Capstone Team Wins Prize at HackHarvard Competition page 7

Discovering the Dynamics of Human Brain Function page 18

Whitehouse Workshop on National Strategic Computing Initiative page 22

ONR Young Investigator Award page 22
It is my pleasure to share with you some exciting news about my department during this past academic year. Before I do that, I would like to offer my sincere thanks to Professor Avina Petropulu, for her tremendous leadership as Chair over the last 6 years and wish her well as she heads off to a well-earned sabbatical.

Our department continues to see an influx of highly talented faculty members contributing expertise in important emerging areas, such as signal and information processing, security, privacy, cyberphysical systems, bioelectrical engineering, big data and high-performance computing. In addition to the 11 faculty members hired over the last 5 years, we welcomed this spring Professor Emina Soljanin. This fall, we also welcomed teaching faculty members Assistant Professor John McGarvey and instructor Dr. Maria Stiti.

Our faculty and students have made ECE at Rutgers into one the most vibrant departments, creating a community that fosters excellence in education and research. This excellence is reflected in the remarkable successes and outstanding achievements of both our students and faculty members alike. Highlights include an Office of Naval Research (ONR) Young Investigator Award for Assistant Professor Vithal Patel, who was also named the A. Walter Tyson Assistant Professor; an invitation to speak at the White House National Strategic Computing Initiative (NSCI) for Professor Shrikanth Jha who also is playing a key role in the $20M Molecular Science Software Institute (MoISSI) funded by the National Science Foundation (NSF); and a best paper award for a WINLAB team led by Distinguished Professor Dipankar Raychaudhuri and Professor Wade Trappe at IEEE DySPAN, the premier conference on spectrum policy and technology. Also, Assistant Professor Janne Lindqvist’s research on Bitcoin was featured multiple times in mainstream national and international media. Like the year before, this year too was marked with a large number of external grants, with research expenditures in the department pushing ~$8M.

ECE graduate students amassed a large number of awards and recognitions, including the Google Anita Borg Scholarship for graduate student Parneet Kaur; a best paper award at IEEE COMSNETS for graduate student Hajar Mahdavi-Dorost; and a best student paper award at the IEEE WAVSP Workshop for graduate student Tang Wu. Graduate student Shubham Jain’s work on pedestrian safety using smartphones was featured in the Wall Street journal. ECE undergraduate student teams won prizes for their research projects at several national competitions such as first place at the 7x24 Exchange Metro NYU Challenge, 2nd place at the HackHarvard Competition and were part of the Rutgers-University of Maryland team invited to the final stage of the SpaceX hosted Hyperloop Pod Competition. Further, our students received a large number of competitive travel grants to conferences from professional societies.

Consistent with this excellence, our student enrollment has grown dramatically with our incoming sophomore class size at over 250 students (a ~ 50% increase from the last year!) and the incoming graduate student class size at well over 100 students. Our international program with a top tier university in China continues to flourish and bring us excellent students. ECE also remains one of the most sought after majors for employers from a broad spectrum of industry, with the fundamentals that ECE students are exposed to here making them versatile and productive employees from day one.

This was a great year for our alumni, whose amazing success is a source of inspiration to our students and faculty. Our department has produced outstanding scholars, industry leaders, entrepreneurs. You can meet some of them on page 29-30.

In our pursuit of excellence the support of our alumni and friends is essential. I would like to thank everybody who supported us this past year. Though this support we were able to supplement startup packages of new faculty, provide student fellowships, support student travel to conferences and maintain state-of-art laboratories.

I am very proud of the accomplishments highlighted in this newsletter. Please visit us next time your travels bring you to our area, to experience up close the vibrancy of this department.

Sincerely,

Narayan Mandayam
Distinguished Professor and Chair
Professor Undergraduate Director and
Professor and Graduate Director
Research Interests: Compilers, and parallel systems, computer graphics, robotics, pattern recognition, machine learning, convex optimization, neural networks, image analysis, computer vision, and biologv.

Jae-seok Jeon Assistant Professor
Research Interests: Nanoelectronics, materials, devices and processing technologies, nano-electro-mechanical systems (NEMS).

Shantenu Jha Assistant Professor
Research Interests: High-performance and distributed computing, computational and data-intensive science and engineering, large-scale cyberinfrastructure for science and engineering.

Nagmeh Karimi Assistant Teaching Professor
Research Interests: Systems security and privacy, mobile systems, social computing, context-aware communication, and human factors in computing systems.

Yicheng Lu Distinguished Professor
IEEE Fellow
Research Interests: Statistical applications to computer vision.

Laleh Najafizadeh Assistant Professor
Research Interests: Functional brain imaging, brain connectivity, diffusion optical brain imaging, electroencephalography, cognitive rehabilitation, circuit design and microelectronics, ultra-low-power circuits for biomedical applications, data converters, system on chip, wireless IC design.

Sophocles Orfanidis Associate Professor
Research Interests: Statistical and adaptive signal processing, audio signal processing, electromagnetic waves and antennas.

Anand D. Sarwate Assistant Professor
ONR Young Investigator Award, A. Walter Tyson Assistant Professor
Research Interests: Signal processing, computer vision, pattern recognition with applications in biometrics and imaging.

Vishal M. Patel Assistant Professor
IEEE Fellow
Research Interests: Micronanoelectronics materials and devices.

Richard Mammono Professor
Fellow National Academy of Inventors
Research Interests: Computer pattern recognition, neural networks, signal processing, technology commercialization, processes involving the innovation of new technology products, entrepreneurship.

Dario Pomplii Associate Professor
NSF Career Award, ONR Young Investigator Award, DARPA Young Faculty Award
Research Interests: Wireless ad hoc and sensor networks, underwater acoustic communications, underwater vehicle coordination, team formation/steering, task allocation, thermal management of datacenters, green computing, cognitive radio networks, dynamic spectrum allocation, traffic engineering, network optimization and control.

Lawrence Rabine Professor Emeritus
IEEE Fellow, National Academy of Engineering, National Academy of Sciences, IEEE Kiely Medal, IEEE Pioneers Award, IEEE Millennium Medal
Research Interests: Digital signal processing, digital signal processing, speech recognition, speech analysis, speaker recognition, and multimedia.

Dipankar Raychaudhuri Distinguished Professor & Director of WINLAB
Research Interests: Network architectures and protocols, wireless and computer systems, technology, dynamic spectrum access and cognitive radio, experimental prototyping and network research testbeds.

Peddapuliah Sannuti Professor
IEEE Fellow
Research Interests: Simultaneous internal and external stabilization of linear time-invariant systems in the presence of constraints is pursued. Internal stabilization is in the sense of Lyapunov while external stabilization is in the sense of $L_p$. $L_p$ stability with different variations, e.g. $w$ or without finite gain, with fixed or arbitrary initial conditions with or without bias.

Anand D. Sarwate Assistant Professor
NSF Career Award
Research Interests: Machine learning, distributed systems, and machine learning, with a focus on privacy and statistical methods.

Deborah Silver Professor & Executive Director
PSM Program
Research Interests: Scientific visualization, computer graphics.

Emina Soljanin Professor
IEEE Fellow and Distinguished Lecturer
Research Interests: Efficient, reliable, and secure storage and transmission networks, coding, information, and queuing theory.

Predrag Spasojevic Associate Professor
Research Interests: Communication and information theory, signal processing and representation, cellular and wireless LAN systems, ad hoc and sensor networks.

Maria Strik Teaching Professor
Research Interests: Analysis/design/optimization of data algorithms, statistical analysis, mathematical modeling, big data, data analytics, social networks, information systems, cybernetics, wireless-mobile-ad hoc-cellular networks, (secure) routing, mobile computing, network-computer security.

Wassid U. Bajwa Assistant Professor
NSF Career Award, ARQ YIP Award
Research Interests: High-dimensional inference and inverse problems, compressed sensing, statistical signal processing, wireless communications, and applications in biological sciences, complex networked systems, and radar & image processing.

Janne Lindqvist Assistant Teaching Professor
Research Interests: Design-for-trust, microprocessor testing, design-for-reliability, hardware security and design-for-testability, fault tolerance and computer architecture, computer aided design.

Yicheng Lu Distinguished Professor
IEEE Fellow
Research Interests: Statistical applications to computer vision.

Laleh Najafizadeh Assistant Professor
Research Interests: Functional brain imaging, brain connectivity, diffusion optical brain imaging, electroencephalography, cognitive rehabilitation, circuit design and microelectronics, ultra-low-power circuits for biomedical applications, data converters, system on chip, wireless IC design.

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Maria Strik Teaching Professor
Research Interests: Analysis/design/optimization of data algorithms, statistical analysis, mathematical modeling, big data, data analytics, social networks, information systems, cybernetics, wireless-mobile-ad hoc-cellular networks, (secure) routing, mobile computing, network-computer security.

Wassid U. Bajwa Assistant Professor
NSF Career Award, ARQ YIP Award
Research Interests: High-dimensional inference and inverse problems, compressed sensing, statistical signal processing, wireless communications, and applications in biological sciences, complex networked systems, and radar & image processing.
ECE student Parneet Kaur received a 2016 Google Anita Borg Scholarship

Parneet Kaur who is pursuing a PhD under the supervision of Prof. Kristin Dana is a recipient of the prestigious Google Anita Borg Scholarship. The Google Anita Borg Scholarship is awarded based on the strength of each candidate’s academic background and demonstrated leadership. As a scholarship recipient, Parneet received a $10,000 award and attended a 3-day Google Scholars’ Retreat in June 2016 at Google headquarters in Mountain View, California.

Parneet’s research focuses on developing computational skin texture models with applications in quantitative dermatology and telemedicine. The goal is to infer information about skin microbiome using computational photography. She is developing advanced methods of handling multiview high dimensional data by using computational appearance to supervise clustering of the bacteria genetic signature. In another project, she is using skin appearance modeling for classifying corneal microscopy skin images.

At Rutgers, she serves as vice-president of the Society of Women Engineers graduate chapter. She is also a co-founder and president of the Nonve-to-Expert engineering club. Parneet also received the MS degree from Rutgers ECE where she was involved in the development of the Robotics Assisted Bridge Inspection Tool (RABIT) and analyzed ground penetrating radar scans.

2016 Google Anita Borg Scholarship

Capstone Team wins the 7x24 Exchange Metro University Challenge

An ECE Capstone team won $2K at the 7x24 Exchange Metro New York University Challenge for the second year in a row! The 2nd Annual 7x24 Exchange Metro New York University Challenge invited selected tri-state area universities to participate in a design challenge related to energy efficiency and data centers. Participating teams are awarded grants ranging from $1000 to $10,000 to further advance the visibility of the data center industry. New York University ECE student, Hajar Mahdavi-Doost, with Dr. Narayan Prasad (NEC Labs America), received the best paper award at COMSNETS 2016, held January 5-9 in Bangalore, India.

Hajar (picture) was a PhD student, working under the supervision of Prof. Roy Yates on the design of efficient algorithms for energy harvesting and energy efficiency in communication systems. The award-winning paper was a result of Hajar’s internship at NEC Labs America.

ECE Fall Capstone Project Wins 2nd Place at HackHarvard Competition

The ECE Fall Capstone Project “Firefighter Monitoring System” won 2nd Place at the HackHarvard Competition held recently at the Harvard Science Center.

Group members include: Kevin Leung, Jigar Bhalodia, Shivam Patel, Michael Zhou and Shawn Fong. The group’s advisor was Dr. Wade Trappe.

The participants, who were selected from a pool of more than 3,700 applicants, came from not only top universities across the United States (including nearby Massachusetts Institute of Technology and Yale), but seven countries as well.

At the Nov. 13-15 competition, teams vied for prizes that totaled more than $12,500. Designated a Major League Hacking hackathon, HackHarvard sponsors included Microsoft, Facebook, Capital One, Twitter, and Google.

The HackHarvard results were posted in the Microsoft Developer Blog and the Harvard Gazette. The group is planning to represent Rutgers at Microsoft’s global competition, Imagine Cup, as well as Microsoft’s Build 2016 conference at the Moscone Center in San Francisco.

Specifically, they handled designing the computer systems and software for the pod. In November 2016, RUMD Loop Team was one of the 115 teams that has progressed from the preliminary design round into the final design round. We are pleased to say that RUMD Loop Team as one of 22 teams has now advanced to the Build round of the competition and is heading to California this summer to test their design prototype at the world’s first Hyperloop Test Track.

On January 29-30, 2016 SpaceX hosted Hyperloop Pod Competition Design at Texas A&M University. Four Computer Engineering Department students took part in the competition as part of the combined Rutgers/Maryland (RUMD Loop Team), Michael Feinstein (Senior), Sheydas Hirday (Junior, team leader), Cedric Blake (Junior), Dominic Ok (Junior) helped design a robust, efficient design for a pod to be used in a Hyperloop tube, a low pressure tube that transports people at very high speeds, up to 215 mph.

RUMD Loop Team advances to the Build round in the Hyperloop SpaceX Competition

ECE student, Hajar Mahdavi-Doost wins Best Paper Award at COMSNETS 2016

The paper entitled “Efficient Downlink Scheduling in LTE-Advanced Networks” by ECE student, Hajar Mahdavi-Doost, with Dr. Narayan Prasad (NEC Labs America), received the best paper award at COMSNETS 2016, held January 5-9 in Bangalore, India.

Hajar (picture) was a PhD student, working under the supervision of Prof. Roy Yates on the design of efficient algorithms for energy harvesting and energy efficiency in communication systems. The award-winning paper was a result of Hajar’s internship at NEC Labs America.
This past summer, the Novice-to-Expert (N2E) Coding Club organized an outreach event for elementary and middle school students (ages 6 to 11) on July 16, 2016. The aim of the 3-hour workshop was to familiarize the students with basic programming concepts in a fun and interactive way. The students used Scratch, a kid-friendly programming language created at MIT (http://scratch.mit.edu/). It simplifies the programming concepts by providing an interactive block interface to design games, animations and stories.

The workshop took place in ECE computer labs on July 16, 2016 and was led by the student volunteer Parneet Kaur (graduate student), Anvita Patel (senior) from ECE and Grishma Shah (sophomore) from Mechanical Engineering. In all, 25 young students attended the event. After a brief introduction of programming in Scratch, students made a trivia game and a fun animation along with the instructors. The event was well received by the students with basic programming concepts in Java, C++ and Python. They will be organizing more workshops in Fall 2016.

More details are available at: www.facebook.com/groups/189455229795573/

### Shubham Jain’s research on Pedestrian Safety featured in Wall Street Journal

Shubham Jain is a PhD student in Prof. Marco Gruteser’s group at WINLAB. His work on ‘Pedestrian safety using smartphones’ was recently featured in the Wall Street Journal story titled “Texting While Walking Isn’t Funny Anymore” (http://on.wsj.com/1C0lWpt). The article points out her smartphone application that determines when someone using a phone is walking into an intersection. When you do, it momentarily locks the phone screen—and flashes a warning to look up.

### Technology distractions are having a negative impact on pedestrian safety in urban environments.

Pedestrians engaged in texting and playing games like Pokemon-Go become oblivious to oncoming traffic, thereby putting their own lives in danger. To this end, she has developed LookUp!, a solution that warns distracted pedestrians when they are potentially at risk. This technology uses shoe-based gradient profiling to learn the pedestrians’ surroundings and convey appropriate warnings. Look Up! has previously received the Large Organization Recognition Award at the AT&T Connected Intersections challenge. Shubham’s research interests lie in the design and development of mobile systems for enhancing traffic safety. She is investigating other smartphone sensors that can be used for pedestrian safety, such as cameras. She is also working on integrating her system into a smart city infrastructure that facilitates vehicle-pedestrian communication.

### Tong Wu Wins Best Student Paper Award

Tong Wu, a fourth-year PhD student in the Department of ECE and is being supervised by Prof. Wahneed Bajwa, has won the Best Student Paper Award at the 12th IEEE Image Video and Multidimensional Signal Processing (IVMSP) Workshop for his paper entitled “Clustering-aware structure-constrained low-rank representation model for learning human action attributes.” This work, which is a collaboration between Rutgers and Drs. Raghuvair Rao and Prudhvi Gurram at the Army Research Lab in Adelphi, MD, is expected to help robots autonomously interact with humans in their surroundings.

### Vidyasagar Sadhu working with Prof. Pompili wins a Center for Science of Information student research grant

ECE graduate student Vidyasagar Sadhu (working with Prof. Dario Pompili) and his multi-university team has won the Center for Science of Information (CoSI) student research project grant funded by the National Science Foundation (NSF). The year-long project, titled ‘Defending Large-Scale Distributed Machine Learning Against Adversarial Attacks’, is supported with an amount of $6,000 towards travel expenses. This student-led project, which is in collaboration with three other PhD students – Li Su (University of Illinois, Urbana-Champaign), Seyyed Fatemi (University of Hawaii, Manoa), and Rehana Mahfuz (Purdue University, West Lafayette), aims at developing novel algorithmic techniques that can contain/counter the effects of selfish agents/Byzantine attacks in a distributed machine-learning scenario.

By using magnesium-doped zinc oxide (MZO) as the channel material of a thin-film transistor, the transistor can operate at high voltage. This MZO thin-film transistor can be used for the solar inverter for photovoltaic systems with increased efficiency and reliability.

Filmmaker Charlie Chalkin came to Rutgers in the fall to film two videos on the ECE Department and students. The videos can be viewed online at http://goo.gl/a3Bz3r
Meet an ECE Student

By Jaimie Swartz

I am a senior majoring in Electrical and Computer Engineering and I am highly interested in power systems and smart grid technologies. Since 2015, I have been working as a researcher in the Laboratory for Energy Smart Systems (LESS) under Dr. Jafar (Industrial and Systems Engineering Department). Under advising of Dr. Jafar, I won 2nd place at the 2016 SWE Region 1 Conference Research Poster Competition. In addition, since 2015 I have been appointed as President of Society of Women Engineers - Rutgers Section and received Most Outstanding SWE Member and Governor’s Choice Award for the 29th Annual SWE-SWE-BET Career Fair which awarded by SWE Region Council. I was also selected for the Collegiate Leadership Institute, a special program within the 2015 SWE National Conference that offers professional development workshops for 60 student leaders from around the country. In 2016, I was also accepted into James J. Slade Scholars Program.

By Saﬁa Shaikh

I am a sophomore majoring in Computer Engineering and minoring in Computer Science. During the spring semester of my freshman year I started working with Prof. Laleh Najafizadeh in the Neuromaging and Integrated Circuits Laboratory. I started off researching Brain-Computer Interface (BCI) paradigms, which essentially provide a neural pathway for the human brain to interact with a computer program or robot in order to stimulate motor activity. This project piqued my interest due to its potential to solve many of the motor impediments to paralyzed or immobile patients. This summer, I worked with PhD student Tianjiao Zeng on an oral health related project. My interests cover intersecting areas of human-computer interaction for small flying drones. I also worked with Prof. Roy Yates and Waheed Bajwa, where I helped to process and analyze large statistical data sets and images in order to optimize control planning and acquire insights into the data. In addition to my research involvements, I served as the Professional Development officer of the engineering honors society, Tau Beta Pi, where I helped organize events to help current Rutgers students develop professional skills and advance job positions. I am working for LGS Innovations in the cybersecurity department, where my team and I develop products and perform security analysis and assessments for the government intelligence community. I enjoy cybersecurity since it requires me to understand complex technology systems and the human factors that can make a system insecure.

By Eric Wengrowski

I am a 25-year-old PhD student working on research problems in the areas of Computational Photography, Computer Vision, and Machine Learning. I am advised by world-class scientists Professor Kristin Dana, Prof. Marco Gruteser, and Prof. Narayan Mandayam. I have spent my entire academic career in the ECE department at Rutgers. I came here as a freshman in 2009 and graduated with a B.Sc. in Electrical and Computer Engineering in 2011 with a focus on robots and computer vision. Before coming to Rutgers, I grew up in the coastal community of Toms River, New Jersey. Like many students, I really found electrical and computer engineering to be extremely challenging. But scientific curiosity ultimately led me with a robust work ethic that has earned me success. The world-class research opportunities here at Rutgers ECE are truly inspiring. I am extremely grateful to have taken interesting courses with my three favorite undergraduate teachers who later became my PhD advisers. As an undergraduate, my ECE education armed me with internships at AT&T Research Labs and the U.S. Army Corps of Engineers. As a PhD student, I have had phenomenal summer internships at Microsoft Research in Redmond, a tech startup in San Francisco, and the computer vision research company Kiloware in New York. At Microsoft Research, I worked with many of the top scientists in the computer vision field to design algorithms for automated storytelling. At Kiloware, I collaborated with top scientists at universities like UC Berkeley, Dartmouth, and Columbia, and industry to work on design algorithms for image forensics. My work at Kiloware recently resulted in the paper “Mobile Application Development. As a PhD student, my research has been focused on invisible light-based communication called “Photographic Steganography.” My collaborators and I have documented our scientific contributions with papers like “Radiometric Calibration for Camera-Display Messaging,” “Photographic Steganography for Camera-Display Messaging,” and “High Rate Flicker-Free Screen-Camera Communication with Spatially Adaptive Embedding.” I have presented my published work at top-tier IEEE academic conferences like Computer Vision and Pattern Recognition (CVPR), the International Conference on Computational Photography, the Winter Conference on Applications in Computer Vision (WACV), and the International Conference on Computer Communications (INFOCOM). I have also worked with fabulous undergraduate students Reem Sipher and Joseph Boyle to create a ground-breaking Android app showcasing our research on Photographic Steganography. My PhD is currently funded with a research grant by Lodhee Matrin, where I am designing Deep Learning algorithms to classify objects based on their radar signatures.

By Gradeigh Clark

I am a PhD student advised by Prof. Jamme Lindqvist and funded by the 3-year National Defense Science and Engineering Graduate (NDSEG) fellowship, supplied by the United States Department of Defense and sponsored by the Air Force Office of Scientific Research (AFOSR). My research interests cover interesting areas of human-computer interaction and security. I have publications or ongoing research in the following subcategories of those two fields: authentication, cryptocurrencies, crowdsourcing, keyboard design, and usable security. My work on authentication and usable security focuses on trying to figure out how to innovate gesture passwords as a more usable, secure, and memorable unlocking method for mobile devices, with accomplishments being four publications in top venues (CHI, MobileSys) covering aspects from design of gesture recognizers to unique metrics for computing visual complexity of user-generated gesture passwords. I am interested in pushing the boundaries on innovating authentication methods made to fit the interaction environments of a 21st century society.

My accomplishments for cryptocurrencies is a first look publication on how people use and perceive Bitcoin, which revealed various misconceptions among groups about how Bitcoin operates and what it can be used for. Ongoing work in this area is on trying to compromise authentication keys from a hardware wallet built for Bitcoin using side-channel attacks. For crowdsourcing, I examine the design space of on-demand mobile workplaces – how services are created, what features they offer, and how they differentiate among themselves. My work on keyboard design issues on people teams and self-designed keyboards different from the standard QWERTY layout on mobile platforms.
Another exciting year in the ECE Capstone project design program has resulted in innovative ideas and inspiring concepts. Around 170 senior year students participated in this year’s program. The resulting 47 projects showcase a wide spectrum of skills, knowledge and technology mastered by our students. Projects ranging from the Ey3, a wearable electronics product that enables the use of a computer on any surface, to a distributed machine-learning test bed and the Herbiove, an autonomous robot that seeks to localize and exterminate weeds. IoT and autonomous vehicles inspired ideas addressed topics related to energy efficiency, smart homes, and more. This funding enabled the department to offer additional ‘seed’ money to projects competing for these resources.

A dedicated team of ECE faculty advisers supported the successful execution of the capstone program and the completion of top-tier projects. Setting projects milestones and deadlines for the teams along with budget constraints and the required presentations, reinforced working habits for students that will come useful in the workplace. In addition to the ECE faculty advisers, we would like to recognize the following advisers for their support: Dr. Anthony Tobia, Dr. Rich Howard, Dr. Pavel Ryzes, Dr. Saad Khan, Dr. Assimina A. Pelegri, Mr. Samuel Ramrajkar, Dr. A. Bhatchachjee, Mr. Michael Komitas, and Mr. Donald Bachman. The partnership with Lutron resulted in two capstone projects and this year was no exception. They faced the hard task of recognizing the best in a class from a large number of exciting projects. We would like to acknowledge and thank the judges that participated this year: Barry Novick (BlackRock), Stephen Willis (Spectrum Financial Partners), Ren-Fu Lo (Siemens), Kumar Ramaswamy ( Qualcomm Inc.), Thomas Davidson (DLB Associates), Manny Rodriguez (Lutron Electronics), Ali Zaringhalam (Juniper), Anand Bhagwat (JP Morgan Chase), Donald Bachman (Emerson), Teddy Brown (Verizon Wireless), Michael Komitas, Rutgers University and Nabi Naganathan (Anago Technologies). Collaboration with the 7x24 Exchange Metro New York Chapter produced a mobile, autonomous, monitoring platform for data centers. Donald Bachman, alumni of the Rutgers ECE Department, has been an active adviser on the project that resulted in another win at the yearly University Challenge competition.

THE TOP-TEN PROJECTS FOR 2016

**First Place Innovation Award** $600
(Sponsored by Siemens)
Project 022: “Ey3”
Team members: Ali Rahimi, Hammad Ajmal, and Rami Madbouly, Advisor: Dr. Nagmeh Karimi

**Second Place** $400
Project 033: “WUPIS: Wireless Utility Pole Integrity Sensor”
Team members: Patrick Coates, Patrick McLaughlin, Sam Baystring and David Arakelyan, Advisor: Dr. Dario Pompli

**Third Place** $300
Project 034: “Autonomous Vehicle Learning System (AVLS)”
Team members: Rahul Tandon, Robert W. Schultz, Frank Hoffman, Peter Cal and Luke Miller, Advisor: Dr. Kristin Dana

**Fourth Place**
Project 020: “SLAM Surveying on a Budget”
Project 034: “Autonomous Vehicle Learning System (AVLS)”

**Fifth Place**
Project 012: “Photovoltaic (PV) System Improvement and Thermal Electric Dissipation”
Team members: Oscar Guillen, Christina Baalkini and James Henriques, Advisor: Dr. Jaseek Jeon

**Sixth Place**
Project 033: "Project Guardian"
Team members: Jonathan Du, Paulo Usali and Peter Nguyen, Advisor: Dr. Mehdi Javanmard

**Seventh Place**
Project 027: “Digi-Sniffer Dog”
Team members: Kyle Ginter, Robert Stefanowicz, Justin Silang, and Ameer Barahim, Advisor: Dr. Hana Godrich

**First Place Impact award** $500
(Sponsored by 7x24 Exchange, NYC Chapter)
Project 031: “Distributed Machine Learning Test Bench with Raspberry Pi”
Team members: Nikhil Shennoy and Revan Sopher, Advisor: Dr. Anand Sanwate

**First Place Sustainability Award** $500
(Sponsored by Lutron) - $600
Project 043: “The Herbiove”
Team members: Samuel Stratzer, Robert Mars, Doreen Sparrow, MAE: Martin Liza, Adam Burrous, Jeremy Garrabrant, Robert Froster, Bhavya Patel, and Parth Patel, Advisor: Dr. Assimina A. Pelegri (MAE) and Dr. Hana Godrich

**Fourth Place**
Project 020: “SLAM Surveying on a Budget”
Team members: Kshitij Minhas, Cesar Castillo and Ashley Weaver, Advisor: Dr. Rich Howard

**Second Place**
Project 022: “Ey3”
Team members: Ali Rahimi, Hammad Ajmal, and Rami Madbouly, Advisor: Dr. Nagmeh Karimi

**First Place Impact award** $500
(Sponsored by 7x24 Exchange, NYC Chapter)
Project 031: “Distributed Machine Learning Test Bench with Raspberry Pi”
Team members: Nikhil Shennoy and Revan Sopher, Advisor: Dr. Anand Sanwate

**Third Place** $300
Project 034: “Autonomous Vehicle Learning System (AVLS)”
Team members: Rahul Tandon, Robert W. Schultz, Frank Hoffman, Peter Cal and Luke Miller, Advisor: Dr. Kristin Dana

**First Place Sustainability Award** $500
(Sponsored by Lutron) - $600
Project 043: “The Herbiove”
Team members: Samuel Stratzer, Robert Mars, Doreen Sparrow, MAE: Martin Liza, Adam Burrous, Jeremy Garrabrant, Robert Froster, Bhavya Patel, and Parth Patel, Advisor: Dr. Assimina A. Pelegri (MAE) and Dr. Hana Godrich

**Fourth Place**
Project 020: “SLAM Surveying on a Budget”
Team members: Kshitij Minhas, Cesar Castillo and Ashley Weaver, Advisor: Dr. Rich Howard
THE TOP-TEN PROJECTS FOR 2016

Eighth Place
Project 004: “WatchMe: Non-intrusive IoT Medical Wearable Apparatus”
Team members: Demetrios Lambropoulos, David Lambropoulos, Harsh Shah, Wanaia Long, and Yanie Myzyk, Advisor: Dr. Janeen Lindequist and Dr. Rich Howard

Students Favorite Award $200
Sponsored by Siemens
Project 001: “Smart Bicycle Helmet”
Team members: Jianjia Gao, Shuyu Lu, Ao Guo, and Xuan Li, Advisor: Dr. Hana Godrich

Lutron Appreciation Award $400
Sponsored by Lutron
Project 040: “Where RU? Conserving Energy by Visualization”
Team members: Mehum Salthota, Felix Yeung, Tyler Huey, and Sagar Patel

More details on the winners can be found at: http://www.ece.rutgers.edu/Projects2016

Emina Soljanin joined Rutgers ECE as a Full Professor last year. Before moving to Rutgers in January 2016, she was a (Distinguished) Member of Technical Staff for 21 years in the Mathematics Sciences Research of Bell Labs. She works as an information, coding, and more recently, queueing theorist. Her interests and expertise are wide. Over the past quarter of the century, she has participated in numerous research and business projects, as diverse as power system optimization, magnetic recording, color space quantization, hybrid ARQ, network coding, data and network security, and quantum information theory and networking. Dr. Soljanin served as the Associate Editor for Coding Techniques, for the IEEE Transactions on Information Theory, on the Information Theory Society Board of Governors, and in various roles on other journal editorial boards and conference program committees. She is a co-organizer of the DIMACS 2001-2005 Special Focus on Computational Information Theory and Coding and 2011-2015 Special Focus on Cybersecurity. She is an IEEE Fellow, member of AMS, AWM, and currently serves as a Distinguished Lecturer for the IEEE Information Theory Society.

Kristin Dana promoted to Professor
Kristin Dana, is a full Professor in Electrical and Computer Engineering Department at Rutgers University. She is the director of the Rutgers ECE Vision lab conducting research in computer vision, computational photography, machine learning, illumination modeling, texture and reflectance, bioimaging, motion modeling, estimation, optical devices, optimization, and robotics. She has authored over sixty peer-reviewed publications in the area of computer vision. She has served as corporate relations chair for IEEE CVPR, publicity chair for ICCV and CVPR, and area chair for several conferences including CVPR, ICCV, ECCV, WACV and ICPR. She was elected to the Rutgers University Senate in 2016. She is also a member of the Rutgers Center for Cognitive Science and a member of Graduate Faculty of the Computer Science Department. Dr. Dana received the PhD from Columbia University (NY,NY) in 1999 and the MS degree from Massachusetts Institute of Technology in 1992, and a BS degree in 1990 from the Cooper Union and NYU (NY,NY). She held student research positions at NYU robotics lab, the machine perception research group of Bell Laboratories, and the auditory physiology group at MIT. From 1992-1995 she was on the research staff at Samoff Corporation developing real-time motion estimation algorithms. She is the recipient of the CE Faculty of the Future Award, Samoff Technical Achievement Award (1994), National Science Foundation Career Award (2001) for a program investigating surface science for vision and graphics and a team member recipient of the Charles Pankow Innovation Award in 2014 from the ASCIE. Her outreach work includes K-12 activities such as MathCounts team coach and High Technology High School Advisory Board. Dr. Dana’s lab has leveraged her seminal PhD work on surface appearance for research funded over 16 years by the NSF ITR, and numerous industry partners in diverse fields such as dermatology, automotive, visible light communications, microscopy and robotic inspection.

New Faculty
Hana Godrich Appointed ECE Undergraduate Director
Assistant Professor Hana Godrich has taken on the role of ECE Undergraduate Director. Since joining the department in 2013, Dr. Godrich has played an active role in the undergraduate program in terms of education and research. Since joining Rutgers Dr. Godrich has designed and taught new courses in power systems, smart grid and sustainable energy. In 2014 she was awarded the Best Teacher Award for Electrical and Computer Engineering Department by the Rutgers Engineering Governing Council. Dr. Godrich took on capstone course organization in Fall of 2014, focusing on enhancing students’ hands-on experience and increasing industrial collaboration. The program has generated over 90 projects in the last two years with interdisciplinary collaboration and industry sponsorship of $37K. In addition, she has been involved with undergraduate research and students advising.

Before joining Rutgers Dr. Godrich was a postdoctoral associate at Princeton University and previously has had rich industrial experience performing research and development as well as project management and team leadership. She received her Ph.D. in Electrical and Computer Engineering from New Jersey Institute of Technology in 2010, her M.S. in Electrical Engineering from Ben-Gurion University in 1993 and her B.S. degree from Technion Institute of Technology in 1987.

H. Godrich

Assistant Professor Hana Godrich has taken on the role of ECE Undergraduate Director.
Rutgers leads a DHS initiative on Privacy-Preserving Practical Smartphone Security

Smartphones are increasingly used in a variety of roles with widely differing data-protection requirements ranging from the access of sensitive content to the production and sharing of personal content via online social networks. The increasing popularity of these devices has recently attracted adversarial parties. The number of complex and fast-spreading privacy and security attacks has grown significantly during the last few years. A team of researchers from Rutgers Electrical and Computer Engineering (ECE) Department were selected by United States Department of Homeland’s Security (DHS) to develop novel cybersecurity techniques and theoretical algorithms against adversarial misbehaviors. The team consists of Profs. Saman Zonouz and Dario Pompili, and Ph.D. students Vijaykumar Sadhu and Gabriel Salles-Loustau from Rutgers ECE. Following a successful demonstration of a solid working prototype of the solution (SWIRLS) and the corresponding research publications and presentations, the research team is currently working on technology transfer aspects of the project in parallel to the proposed the research tasks during the second year of the project.

Today, the only line of defense against accidental or malicious sensitive data leakage is through isolation of execution environments, e.g., virtualization-based techniques that provide separate virtual phones that run on the same hardware but are otherwise completely isolated. However, the development and maintenance of multiple such environments is burdensome for both content owners and users. Content owners are burdened by having to develop apps for the sole purpose of enforcing data protection when, otherwise, a third-party app, perhaps with better functionalities, might have sufficed. These apps often leak in slipshod containers and are unable to access services provided by the rest of the mobile platform for fear of information contamination. For users, these multiple environments present a fragmented and often inconsistent experience that increases cognitive effort.

Finally, in cases where system resources such as camera, microphones, or location are concerned, container-based approaches fail entirely. SWIRLS provides a flexible data-flow isolation architecture for mobile operating systems that uses dynamic information flow tracking and cryptographic policy enforcement technologies to isolate data instead of execution environments. SWIRLS provides formal methods capabilities to selectively guarantee the trustworthy usage of mobile phones without worrying about potential data leakage and unauthorized sensitive data access by third parties. Consequently, Government and enterprise personnel could use their devices for various purposes involving sensitive data with different security requirements while SWIRLS controls the data-flow and access through the system in a very fine-grained manner and with negligible overhead. In addition to collaborative academic publications and presentations by the research team, as a part of this effort, Gabriel Salles-Loustau discovered a severe security vulnerability in Google Android-operating systems that are used by billions of mobile devices in the world. Following the standard responsible disclosure procedures with Google, Gabriel was awarded $10K reward by Google, and the Rutgers ECE Department is recognized on the Google Hall of Fame portal.

Robust Estimation of Multiple Inlier Structures

Modern computer vision has moved from the labs and into real-world applications. Future technologies that are being built with a computer vision foundation include automated driving, augmented reality and robot navigation. None of these future trends can come to fruition safely without solid robustness to handle the variations of real world illumination, motion and unexpected visual interferences. The underlying algorithms must be developed with robustness to noise and outliers. The inlier points, which are close to the true model but corrupted by noise, have to be first separated from the outliers in the background. The scale of the structure, indicating the range of its inliers, is the critical parameter for the classification. For the past 35 years the robust recovery has been mostly done with RANSAC (Sample Consensus RANSAC), which returns the maximum number of inlier points within a user-specified scale. The scale in RANSAC is a heuristic parameter and can lead to problems if not predicted accurately, or in the presence of multiple structures with different scales. Prof. Peter Meer, a pioneer in computer vision and recipient of the 2010 IEEE Langmuir-Higgins prize, and his PhD student Xiang Yang have developed a new algorithm for robust estimation that first adaptively computes the scale from the input data instead of an empirical user-given prior, followed by the estimation of the current structure. It provides a fast implementation, stable performance and can segment multiple structures existing simultaneously inside the input data. A 2D homography estimation where planes in two images are correlated, is shown as an example. From all the points in the left image, five plane correspondences shown in 5 different colors are recovered.

ECE Faculty Host “Role of Engineering in 21st Century Healthcare”

The Rutgers ECE Department, under the leadership of Prof. Waheed U. Bajwa, organized the Johns Hopkins Center for Talented Youth Program at Rutgers University on the “Role of engineering in 21st century healthcare” for students in grades 7–12 in April 2016. This event was attended by a total of 75 participants, who interacted with some of the leading researchers at the intersection of engineering and healthcare, and who also got an opportunity to understand the workings of some of the devices that play/ will play role in the delivery of 21st century healthcare. ECE faculty who were instrumental in making this event a success included Profs. Dana, Najafizadeh, and Sarwate.

Rutgers is playing a key role in designing critical controller device-level resilience solutions as a part of the DOE-initiated Cyber Resilient Energy Delivery Consortium (CREDIC)

CREDIC, a $28.1 million consortium supported by Department of Energy (DOE), is advancing security and resiliency in the cyber support infrastructure as a key enabling of Energy Delivery System (EDS) resiliency. The cyber security of EDS delivery systems, such as power grids and oil and gas (O&G) refinery and pipeline operations, has been the subject of media attention and been addressed in legislation, standards, and executive actions. However, there is growing awareness that we must also explicitly ensure cyber resilience in order for an EDS to maintain critical functions in the presence of disruptive events, in particular those arising from attacks on the cyber infrastructure.

CREDIC consists of 11 universities and national laboratories from Argonne National Laboratory, Arizona State University, Darmouth College, the Massachusetts Institute of Technology, Oregon State University, the Pacific Northwest National Laboratory, Rutgers University, Tennessee State University, the University of Houston, and Washington State University. The team is addressing project objectives through research and development activities and the partner institutions, working in close collaboration with industry (utilities, O&G asset owners, and equipment vendors). The CREDIC model explicitly creates a pipeline that generates research results and takes them through evaluation and deployment phases in industrial settings, with a handoff to the sectors through licensing, startups, and open-source mechanisms. CREDIC is impacting foundational science and engineering approaches to EDS cybersecurity and resiliency, will impact practice through provisioning of industry-vetted solutions to near-term and far-term problems, and will impact the practice of education and workforce training in EDS cybersecurity and resiliency.
Discovering the Dynamics of Human Brain Function

The human brain is a highly complex dynamic system, constituted by interdependent subsystems with elements that are subjected to various types of time-varying interactions. Achieving a complete understanding of how the anatomical structure of the brain supports a diverse range of functional interactions is a fundamental challenge. Functional brain networks, however, exhibit complex structures across space and time scales. For example, neural functional connections are continuously changing at multiple time scales. These changes can occur at very short scales (e.g., due to learning a simple task), or at relatively longer scales (e.g., due learning complex concepts or brain-related diseases such as Alzheimer’s). Given the limitations each neuroimaging technique in terms of spatial and temporal resolutions, to uncover such dynamic properties of brain functional networks, new computational and experimental techniques should be developed.

Professor Najafizadeh and her students are experimenting with new methods to investigate the functionality of the human brain at different spatial (e.g. single neurons, cortical circuits) and temporal (e.g. milliseconds, neuronal responses, slow hemodynamic responses) scales. Outcomes of these studies have led to the knowledge that human cognition arises from patterns of neural activity forming functionally distinct networks across the brain, which are ultimately coordinated via the brain’s anatomical structure, setting the motivation to investigate the functionality of the brain at the network level, within the context of functional connectivity.

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Summer internships provide students a chance to explore ideas and develop new skills outside of the classroom, as well as have fun. With this in mind, the WINLAB summer internship program designs a collection of projects that builds on those ideas, with an eye to the lab’s areas of interest in wireless technologies.

This year, the program founded by Ivan Seskar, Associate Director of Information Technology at WINLAB, and which is in its 14th year of existence, hosted 49 students (14 high school, 19 undergraduate, and 16 graduate) who came together to tackle problems in areas such as Sensor Networks, Augmented Reality, and Software Defined Radios. All told, there were 18 project teams this year. Many teams found themselves working on projects that dovetailed with those of others, in keeping with the program’s goal of providing students with real-world, team-based research experience.

Each week, the students gathered together to report on their progress, answer questions from fellow students and WINLAB faculty, and get advice on how to solve their most pressing problems. “Though we were each assigned a topic to work on, we always felt welcome to discuss, collaborate and involve ourselves in other projects,” says Siddharth Rupavatharam, a graduate student at Rutgers, “It was the right mix of fun and work.”

It seems as though they certainly did have fun. Between building robotic butlers, detecting the number of people in a room using a variety of sensors, recreating a popular video karting game in virtual reality (and relying on the simulation to drive a real-world kart), and more, this year’s summer internship program was at its busiest ever, filling all available spots in the program.

The application process resulted in a collection of students from different backgrounds, and even different countries. “The exposure to such a wide range of interests was priceless,” Rutgers undergraduate Michael Sanzari says, “I often learned more over lunch than I could in a semester’s worth of classes.”

“There’s a lot of accumulated wisdom in the lab, and it’s always interesting to watch the interns encounter it. When students come ask for help, Ivan’s particularly good at separating the interesting or educational problems from those that are either impossible, or boring and already solved,” says Michael Sherman, a laboratory engineer at WINLAB, “For both cases, he points them to someone who’s made a career out of the area. For example: every year a group tries to do RSSI based localization, and they get sent to Prof. Rich Howard (formerly of Bell Labs) to be told why it won’t work, and things to try instead.”

It’s an observation echoed by students and peers as well. Kush Oza, another Rutgers undergraduate, had this to say after completing the program: “Students can pursue research topics pertaining to their interests as well as develop teamwork, leadership, and presentation skills under the guidance of great professors and mentors such as Ivan Seskar.”

Professor Roy Yates also confirms this, “While many of the projects are associated with ongoing faculty research, students know that Ivan will point them toward solutions to their problems.”

Discovering problems in the middle of research is arguably traditional, and in this setting instructive. Regardless, the students kept working through them, occasionally celebrating small victories over the course of the internship.

The program supported in part by NSF Research Experiences for Undergraduate (REU) funding, culminated on August 17th with an Open House at the WINLAB Tech Centre with over 100 visitors. On this occasion, a presentation by Christopher Pflaum of the Rutgers New Ventures Office of Research Commercialization was followed by demos and posters presented by the Summer Research students.

When all’s said and done, the success of the internship program depends on the students. In the words of Kush Oza: “I would definitely do research at Winlab again next summer given the opportunity.”
Professor Shantenu Jha invited to White House Workshop on National Strategic Computing Initiative

The White House invited Professor Shantenu Jha to attend a workshop held on the one year anniversary of the National Strategic Computing Initiative (NSCI). The NSCI, an Executive Order of the President of the United States, is a whole-of-Nation effort to sustain and enhance U.S. leadership in high-performance computing (HPC). The NSCI seeks to accomplish five strategic objectives in high-performance computing and its application to computational science.

As part of this initiative, Dr. Jha will study "Structured Sparse and Low-Rank Representations for Multimodal Recognition". The total award is $500,684 and its duration is three years.

The goal of Dr. Jha’s project is to develop robust and efficient methods for learning structured representations of multimodal data. In particular, this will develop methods for multimodal metric learning and multimodal data fusion based on sparse and low-rank representations.

The Office of Naval Research awarded the ONR YIP to 47 scientists whose exceptionally creative research holds promise across a range of naval-relevant science and technology areas, from robotics to solar cells. Awardees represent 34 academic institutions across the country, in disciplines including optoelectronics, corrosion, biomaterials, semiconductor device physics, dynamics, combustion, ocean-atmospheric interactions, metamaterials, energetic materials, active flow control, efficient computing, foodborne diseases, and warfighter training.

ECE Bitcoin Study Reveals False Beliefs on Ease of Use and Privacy

Prof. Janne Lindqvist’s group published a study on Bitcoin that received attention worldwide. This first of a kind peer-reviewed study “Of Two Minds, Multiple Addresses, and One Ledger: Characterizing Opinions, Knowledge, and Perceptions of Bitcoin Across Users and Non-Users” was formally published in May 2016 at the annual Association for Computing Machinery’s Conference on Human Factors in Computing Systems (CHI 2016). CHI is the premier international conference on human-computer interaction, the most prestigious publication venue in the field. Prof. Lindqvist authored the study with two PhD candidates in his group, Xianyi Gao and Gradeigh D. Clark.

The major findings of the study included:

1) although some non-users thought not knowing how Bitcoin works was what stopped them from using it, we found our users did not need this knowledge to make transactions;
2) most user participants thought Bitcoin had good security and privacy controls despite evidence to the contrary; 3) participants highly disapproved of government regulation but still wanted governments to insulate deposits; 4) participants’ opinions about attributes of an ideal payment system map directly to properties that Bitcoin has; and 5) Bitcoin has barriers to overcome that make it difficult to be used for mainstream adoption.

Over 100 websites featured the study, first published in Rutgers Today Top Stories. In addition to usual science websites, prominent finance and investment sites such as Yahoo! Finance, Morningstar and IBS Intelligence included coverage.

The preprint (published in the Social Science Research Network (SSRN) preprint service) was featured in length in a European Parliament study “The Collaborative Economy - Impact and Potential of Collaborative Internet and Additive Manufacturing”, and was during 2015 among the top downloads in SSRN for categories such as “IRPN: Innovation & Finance (Topic)” and “LSN: Consumer Credit & Payment Issues (Topic).”

Professor Vishal Patel’s Mobile Face Detection in the News

Prof. Vishal M. Patel’s recent work on mobile face detection and recognition is making the news. His research work was featured on ZDNet, the business technology news website owned by CBS Interactive.

Dr. Patel’s group, working with researchers at University of Maryland and Google’s Advanced Technology and Projects (ATAP), developed a method to use the cellphone’s front camera to continuously authenticate users when they are logged into bank or email accounts.

Dr. Patel’s group developed a part-based technique for real-time detection of users’ faces on mobile devices. The proposed method is specifically designed for detecting partially cropped and occluded faces captured using a smartphone’s front-facing camera for continuous authentication. The key idea is to detect facial segments in the frame and cluster the results to obtain the region which is most likely to contain a face. Dr. Patel’s work in collaboration with University of Maryland researchers Dr. Rama Chellappa and Dr. Rajeev Ranjan has resulted in created an invention named “HyperFace”, which won the 2015 Invention of the Year Award in the Information Sciences category at the University of Maryland. The Office of Technology Commercialization at the University of Maryland gave this award.

HyperFace is an algorithm that simultaneously detects faces, finds facial landmarks (including eye center, nose tip, etc.), estimates the head pose, and recognizes their gender from any real-world images and videos. In applications include automatic face tagging, mobile active authentication, automatic monitoring through surveillance cameras, face identification, effective computing, and expression analysis for medical applications, such as automatic pain and fatigue detection, facial emotion analysis, and many more. The Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA) has provided funding and support for the project.

Figure 1: The face detection system was tested using face video from the front-facing camera of an iPhone users in different illumination conditions.

Figure 2: Sample results from HyperFace.
Rutgers is playing a key role in a new NSF scientific software initiative

Highlighting the importance and challenge of sustainable and scalable software in the scientific discovery process, the US National Science Foundation recently announced the establishment of a Scientific Software Innovation Institutes for Molecular Sciences. Dr. Shantenu Jha, Associate Professor in ECE is a co-PI and the lead Computing Faculty on this ambitious 5 year $20M NSF award. ECE is a co-PI and the lead Computing Faculty on this ambitious 5 year $20M NSF award. Dr. Jha leads the Scientific Software Innovation Institute (MolSSI) which is one of only two Software Institutes funded by the NSF and represents some of the most innovative and daring investment in cyberinfrastructure in decades by the NSF. As part of this initiative, Prof. Jha will be responsible for the (i) software engineering process, (ii) middleware upon which MolSSI supported science and codes will depend, and (iii) deployment and integration with NSF production infrastructure.

Figure 1 (left) Some parts of the p53 protein take on a defined structure (gray model) while other regions remain disordered in the unbound state. (Right) Disordered-protein region can become structured upon binding with another protein (images adapted from Tompa, P and Dyson, H. J et al).

Shantenu Jha wins Chancellor’s Award for Excellence in Research

Prof. Weahed U. Bajwa selected for National Academy of Engineering Frontiers Symposium

Prof. Weahed U. Bajwa was selected as a Member of the Class of 2015 National Academy of Engineering (NAE) Frontiers of Engineering Education Symposium. According to the NAE, the purpose of this symposium is to “bring together some of the nation’s most engaged and innovative engineering educators in order to recognize, reward, and promote effective, substantive, and inspirational engineering education.” Prof. Bajwa was selected among this prestigious group of academics in recognition of his efforts for enabling flipped classroom experiences in large-scale settings.

ECE Professor Richard Freknel has been named Fellow of the National Academy of Inventors

The National Academy of Inventors announced its 2015 fellows Dec. 15. They include 168 inventors who collectively hold more than 5,300 U.S. patents. This year’s class brings to 583 the number of NAI fellows, including 310 members of the National Academy, 32 recipients of the U.S. National Medal of Technology and Innovation and 27 Nobel Laureates.

Freknel, who is a cellular pioneer recognized for his contributions to establishing the world’s first cell phone networks, earned a master’s degree in engineering mechanics from Rutgers in 1965. He joined Bell Labs in 1963 and quickly became involved in the design of cellular systems, which he worked on for 16 years. He co-authored the technical report on cellular that AT&T submitted to the FCC in 1971, which became the basis for the first cellular systems. For his work in cellular and cordless, Freknel received the IEEE Alexander Graham Bell Medal in 1987, the Achievement Award of the Industrial Research Institute in 1992, the National Medal of Technology from the president of the United States in 1995 and the Diaper Prize in 2013. He was named N.J. Inventor of the Year in 1995 and was elected to the National Academy of Engineering in 1997. He received the Rutgers University Alumni Association’s Engineering Achievement Award in 2004. After the commercialization of AT&T’s first cellular system in Chicago, Freknel moved into consumer electronics, becoming head of R&D for AT&T’s cordless telephone business and leading the team that designed a series of cordless telephones that set a new standard of voice quality with improved battery life and security, moving cordless telephones from unreliable gadgets to useful telecommunications devices. Following 30 years at AT&T, Freknel joined WINLAB (the Wireless Information Networks Laboratory) at Rutgers in 1993, where he serves as senior advisor and also teaches an interdisciplinary course in wireless systems and strategic thinking. Freknel served two terms on the Township Committee of Manalapan Township in N.J. and was mayor of Manalapan in 1999.

Professor Athina Petropulu has been named a Distinguished Lecturer of the IEEE

Prof. Athina Petropulu has been named a Distinguished Lecturer of the IEEE Signal Processing Society for the term January 1, 2017 to December 31, 2018. IEEE Distinguished Lecturers are engineering professionals who help lead their fields in new technical developments that shape the global community. These experts specialize in the field of interest of their society and travel to various technical and regional groups, such as society and technical council chapters to lecture at events. In this role, Professor Petropulu will deliver lectures worldwide on the topics of sparse sensing based MIMO radar, coexistence of radar and communication systems, cooperative approaches for physical layer security, cooperative approaches for improving the performance of wireless communication and more.

Vishal Patel selected for the A. Walter Tyson Assistant Professorship Award

Prof. Vishal M. Patel has been selected for the A. Walter Tyson Assistant Professorship Award. The Tyson fund, established by A. Walter Tyson, a 1952 alumnus of the School of Engineering, is used to recruit promising junior faculty. Funds made available through the generosity of the Tyson Family are used to offset the School’s investments in talented young faculty. With this award, funds will be used toward the School commitments that were made toward Professor Patel’s startup package.

WINLAB Faculty Win Best Paper Award

Researchers from WINLAB have won best paper awards at multiple conferences in the past year. The paper entitled “Coordinated Dynamic Spectrum Management of LTE-U and WiFi Networks” by the WINLAB team led by Prof. Dipankar Raychaudhuri and Wade Trappe won the best paper award at IEEE DySPAN 2015 conference held in Stockholm. Shweta Sagare (ECE PhD student) was named as the first author, and the other authors are Samuel Baysting, Dola Saha, and Ivan Seskar.

IEEE DySPAN is the premier conference on spectrum policy and technology and is sponsored by NSF and several communications companies. The team of Anand Garnaev (WINLAB Research Scientist), Shweta Suresh Sagare (ECE/WINLAB student) and Prof Wade Trappe (ECE/WINLAB) also received the best paper award at the Multi Access Networking Conference (NACOM 2015) Workshop held in Helsinki for their paper “Fair Allocation of Throughput under Harsh Operational Conditions”.

Rutgers News | Rutgers School of Engineering | Department of Electrical and Computer Engineering
For his work, Dr. Rabiner has enjoyed a long list of honors:

- Acoustical Society of America Fellow, 1970
- Paper Award of IEEE on Audio and Electroacoustics, 1971
- ASA Biennial Award, 1974
- IEEE Fellow, 1976
- IEEE ASSP Achievement Award, 1978
- IEEE Pioneers Award, 1990
- IEEE ASSP Society Award, 1980
- Election to National Academy of Engineering, 1983
- IEEE Centennial Award, 1984
- AT&T Bell Laboratories Fellow, 1989
- Election to National Academy of Sciences, 1990
- Speech Processing Magazine Award of the IEEE, 1994
- AT&T Patent Award, 1995
- AT&T Fellow Award, 1996
- IEEE Millennium Medal, 1999
- IEEE Kibby Medal, 1999

During his career at Rutgers, Professor Rabiner educated hundreds of students in advanced signal and speech processing methodology. In addition, he published a landmark textbook (with his colleague Ron Schafer) that was widely used as the technical sides of speech processing systems. This textbook has been well-received in the technical and academic communities and is used as the basis of speech processing courses throughout the world.

For more information about Professor Lawrence Rabiner’s career, please visit the Rutgers ECE website.

For more information about the AT&T Foundation, please visit their website.

For more information about the AT&T Fellowship Program, please visit their website.

For more information about the AT&T Alumni Network, please visit their website.

For more information about the AT&T Alumni Center, please visit their website.

For more information about the AT&T Alumni Association, please visit their website.

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For more information about the AT&T Alumni Student Leadership Program, please visit their website.

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Multiple Temporal Scales”. (Department of Cell Biology and Neuroscience)
Research: Foundations of Prosumer-Centric
$100K for “EAGER: Renewables: Collaborative
Psychology) received an NSF EAGER Award of
Narayan Mandayam
$300K from the NSF for project “Enhancing
Suite to Enhance Army’s ISTAR Capabilities and

Dr. Najafizadeh
received $250,000 from
Department of Electrical and Computer Engineering
Dr. Bajwa
received a $344,942
School of Engineering
Arnold Glass
received a 5-year grant of
amount is $500,000 for 3 years.

Dr. Najafizadeh and David Margolis were part of a team with Janet Adler
(Neuroscience and Cell Biology) and received a grant of $340,000 from New Jersey
Commission on Brain Injury Research for a project titled “Role of Cortical Network Plasticity in
Recovery from Traumatic Brain Injury.”

Vishal M. Patel received an NSF award of $249,152 for the project titled “Sparse and Low Rank Methods for Imbalanced and
Heterogeneous Data.” This is a two year collaborative effort between Dr. Patel and
The Johns Hopkins University.

Also, Dr. Patel received a 3-year grant of $327,127 from ARO for the project titled “Adaptive Sparse and Low-Rank Models for Real-World
Visual Recognition”.

Dipankar Raychaudhuri, Roy D. Yates, Yaming Zhang, Wade K. Trappe, Richard P. Martin received supplemental funding in the
amount of $598,451 for NSF-NP Collaborative Research. The Next-Phase MobilityFirst Project - From Architecture and Protocol Design to
Advanced Services and Task Deployments. The award, with this amendment, now totals $2,899,858.

Anand Sarwate received a 5-year grant from DARPA for project entitled, “Tera: Ensuring Secure, Private and Flexible Data Access”.

Also, Dr. Sarwate received an award of $125K from the Department of Homeland Security (DHS) for the project “Differentially Private Anomaly Detection”.

Dr. Sarwate and Mandayam (co-PI) received NSF grant from the Secure and Trustworthy Cyberspace (SaTC) program. The title of the project is “PERMIT: Privacy-Enabled Resource Management for Iot Networks” and the award amount is $500,000 for 3 years.

Wade Trappe received 8-month contract with initial budget of $71,335 from The Space
and Terrestrial Communications Directorate (SATCOM) of the U.S. Army. Team will support
the Army’s development of a next generation tactical
waffeform.

Also, Dr. Trappe, in collaboration with
Mayflower Inc, received a Phase 1 STTR from the US Air Force for a project titled,
“Collaborative Situation Aware PNT (CSAP) Solution”. This is a 6-month contract with award of $50K.

Saman Zonouz received a grant of $600K from the Department of Energy for the project
“Cyber Resilient Energy Delivery Consortium”. This is a joint grant with MIT, OSU, UBC, TSU, WSU, Dartmouth, ANL, PNNL, ASU. The total budget is $22M for 5 years.

Professor Shanthu Jha is the lead PI on a 3 year NSF award for $1.25M on a project titled,
“The Power of Many: Ensemble Toolkit for Earth Sciences”. This is a three way collaborative project between Rutgers, Penn State University and Princeton. In this project, Dr. Jha will work with Michael Mann (https://en.wikipedia.org/
/wiki/Michael_E._Mann) a distinguished Climate Scientist at Penn State and Guido Cernone to advance high-performance computing based methods for the analysis of CMIP5 data. Dr. Jha will also work with Jensen “Jomp” and others at Princeton to help advance computational modelling capabilities of Seismic Inverse Problems and thus seismic hazard assessment. This award is funded as part of the NSF EarthCube Program which is a joint solicitation between Advanced Cyberinfrastructure and Geosciences.

Dr. Dror Comaniciu
has been named the recipient of the 2016 Rutgers SOE “Distinguished Alumnus Research & Education Award.” Dr. Comaniciu is currently Vice President, Medi-
cal Imaging Technologies, Siemens Healthcare. Before that, Dr. Comaniciu directed Siemens research and development in medical imaging and computer vision for 12 years, being responsible for more than $250M of R&D projects, and contributing to the company’s success in the field of healthcare. At Siemens Healthcare, one of the largest global suppliers to the healthcare industry, Dr. Comaniciu and his team pioneered the first automated algorithms to guide minimally invasive, catheter-based
heart valve implantations. The new technology called Marginal Space Learning reconstructs in real-time the para-valvular leak around
aortic valve implant and mitral valve repair. eSie Valves is the first clinical application
that allows joint real-time 3D visualization of the heart valves anatomy and blood flow.

Furthermore, Dr. Comaniciu has established the theoretical basis for machine learning-based whole body image analysis and led the development of highly innovative automated imaging algorithms and subsequent diagnostic products. His work concentrated on volumetric measurements of internal organs and vessels, and characterization of tumors and lymph nodes, coronary plaque, and structural heart disease. The new products are used daily worldwide, making a difference for millions of patients, increasing the quality of healthcare while reducing its cost. For example, one year after its release, the CT Bone Reading has been installed in 147 hospitals in 65 countries and applied to more than 40,000 patients, being used daily to diagnose bone pathologies.

During his early career and building upon his graduate work at Rutgers under the supervision of Prof. Peter Meer, Dr. Comaniciu introduced a new family of robust methods for image analysis, based on the iterative procedure Mean
Shift. Mean shift analysis, Variable bandwidth mean shift, and Kernel-based Tracking are among the highest cited non-parametric methods in the imaging and computer vision literature, e.g., most cited IEEE Transactions on Pattern Analysis and Machine Intelligence paper published since 2002 and 7th most cited of all time, often often taught as part of graduate courses. Kernel-based Tracking introduced object tracking based on feature histograms representations with a metric derived from the Bhattacharyya coefficient as similarity measure. Due to its robustness and impact in computer vision, the work has been awarded the 2010 IEEE Longuet-Higgins Prize for “Fundamental Contributions in Computer Vision”. The mean shift algorithms have been deployed into multiple medical and industrial systems. Dr. Comaniciu is one of the highly cited authors in imaging and computer vision, his 300 publications generating more than 28,000 citations according to Google Scholar. He is also a prolific inventor, being granted 202 US and Internation-
al patents. A graduate of the Advanced Management Program at the University of Pennsylvania’s Wharton School (2011), Dr. Comaniciu received a doctorate in electrical and computer engineering from Rutgers University in 1999 and a doctorate in electronics and telecommunications from Polytechnic University of Bucharest in 1995. He is a Fellow of the IEEE, the Medical Image Computing and Computer Assisted Intervention Society, the American Institute for Medical and Biological En-
ing, and a Top Innovator of Siemens.

Class of 2016 Yulong Yang joins Uber
Yulong Yang joined ECE of Rutgers in 2011. His research area mainly focuses on security, but overlaps with mobile computing and human computer interaction. Yulong received his Ph.D. in 2016. His thesis is titled “Usable Security: Human Factors in Mobile Authentication”, advised by Prof. Janne Lindqvist. His research was funded by the National Science Foundation. Yulong has publications in premier peer-reviewed ACM conferences, including CHI, Mobilities and Ubicomp. During his research, he was also a member of WINLAB at Rutgers. He interned at Amazon in the fall of 2015, and Uber in the winter of 2015. Yulong Yang is currently a software engineer with Uber Technologies, Inc. in San Francisco.
My experience at Rutgers ECE
By Revan Sopher, Class of 2016 and a Software Engineer at Google

Choosing Rutgers was probably the best decision I made senior year of high school. The peculiar thing about the tech industry is that employers care about what a candidate knows, not which school they attended—certainly more so than in business or law, but also more than in more "traditional" engineering fields. I was confident that I could achieve my goals no matter which university I chose, so I couldn’t justify paying the high prices of the "elite" schools. As an in-state student, Rutgers was a fantastic value—the scholarships only made the choice easier.

At the time, I was unsure whether I wanted to follow an academic or industry career path: the former would involve undergraduate research and careful GPA planning to prepare for graduate studies, while the latter would entail internships and the self-driven study of practical skills. Fortunately, Rutgers afforded me the luxury to straddle the divide, pursuing both directions through senior year as I continued my soul-searching.

During semesters, I had the opportunity to contribute to a biomedical research project on stroke rehabilitation using smartphones, and to a computer vision research project on transmitting hidden messages using light (funded by NASA’s NJ Space Grant Consortium). During summers, I interned at a nutrition app startup in New York, and at an online university course startup in Silicon Valley.

My advice to current students, then, is to muster up the drive to take advantage of the opportunities available at Rutgers. There’s an excellent Computer Science undergrad community which regularly holds workshops, events, and "hackathons" competitions to help beginners pick up essential skills and prepare for technical interviews. And as a large research university, there’s an abundance of projects which would appreciate the contributions of a programmer, if you only reach out to the professor. My advice to prospective students, hesitating between Rutgers and pricier private options, is to believe in your ability to develop yourself and shape your career. With motivation, you can achieve as much at Rutgers as at any Ivy.

Dr. Ulukus, who was advised by Prof. Roy Yates at Rutgers, was named a Distinguished Scholar-Teacher of the University of Maryland in 2016. She received the 2003 IEEE Marconi Prize Paper Award in Wireless Communications, the 2005 NSF CAREER Award, the 2010-2011 ISR Outstanding Systems Engineering Faculty Award, and the 2012 ECE George Corcoran Education Award. Dr. Ulukus is on the Editorial Board of the IEEE Transactions on Green Communications and Networking (2016–) and IEEE Journal on Selected Areas in Communications – Series on Green Communications and Networking (2015–2016). She was an Associate Editor for the IEEE Transactions on Information Theory (2007–2010) and IEEE Transactions on Communications (2003–2007). She was a Guest Editor for the IEEE Journal on Selected Areas in Communications (2015 and 2008). Journal of Communications and Networks (2012), and IEEE Transactions on Information Theory (2011). She is a general TPC co-chair of 2017 IEEE ISIT, 2016 IEEE Globecom, 2014 IEEE PIMRC, and 2011 IEEE CITW.

Ulukus is a Professor of Electrical and Computer Engineering at the University of Maryland at College Park, where she also holds a joint appointment with the Institute for Systems Research (ISR). Prior to joining UMD, she was a Senior Technical Staff Member at AT&T Labs Research. She received her B.S. and M.S. degrees in Electrical and Electronics Engineering from Bilkent University. Her research interests are in wireless communications, information theory, signal processing, networking, information theoretic physical layer security, and energy harvesting communications.

The Advisory Board provides input on academics, research, administration, outreach, advocacy and development. The Board reviews the graduate and undergraduate curriculum and degree programs, program educational objectives, and program outcomes, and offers suggestions to keep them current. The Board evaluates the quality and scope of our research, its relationship to our programs, its relevancy and helps guide future directions. The Board recommends ways to build new relationships with industry and to strengthen those we have.

Sennur Ulukus
Elevated to IEEE Fellow

Sennur Ulukus, a 1998 Ph.D. graduate of WINLAB, Department of Electrical and Computer Engineering, Rutgers University, has been elevated to Fellow of the Institute of Electrical and Electronics Engineers (IEEE) "for contributions to characterizing performance limits of wireless networks," effective Jan. 1, 2016.

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