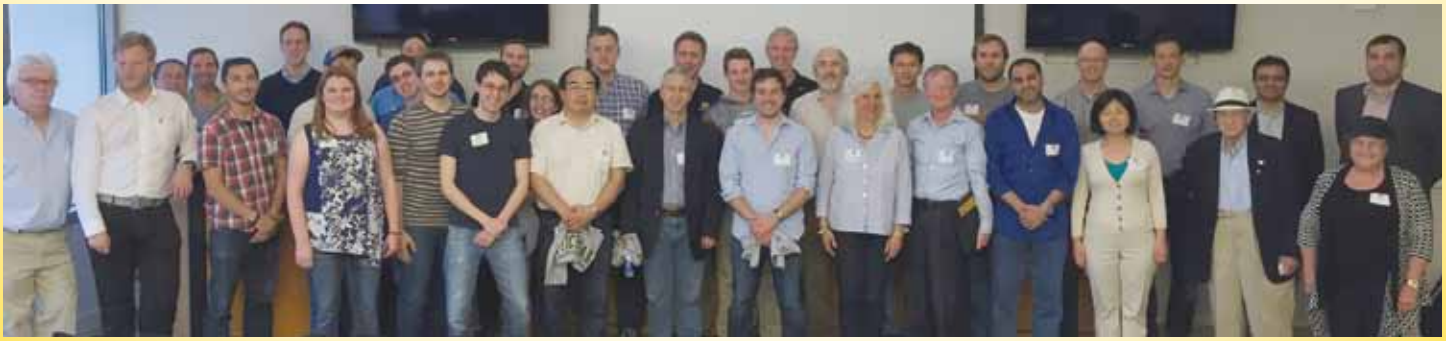
Children built a robot that can find its way through a maze as they learned how high-tech robots use sensors and computer programming to see the world around them.

Filling in the Blanks

How does a computer know what you want to say and make suggestions to finish your sentence? It's called computational linguistics. Children learned how computers recognize patterns and make suggestions.

Around the Country With Our Alumni

This year, events were held at the *International Solid-State Circuits Conference* and the *International Microwave Symposium* in San Francisco, CA, the *American Control Conference* in Boston, MA, and at special U-M alumni events in San Diego and Palo Alto, CA.



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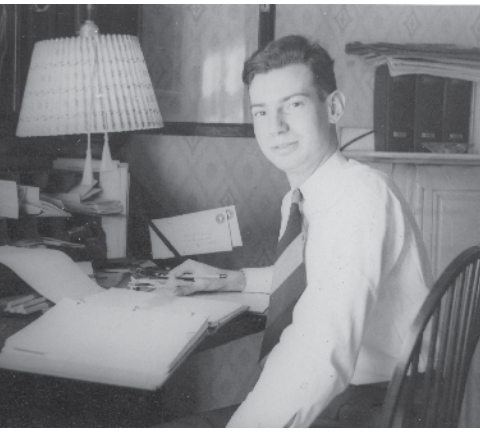
M. Alten Gilleo Distinguished Lecture Series in Optical Sciences and Optoelectronics

To honor the legacy of her late brother Mathias Alten Gilleo (BSE EE ‘44), Anita Gilleo (BS Lit ’44) endowed the M. Alten Gilleo Distinguished Lecture Series in Optical Sciences and Optoelectronics. Anita’s gift will give Michigan students and faculty the opportunity to engage with the world’s top researchers in the field of optics and optoelectronics.

“There were no fewer than six Nobel Prize winners last year who did optics or optoelectronics related work,” says Prof. Ted Norris, Gérard A. Mourou Professor of Electrical Engineering and Computer Science and Director of the Center for Photonic and Multiscale Nanomaterials (C-PHOM). “On behalf of our students and faculty, I offer our sincere thanks to Anita Gilleo for allowing us to bring such inspiring individuals to campus through this lectureship.”



As a student at Michigan, Alten chaired the student chapter of the American Institute of Electrical Engineers/Institute of Radio Engineers (AIEE/IRE).

Alten Gilleo enjoyed a career that took him around the globe and into some of the most advanced optics and solid-state physics research labs of his time. At Bell Telephone Labs, he co-discovered the magnetic properties of yttrium iron garnet, now an important microwave material. At Teledyne in the early 1960’s, he worked on eliminating the wired electric bulb connections by incorporating integrated optics, and demonstrated the value of optical coupling of semiconductor elements in computing. His last position was as Acting Head of Research at Allied Chemical Corporation, where his team developed a number of materials for lasers and other applications.

Anita’s gift is a lasting tribute to a brother she greatly admired. “He was not only gifted intellectually, but hard-working, disciplined, ethical, and self-sufficient,” she says of Alten. “He was a child of the Great Depression who refused to let circumstances hold him back.”

Full story: eecs.umich.edu/n/gilleo

Shirish and Manisha Nadkarni Support Student Teams

Shirish Nadkarni (BSE EE ‘82) and Manisha Nadkarni, of Medina, Washington, have made a gift to support student teams in upper-level project-oriented courses in CSE and to encourage student participation in conferences where they can show prototypes of projects.

Shirish Nadkarni is a serial technology entrepreneur who founded three companies in mobile email, social language learning, and mobile shopping, two of which were acquired by Research in Motion and Rosetta Stone. He serves on the CSE Advisory Board.

Richard P. and Mara F. Wallace Scholarship Fund

Rick (BSE EE ‘82) and Mara (BA ‘88) Wallace, Palo Alto, CA, have established the Richard P. and Mara F. Wallace Scholarship Fund to provide need-based scholarship support to electrical and computer engineering undergraduate students.

Rick Wallace is CEO and president of KLA-Tencor Corporation. He and Mara were on campus last year to celebrate Homecoming and Rick’s appointment as the 2015 CoE Alumni Merit Award recipient for ECE.

Wurman Family Computer Science Fellowship Student Fund

Peter Wurman (MSE ME ‘88, MS CSE ‘96, PhD CSE ‘99) and Nancy Wurman of Acton, Massachusetts, have endowed the Wurman Family Computer Science Fellowship Student Fund, which will benefit CSE graduate students.

Peter Wurman is an independent consultant who most recently served as chief technology officer and technical co-founder of Kiva Systems (now part of Amazon Robotics).

Thanks to our Donors

The Department thanks the donors named below as well as those who gave anonymously since 2015. Your support is essential in keeping the Department strong and ensuring that the best students attend Michigan to receive the education they deserve.

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Karl B. Duerr (‘23; 11/22/1991)
Hamann Lyon (‘23; 04/10/1944)
Almon N. Fenton (‘24; 05/25/1978)
Edward E. Wilde (‘25; 11/10/1987)
Herbert C. Annas (‘26; 01/23/1985)
Harold R. Johnson (‘26; 12/02/1987)
Donald P. Schrier (‘26; 03/12/1987)
Edgar C. Appold (‘27; 02/01/1967)
Arakel K. Merigian (‘27; 01/27/1978)
Lal C. Verman (‘27; 10/21/1979)
Gustave H. Anderson (‘29; 03/03/1965)

CLASS OF 1930-1939

Roy Robinson (‘39; 09/07/2015)
Albert M. Stutz (‘39; 03/01/2014)

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Stuart W. Churchill (‘42; 03/24/2016)
John A. Vandenhoek (‘42; 12/19/2015)
Peter Krailo (‘43; 08/20/2014)
Jack Kuipers (‘43; 04/27/2016)
John M. Norton (‘43; 07/27/2015)
Robert B. Dillaway (‘45; 06/11/2015)
Felix I. Evans (‘46; 11/07/1957)
Daniel J. McKiever (‘47; 12/16/2015)
Wallace K. Klager (‘48; 09/25/2015)
Douglas D. MacLeod (‘48; 10/25/2015)
William W. Oren (‘48; 12/10/2015)
John M. Perry (‘48; 06/26/2015)
Jack D. Zuiderveld (‘48; 05/11/2016)
Robert F. Angle (‘49; 07/12/2014)
Raymond J. Beeley (‘49; 04/24/2015)
Kenneth J. Carr (‘49; 11/15/2015)
Claude E. Rudy (‘49; 02/10/2016)
John I. Smith (‘49; 12/07/2015)
David E. Weyant (‘49; 10/01/2012)

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Frank R. Beyer (‘50; 06/22/2015)
John M. Calimafde (‘50; 08/05/2015)
Michael Chanat (‘50; 12/11/2015)
James H. Chin (‘50; 09/25/2015)
Robert E. Dieter (‘50; 05/07/2016)
Morton T. Eldridge (‘50; 05/25/2016)
Earl G. Forbush (‘50; 07/01/2016)
George E. Karres (‘50; 03/08/2016)
Donald G. MacLean (‘50; 03/26/2016)
William C. Miller (‘50; 07/12/2015)
Daniel C. Probert (‘50; 02/21/2016)
Gail V. Slocum (‘50; 01/22/2016)
Stanley J. Szmytkowski (‘50; 11/20/2015)
Douglas D. Geib (‘51; 10/04/2015)
Donald H. Groelsema (‘51; 09/21/2015)
Robert E. Hollister (‘51; 06/09/2015)
Arlindo Jorge (‘51; 09/14/2011)
James R. Metz (‘51; 12/23/2015)
Lester Rice (‘51; 06/20/2015)
Arthur L. Rousseau (‘51; 01/20/2016)
Duane C. Sherman (‘51; 06/12/2015)
Kenneth R. Waltz (‘51; 10/24/2012)
Gerald E. Wentworth (‘51; 04/20/2008)
Al M. Meisel (‘51)
Edward Hudock (‘52; 04/04/2016)
Quinten E. Ward (‘52; 02/11/2016)
Franklin H. Westervelt (‘52; 07/29/2015)
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Stanley G. Bushhouse (‘54; 06/14/2015)
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Neil R. Stewart (‘54; 03/10/2014)
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Joseph D. Sabo (‘55; 12/28/2015)
William R. Evans (‘56; 12/27/2015)
Robert L. Fallis (‘56; 12/31/2015)
Roy O. Baker (‘57; 07/28/2015)
Donald H. DeVries (‘57; 08/03/2015)
Arvydas J. Kliore (‘57; 12/07/2014)
Edward V. Mathis (‘58; 09/23/2015)
Lambert R. Vanderkooi (‘58; 11/17/2015)
Kuo-Chiew Quan (‘59)

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Leonard M. Brush (‘60; 01/15/2016)
Rhine Jager (‘60; 12/02/2015)
Leroy E. Medendorp (‘60; 03/28/2016)
Gerald A. Potter (‘60; 10/02/2015)
William C. Ellsworth (‘61; 12/22/2011)
Thomas E. Owen (‘61; 04/20/2015)
Robert F. Hand (‘62; 06/27/2016)
Richard W. Fellows (‘64; 05/24/2015)
Paul F. Semmler (‘64; 08/03/2016)
Norman R. Brainard (‘65; 11/05/2015)
David K. Jefferson (‘65; 01/27/2016)
Joseph A. Phillips (‘65; 12/18/2015)
Joseph A. Vanzale (‘65; 10/27/2014)
Kippert R. Wheeler (‘65; 12/30/2015)
Richard S. Saari (‘66; 07/03/2012)
Robert L. Veenstra (‘66; 08/13/2015)
Edmund F. Lapham (‘67; 12/02/2015)
Gerald D. Luzum (‘67; 01/31/2016)
Donald M. Thomas (‘68; 01/08/2010)

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Michael F. Shields (‘71; 01/21/2016)
Michael K. Brown (‘73; 02/07/2016)
Paul G. Robertson (‘74; 06/16/2013)
Melvin E. Sawyer (‘76; 08/05/2015)

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Gregory A. Dorr (‘80; 01/09/2016)
Richard D. Woltil (‘80; 04/24/2016)
James S. Nakama (‘81; 06/06/2015)
Abraham Shenker (‘81; 03/27/2016)
David P. Skrlec (‘82; 06/01/2015)
Kevin P. Wenk (‘83; 09/22/2015)
Donald R. Johnson (‘87; 12/29/2014)
Michael S. Doyle (‘88; 07/22/2012)
James E. Simon (‘89; 05/04/2011)

CLASS OF 1990-1999

John P. Montanbault (‘90; 03/26/2012)
Donna J. Thomason (‘90; 03/13/2016)
Matthew S. Brummer (‘90)
Mark W. Rueh (‘93; 06/26/2013)
Aveek Guha (‘95; 03/27/2016)

CLASS OF 2000-2010

Aashish K. Garg (‘01; 03/09/2011)

John L. Tishman (1926–2016): Builder Who Shaped American Skylines

John Tishman (BSE EE ‘46, D.Eng. hon. ‘00), former CEO of Tishman Realty & Construction Corporation, was a giant in the world of construction. He led the development of innovative building technologies that transformed the skylines of Chicago, Detroit, Los Angeles, and New York.

Tishman was the grandson of company founder Julius Tishman, and joined the corporation in 1947. He oversaw the construction of three of the world’s first 100-story-plus skyscrapers: the John Hancock Center in Chicago, completed in 1970, and the twin towers of the World Trade Center, completed in 1973. As early as 1960, he predicted that reinforced concrete would replace steel-frame construction for residential high-rise projects, a statement that gave him his first bit of fame.

Tishman received the College of Engineering Alumni Society Medal in 1998 and an honorary doctoral degree in 2000 from the University of Michigan. He was honorary co-chair of the College’s Progress & Promise: 150th Anniversary Campaign, and provided funding for Tishman Hall. He also established the John L. Tishman Fellowship and endowed the John L. Tishman Professorship of Engineering. In 2011, he published his memoir, *Building Tall: My Life and the Invention of Construction Management.*

Irma Wyman (1928–2015): Women in Engineering Pioneer and Advocate

Irma Wyman (BSE Eng Math 49) was a pioneer in the field of computers and a strong advocate for equal opportunity for women.

From the moment Irma began her career in engineering, she faced an uphill battle in a field dominated by men. But she persevered. “I felt that if I gave up, I would be rewarding all these people who said I couldn’t do it, I shouldn’t do it,” Irma said.

Irma’s first job was to calculate the trajectory of missiles at Willow Run Research Center. But during a visit to a Navy research facility, she found that they were using a prototype programmable computer to solve similar problems, and was hooked. Wyman joined the National Bureau of Standards, and by the mid ‘50s, she had experience with at least eight early computers, which was exceptionally rare. She then joined a startup company that was later acquired by Honeywell. This began a long career in management, and led to her appointment as the company’s first female vice president.

Throughout her career, Irma dedicated much of her time and money to helping young women succeed. She established the Irma M. Wyman Scholarship at the University of Michigan’s Center for the Education of Women to support women in engineering, computer science, and related fields, and she knew each and every one of her scholarship recipients. In 2001, Irma received the Alumni Society Medal from the College of Engineering, and in 2007, she was awarded with an honorary doctorate.

Full story: eecs.umich.edu/n/irma

Wyman demonstrates one of the earliest programmable computers in the world to members of the U.S. Treasury.

EECS Faculty

This list includes active faculty (tenure-track, research scientists, and lecturers) as of September 2016. The primary departmental affiliation (either CSE or ECE) for each faculty member is listed first, followed by any secondary appointments in other departments (a key for the acronyms is found on page 103).

Abernethy, Jacob
Asst. Professor
CSE

Ackerman, Mark S.
George Herbert Mead Professor of Human-Computer Interaction
CSE, SI

Afshari, Ehsan
Assoc. Professor
ECE

Aktakka, Ethem Erkan
Asst Research Scientist
ECE

Anastasopoulos, Achilleas
Assoc. Professor
ECE

Arthur, William
Lecturer
CSE

Austin, Todd
Professor
CSE, ECE

Avestruz, Al-Thaddeus
Asst. Professor
ECE

Balzano, Laura
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ECE

Baveja, Satinder Singh
Professor
CSE

Berenson, Dmitry
Asst. Professor
ECE

Bertacco, Valeria
Professor
CSE

Bhattacharya, Pallab K.
Charles M. Vest Dist. Univer. Professor; James R. Mellor Professor of Engineering
ECE, AP

Blaauw, David T.
Professor
ECE

Brehob, Mark
Collegiate Lecturer
CSE, ECE

Cafarella, Michael J.
Assoc. Professor
CSE

Chen, Peter M.
Arthur F. Thurnau Professor
CSE

Chen, Yu-Chih
Asst. Research Scientist
ECE

Chesney, David
Lecturer
CSE

Cho, Jae Yoong
Asst. Research Scientist
ECE

Chowdhury, Mosharaf
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CSE

Compton, Kevin J.
Assoc. Professor
CSE

Corso, Jason
Assoc. Professor
ECE, CSE

Darden, Marcus
Lecturer
CSE

Das, Reetuparna
Asst. Professor
CSE

Deng, Jia
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CSE

DeOrio, Andrew
Lecturer
CSE

Deotare, Parag B.
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ECE

Dick, Robert
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ECE

Dorf, Mary Lou
Lecturer
CSE

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CSE

Durfee, Edmund H.
Professor
CSE, SI

Dutta, Prabal
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CSE

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ECE, CLASP, AP

Fessler, Jeffrey A.
William L. Root Professor of EECS
ECE, BME, RAD, AP

Finelli, Cynthia
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CSE

Flynn, Michael P.
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Assoc. Chair for Graduate Affairs
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ECE, MSE, PHY, AP

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Professor
ECE

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Assoc. Professor
CSE

Galvanauskas, Almantas
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ECE

García, Héctor
Lecturer
CSE

Gianchandani, Yogesh
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Gilchrist, Brian E.
Professor
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Grbic, Anthony
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ECE, AP

Green, Scott
Asst. Research Scientist
ECE

Grizzle, Jessy W.
Elmer G. Gilbert Dist. Univ. Prof.; Jerry W. and Carol L. Levin Prof. of Eng.
ECE, ME

Guo, Lingjie
Professor
ECE, Macro, ME, AP

Halderman, J. Alex
Professor
CSE

Hayes, John P.
Claude E. Shannon Professor of Engineering Science
CSE, ECE

He, Guohong
Asst. Research Scientist
ECE

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ECE, BME, CSE, STATS

Hiskens, Ian A.
Vennema Professor of Engineering
ECE

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ECE

Honeyman, Peter
Research Professor and Lecturer
CSE

Islam, Mohammed N.
Professor
ECE, BME, IntMed

Jagadish, H.V.
Bernard A. Galler Professor of EECS
CSE

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CSE

Jenkins, Odest Chadwicke
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CSE

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Lecturer
CSE

Kamil, Amir
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CSE

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Kieras, David E.
Professor
CSE, PSYCH

Kim, Hun-Seok
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ECE

Kira, Mackillo
Professor
ECE

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Asst. Professor
CSE

Ku, Pei-Cheng
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ECE, AP, Macro

Kuipers, Benjamin
Professor
CSE

Kushner, Mark J.
George I. Haddad
Professor of EECS
ECE, AP, ChemE, NERS

Lafortune, Stéphane
Professor
ECE, CSE

Lahiji, Gholamhassan R.
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ECE

Laird, John E.
John L. Tishman Professor
of Engineering
CSE

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Lee, Honglak
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CSE

Lee, In Hee
Asst. Research Scientist
ECE

Lee, Somin Eunice
Asst. Professor
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Li, Tao
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ECE

Liepa, Valdis
Research Scientist
ECE

Liu, Mingyan
Professor
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Lu, Wei
Professor
ECE, AP

Lukefahr, Andrew
Lecturer
CSE

Madhyastha, Harsha
Asst. Professor
CSE

Mahlke, Scott
Professor
Assoc. Chair
CSE

Maksimchuk, Anatoly
Research Scientist
ECE

Mao, Z. Morley
Professor
CSE

Markov, Igor
Professor
CSE

Mars, Jason
Asst. Professor
CSE

Mathieu, Johanna
Asst. Professor
ECE

Mazumder, Pinaki
Professor
CSE, AP, ECE

Meerkov, Semyon M.
Professor
ECE

Mi, Zetian
Professor
ECE

Michielssen, Eric
Louise Ganiard Johnson
Professor;
Assoc. VP for Adv.
Research Computing
ECE

Mihalcea, Rada
Professor
CSE

Morgan, Andrew
Lecturer
CSE

Mortazawi, Amir
Professor
ECE

Mower Provost, Emily
Asst. Professor
CSE

Mozafari, Barzan
Asst. Professor
CSE

Mudge, Trevor
Bredt Family Professor
of Engineering
CSE, ECE

Munson, Jr., David C.
Professor
ECE, AP

Nadakuditi, Rajesh Rao
Assoc. Professor
ECE, AP

Najafi, Khalil
Peter and Evelyn Fuss Chair
of ECE; Schlumberger Prof.
of Engineering;
Arthur F. Thurnau Professor
ECE, BME

EECS Faculty

Narayanasamy, Satish
Assoc. Professor
CSE

Nashashibi, Adib Y.
Assoc. Research Scientist
ECE

Nees, John
Assoc. Research Scientist
ECE

Neuhoff, David L.
Joseph E. and Anne P. Rowe Professor; Sr. Assoc. Chair
ECE

Noble, Brian
Professor and Assoc. Dean for Undergraduate Education
CSE

Norris, Theodore B.
Gérard A. Mourou Professor of EECS
ECE, AP

Olson, Edwin
Assoc. Professor
CSE

Ozay, Necmiye
Asst. Professor
ECE

Paoletti, David R.
Lecturer
CSE

Papaefthymiou, Marios
Professor and Chair, CSE
CSE

Peikert, Christopher
Assoc. Professor
CSE

Peterson, Rebecca L.
Asst. Professor
ECE

Pettie, Seth
Assoc. Professor
CSE

Phillips, Jamie
Professor
Assoc. Chair for Undergraduate Affairs
ECE, AP

Pierce, Leland E.
Assoc. Research Scientist
ECE

Pollack, Martha
Professor and University Provost
CSE, SI

Pradhan, Sandeep
Professor
ECE

Prakash, Atul
Professor
CSE

Qin, Yutao
Asst. Research Scientist
ECE

Radev, Dragomir
Professor
CSE, SI

Rais-Zadeh, Mina
Assoc. Professor
ECE, ME

Rand, Stephen C.
Professor
ECE, PHY, AP

Revzen, Shai
Asst. Professor
ECE, EEB

Ringenberg, Jeffrey S.
Lecturer
CSE

Sakallah, Karem A.
Professor
CSE, ECE

Sarabandi, Kamal
Rufus S. Teesdale Professor of Engineering
ECE

Schoenebeck, Grant
Asst. Professor
CSE

Scott, Clayton
Asst. Professor
ECE, STATS

Seymour, John
Asst. Research Scientist
ECE

Shi, Yaoyun
Assoc. Professor
CSE

Shin, Kang G.
Kevin and Nancy O'Connor Professor of Computer Science
CSE, ECE

Sinha, Arunesh
Asst. Research Scientist
CSE

Soloway, Elliot
Arthur F. Thurnau Professor
CSE, SI, SOE

Stark, Wayne E.
Professor
ECE

Steel, Duncan G.
Robert J. Hiller Professor of Engineering
ECE, BioPHY, PHY, IOG, AP

Stout, Quentin F.
Professor
CSE, CLASP

EECS Faculty

Subramanian, Vijay
Assoc. Professor
ECE

Sylvester, Dennis
Professor
ECE

Tang, Lingjia
Asst. Professor
CSE

Teneketzis, Demosthenis
Professor
ECE, CSE

Terry, Fred L.
Professor
ECE, AP

Tsang, Leung
Professor
ECE

Ulaby, Fawwaz T.
Emmet Leith Dist. Univ. Professor;
Arthur F. Thurnau Professor
ECE

Volkovich, Ilya
Lecturer
CSE

Wakefield, Gregory H.
Assoc. Professor
ECE, CSE, SMTD, OTO

Wellman, Michael P.
Lynn A. Conway Professor
of CSE; Assoc. Dean
for Academic Affairs
CSE

Wenisch, Thomas F.
Assoc. Professor
CSE

Wentzloff, David D.
Assoc. Professor
ECE

Whitaker, John F.
Research Scientist
ECE

Wiens, Jenna
Asst. Professor
CSE

Winful, Herbert G.
Arthur F. Thurnau Professor
ECE

Winick, Kim A.
Professor
ECE

Yagle, Andrew E.
Professor
ECE

Yanovsky, Victor P.
Research Scientist
ECE

Yoon, Euisik
Professor
ECE, BME

Zhang, Zhengya
Assoc. Professor
ECE

Zhong, Zhaohui
Assoc. Professor
ECE

Affiliated Faculty

Abney, Steve, Assoc. Professor, *LING, SI, CSE*
Adar, Eytan, Assoc. Professor, *SI, CSE*
Atkins, Ella, Assoc. Professor, *CLASP, CSE, ECE*
Cain, Charles A., Richard A. Auhll Professor, *BME, ECE*
Chestek, Cynthia, Asst. Professor, *BME, ECE*
Collins-Thompson, Kevyn, Assoc. Professor, *SI, CSE*
Cundiff, Steven, Harrison M. Randall Collegiate Professor of Physics, *PHY, ECE*
Dillahunt, Tawanna, Asst. Professor, *SI, CSE*
Eustice, Ryan, Assoc. Professor, *NAME, CSE*
Gilbert, Anna, Professor, *MATH, ECE*
Goldman, Rachel S., Professor, *MSE, ECE*
Guan, Yuanfang, Asst. Professor, *CMB, CSE*
Johnson-Roberson, Matthew, Asst. Professor, *NAME, CSE*
Krushelnick, Karl, Professor, *NERS, ECE*
Kurabayashi, Katsuo, Professor, *ME, ECE*
Lynch, Jerome P., Assoc. Professor, *CEE, ECE*
McClamroch, N. Harris, Professor, *CLASP, ECE*
Mei, Qiaozhu, Assoc. Professor, *SI, CSE*
Merlin, Roberto D., Peter A. Franken Professor of Physics, *PHY, ECE*
Michailidis, George, Professor, *STATS, ECE*
Nagy, Andre, Professor, *CLASP, ECE*
Najarian, Kayvan, Assoc. Professor, *CMB, CSE*
Newman, Mark W., Assoc. Professor, *SI, CSE*
Nguyen, Long, Assoc. Professor, *STATS, CSE*
Pipe, Kevin P., Asst. Professor, *ME, ECE*
Romero, Daniel, Asst. Professor, *SI, CSE*
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AP – Applied Physics
BioPHY – BioPhysics
BME – Biomedical Engineering
CEE – Civil and Environmental Engineering
ChemE – Chemical Engineering
CLASP – Climate and Space Sciences and Engineering
CSE – Computer Science and Engineering
CMB – Computational Medicine and Bioinformatics
ECE – Electrical and Computer Engineering
EEB – Ecology and Evolutionary Biology
IntMed – Internal Medicine
IOE – Industrial and Operations Engineering
IOG – Institute of Gerontology
LING – Linguistics
Macro – Macromolecular Science and Engineering
MATH – Mathematics
ME – Mechanical Engineering
MSE – Materials Science and Engineering
NAME – Naval Architecture and Marine Engineering
NERS – Nuclear Engineering and Radiological Sciences
OTO – Otolaryngology
PHIL – Philosophy
PHY – Physics
PSYCH – Psychology
RAD – Radiology
SI – School of Information
SMTD – School of Music, Theatre & Dance
SOE – School of Education
STATS – Statistics
UMTRI – University of Michigan Transportation Research Institute

EECS ELECTRICAL ENGINEERING AND COMPUTER SCIENCE
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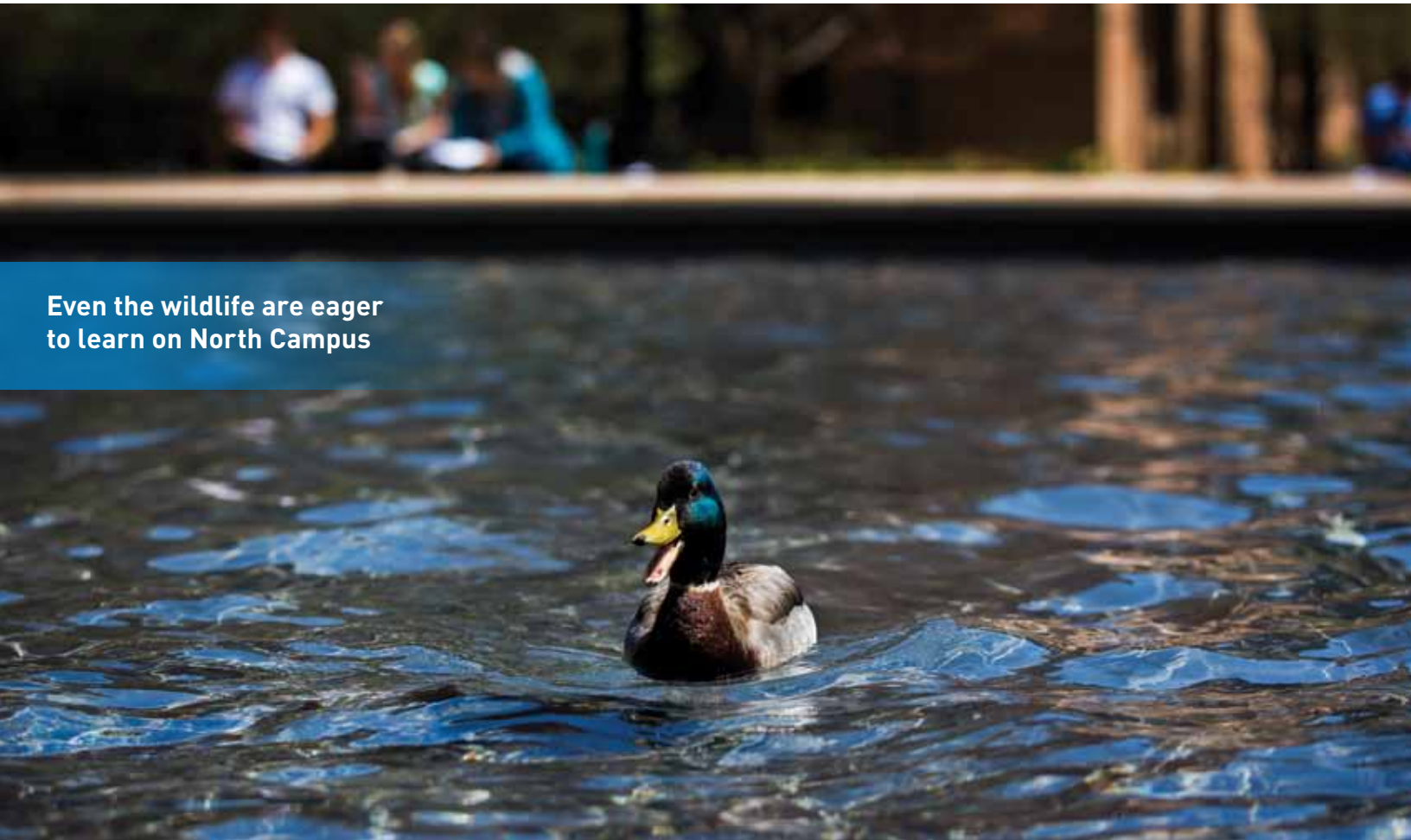

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