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CONNECTIONS

DEPARTMENT of ELECTRICAL & COMPUTER ENGINEERING

A. JAMES CLARK SCHOOL *of* ENGINEERING

Discovering electrical & computer engineering: ONE MODULE AT A TIME

FALL 2015 | Vol. 21 No. 1

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UNIVERSITY OF MARYLAND / FEARLESS IDEAS

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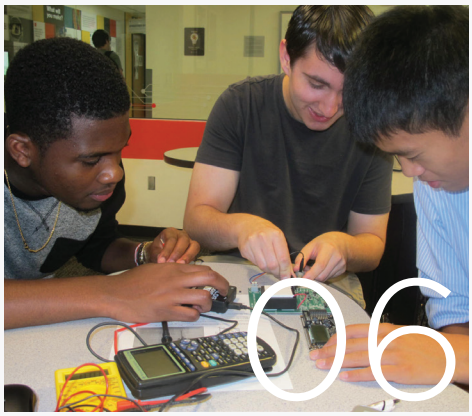

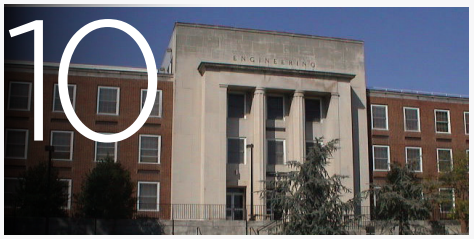

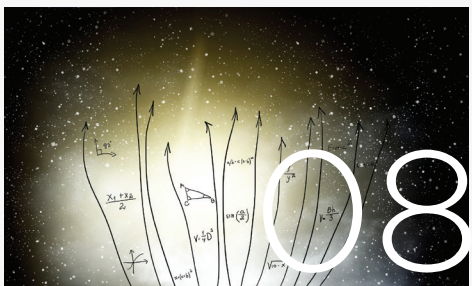

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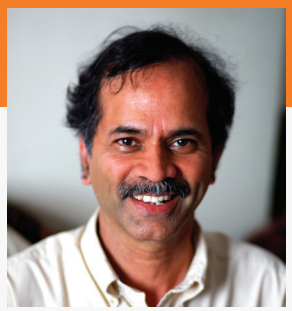


RAMA CHELLAPPA

As the Chair of Electrical and Computer Engineering at the University of Maryland, I am inspired by our students, faculty, staff and alumni to raise the department to new heights. While traditional electrical and computer engineering will always be at the core of our mission, our faculty members, alumni, and students look upon the field with a new perspective, thus driving innovation in our classrooms and research. Beginning fall 2015, we are offering our freshmen, "*What's Cool About ECE?*" a hands-on, gadget-based laboratory course partially sponsored by Texas Instruments (TI). This course is team taught by six faculty members spanning areas such as feedback control, energy harvesting, data hiding, embedded systems, neuro-signal processing, and more. We believe this course will excite young minds to be bold and innovative throughout their careers while introducing them to concepts in a tactile way. We are grateful to TI for financial support, Prof. Mel Gomez and many colleagues for designing the course structure, and Mr. Bryan Quinn and his team for creating a cool, contemporary lab.

To help our students be even more well-rounded, we have also introduced a new minor in computer engineering for electrical engineering (EE) students. The additional instructions in computer engineering will help EE students to appreciate as well as code Maxwell's equations! This newfound expertise will enable our future engineers to lead efforts on software routers, Internet of Things and embedded systems.

The Department is investing in our undergraduate students because we know that they are vital to our success. We welcome them each year at a "back to school" event with their families in October and send off our graduating seniors at an event in May. With the addition of several new faculty members over the last three years, we are able to add new sections to core undergraduate classes, thereby reducing the class size. We have also invested significant funds for upgrading most of our undergraduate laboratories. Beginning in fall 2016, we will offer B.S. in EE programs in southern Maryland by accommodating transfer students from that region.

Several faculty members were recognized by prestigious awards given by professional societies and the university. Prof. **Mohammad Hafezi** received the prestigious Sloan Fellowship; Prof. **Jeremy Munday** received the Alfred Lomb Medal from the Optical Society of America and and IEEE Young Investigators Award; Prof. **Dana Dachman-Soled** won the ORAU award for junior faculty and NSF's Career award; Prof. **K.J. Ray Liu** won the 2016 Kirchmayer Graduate Teaching Award. Prof. **Carol Espy-Wilson** was named to the NIH Advisory Council. Prof. **Min Wu** was recognized by the Innovation Award by the University's Office of Technology Commercialization. Prof. **Chris Davis** and **Edo Waks** received senior and junior faculty research awards from the Clark School of Engineering. The ECE faculty has the breadth and depth of experience and knowledge to offer top-tier academic instruction to their students.

To continue improving the department, I need your help. It is my sincerest hope that you will take this opportunity to support ECE in a way that is meaningful to you—whether that means supporting current research, lab improvements, education, or extracurricular activities. Our alumni are instrumental in helping us improve our program through their time, expertise, and financial support whether personal or through industry sponsorship.

I look forward to leading our continued advance. To discuss any of the priorities outlined or the plan for your personal giving, please contact our Director of External Relations, Amanda Stein, at steina@umd.edu. Thank you for supporting our department.

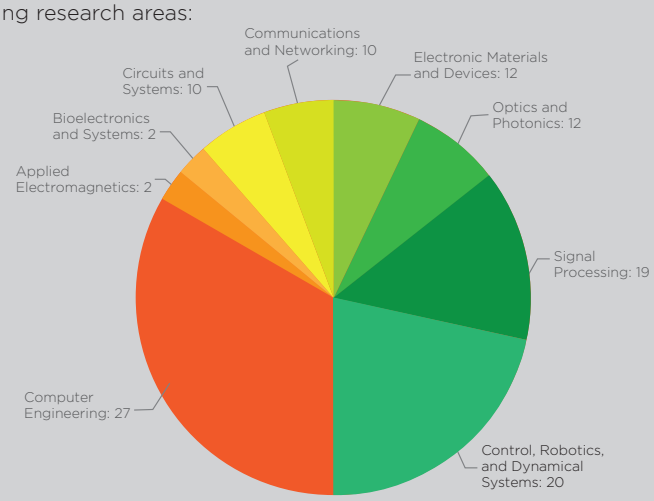
Rama Chellappa

MINTA MARTIN PROFESSOR OF ENGINEERING

GRADUATE STUDENTS' SNAPSHOT

Approximately 114 new graduate students joined the Department of Electrical and Computer Engineering this fall. Students attending our programs are from the USA, South Korea, India, China, Taiwan, Greece, Iran, Bangladesh, Saudi Arabia, Sri Lanka and Turkey. Our American students join us from Alabama, California, DC, Delaware, Illinois, Maryland, North Carolina, Ohio, Pennsylvania, and Washington.

Our 51 Masters students and 63 Ph.D. students have chosen to specialize in the following research areas:

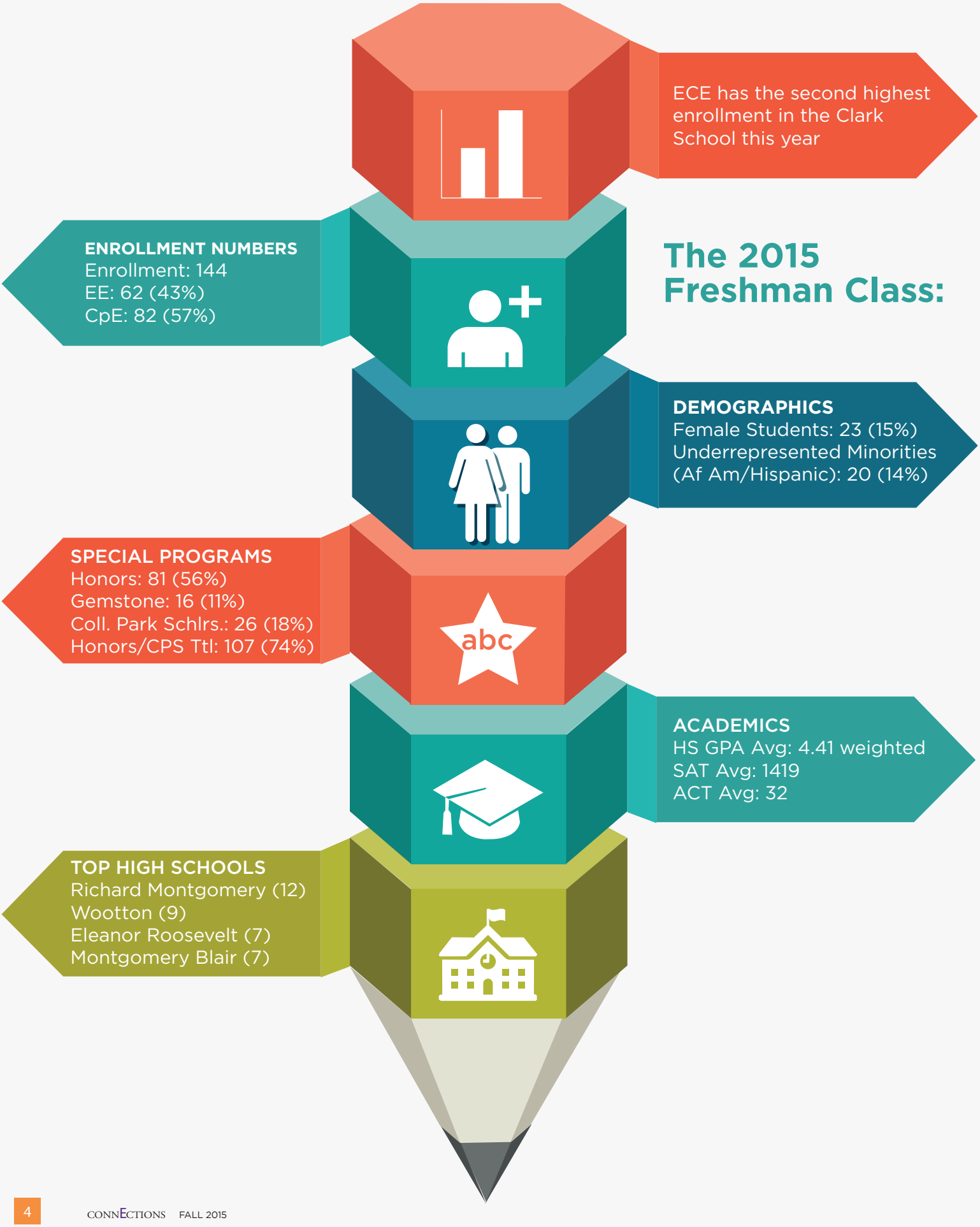


UNDERGRADUATE ENGINEERING PROGRAMS EARN TOP RANK IN U.S. NEWS & WORLD REPORT

The A. James Clark School of Engineering has maintained its rank as a top 25 undergraduate engineering program in the country in the 2016 U.S. News & World Report Best College Rankings. The Clark School ranked No. 23 among all undergraduate programs and No. 12 among public universities.

Overall, the University of Maryland has been ranked No. 19 among national public universities in the 2016 U.S. News & World Report Best Colleges rankings. This is the 13th year that the university has been ranked in the top 20. UMD also ranked No. 21 overall for Most Innovative Schools, a new ranking which highlights universities that are making the most innovative improvements in terms of curriculum, faculty, students, campus life, technology, or facilities. ■

thE 2015-2016 academic year



Now Offering *Computer Engineering Minor* for all Engineers

Knowledge of computing technology is essential in today's world. Faculty members in the Department of Electrical and Computer Engineering (ECE) recognized a void in knowledge of hardware and software that crossed the Clark School's engineering curriculum.

"Computing is everywhere, and it permeates many fields of engineering. A number of engineering students want to become literate in core computing fields, even if they major in another field," says Uzi Vishkin, professor of electrical and computer engineering and computer science.

The U.S. Department of Labor predicts that job growth in computing-related positions and particularly software-related jobs outpace nearly any other category (Bureau of Labor Statistics, 2014). The Bureau of Labor Statistics predicts that 222 thousand new jobs will be available for applications and system software developers during the decade ending in 2022. Accounting for the rate of retirement in this established field, an additional 330 thousand positions will be open in that time period.

The Undergraduate Minor in Computer Engineering will introduce students to core hardware concepts—such as computer architecture, digital logic design, and digital circuit design—as well as core software concepts—such as algorithms, discrete mathematics, and programming. Students will also learn how hardware and software interact at the interface, for example in embedded systems, and have access to an array of elective courses, including hardware design tools, system programming, microprocessors, computer architecture, computer security, cryptology and parallel algorithms.

"Whether you are in engineering, physics, mathematics, or another field of study affected by computing, you are likely to benefit from gaining a deeper understanding of computer hardware and/or software," says Donald Yeung, associate professor of electrical engineering and director of computer engineering education. "By offering a compact minor, we hope to make computer engineering accessible to students across campus enabling them to apply this knowledge in their primary fields of study."

The minor program will be offered to all Clark School students beginning in the fall 2015 semester. This course of study is open to any engineering major who has completed the necessary pre-requisites; it requires 18 credits of coursework. ■

Discovering Electrical and Computer Engineering: One Module at a Time

Students walk into a sleek, expertly-appointed lab on the first floor of the A.V. Williams Building. They take in high-topped, black lab stations designed for two or three to collaborate, large screens for watching video of lectures, experiments or engineering presentations, and inspirational and encouraging artwork.

These students are first year electrical or computer engineering students. They are the first to experience ENEE 101 or "Introduction to Electrical and Computer Engineering." As engineering students in the A. James Clark School, they have been selected into one of the most rigorous, highly-regarded engineering programs in the Mid-Atlantic region. Each individual chose to enroll in the Department of Electrical and Computer Engineering's (ECE) programs at the University of Maryland for different reasons; but they are all about to have multiple facets of their chosen field and the electrical and computer engineering industry unveiled to them in a compelling and innovative way.

The Inception of Teaching Innovation

ECE, under the direction of **Rama Chellappa**, electrical and computer engineering department chair, has a deep and significant commitment to providing an excellent undergraduate education. In the past year, Dr. Chellappa, Dr. **Romel Gomez**, associate chair for undergraduate studies, and a team of faculty members, have been crafting a new course to introduce incoming students to the areas of electrical and computer engineering in which our faculty specialize through hands-on modules featuring real world applications of engineering theory and principles. "ENEE 101 will allow students to understand, early in their academic careers, the relevance of the technical subjects to their profession. They will understand the context in which their upper division technical courses will be used and thereby acquire a more cohesive learning experience," says Dr. Gomez.

After a meeting last summer with alumnus **Ray Upton**, vice president and general manager of microcontrollers at Texas Instruments (TI), many months of planning came to fruition due to the generous support of TI in creating a new, unconventional lab space. The goal is to anchor the students in the ECE program while better preparing them for careers right after school.

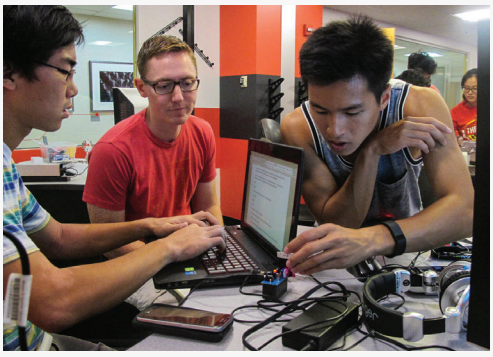
"TI is committed to cultivating young minds and preparing students for their career in engineering," he said. "Our hope is that this new hands-on lab will enable students to grasp complex concepts to help them be industry-ready, all while having fun learning."

Fast-Paced Fun

The course is divided into eight diverse, but highly structured modules. All but the ethics module are gadget-based in which the students build, use, or analyze. The modules have been carefully chosen and arranged to introduce the foundational concepts in the ECE curriculum. Students will find themselves immersed in analog and digital circuits, electromagnetics, power, controls, communications, signal processing and computers through fun-sized, gratifying tasks.

Each week students attend a 75 minute lecture and perform four hours of hands-on laboratory work related to that module. Each module is allotted one to three weeks of instruction. Students will partner to complete the lab exercises as they are guided by the instructor, teaching assistants and supported by technical staff. Like any course, they are assessed on completed projects, lab reports, quizzes, and ethic paper and final report.

"Having the opportunity to introduce students to practical applications of engineering and technology early on is an awesome idea. As an undergraduate teaching assistant I help the students see devices and technology in action and that inspires my students to ask questions about the theory that drives the experiments. It's a class I really wish I would have had a chance to take during my freshman year, and I think that the students will be even more excited to continue



The recent topics (brain waves, image processing) have been rather intriguing and engaging. I appreciate the thought and efforts put into these labs, and think that the way they force me to adapt and learn can be helpful. --Shih-Hsuan Huang

learning after taking the course," says **Brent Schlotfeldt**, a fourth year electrical engineering student and president of Eta Kappa Nu honors society.

For this first semester, the modules will be presented in this order:

- **Optical Communication** experiments are designed to introduce analog circuits, measurement techniques for direct current and time-varying electrical quantities, Fourier transforms, spectral decomposition, filtering and optical amplitude modulation (AM) communication. During this module, students assemble optical receiver and transmitter circuits, perform electrical measurements, learn rudimentary circuit analysis and verify predictions of computations. In the laboratory they will digitally compute the Fourier spectra of audio signals using MATLAB®, and verify their results using an audio frequency spectrum analyzer. Frequency decomposition will be extended to optical frequencies through the assembly and use of a spectrometer, which students will use to spatially separate the individual frequency components of various light sources. Students will also learn rudimentary concepts of wavelength division multiplexing by placing different audio data on different optical wavelengths in optical fibers and extracting the different data signals using spectrometers or optical filters.
- **Energy Harvesting** aims to reinforce concepts in circuit analysis, with emphasis on power generation, transmission, storage and delivery of low power devices. Students study harvesting systems such as solar, wind, thermoelectric and piezoelectric energy conversion. "I am glad to be exposing students to the fundamentals of energy harvesting from renewable energy resources during ENEE 101. These incoming electrical and computer engineering students will gain hands-on experience through the activities accompanying lecture in the TI Discovery Lab," says Professor **Alireza Khaligh**. Students will reinforce their knowledge of circuits, instrumentation and data acquisition, and modeling within the context of current-voltage (I-V) and power-voltage (P-V) characteristics of PV systems. They will learn concepts such as fill-factor, and impacts of irradiation and temperature on the I-V curves of PV systems. They will also become familiar with the basic concepts of wind, thermoelectric and piezoelectric energy conversion systems.
- **Control Systems and the 65°C Egg** teaches the fundamental linear control system while reinforcing concepts in analog and digital circuits, power management and control. Students are provided with a system capable of heating a small cup containing water and an egg to temperatures well above 65 degrees. By designing a feedback controller they will reach their desired goal of steady-state behavior. If they wish, they will have the gastronomical pleasure of eating a 'perfectly' cooked 65°C egg.
- **Brainwaves and Cognition** focuses on the fundamentals of signal processing and computation. The students will analyze electroencephalogram data from 16 channels in various locations of the brain to learn basic signal processing concepts. Using raw data from inexpensive headsets students perform Fourier transforms, signal conditioning, and more. Using available software, they will convert the data into frequency space and develop algorithms to identify specific mental or physical activity into characteristic brain wave patterns, and then they will be challenged to develop a system of communication relying solely on brain wave patterns.
- **Image Processing** will reinforce signal processing concepts as students use 2D image processing techniques. In this module, students will learn methods of image representation, preprocessing, enhancement reconstruction and data compression. Students will perform matrix operations to implement various algorithms and various types of image filters.
- **Model-Based Design of Signal Processing Software (MDSPS)** teaches concepts in engineering software design. In digital communications and signal analysis, deep waveform measurement refers to analysis of characteristics, such as timing properties, associated with signals that have relatively long durations. Students will learn rudimentary concepts of deep waveform analysis and of design methodologies and software tools that are important in the construction of practical signal processing software systems. Students will learn methodologies and tools including the use of UNIX commands for engineering software development; the development of automated test suites for efficiently validating software; and the application of model-based design to systematically integrate processes of design, implementation, and testing.

I think that the course is a good introduction to the field of electrical engineering in general, and I have enjoyed exploring all these different aspects of the field that I did not know about before. This course will help, as I move deeper into the field, to know where to specialize. I have learned so much about the breadth of the industry. --Alex Jiao

- **The Android programming and Microcontroller** module introduces concepts related to the Internet of Things (IoT). Student will program an Android OS device, such as a tablet and using Bluetooth will remotely actuate a robot cart.
- **Ethics** introduces students to the principles of engineering ethics. Students will participate in a case study of current engineering events like the Volkswagen crisis and discuss ramifications.

Anticipated Outcomes

"The ENEE 101 Texas Instruments Discovery Lab was a collaborative effort to create learning and teaching space that moves away from how engineering has traditionally been taught, said Chellappa.

"We wanted to provide our freshmen a lab that does not look like what their parents saw in their college years," he said. "We also wanted to move away from traditional workbench labs where the students face the walls; therefore, thanks to TI, we are providing a more collaborative space to encourage team building and exchange of ideas." ■

UMD Discovery Could Enable Portable Particle Accelerators

By Matthew Wright

Conventional particle accelerators are typically big machines that occupy a lot of space. Even at more modest energies, such as that used for cancer therapy and medical imaging, accelerators need large rooms to accommodate the required hardware, power supplies and radiation shielding.

A new discovery by physicists at the University of Maryland could hold the key to the construction of inexpensive, broadly useful, and portable particle accelerators in the very near future. The team has accelerated electron beams to nearly the speed of light using record-low laser energies, thus relieving a major engineering bottleneck in the development of compact particle accelerators. "We have accelerated high-charge electron beams to more than 10 million electron volts using only millijoules of laser pulse energy. This is the energy consumed by a typical household lightbulb in one-thousandth of a second." said **Howard Milchberg**, a professor of Electrical and Computer Engineering in the A. James Clark School of Engineering as well as the UMD Department of Physics, and senior author of the study. "Because the laser energy requirement is so low, our result opens the way for laser-driven particle accelerators that can be moved around on a cart."

"As an unexpected bonus, the accelerator generates an intense flash of optical light so short that we believe it represents only one-half of a wavelength cycle," Milchberg added. These ultrashort light flashes could lead to the development of optical strobe lights that can capture the motion of electrons as they swarm across their atomic orbits—a potentially important development for materials science and nanotechnology.

The UMD team began with a technique known as laser-driven plasma wakefield acceleration and pushed it to the extreme. Generally speaking, the approach works by shooting a laser pulse into plasma, which is a gas (in this case, hydrogen) that has been fully ionized to remove all the electrons from the gas atoms. An intense laser pulse can create a plasma wake that follows the laser, much like the water wake that trails a speedboat. A bunch of electrons following the initial laser pulse can "surf" the waves of this wake, accelerating to nearly the speed of light in millionths of a meter.

"Unless your laser pulse can induce the plasma wake in the first place—and it takes a very intense pulse to do that—you're out of luck," Milchberg explained. Prior efforts needed much bigger laser energies to accomplish this effect. So Milchberg and his team tried a different approach, instead forcing the plasma itself to transform a weak laser pulse into a very intense one.

When a laser pulse passes through plasma, the laser causes the electrons to wiggle back and forth in the laser field. The electrons in the center experience the most intense part of the beam, so they wiggle the fastest. As they do they become more massive, as dictated by Einstein's law of relativity, which says that faster objects must increase in mass. The result is that the center of the beam—where the electrons become heaviest—slows down compared to the outer parts of the beam. This causes the beam to self-focus, gaining intensity as it collapses, finally generating a strong plasma wake. This effect is known as relativistic self-focusing, and becomes more pronounced as the plasma density increases.

The UMD team took advantage of this self-focusing effect, drastically increasing the density of the plasma to as much as 20 times that used in typical experiments. In the process, they dramatically reduced the laser pulse energy needed to initiate relativistic self-focusing and thereby generate a strong plasma wake.

"If you increase the plasma density enough, even a pipsqueak of a laser pulse can generate strong relativistic effects," Milchberg added.

"From a practical standpoint, the key difference here is the footprint of the accelerator. What once required a room full of equipment and a very powerful laser could eventually be done with a small machine on a movable cart, with a standard wall-socket plug," said **Andrew Goers**, a graduate student in Physics at UMD and the study's lead author. "We started with a very powerful laser and found that we were able to keep dialing the energy back. Eventually we got down to about 1 percent of the laser's peak energy, but we were still seeing an effect. We were blown away by this."

The UMD laser-driven accelerator produces a beam of electrons and radiation, including gamma rays, which can be used for safe medical imaging and other applications without the need for significant levels of radiation shielding outside the beam path. The secondary effect of bright, extremely brief flashes of light is the result of the initial accelerations of electrons within the plasma wake, as they are accelerated from rest to almost the speed of light in less than 1 millionth of a meter.

"Such a violent acceleration means they radiate like crazy," Goers said. "As much as 3 percent of the initial laser radiation is emitted in the flash in a millionth of a billionth of a second."

In terms of sheer acceleration, laser-driven particle accelerators have a long way to go before they are ready for applications in high-energy physics, where facilities such as Fermilab and CERN reign supreme. But for more immediate applications, such as ultra-fast medical and scientific imaging, the main barriers to laser-driven acceleration are cost, complexity, and portability.

"We may have found a solution to overcome all three of these barriers," Milchberg said. ■

This research was supported by the U.S. Defense Threat Reduction Agency, the U.S. Department of Energy, and the U.S. Air Force Office of Scientific Research. The content of this article does not necessarily reflect the views of these organizations.

New NSF-funded project targets secure and private function computations

Professor **Prakash Narayan** (ECE/ISR) is the recipient of a new $499K NSF grant on "Secure and Private Function Computation by Interactive Communication." This project was developed collaboratively with his former student **Himanshu Tyagi** (EE Ph.D. 2013), now an assistant professor at the Indian Institute of Science; and his former ISR Visitor Shun Watanabe, now an associate professor at Tokyo University of Agriculture and Technology.

The project takes an information theoretic approach to develop principles that govern secure or private function computation by multiple terminals that host user data. The goal of the terminals is to compute locally and reliably, a given function of all the possibly correlated user data, using an interactive communication protocol. The protocol is required to satisfy separate security and privacy conditions.

A common framework is developed for analyzing the distinct concepts of security and privacy, and new information theoretic formulations and approaches are proposed with the objective of understanding basic underlying principles. Potential applications arise, for instance, in: hospital databases that store clinical drug trial results or university databases with student performance records; private information retrieval from user data stored in private clouds; and security and privacy certifications for the identities/locations of communities and individuals participating in crowd-sourced traffic and navigation services.

The technical approach involves the development of a theory with three main distinguishing features. It (i) establishes a key role for interactive communication in reducing communication complexity, and in enhancing security and privacy; and formulates computable measures of security and privacy in terms of conditional Renyi entropy; (ii) provides a common framework for formulating and analyzing problems of secure and private function computation with prominent roles for classical Shannon theory as well as zero-error combinatorial information theory; and introduces the concept of a multiuser privacy region for quantifying privacy tradeoffs among users; and (iii) develops a new method for obtaining converse bounds for communication complexity, upon analyzing the common randomness or shared information generated in function computation with an interactive communication protocol.

Rooted in information theory, estimation theory and theoretical computer science, a central objective of the research is to elucidate tradeoffs among computation accuracy, terminal security and user privacy; key to these tradeoffs is the essential role of interactive communication. Expected outcomes are precise characterizations of the mentioned fundamental tradeoffs, and associated algorithms for secure and private computing. ■

For more visit #UMDdiscovers

UMD Researchers Creating First Onboard Fast-Charging System for Electric Vehicles

Professor **Alireza Khaligh** (ECE/ISR) and his mechanical engineering colleague, Professor Patrick McCluskey have received a three year Grant Opportunity for Academic Liaison with Industry (GOALI) valued at $460K. Their project, "Integrated On-Board Universal SiC-based Fast Charging for Plug-In Electric Vehicles" centers on the design of an integrated, universal on-board fast charger compatible with all charging levels.

Khaligh and McCluskey are collaborating with Steven Rogers of Genovation, an electric car company in Rockville, Md. Their ultimate goal is to provide a transformative solution to overcome present limitations of the charging methods for electric vehicles which integrates different disciplines of engineering, therefore fostering interdisciplinary collaboration.

To learn more visit: go.umd.edu/fastchargingEV

NSF Funds Novel Research to Create Scalable Wireless Networking, Averting Usage Crisis

Professor **Anthony Ephremides** (ECE/ISR) and his colleague at Rice University, have received a three year grant valued at half-a-million dollars to study a novel view of wireless networks that center on virtual users and includes the evolving paradigms of social networks, and service-based applications. Their ultimate goal is to expand the application base of wireless networks from wireless Internet to include the development of realizable networks for scalable mobile health care, first responders, security applications, transportation, factory automation and robotics.

The main underpinning of the project will be to conceptualize and prove the theoretical foundations, as well as system level designs and algorithms necessary to bring these networks to fruition. This project, "Service-Centric Architecture for Efficient Spectral Utilization in Wireless Networks," represents a fundamentally novel approach to address spectrum efficiency. Currently, wireless networks are seen as a tool for the provision of services to a well-defined group of users and operators. Instead, the researchers will work with industrial partners to ensure that next-generation wireless networks will be service-centric, delivering content and fresh information about ongoing processes.

Read more at go.umd.edu/servicecentricnetworks

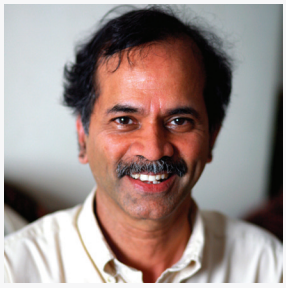
Awards and Honors for ECE Faculty

Barg & Tamo Receive 2015 IEEE Information Theory Society Paper Award

Professor **Alexander Barg** (ECE/ISR) and his former postdoctoral researcher **Itzhak Tamo** (2013-2014) have received the 2015 IEEE Information Theory Society Paper Award for their paper, "A family of optimal locally recoverable codes." The paper was published in the August 2014 edition of IEEE Transactions on Information Theory. The purpose of the Information Theory Paper Award is to recognize exceptional publications in the field and to stimulate interest in and encourage contributions to fields of interest of the Society. The award is given annually to an outstanding publication in the fields of interest to the Society appearing anywhere during the preceding two calendar years.

Chellappa Elevated to AAAI Fellow

Department Chair and Minta Martin Professor of Engineering **Rama Chellappa** (ECE/CS / UMIACS/CFar) was elected in the 2015 class of Fellows of The Association for the Advancement of Artificial Intelligence (AAAI). Chellappa was recognized for his "significant contributions to Markov random fields, 3D recovery from single and multiple images and image/video-based recognition." Chellappa's research areas include signal and image processing, computer vision, pattern recognition, multi-dimension stochastic processes, statistical interference, image analysis, robust and secure biometrics, and artificial intelligence in computer vision.



Dachman-Soled Wins NSF CAREER & ORAU Awards

Professor **Dana Dachman-Soled** (ECE/UMIACS) is the recipient of a 2015 National Science Foundation Faculty Early Career Development (CAREER) Award for "Non-Black-Box Cryptography: Defending Against and Benefiting from Access to Code." "I am very excited to receive the NSF Faculty Early Career award. This grant will allow me to support and develop my research and educational agenda. I am looking forward to using this opportunity to make an impact in my field." Dachman-Soled also received the Ralph E. Powe Junior Faculty Enhancement Award which will support her research collaboration with Professor Gang Qu in "Threat Models and Practical, Provably Secure Architecture for the Secure Scan-Chain Problem." This award provides seed money for research by junior faculty at Oak Ridge Associated Universities (ORAU) member institutions. The award is intended to enrich the research and professional growth of young faculty and result in new funding opportunities. Dachman-Soled is an assistant professor in the Department of Electrical and Computer Engineering. Her research interests include cryptography, complexity theory and security.

Espy-Wilson Elected to NIH Council

PProfessor Carol Espy-Wilson (ECE/ISR) has been named to the National Institute of Health's National Advisory Council for Biomedical Imaging and Bioengineering. The council advises the Secretary of Health and Human Services; the Director of the National Institutes of Health; and the Director of NIH's National Institute of Biomedical Imaging and Bioengineering. The scope of the council is matters relating to the conduct and support of research, training, health information dissemination and other programs that address biomedical imaging, biomedical engineering and associated technologies and modalities with biomedical applications..

Ghodssi Elevated to ASME & AVS Fellow

Professor **Reza Ghodssi** (ECE/ISR was elevated to Fellow of the American Society of Mechanical Engineers (ASME) and the American Vacuum Society (AVS). ASME recognized him for his "research focuses on design and development of microfabrication technologies and processes in micro/nano/bio devices and systems for chemical and biological sensing, small-scale energy

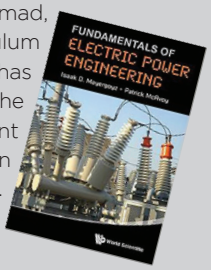
Mayergoyz and McAvoy Publish Unique Text on Electric Power Engineering

ECE Professor Isaak Mayergoyz and alumnus Patrick McAvoy authored "Fundamentals in Electric Power Engineering" which is published by World Scientific. This text presents a concise and rigorous exposition of the main fundamentals of electric power engineering.

Electric power engineering has always been an integral part of electrical engineering education. Unique from other texts on the market, the materials contained in this single volume can be used to teach three separate courses — electrical machines, power systems and power electronics, which are in mainstream electrical engineering curriculum at most universities worldwide. The book also highlights an in-depth review of electric and magnetic circuit theory with emphasis on the topics which are most relevant to electric power engineering.

The text has a strong theoretical focus emphasizing the physical and mathematical aspects of electric power engineering fundaments which clearly reveals the multidisciplinary nature of power engineering and its connections with other areas in electrical engineering. The authors strove to produce a student-friendly textbook. They feel a student's interests are best served when complicated concepts are not avoided, but discussed in a straightforward way.

Professor Mayergoyz became a full professor of the Electrical and Computer Engineering Department of University of Maryland, College Park in 1980. In cooperation with Prof. Fawzi Emad, he established the electric power engineering curriculum and educational program in the ECE Department and has maintained it for more than 30 years. For many years, he served as a consultant for the Research and Development Center of General Electric Company and has been selected as a visiting research fellow of this center. He has authored and coauthored 12 books and over 400 scientific papers. He is a Fellow of IEEE (1988), Visiting Research Fellow of GE Research and Development Center (1988), Distinguished Lecturer of the IEEE Magnetics Society (1994), Distinguished Scholar-Teacher of University of Maryland, College Park (1994) and a recipient of Outstanding Teacher Award of College of Engineering (1987). In 2009, he received the Achievement Award of the Institute of Electrical and Electronics Engineers (IEEE) Magnetics Society, the highest award given by the society. He has served on numerous IEEE committees, editorial boards of scientific journals and as the Editor of Academic Press-Elsevier Electromagnetism series.



Patrick McAvoy received his Ph.D. from the University of Maryland in 2008. He was advised by Professor Mayergoyz and has worked as research associate on Professor Mayergoyz's team since 2010. He has taught the undergraduate Electrical Machines laboratory course and has interests in electromagnetics and electric power engineering. ■

conversion and harvesting with a strong emphasis toward health monitoring applications. Dr. Ghodssi has pioneered a number of key engineering technology areas in the Micro-Electro-Mechanical-Systems (MEMS), including micro-ball bearing rotary micro-engines, optical microsystems based on InP compound semiconductor, and integration of biological materials such as Tobacco Mosaic Virus (TMV) in micro-energy storage devices. In each of these areas, he has not only pushed the technology forward but was able to provide deep fundamental insights." AVS recognized him for outstanding leadership in microsystems technology achieved by combining knowledge of materials and processing, innovative device concepts, and diverse applications."

Hafezi Wins ONR Young Investigator Award

ECE Assistant Professor and Joint Quantum Institute Fellow Mohammad Hafezi (IREAP / Physics) has been selected as an Office of Naval Research (ONR) Young Investigator. The award will support his research in "Quantum Transport of Photons in Nanostructures" It is a three-year award which will support laboratory equipment, graduate student stipends and scholarships, and other expenses critical to ongoing and planned investigational studies. The program is designed to attract young scientists and engineers who show exceptional promise for doing creative research and teaching. "These recipients demonstrate the type of visionary, multidisciplinary thought that helps the U.S. Navy anticipate and adapt to a dynamic battlespace," said Dr. Larry Schuette, ONR's director of research. "The breadth of their research and combined value of awards underscore the significance the Navy places on ingenuity, wherever it's harbored, and support the framework of a Naval Innovation Network built on people, ideas and information.Hafezi is one of only 36 investigators selected for awards nationwide from a pool of 383 proposals. The competition for this award, one of the oldest and most selective scientific research advancement programs in the U.S., is fierce; less than 10 percent of the proposals submitted resulted in an award.

Khaligh Wins Best Vehicular Electronics Paper Award for Third Time

Professor **Alireza Khaligh** (ECE/ISR) received the Best Vehicular Electronics Paper Award from the IEEE Vehicular Technology Society. "Comprehensive Topological Analysis of Conductive and Inductive Charging Solutions for Plug-In Electric Vehicles" was co-written by Khaligh and his former student at the Illinois Institute of Technology, Serkan Dusmez. Dusmez also worked at the University of Maryland as a faculty research assistant. This award is given annually to the best transaction paper on the topic of vehicular electronics; Khaligh has won for a third time. It will be presented at the VTC-Fall 2015 Conference in Boston.

More Honors and Awards for ECE Faculty

Liu Receives 2015 IEEE Kirchmayer Teaching Award

Christine Yurie Kim Eminent Professor of Information Technology **K.J. Ray Liu** is the recipient of the 2016 IEEE Leon K. Kirchmayer Graduate Teaching award for inspirational teaching and mentoring of graduate students. The citation reads, "For exemplary teaching and curriculum development, inspirational mentoring of graduate students, and broad educational impact in signal processing and communications." Liu has trained graduate students in pursuit of both the Master of Science and Ph.D. degrees. Of his 60 former Ph.D. students and post-doctoral fellows, 26 have pursued an academic career in which they cite Liu's mentorship and inspiration as essential to their success. His remaining students work in major industry research labs or have started their own companies.

Munday Receives NASA Smallsat Technology Partnership Award

Jeremy Munday (ECE/IREAP/NanoCenter) was selected to receive a NASA Smallsat Technology Partnership Award. He was only one of 8 selected recipients out of approximately 100 applicants this year. This Smallsat program sponsors teams of University researchers who collaborate with counterparts in NASA to develop technology needed for future small, affordable spacecrafts. It provides up to $100,000/ year to the University participants, along with personnel support for NASA collaborators. Munday's group will be partnering with Tiffany Russell (Marshall Space Flight Center) to develop reconfigurable solar sails that can be used to orient and position spacecrafts without using traditional propellants.

Papamanthou Wins Yahoo! Labs Award

Charalampos (Babis) Papamanthou (ECE/MC2/UMIACS) received a $25,000 award from Yahoo! Labs to develop

new algorithms for searchable encryption that will make it easier for users to navigate end-to-end secure email. He received this Faculty Research and Engagement Award for his proposal, "Searchable Encryption for More Functional End-to-End Encryptyed Email." He is collaborating with Payman Mohassel, a research scientist at Yahoo! Labs. As people grow more concerned about the privacy of email, major Internet service providers have developed plug-ins to provide end-to-end encryption which allows only the sender and recipient to read contents of an e-mail. This, in particular, means that search functionality is no longer supported. Since search is one of the most popular features of email, he adds, this is a pretty big limitation. Papamanthou's research aims to make searching possible even as the emails remain encrypted.

Simon Speaks at Paris Workshop on Decoding of Sound and Brain

Professor **Jonathan Simon** (ECE/Biology/ISR) was the invited opening speaker at the Paris Workshop on Decoding of Sound and Brain, this November in Paris. He spoke on "Neural Representations of the Cocktail Party in Human Auditory Cortex."

Ulukus Elevated to IEEE Fellow

Professor **Sennur Ulukus** (ECE/ISR) has been elevated to fellow of the Institute of Electrical & Electronics Engineers. Ulukus was honored for contributions to characterizing performance limits of wireless networks. The title of IEEE Fellow is conferred by the IEEE Board of Directors upon those with an outstanding record of accomplishments in any of the IEEE fields of interest. The total number selected in any one year cannot exceed one-tenth of one percent of the total voting membership. IEEE Fellow is the highest grade of membership and is recognized by the technical community as a prestigious honor and an important career achievement.

UMD Ties Stanford, MIT for Most Researchers on 2015 DOD Multidisciplinary Research Grants

University of Maryland researchers are involved with more than a quarter of the research teams awarded 2015 Multidisciplinary University Research Initiative (MURI) grants by the Department of Defense (DOD). UMD is represented on six of the 22 teams that received awards, putting UMD in a three-way tie with the Massachusetts Institute of Technology and Stanford University for the most grants involving any one university in 2015.

A highly competitive program, the MURI program supports research teams, primarily at academic institutions, whose work spans multiple traditional science and engineering disciplines in order to accelerate research progress. The Army Research Office, the Air Force Office of Scientific Research, and the Office of Naval Research solicited proposals in 19 topics important to the DOD. After a total of 289 white papers were submitted, followed by a total of 76 proposals, 22 teams were selected to receive awards worth a total of $149 million over the next five years. MURI awards provide students and researchers with long term support that is important for discovery and applied research programs.

"The University of Maryland's outstanding performance in securing these MURI awards, tied for the highest number of any university, demonstrates our world class, interdisciplinary research expertise in science and engineering," said UMD Vice President and Chief Research Officer Patrick O'Shea.

MURI award recipients include the following ECE researchers:

Professor **Mohammad Hafezi** (ECE/Joint Quantum Institute/IREAP) will join a MURI effort led by Princeton University to study "Engineering Exotic States of Light with Superconducting Circuits." Professor **Howard Milchberg** (ECE/Physics/IREAP) will join a MURI project entitled "Harnessing Strong-Field MidInfrared (IR) Lasers: Designer Beams of Relativistic Particles and THz-to-X-ray Light." The initiative is led by the University of Colorado, Boulder.

Professor **Sarah Bergbreiter**, an affiliate professor in ECE will be joining a MURI team working on a project entitled "Evolutionary Mechanics of Impulsive Biological Systems: Guiding Scalable Synthetic Design." The initiative is led by Duke University.

Over the past 29 years, the DOD's MURI program has resulted in significant capabilities for U.S. military forces and opened up entirely new lines of research. In a March 3 Science magazine "ScienceInsider" news article, News Editor David Malakoff noted: "Since it was founded in the mid-1980s, MURI has become a mainstay of DOD's basic research programs, accounting for about one-quarter of the $1 billion in basic research funding that the Pentagon spends annually at U.S. universities. In some fields, including computer science, engineering research, and math, the military is now the dominant U.S. funder of fundamental science. Whereas many of DOD's funding efforts focus on single-investigator grants, MURI aims to unite researchers from different disciplines and universities on a single project." ■

Wu Wins Meritorious Service Award

Professor **Min Wu** (ECE/ISR/UMIACS/MC2) has been selected to receive the 2015 Institute of Electrical and Electronics Engineers (IEEE) Signal Processing Society Meritorious Service Award for exemplary service to and leadership in the Signal Processing Society. Wu currently leads the Media and Security Team (MAST) in the Clark School of Engineering with main research interests in information security and forensics, and multimedia signal processing.

The award will be presented at the opening ceremony of the 41st annual IEEE International Conference on Acoustics, Speech, and Signal Processing (ICASSP) 2016. On the first full day of the conference an announcement will be made regarding the award and 2016-17 President Rabab Ward will present the award to Professor Wu.

Wu and Students Win Invention of the Year

Professor **Min Wu** and her Ph.D. students **Hui Su** and **Adi Hajj-Ahmad** won the 2015 University of Maryland Invention of the Year Award in Information Science for a method they have identified to extract Electrical Network Frequency (ENF) signals from video recordings of complex and realistic scenarios to be used in a variety of applications including security and forensics, digital humanities and immersive multimedia. The invention was one of nine nominated for the Invention of the Year Award and was presented during the UMD Celebration of Innovation and Partnerships. The invention successfully extracts ENF from videos that have moving objects, changing brightness settings and moving cameras, representing an advancement from the previous applications with capabilities demonstrated only for static video. The invention also includes a novel application of ENF to temporal multimedia synchronization supporting an immersive multimedia experience. This new modality for synchronization imposes no constraints on camera calibration or view angle and no content overlap between media streams is required. The technology uses the effects of the rolling shutter mechanism, found in most digital cameras in use today, to capture the ENF signals. "The capabilities that our invention provides are unprecedented," Wu said. "The technologies in particular are a leap forward from the prior art in order to enable ENF extraction from a wider range of video recordings."

Four Honored at Fourth ECE Distinguished Alumni Awards

This fall ECE honored four alumni for their leadership and meritorious contributions to the field of engineering, their humanitarian efforts, and the application of their engineering education to other disciplines. At the fourth annual ECE Distinguished Alumni Award presentation fellow alumni, faculty, and staff gathered in A.V. Williams for a luncheon to honor the recipients. This year, ECE's Distinguished Alumni are Nital Patel, Balaji Sampath, Mark Smith, and Leandros Tassiulas.

Recipients of the 2015 ECE Distinguished Alumni Award with ECE Department Chair (from L-R: Balaji Sampath, Nital Patel, Leondros Tassiulas, Rama Chellappa, department chair, and Mark Smith

Nital Patel (M.Sc. '93, Ph.D. '95) was nominated to receive the 2015 ECE Distinguished Alumni Award by his advisor Professor **John Baras**. Patel has made significant technical contributions to the area of systems, control, and signal processing applications in the area of semiconductor manufacturing. As a Principal Engineer with Intel Corporation, he is responsible for leading a team of researchers in identifying and developing the next set of software systems capabilities for Intel's assembly and test operations.

His foci are on the design and development of solutions and systems that are related to process modeling and control, factory scheduling algorithms and systems, data mining and machine learning solutions for rapid information turns, and in-house design and development of complex image processing systems for inspection and metrology. He defined the fab process control roadmap; created the first solution to circumvent the system level observability issues encountered in process control under high-mix conditions; and subsequently, leading the process control strategy and thrust for wafer and component test areas.

Patel also worked at Texas Instruments, Inc. (TI). As one of the original pioneers in driving widespread acceptance of modern systems and control techniques in semiconductor manufacturing; there he derived a solution for an implicit tuning algorithm that was guaranteed to be always stable which led to the first practical adoption of control techniques for lithography pattern overlay control.

Dr. Patel holds 11 patents in the area of process control, modeling, and data analysis in semiconductor manufacturing. He has served on the Editorial Board of the IEEE Transactions on Semiconductor Manufacturing since 2003. Patel has authored over 35 papers, a book chapter, participated in many industry conferences. He is an associate faculty member at Arizona State University.

Balaji Sampath ((Ph.D. '97) is a central figure in the Association for India's Development, Inc. (AID). He has made several vital contributions in planning and executing large-scale campaigns in health, literacy and improving quality of education in India. His work has culminated in the Hundred Block Plan (HBP), a multi-pronged rural intervention and development program across India - which he pioneered with the All-India People's Science Network (AIPSN).

During graduate school, Sampath became a volunteer for AID-College Park when it was still a local organization. He mobilized 500 volunteers and started 25 chapters of Association for

India's Development in the USA. Sampath returned to India to start working full-time on social issues in 1997 then founded AID INDIA. He worked with Center for Ecology and Rural Development and the People's Science Movement on various health and education programs and was also a National Organizer of the People's Health Assembly Campaign in 2000. Recently, he has played a key role in AID India's large scale primary education program, the Eureka Child initiative, which reaches out to 1 million children in Tamil Nadu to improve reading, math and science skills. For his altruistic endeavors, his advisor Professor **K. J. Ray Liu**, nominated Dr. Sampath for this award.

Sampath is a graduate of IIT-Chennai where he had stood All India No. 4 in the Joint Entrance Examination. Sampath is a recipient several awards for AID INDIA's work in reading and science education - Ashoka Fellowship, Lemelson Innovator's Award, Rotary Distinguished Service Award. He also hosts a popular weekly science program for children on television. Dr. Sampath is an author of several books and videos on education, science popularization and health.

Mark Smith, M.D. (B.S.E.E. '80) has been a Director at Kelyniam Global, Inc. since June 2014 and has over 20 years of clinical experience in neurosurgery. He also worked as a biomedical engineer at the University of Maryland Shock Trauma Unit.

In 1999, Smith started a private practice neurosurgery group in Utica, New York. He also served as an Assistant Professor of Neurological Surgery at SUNY Health Sciences Center in Syracuse, New York from 1994 - 1999. During his tenure there, he specialized in epilepsy and skull based surgery. Dr. Smith has received numerous awards and grants and is published in the fields of neuroanatomy, neurophysiology and neurosurgery.

Smith completed his Neurosurgery training at SUNY Upstate University Hospital in Syracuse, New York in 1993. He is also fellowship trained in pituitary surgery and epilepsy surgery. He says, "it is in epilepsy surgery where my electrical engineering education truly was an asset—when working to assist patients with this neurological disorder, one must focus on the electrical impulses impacting the brain and nervous system." Professor **Robert Newcomb**, who Smith worked closely with as an undergraduate, nominated him for this award. Dr. Smith graduated magna cum laude with a Bachelor's degree in Electrical Engineering from the University of Maryland. After working two years as a biomedical engineer, he was admitted to medical school, where he earned a Doctorate of Medicine from the University of Maryland in 1986.

Leandros Tassiulas (Ph.D. '91) is the John C. Malone Professor of Electrical Engineering at Yale University. His research interests are in the field of computer and communication networks with emphasis on fundamental mathematical models and algorithms of complex networks, architectures and protocols of wireless systems, sensor networks, novel internet architectures and experimental platforms for network research.

Tassiulas' most notable contributions to the field, which contributed to his nomination for this award by advisor Professor **Anthony Ephremides**, include the max-weight scheduling algorithm and the back-pressure network control policy, opportunistic scheduling in wireless, the maximum lifetime approach for wireless network energy management, and the consideration of joint access control and antenna transmission management in multiple antenna wireless systems.

Dr. Tassiulas is a Fellow of IEEE (2007). His research has been recognized by several awards including the inaugural INFOCOM 2007 Achievement Award "for fundamental contributions to resource allocation in communication networks," the INFOCOM 1994 best paper award, a National Science Foundation (NSF) Research Initiation Award (1992), an NSF CAREER Award (1995), an Office of Naval Research Young Investigator Award (1997) and a Bodossaki Foundation award (1999). He has held faculty positions at Polytechnic University, New York, University of Maryland, College Park, and University of Thessaly, Greece.

Leonard Honored for Cooperative Control Innovations

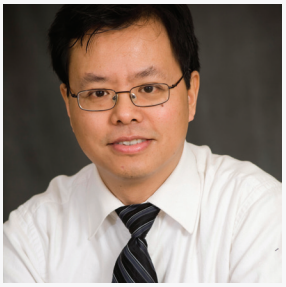
Dr. Naomi Ehrich Leonard was inducted into the A. James Clark School of Engineering Innovation Hall of Fame for her research in the field cooperative control of autonomous vehicles. She is an Edwin S. Wilsey Professor of Mechanical and Aerospace Engineering at Princeton and an associate faculty member of the Program in Applied and Computational Mathematics. Dr. Leonard was among the first to investigate the simple rules that enable individual agents—whether living organisms or robotic vehicles—to work together in groups by coordinating decision-making, sensing, and motion. Dr. Leonard has applied her work to help explain the behaviors observed in animal groups and to design the decision-making behaviors of networks of autonomous vehicles in missions that include environmental monitoring and exploration. Her experiments have produced myriad new theoretical investigations by a large community of academic researchers in engineering, mathematics, physics, and biology on topics ranging from geometric mechanics and control to social decision-making dynamics. Her work also inspires investigation at the intersection of engineering and art, as co-creator of Flock Logic, an art-making project that explores what happens when dancers carry out the rules used to model flocking birds.

Dr. Leonard earned M.S. and Ph.D. degrees from the University of Maryland's Department of Electrical and Computer Engineering in conjunction with the Institute for Systems Research in 1991 and 1994, respectively, with a major in control theory and a minor in communication theory. She was advised by Prof. **P.S. Krishnaprasad**.

LEARN MORE: http://go.umd.edu/IHOFLeonard

Chen Wins Killam Award

Jie Chen (Ph.D. '98, M.S. '92) is a 2015 recipient of the Killam Annual Professorship Award. The Killam Annual Professorship is one of the most prestigious awards granted to professors at Canadian universities; Chen is one of five to receive the 2015 award at the University of Alberta. Recipients are chosen based on two criteria: a record of outstanding scholarship and teaching over three or more years, and a record of substantial contributions to the community outside the university. Chen is a full professor in the Department of Electrical and Computer Engineering at the University of Alberta (Edmonton, Canada). He is also a research officer at the Canadian National Research Council/National Institute for Nanotechnology (NINT). Chen was advised by Professor **K.J. Ray Liu**.



LEARN MORE: http://go.umd.edu/chenkillam

Forte Accepts Professorship at UF

Domenic Forte (Ph.D. '13) accepted a tenure-track position at the University of Florida. He joined the school's ECE department as an assistant professor. Forte works primarily in cybersecurity and computer engineering. He is establishing a lab with other professors at UF where his research will focus on hardware security and trust. His work devoted to counterfeit electronics detection and avoidance, hardware Trojan detection and prevention, and physically unclonable functions led him to co-author the first book on counterfeit electronics, "Counterfeit Integrated Circuits" with Mark (Mohammed) Tehranipoor and Ujjwal Guin. He plans on primarily teaching "Hardware Security and Trust" and "Digital VLSI" courses while at UF. At Maryland, he was advised by Professor **Ankur Srivastava**.

Himanshu Tyagi joins Indian Institute of Science

Himanshu Tyagi (Ph.D. '13) joined the Indian Institute of Science as an assistant professor in the Department of Electrical Communication Engineering. At UMD, Tyagi was advised by Professor **Prakash Narayan**. Most recently, Tyagi was a postdoctoral fellow in the Information Theory and Applications Center at the University of California, San Diego. His research interests are in the application of information theory to security, interactive communication and statistical learning.

Mischiati Publishes in Nature

Matteo Mischiati (Ph.D. '11), is the principal author of "Internal models direct dragonfly interception steering," published in the Dec. 10, 2014 issue of the journal Nature. Mischiati is a postdoctoral associate in the Leonardo Lab at the Howard Hughes Medical Institute's (HHMI) Janelia Research Campus in Ashburn, Va. At Maryland he was advised by Professor **P. S. Krishnaprasad**. LEARN MORE: http://go.umd.edu/dfly.

Stamm & Zhou Return to ECE

Matthew Stamm (Ph.D. '13) and Enlu Zhou (Ph.D. '09) returned to participate in the 8th Annual ECEGSA Academic Roundtable, a panel discussion to help graduate students discern their path toward academia. Stamm is currently an assistant professor at Drexel University. His research involves developing techniques to detect information forgeries, such as falsified images and videos, along with understanding what anti-forensic countermeasures an information attacker can use to disguise their forgery.Stamm was advised by Professor **Min Wu**. Zhou currently is on the faculty at Georgia Tech. Her research is at the interface of simulation, control, and optimization. The application areas of her research include financial engineering, inventory control, and systems biology. She was advised by Profs. **Steven Marcus** and Michael Fu.

Alumna Sun Promoted; Recognized in 40 Under 40

Yan Lindsay Sun (Ph.D. 2004) has been promoted to associate professor at the University of Rhode Island in the department of Electrical, Computer and Biomedical Engineering. Her research interests include power grid security, trustworthy social computing, wireless network security, and reliable biomedical systems. She applied signal processing techniques in modeling, detection, and estimation of abnormal behaviors in various computing and communication systems. At Maryland, she was advised by Professor **K.J. Ray Liu**. Sun was also counted among Providence's 40 Under 40 (2015) by Providence Business News in recognition of her professional success and community involvement.

Borbath Gains Valuable Knowledge at U.S. Air War College

Mike Borbath (MSEE '97), a GCS Photonics Engineer and Colonel (select) in the U.S. Air Force, recently returned from 10 months on active duty, during which he attended and graduated from the U.S. Air War College at Maxwell Air Force Base in Alabama with a master's in Strategic Studies. The Air War College educates senior international military officers and interagency civilians who are expected to serve as strategic national security leaders, providing an education on air, space and cyberspace domains. While at the school, Borbath's studies led to a unique master's thesis, "Establishing Military Utility of Non-Traditional Sensing," that was nominated for an Air War College technology research award and is now part of the required reading curriculum for incoming students.

Colonel (select) Mike Borbath, far right, with classmates from the U.S. Navy, U.S. Army and Air Forces of the U.S., Saudi Arabia, and Brazil.

Four Students Receive 2015-16 IEEE PES SCHOLARSHIP

Kelly Fernadez, Justin Kelman, Tony Zhang, and XiaoXi Zhang Among 210 Selected

Kelly Fernadex, Jusitn Kelman, Tony Zhang, and XiaoXi Zhang received a $2,000 IEEE scholarship as part of the IEEE Power and Energy Society (PES) Scholarship Plus Initiative. Department Chair Rama Chellappa presented the award. The four were among a select group of 210 students selected from 105 U.S., Puerto Rican, and Canadian universities who have declared a major of electrical and computer engineering. The award recognizes high achieving students, maintaining high GPAs, with distinctive extracurricular commitments who are also committed to exploring the power and energy field.

Berkovich and Hajj-Ahmad Co-Recipients of Northrop Grumman Fellowship

Adi Hajj-Ahmad and **Andrew Berkovich** were selected by the Clark School as co-recipients of the Northrop Grumman Graduate Fellowship in Engineering Education. The Northrop Grumman Graduate Fellowship in Engineering Education encourages outstanding students to continue in an engineering education teaching career by recognizing mechanical or electrical engineering students who are committed to teaching. The award is valued at approximately $5,000 and will be shared by the recipients.

Ha Selected for Two Sought-After Fellowships

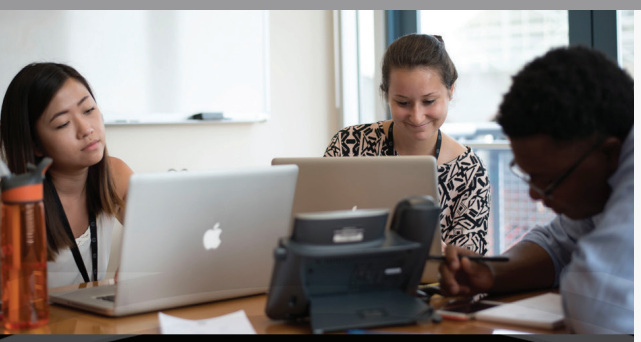
Dongheon Ha, an ECE Ph.D. candidate, advised by Professor Jeremy Munday received both the Graduate Dean's Dissertation Fellowship and the Ann G. Wylie Dissertation Fellowship for academic year 2015-16. This distinct honor counts Ha among only ten awardees bestowed the Graduate Dean's Dissertation Fellowship in the university. Ha received a Bachelor of Science in electrical engineering and computer science with honors from Handong University and an M.S. in electrical engineering from KAIST.

New Student Group Formed

Terrapin Development and Consulting, or TerpDAC, is an organization started by **Albert Huang**, a junior studying electrical engineering and computer science, enabling University of Maryland students to give back to the University of Maryland community through technology development and consulting. This organization exclusively offers services to the University of Maryland community - this includes university departments (such as ECE, McKeldin, DOTS), student organizations, and other organizations affiliated with the University of Maryland. TerpDAC consults with an organization to determine their problems, suggest solutions to said problems, and actually follow through with implementing those technical solutions - from software to hardware. Their first project, which will help to build organizational identity, aims at solving problems in McKeldin library with wireless traffic and overcrowding. In addition to nine electrical and computer engineering students, the membership includes finance, computer science, and mechanical engineering students, too.

Zhu Selected as Next ECEGSA President

Tiecheng Zhu, a fifth year ECE PhD candidate, was named the new president of the Electrical and Computer Engineering Graduate Student Association (ECEGSA) for the 2015-2016 academic year. Zhu is advised by Prof. Mario Dagenais in the field of photonics and astrophysics. His research interests include Complex Waveguide Bragg Grating (CWBG), high efficiency fiber-to-waveguide coupler and Interband Cascade Lasers (ICL). He received his Bachelor of Science the ECE Distinguished Graduate Fellowship in 2011. Zhu served on the ECEGSA board during the 2014-2015 academic year and is currently serving on the ECE Department Council.



CyberPoint

The Department of Electrical and Computer Engineering welcomes CyberPoint as our newest Corporate Affiliate committed to supporting and sponsoring our students and their educational goals. CyberPoint, headquartered in Baltimore, offers deep technical expertise in cyber security and delivers solutions to complex, challenging, and mission-critical problems in a rapidly evolving field. CyberPoint is also a supporting member of the Maryland Cybersecurity Center (MC2) and has long benefitted from a partnership with the computer science department. After hiring a number of summer interns from Maryland programs, including ECE, the company sought a way to continue supporting such students during the academic year.

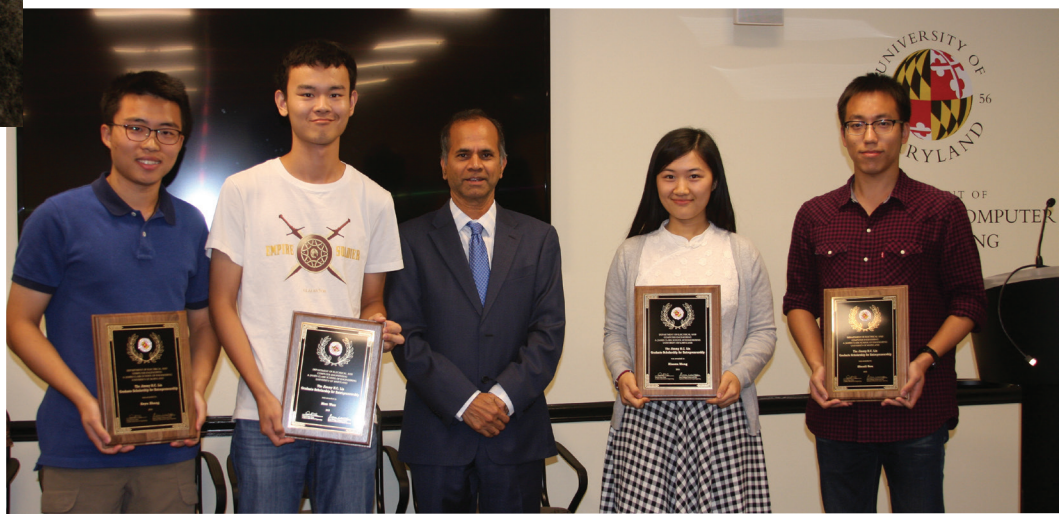
One way in which ECE offers Corporate Affiliate sponsorships is through the support of Undergraduate Research Fellowships (URF). Companies are able to sponsor students as they focus on specific research throughout the academic year. CyberPoint is sponsoring two ECE students, **Saad Khawar** and **Sandesh Tharu** who will be working with ECE professors **Armand Makowski** and **Babis Papamanthou**. CyberPoint is sponsoring research into the Internet-of-Things (IoT) to better understand network and operating system technologies relevant to the IoT, helping the company advance their long-term efforts in IoT security research. Khawar and Tharu will also gain expertise in a burgeoning field.

Sandesh Tharu plans to graduate with his degree in computer engineering this May. He is working on a concentration in cyber security and with CyberPoint's support will work in a URF position with Dr. Babis Papamanthou. "I chose to apply for a URF position because I wanted a cutting-edge research experience to help me develop skills necessary for graduate school. I plan to take advantage of this opportunity to apply my academic learning, problems solving and critical thinking skills to enhance my undergraduate experience in ECE at the University of Maryland."

Sandesh chose to apply for the URF opportunity with CyberPoint because of the research focus on the vulnerabilities associate with the IoT. He hopes to explore these vulnerabilities and ways to make IoT networks more secure. "I am particularly interested in CyberPoint because of the opportunity to work closely with Dr. James Ulrich, senior scientist at CyberPoint; being involved in this research will expose me to valuable knowledge and opportunities."

CyberPoint is committed to sharing its industrial cybersecurity expertise with colleagues in government and academia through interdisciplinary collaboration through their strong research program. ECE applauds CyberPoint's multidisciplinary approach to research—their team of mathematicians, physicists, electrical engineers, computer scientists, and biologists collaborates to solve complex research problems and advance technology to meet the ever-changing challenges of cyber security.

CyberPoint is sponsoring URFs to build a strong working relationship with ECE and enhance their existing close partnership with the University. "We hope not only to bring interns from ECE to CyberPoint, but to build closer working relations with ECE faculty as well. We think those faculty who are interested in collaborative research, especially in federally funded research programs, will find CyberPoint a ready partner, " says Dr. Mark Raugas, Chief Scientist at CyberPoint. ■



A Look Back Over the Year 2015!

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