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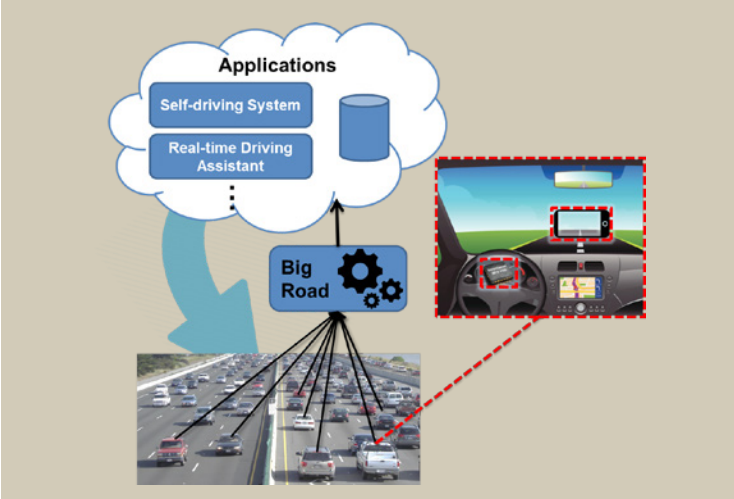
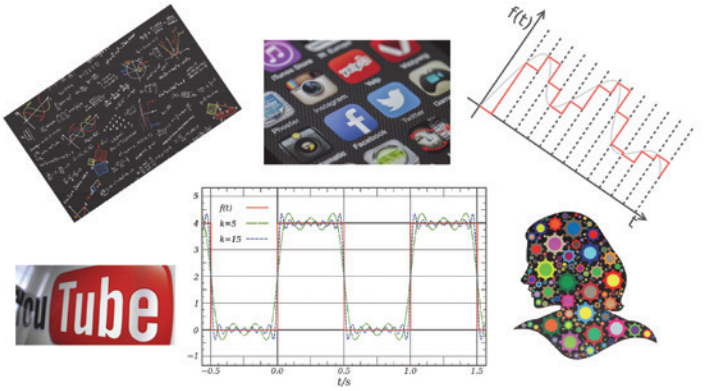
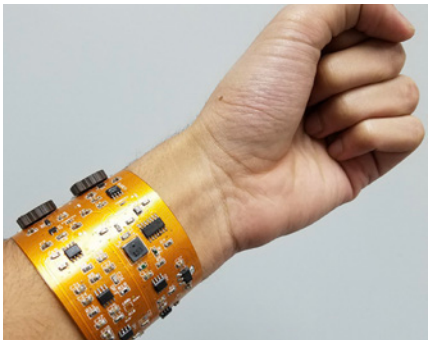
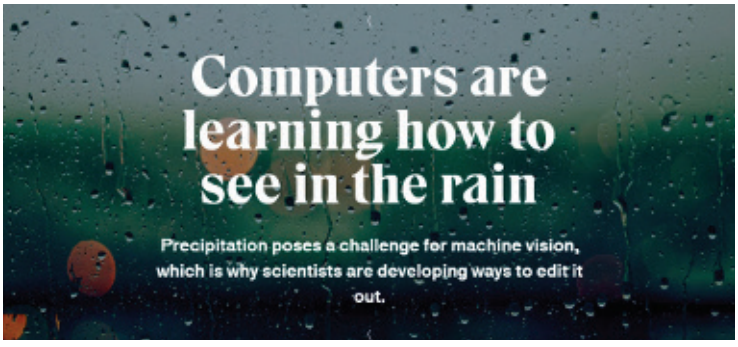
Rutgers University School of Engineering | Department of Electrical and Computer Engineering | 2017









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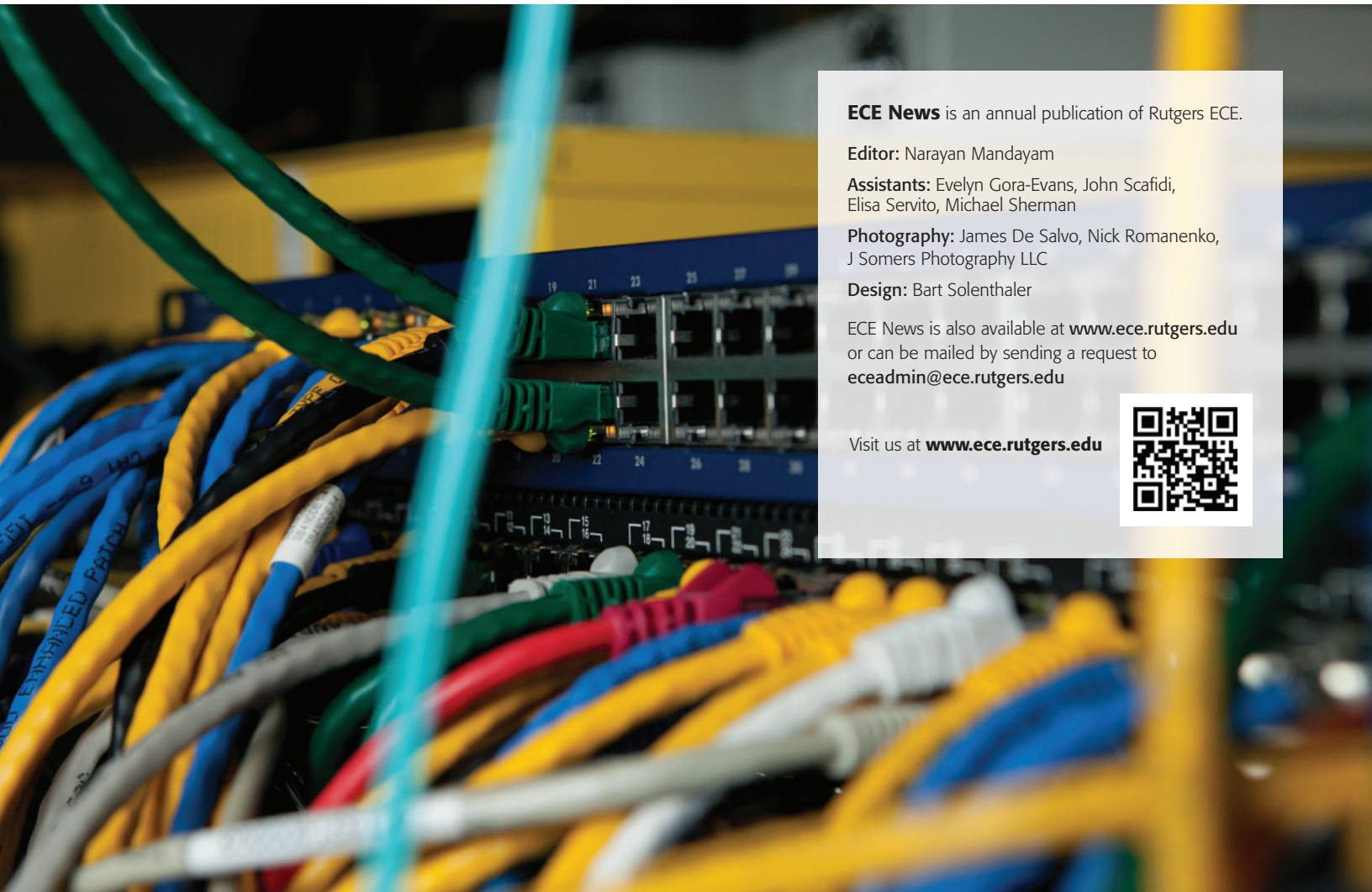

ECE News is an annual publication of Rutgers ECE.

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ECE News is also available at **www.ece.rutgers.edu** or can be mailed by sending a request to **eceadmin@ece.rutgers.edu**

Visit us at **www.ece.rutgers.edu**

message from the Chair


N. Mandayam

ECE Numbers

38 Faculty

6 Part-Time Lecturers

750 Undergraduate Students

333 Graduate Students, 100 PhD

Space: **40,000 sq. ft.**

New Research Grants: **$6,662,182**

It is my pleasure to share with you some exciting news about my department during this past academic year. Our department continues to see an influx of highly talented faculty members contributing expertise in important emerging areas. This Fall we welcomed 3 new faculty members: Professor Yingying Chen (an expert in Mobile Health), Professor Salim El Rouayheb (an expert in data privacy and security) and Professor Michael Wu (an expert in antennas and metamaterials). This makes it 15 new tenured and tenure-track faculty members we have welcomed to the department in the last 6 years, strengthening our footprint in areas such as signal and information processing, security, privacy, cyberphysical systems, bioelectrical engineering, big data and high performance computing.

Our faculty and students have made ECE at Rutgers into one of 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 Professor Peter Meer (2016 AMiner Most Influential Scholar in Computer Vision), Professor Vishal Patel (2016 Jimmy H. C. Lin Award for Invention at the University of Maryland), Professor Grigore Burdea (2017 IEEE Virtual Reality Career Award), Professor Dipankar Raychaudhuri (2017 Rutgers School of Engineering Faculty of the Year), Professor Emina Soljanin (2017 Outstanding Engineering Alumni Award at Texas A&M) and Professor Athina Petropulu (ECE Department Heads Association (ECEDHA) Diversity Award). Professors Waheed Bajwa and Hana Godrich also received Presidential Awards for Teaching Excellence at Rutgers. Professors Mehdi Javanmard and Vishal Patel's research on biosensing and biometric authentication, respectively, 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.

ECE graduate students amassed a large number of awards and recognitions, including best paper awards in the IEEE Transactions on Automation Science Engineering (Parul Pandey), ACM Student Research Competition Grand Finals (Kazem Cheshmi), IEEE/IFIP WONS Conference (Tuyen Tran, Parul Pandey and Abolfazl Hajisami), ACM Mobicom Visibile Light Communications Workshop (Viet Nguyen, Siddharth Rupavatharam, Minitha Jawahar), IEEE/ACM Internet of Things Design and Implementation Conference (Sugang Li), IEEE VTC Future Networking Technologies Workshop (Parishad Karimi, Michael Sherman, Francesco Bronzino), and a best dissertation award from the IEEE Aerospace and Electronics Systems Society (Shunqiao Sun). ECE undergraduate student teams won prizes for their research projects at several national competitions such as first place at the Harvard PacBot Robotics competition and the Excellence Award at IEEE Robotics VEX U competition.

Consistent with this excellence, our student enrollment has grown dramatically with our incoming sophomore class size at nearly 320 students (an increase from the 250 last year!) and the incoming graduate student class size at around 100 students. Our international program with a top tier university in China continues to flourish bringing in excellent students as we seek to expand such partnerships with other universities. 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. Through this support we were able to supplement startup packages of new faculty, provide student fellowships, support student travel to conferences and maintain state-of-the-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.

Narayan Mandayam
Distinguished Professor and Chair

ecefaculty

Waheed U. Bajwa
Associate Professor
NSF Career Award, ARO 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.

Grigore Burdea
Professor
NSF Initiation Award
Research Interests: Virtual rehabilitation, telerehabilitation, haptics virtual reality.

Yingying (Jennifer) Chen
Professor
NSF Career Award, Google Faculty Research Award, NJ Inventors Hall of Fame Innovator Award
Research Interests: Smart healthcare, internet of things (IoT), smart safety systems, cyber security and privacy, large-scale sensing data analysis.

Kristin Dana
Professor
NSF Career Award
Research Interests: Computer vision, pattern recognition, machine learning, convex optimization, novel cameras, camera networks, computer graphics, robotics, computational photography, illumination modeling.

Maryam Mehri Dehnavi
Assistant Professor
Research Interests: High-performance computing, machine learning, numerical analysis, compilers, and parallel systems.

Salim El Rouayheb
Assistant Professor
NSF Career Award
Research Interests: Information theory, distributed storage systems and networks, distributed coded data, data secrecy and Wireless Networks.

Zoran Gajic
Professor and Graduate Director
Research Interests: Power control of wireless networks.

Hana Godrich
Assistant Teaching Professor and Undergraduate Director
Research Interests: Distributed power systems, energy resources management and storage, energy efficiency, statistical and array signal processing, resource allocation optimization, distributed detection and estimation with application to smart grid, microgrids, and active sensor networks.

Marco Gruteser
Professor
NSF Career Award,
ACM Distinguished Scientist
Research Interests: Location-aware systems, pervasive computing systems, privacy and security, mobile networking, sensor networks and performance evaluation.

Mehdi Javanmard
Assistant Professor
Research Interests: Nanobiotechnology, bioMEMS, point of care diagnostics, biomarker detection, microfluidics, electrokinetics, applications of nanotechnology to medicine and biology.

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

Shantenu Jha
Associate Professor
NSF Career Award
Research Interests: High-performance and distributed computing, computational and data-intensive science and engineering, large-scale cyberinfrastructure for science & engineering.

Janne Lindqvist
Assistant 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: Microelectronics material and devices.

Richard Mammone
Professor
Research Interests: Computational pattern recognition, neural networks, signal processing, technology commercialization, processes involved with the innovation of new technology products, entrepreneurship.

Narayan Mandayam
Distinguished Professor, Department Chair & Associate Director of WINLAB
Peter D. Cherasia Faculty Scholar and Associate Director of WINLAB, IEEE Fellow, Distinguished Lecturer of IEEE
Research Interests: Cognitive radio networks and spectrum policy radio, resource management for smart city, privacy in IoT.

Ivan Marsic
Professor
Research Interests: Mobile computing, software engineering, computer networks.

Sigrid McAfee
Associate Professor
Research Interests: Defects in semiconductors, nanotechnology, financial engineering.

John McGarvey
Assistant Teaching Professor
Research Interests: Design and simulation of power electronic systems, control system modeling via both the classic and modern state-space techniques, and the design and testing of motor control systems.

Peter Meer
Professor
IEEE Fellow, AMiner Most Influential Scholar
Research Interests: Statistical approaches to computer vision.

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

Laleh Najafizadeh
Assistant Professor
Research Interests: Functional brain imaging, brain connectivity, diffuse 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.

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

Athina Petropulu
Distinguished Professor
IEEE Fellow and Distinguished Lecturer, NSF Presidential Faculty Fellow
Research Interests: Statistical signal processing, blind source separation, cooperative protocols for wireless networks, physical layer security, MIMO radar, compressive sensing.

Dario Pompili
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 Rabiner
Professor Emeritus
IEEE Fellow, National Academy of Engineering, National Academy of Sciences, IEEE Kilby Medal, IEEE Piore 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
IEEE Fellow
Research Interests: Future network architectures and protocols, wireless systems and technology, dynamic spectrum access and cognitive radio, experimental prototyping and network research testbeds.

Peddapullaiah Sannuti
Professor Emeritus
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. with 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 optimization, 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, informatin, and queueing theory.

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

Maria Striki
Assistant 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.

Matteo Turilli
Assistant Research Professor
Research Interests: Parallel and distributed Computing, software design for distributed infrastructures, computer science computer ethics.

Wade Trappe
Professor & Associate Director of WINLAB
IEEE Fellow
Research Interests: Multimedia security, wireless security, wireless networking and cryptography.

Chung-Tse Michael Wu
Assistant Professor
NSF Career Award
Research Interests: Microwave and millimeter wave components and circuits, passive and active antennas and arrays, electromagnetic metamaterials, wireless sensors and RF systems.

Roy Yates
Distinguished Professor & Associate Director of WINLAB
IEEE Fellow
Research Interests: Resource management in wireless systems, dynamic spectrum access and spectrum regulation, information theory for wireless networks and future internet architectures.

Yanyong Zhang
Professor
NSF Career Award
Research Interests: Computer architecture, operating systems, parallel computing cluster computer, performance evaluation and sensor networks.

Jian Zhao
Professor
IEEE Fellow, NSF Initiation Award
Research Interests: Silicon Carbide (SiC) semiconductor devices, SiC JFETs, BJTs, MOSFETS, GTOs, high efficiency smart power integrated circuits, SiC sensors, UV and EUV detectors, SiC inverters/converters.

Saman Zonouz
Associate Professor
NSF Career Award
Research Interests: Networks security and privacy, trustworthy cyber-physical critical infrastructures, embedded systems, operating system security, intrusion detection and forensics analysis, and software reverse engineering.

Abraham Borno
Part-time Lecturer
AT&T Labs Research
Expertise: Optimal control, large-scale systems, Markov chains, parallel algorithms.

Michael Caggiano
Professor Emeritus
Expertise: Electrical Packaging, microwave packaging, analog circuit design, digital circuit and logic design.

Marta Rambaud
Part-time Lecturer
Expertise: Digital circuit design, FPGA design, high speed deep sub-micron custom digital and mixed-signal telecommunications design, wireless circuits, DSP design, Framer design, network processors, data interfaces and signal processing blocks.

Phil Southard
Part-time Lecturer
Principal, ProDigiSys
Expertise: Field programmable gate arrays (FPGA's), computer hardware, digital design, programmable logic, application specific integrated circuits.

Shiyu Zhou
Part-time Lecturer
Expertise: design and analysis of data structures and algorithm, computational complexity, information theory.

studentnews

The Rutgers IEEE Robotics team won First Place at the Harvard PacBot Robotics

Every self-proclaimed engineer has faced the challenge...the notorious game of Pac-Man. As it is, playing Pac Man as a human can be extremely challenging, however programming a micromouse robot that can fit in the palm of your hand, running simply on Arduinos, to beat Pac-Man seems crazy! Organized by Harvard Robotics, the Pac Bot challenge was the first micromouse robot competition of its kind, especially aimed at freshmen and sophomores interested in getting hands on experience with robotics and competitions. Schools all over the east coast were invited including all the Ivy League schools. This year Rutgers IEEE rejuvenated its robotics programming opting to have a busy competition season, with 3 teams, cumulatively over 25 students, compete in competitions at Harvard, Brown, along with various regional and national competitions through VexU.

The Rutgers team at Harvard was led by Rutgers MechE sophomore, Belal Said, who with his teammates spent months playing with sensors, attempting various 3D printed designs for the robot, programing custom algorithms and even building their own large scale Pac-Man field from wood! As a result, Rutgers IEEE's victory beating Harvard in a best of three game of robot Pac-Man was sweet and a memorable experience!

The students representing Rutgers at the competition were **Niral Shah** (ECE '17), **Waseem Khan** (Physics '18), **Belal Said** (ME '19), **Ryan Weikel** (ME '19), **Mohammed Saleh** (ECE '20), and IEEE faculty advisor **Maryam Mehri-Dehnavi**

One Determined ECE Grad

Sherrie Negrea

Twenty-nine years ago, **Doreen Sparrow** began her journey to become an engineer and enrolled as a freshman at Rutgers.

Her experience in college, however, turned out to be anything but typical. She left school three times – to get married and have two children. When she decided to return as a full-time student after an 18-year hiatus, the dean of the engineering school told her she would have to earn an A in "Calculus 2" before she could be readmitted.

Sparrow retook the course at Union County College, went for tutoring every day and received an A. "If it wasn't for those tutors, I wouldn't have made it," says Sparrow, the first of her seven brothers and sisters to attend college. "But I was very determined to come back and finish what I started."

D. Sparrow

When she finally received her degree from the School of Engineering in May, Sparrow not only reached a goal that took her nearly three decades to achieve, but she also saw her youngest son earn his bachelor's degree from Rutgers' School of Arts and Sciences in criminal justice.

"It's been a long road," says Sparrow, who has six children, ranging in age from 14 to 26. "There have been so many ups and downs. Doing full-time school and raising children and trying to be a wife was, well – it's been a challenge."

Sparrow became interested in engineering while she was a student at her middle school in Plainfield, which offered an after-school program in engineering for minority students. Her thrill in building rockets and solving engineering problems eventually led her to apply to Rutgers School of Engineering.

One of the highlights of her final sprint toward graduation was her senior capstone team project, which won a $700 first-place prize in the engineering school last spring. Her team built a robot that could eradicate weeds in lawns by using detection software to identify specific plants.

Rutgers IEEE Robotics team competed in the VEX World Championship

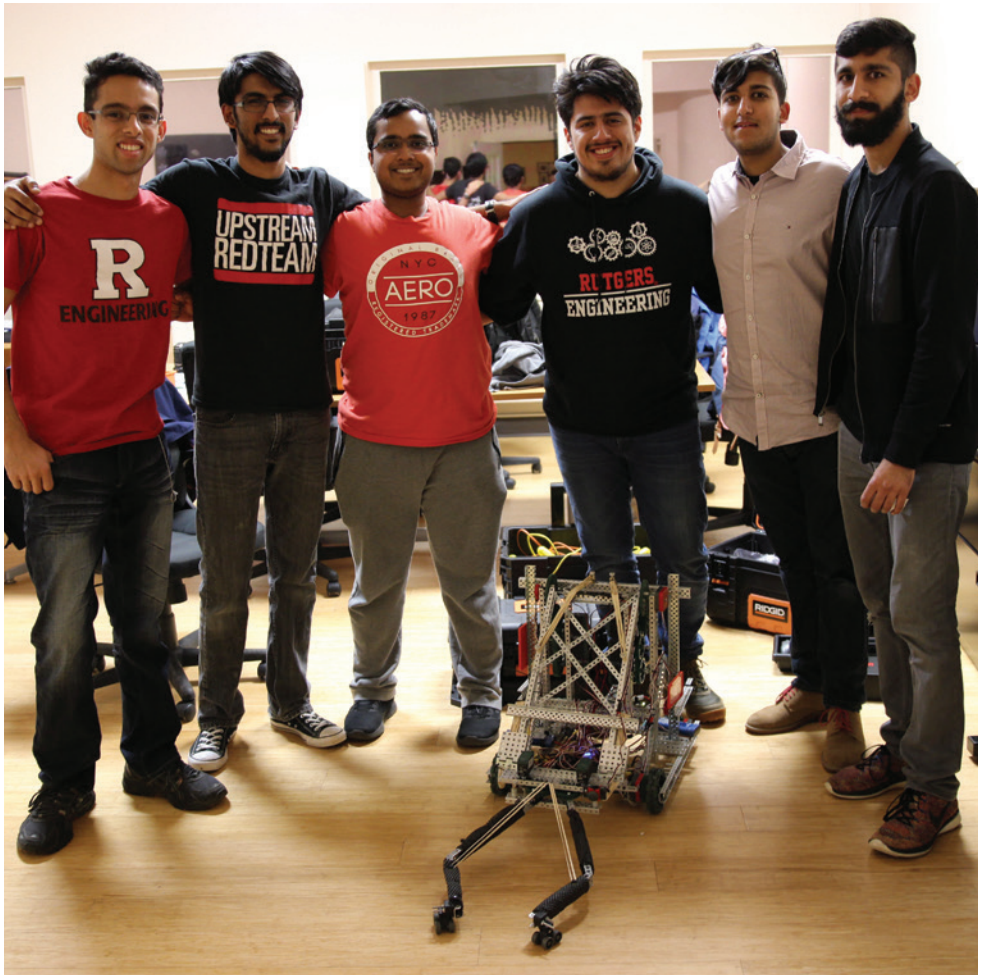
Advancing technology for humanity, a simple mission with a broad reach. From robotics to machine learning to drones, cyber security, and more, Rutgers IEEE has a diverse array of programs targeting at pushing the limits of technology through student initiative. In the 2016-2017 academic year, the student organization expanded dramatically, and has made significant headway in establishing the Rutgers community as a hub for creativity and ingenuity.

For the first time in over five years, the Rutgers IEEE Robotics Team participated in the VEX U competition, battling more than 350 college level teams for a spot in the world championship. After a challenging regional competition in New York, Rutgers won the Excellence Award, the most prestigious award at a VEX competition, and qualified for the world championships in Louisville, Kentucky.

The IEEE team members were **Ajay Srivastava** (ECE/CS '17), **Kevin Quizhpi** (ECE '18), **Rupesh Chinta** (ECE/CS '19), **Vallab Nayak** (ECE '20), **Atul Srivastava** (ECE '20), and **Hari Vijayakumar** (MechE '20)

Rutgers IEEE is not all competition though. Its drone team is utilizing computer vision for obstacle avoidance and target detection. The machine learning team is experimenting with neural nets to develop a website for facial recognition. The Intelligent Sensor Network (ISN) Program focuses on working with a variety of 'connected' sensors to transform the IEEE lab in the basement of the EE building into a "Smart Lab". This would enable monitoring and control of the lab via the internet, as well as integration with Amazon's Alexa voice assistant, as well as other useful features.

Ultimately, Rutgers IEEE is an organization for students who are looking for a challenge and have the motivation to change the world. Last year, IEEE doubled in size effectively making it one of the most active engineering organizations at Rutgers, and as its reach broadens again this year, the mission remains the same. Advancing technology for humanity.



Kazem Cheshmi Wins First Place at 2017 ACM Student Research Competition Grand Finals


K. Cheshmi

ECE graduate student **Kazem Cheshmi** working with Professor **Maryam Mehri Dehnavi** has won First Place in the ACM Student Research Competition Grand Finals for 2017.

The ACM SRC 2017 competitions take place at 25 major ACM conferences, sponsored by SIGACCESS, SIGACT, SIGARCH, SIGCHI, SIGCOMM, SIGCSE, SIGDA, SIGDOC, SIGGRAPH, SIGHPC, SIGMIS, SIGMOBILE, SIGPLAN, SIGMICRO, SIGSAC and SIGSOFT and include more than 300 student participants. The first place winners from each conference compete for the grand final award. Back in February, Kazem's paper "Decoupling Symbolic from Numeric in Sparse Matrix Computations" was nominated as the best work from the SIGMICRO-CGO conference. He subsequently won first place in the Grand Final Competition.

Grand Finalist and their advisors were invited to the Annual ACM Awards Banquet in June where they were recognized for their accomplishments, along with other prestigious ACM award winners, including the winner of the Turing Award.

Meet an ECE Student

By Luis Garcia

I am a PhD candidate majoring in Computer Engineering with a Cybersecurity track. I am working under the tutelage of Professor **Saman Zonouz.** I am a member of his all-star research team, the 4N6 Cyber Security and Forensics Research Group. I came to Rutgers from a Master's program in Computer Engineering at the University of Miami. I was also born and raised in Miami, and I attribute any of my success to the amazing support system I have been fortunate to have both in Miami as well as here at Rutgers.

My current research interests are in the security and verification of cyber-physical and embedded systems that are widely used in critical infrastructures such as medical devices and industrial control systems. I have collaborated with professors and students at top universities both locally and internationally such as Carnegie Mellon University, Technische Universität Darmstadt, the Georgia Institute of Technology, the University of Illinois at Urbana-Champaign, Florida International University, the Singapore University of Technology and Design, and several others. Our work has been featured at top security conferences, such as the Network and Distributed System Security Symposium (NDSS), USENIX Security Symposium, and the International Conference on Dependable Systems and Networks. In particular, we have worked on ground-breaking research projects focusing on the security and verification of programmable logic controllers (PLCs) and the physical systems they control. We have presented both offensive and defensive works for cyber-physical systems, including a cyber-physical rootkit that leverages the physics of an industrial control system to maximize the amount of damage that can be inflicted on a system while maintaining stealthiness. From a defensive perspective, we have worked with industrial partners to implement security solutions for these devices to prevent such attacks. I participated in a summer internship with Siemens working on their future automation technology with respect to programmable logic controllers and industrial control systems. Furthermore, I have participated in an internship at the Logical Systems Lab at the School of Computer Science at Carnegie Mellon University. This is a continuous collaboration in which we are developing hybrid systems models using sound logic to specify and verify safety properties of such cyber-physical systems. All of these opportunities that I am so humbly grateful for have been afforded to me through my Graduate Assistance in Areas of National Need (GAANN) Fellowship from the U.S. Department of Education.

Outside of my academic experience, the social life here has been just as fulfilling. I have been able to experience the world through international conferences as well as by having access to the numerous different cultures of the surrounding metropolitan cities. I have also been able to try every type of extreme sport, including surfing on the Jersey shore, snowboarding at any of the nearby mountains, or white water rafting at numerous locations. I have done all of this alongside my best friends here at Rutgers, and these are experiences I will carry with me for the rest of my life.

By Niral Shah

I graduated from Rutgers in May 2017, double majoring in Electrical & Computer Engineering and Computer Science. My time at Rutgers was incredible and went by too fast! Early on, as a member of the Engineering Honors Academy, I participated in the freshman mentorship program and was introduced to Rutgers IEEE, a club focused on giving students hands on opportunities to work with new technologies. Soon after I become heavily involved in the club and served multiple positions, most recently serving as President in my senior year. As a member of IEEE, I had the opportunity to learn from upper-classmen and faculty about cool new programming languages, about hardware such as Raspberry Pi and Arduino, as well as work on cool projects like building an Autonomous Drone along with participating in robotics competitions.

Over my four years as a Rutgers ECE student, I received fantastic internships at companies like Verizon, Boeing and Tesla Motors. These internships gave me great insight into how courses like Algorithms and Digital Signal Processing are applied in the real world. After these internships and taking Professor **Kristin Dana**'s Robotics & Computer Vision Course and Professor **Anand Sarwate**'s Signal & Data Analysis course, I was motivated to pursue a Master's in Engineering focused on Machine Learning & Computer Vision. I will be attending Duke University this fall.

By Jaimie Swartz

I just graduated from the ECE department in May 2017 with particular interest in power systems. Ever since I proclaimed to my high school science class that "we don't have an energy *problem* – we have a *crisis,*" I have been an avid investigator of clean energy solutions. Discussing with energy policy, climate, and utility experts from the Rutgers Energy Institute helped me decide that I would best advance the renewable energy industry by studying ECE. After interning with First Solar, I used my familiarity with the utility-scale solar PV industry to conduct research in the Laboratory for Energy Smart Systems. Co-advised by ISE Professor **Mohsen Jafari** and ECE Professor **Hana Godrich,** I helped build a cyber-physical energy testbed that achieves net-zero energy for a given community of buildings. Mainly, I developed a process to size and predict the behavior of a hybrid renewable energy system (comprised of wind, solar PV, and battery storage) that can power a microgrid community year-round. For my work, I won 2nd place at the 2016 SWE Region E Conference Research Poster Competition, and had the opportunity to present my paper at the 2017 IEEE Innovative Smart Grid Technologies conference in Washington DC.

Outside of the ECE department, I am passionate about Women in STEM and making Rutgers a greener place. As President for the Rutgers Society of Women Engineers section, I was a lead organizer for 29th Annual SHE-SWE-MEET Engineering and Computer Science Career Fair, which won the SWE Mid-Atlantic Region Governor's Choice Award. I also worked with students from different environmental organizations to collect data about Rutgers' sustainability practices for the national AASHE STARS reporting program. This fall, I am excited to study power systems, optimization, and control in the Electrical Engineering and Computer Science M.S./Ph.D. program at U.C. Berkeley. After completing my doctorate, I plan to work at a national lab, clean tech startup, or R&D division of a company. Whichever the avenue, I will always

be devoted to my purpose: to contribute my knowledge and leadership skills to revolutionize the grid integration of renewable energy. I can't thank Rutgers, the School of Engineering, and especially the ECE department enough for providing me with the knowledge and mentorship to find and do what I love.

By Michael Soskind

I am a recent graduate in Electrical and Computer Engineering, interested in photonics and optical technologies. At Rutgers, I involved myself in a variety of extracurricular activities, including the Engineering Governing Council, Tau Beta Pi, Eta Kappa Nu, and the Rutgers Photonics Club. I served on the Engineering Governing Council in a variety of capacities for all four years. I additionally was the event coordinator for both Eta Kappa Nu and Tau Beta Pi honor societies, holding a variety of social events, as well as outreach events to middle school students. I co-founded the Rutgers Photonics Club, serving as its president my senior year. The club is a group for students interested in learning more about the amazing capabilities and impact of optical technologies in society. I additionally spent time playing extracurricular sports like basketball and ultimate frisbee with other engineers.

As a Rutgers student, I held a variety of research positions. Since 2014, I worked in the Specialty Fiber Optics Lab led by Dr. James Harrington in the Materials Science and Engineering department. Under Dr. Harrington, I worked on developing an advanced opto-mechanical system for growing single crystal fibers used as laser source materials. Additionally, I spent time in additional research groups during the summer. This includes the summer before my sophomore year at Princeton University researching advanced optical sensor systems. I spent the following summer in Germany as part of the DAAD RISE research program. There, I performed research at the Friedrich Alexander University in Erlangen, Bavaria, Germany on laser based nanofabrication.

I am currently enrolled as a graduate student in electrical engineering at Princeton University, and plant to focus in photonics. As part of the PhD program, I hope to select an advisor soon, in the area of photonics. After graduation, I plan to contribute my expertise to industry or academia, in order to improve the quality of life of people in all nations. I know that by pursuing graduate study, I am one step closer to achieving this goal, and am excited to start this new chapter of my life. However, without putting in plenty of hard work at Rutgers, none of this would have been possible. I appreciate the amazing faculty that I have had at Rutgers in the ECE department, as well as the many valuable friends and connections I have fostered.

By Umama Ahmed

From a young age, I have always been mesmerized by computers. When I was seven years old my older brother got his first desktop computer. It was a very basic Samsung PC with Windows 97 operating system. Though a mere toy compared to today's standards, I remember watching with amazement when I saw a computer for the first time in my life. I didn't know what all the buttons represented, but I was really excited to know how pictures and music came from this amazing device. By age ten, I was sure computer engineering was the career for me and I haven't changed my mind.

Although I have dreamt of becoming an engineer, before coming to college I wasn't sure what they exactly did. I took many math courses in high school, but I had no idea how to apply them towards real life problems. However, all of this changed after I started college. From the beginning, Rutgers was very keen in helping me choose the right path. During freshman year, I was able to take a course that gave insight into various engineering fields. Through the engineering kickoff, I was given the chance to meet all the clubs in our department: I got to see demonstrations of some of the cool projects they were working on too. Throughout the year, I was provided with many opportunities to talk to professors and upperclassmen before settling on my major.

While I am very passionate about studying engineering, I also wanted to branch out and do extracurricular activities that would let me explore my interest in coding. When I first heard of the new Novice2Expert Coding Club's kickoff meeting, I knew I had to be there. Professor **Kristin Dana** and graduate student **Parneet Kaur**'s vision of this club was to promote interest in coding with different programming languages, and providing workshops and events for programmers in novice to expert levels. I joined this club as the Workshop Coordinator and a teacher to share my knowledge with students just starting out in coding, as well as learning from my peers who are experts and coding languages I was unfamiliar with. We also held programming workshops using software such as Scratch and MIT App Inventor with kids in elementary and middle school to familiarize them with programming at an early age. This year, I'll be the President of the club, and I plan to continue to spark interest in students to learn coding.

If I had to pick my favorite thing about Rutgers, I would say it's the people. From the professors, to the faculty, to my peers, Rutgers is home to a diverse group of intelligent people who work hard every day to not only work towards success, but also to inspire others to succeed along the way. "And, when you want something, all the universe conspires in helping you to achieve it," is a quote by Paulo Cohelo that truly describes my experience at Rutgers. I've come in with high hopes and dreams, and Rutgers continues to guide me in my path to achieving those dreams.


L. Garcia


N. Shah


J. Swartz


M. Soskind

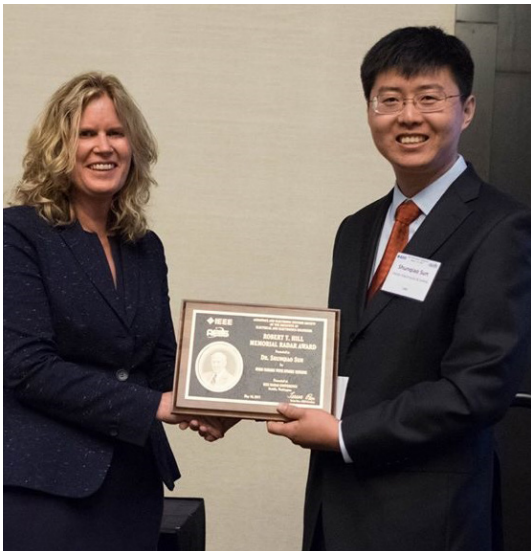

U. Ahmed

Shunqiao Sun wins 2016 Robert T. Hill Memorial Best Dissertation Award from IEEE Aerospace and Electronics Systems Society

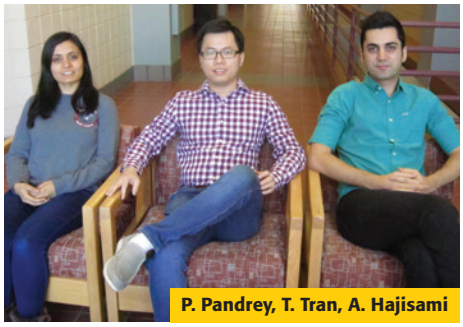
Shunqiao Sun, a recent Ph.D. graduate of the Rutgers Electrical and Computer Engineering (ECE) department, has won the 2016 Robert T. Hill Memorial Best Dissertation Award, given by the Institute of Electrical and Electronics Engineers (IEEE) Aerospace and Electronics Systems Society (AESS).

Shunqiao's Ph.D. thesis, entitled ``MIMO Radars with Sparse Sensing," proposed a new radar concept that enables high target scene surveillance while requiring substantially reduced volume of data as compared to state-of-art radar systems. Shunqiao was a member of the Communications and Signal Processing Laboratory (CSPL) and worked under the supervision of Prof. **Athina Petropulu.**

Shunqiao joined CSPL in 2011, after completing his bachelor's and master's degrees in Electrical Engineering from Southern Yangtze University and Fudan University, respectively. Following the completion of his Ph.D. in January 2016, he joined the radar core team of Delphi Electronics & Safety, where he now works on millimeter-wave radar signal processing and machine learning algorithms for self-driving cars. The Best Dissertation Award, in honor of Robert T. Hill, is an annual AESS award to recognize candidates that have recently received a Ph.D. degree and have written an outstanding Ph.D. dissertation that has made particularly noteworthy contributions in a field of interest of the Aerospace and Electronic Systems Society. Its purpose is to grant international recognition for the most outstanding Ph.D. dissertation by an AESS member in the year she/he is nominated. The award consists of an honorarium of $1,000 and a plaque.



ECE Team Wins Best Paper Award at 2017 IEEE/IFIP WONS Conference



P. Pandrey, T. Tran, A. Hajisami

A team of ECE researchers working with Professor **Dario Pompili** have won the Best Paper Award at the 2017 IEEE/IFIP Wireless On-demand Network systems and Services Conference (WONS), which was held in Jackson Hole, WY. The paper titled "Collaborative Multi-bitrate Video Caching and Processing in Mobile-Edge Computing Networks" was coauthored by ECE graduate students **Tuyen Tran, Parul Pandey, Abolfazl Hajisami** along with Dario Pompili. WONS, now in its thirteenth edition, is a high quality forum to address challenges such as how to make smart use of novel technologies when multiple technologies or a mix of permanent services and on-demand networking opportunities are available to a network node, how to provide robust services in highly dynamic environments, how to efficiently employ and operate heavily resource-constrained devices, and how to develop robust and lightweight algorithms for self-organization and adaptation.

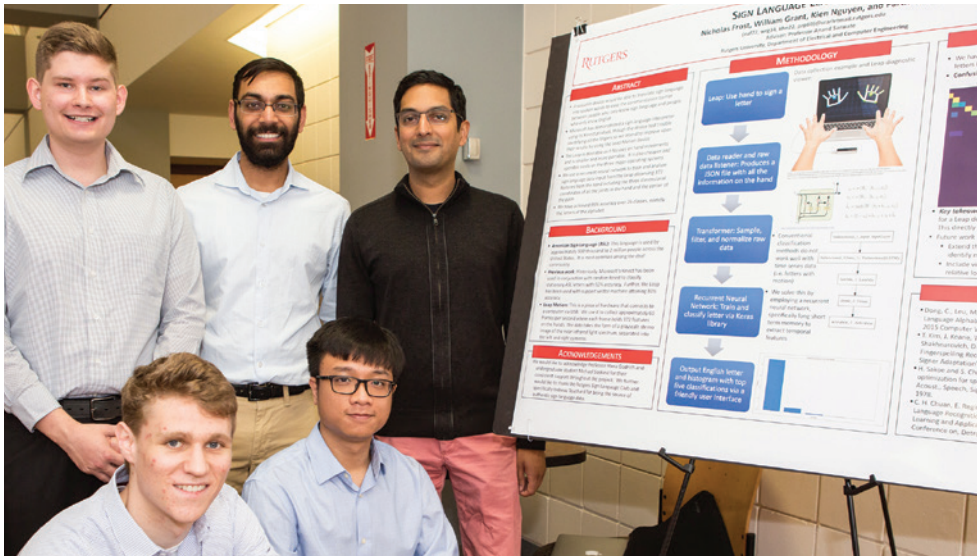
ECE PhD Student Dionysios Kalogerias receives 2017 School of Engineering Outstanding Graduate Student Award

ECE graduate student **Dionysios Kalogerias** who completed his PhD degree in May 2017 under the supervision of Professor **Athina Petropulu** received the 2017 School of Engineering Outstanding Graduate Student Award for his thesis on autonomously controlled cyber-physical systems, network control and resource allocation. In particular, he has made fundamental contributions to the formulation and solution of the problem of mobile beamforming, where he developed a novel two-stage stochastic optimization approach for the first ever location-aware optimal resource allocation scheme. The results of his research have appeared in premiere IEEE journals and conferences, and he is a recipient of the 2016 ICASSP Best Student Paper of the Special Sessions Award. Dionysios who grew up on the island of Zakynthos, Greece, is an accomplished electric guitar player and has commenced a postdoctoral position this Fall at Princeton University.

D. Kalogerias

ECE Capstone Expo Day and Top Ten Award Winners

Hana Godrich



Over 200 students participated in this year's capstone program, forming 55 teams. Our students' capabilities, creativity, and engineering skills were reflected in this year's projects.

Capstone Expo, held April 26th at the EE building hallways, was the culmination of the hard work our students put towards their capstone projects. A panel of 21 judges joined us that day to identify the top ten projects. Our judges were very impressed with the quality of the projects and commended our students' capabilities and enthusiasm. The capstone teams did a fantastic job and made us all proud!

This year the students were the beneficiaries of several advisers from within Rutgers and outside. We would like to thank the ECE faculty who supported the program and advisers inside and outside of Rutgers who contributed their time and effort to help our students. Their efforts and support is key to the success of our capstone program and the students' learning experience.

We would like to thank the following industry advisors who worked with our students: **Chris Marty** (Two Sigma), **Hubertus Franke** (IBM), **Don Bachman** (ASCO Power Technology & 7x24 Exchange Metro New York Chapter), **Jon Pucila** (BlackRock), **Daniel Arkins** (BlackRock), **Phillip Southard** (Harris), **Nagi Naganathan** (Broadcom), and **Samuel Ramrajkar.** Thanks also to the ECE faculty who advised students. Special thanks to Rutgers advisers: **Michael Kornitas, Pavel Reyes, James Harrington, Richard Howard, Ivan Seskar** and **Mubasir Kapadia.**

We would like to acknowledge the support of the following industry sponsors through funding and equipment donations: **7x24 Exchange Metro New York Chapter, Siemens, Verizon Wireless, JP Morgan Chase, ASCO Power Technology,** and **Qualcomm.**
Many thanks to our panel of judges for their effort and time taken to support and celebrate our students' achievements. The panel included: **Kishore Ramachandran** (Zipreel), **Michael D. Kornitas** (Rutgers), **Chris Marty** (Two Sigma), **Hubertus Franke** (IBM), **Don Bachman** (ASCO Power Technology), **David Katz** (Credit Suisse), **Justine McLean** (JP Morgan), **Saravanan Kunju** (JP Morgan), **Jasmine Feng** (JP Morgan), **Phillip Southard** (Harris), **Nina Krikorian-Ezik** (Harris), **Rachel Hartmen** (Harris), **Jon Pucila** (Blackrock), **Daniel Arkins** (Blackrock), **Srinivas Bangalore** (Interactions LLC), **Ludwig Randazzo** (Juniper), **Craig Metcho** (Bloom Energy), **Parishad Karimi** (Rutgers), **Eric Wengrowski** (Rutgers), **Phil Southard** (Harris), **Nagi Naganathan** (Broadcom), and **Nazmul Islam** (Qualcomm). Their expertise, care, and insights were priceless in making the hard decisions for the top projects.

A very warm thank you to our wonderful ECE staff! **Arletta Hoscilowicz, John Scafidi, Steve Orbine, Ora Titus, Tea Akins, Evelyn Gora-Evans,** and **Abha Gandhi.** As always, their commitment and hard work made this event and others happen. Many thanks to **Samyuktha Nagesh** and **Alphy Jose** who worked tirelessly to support the capstone program and to all the undergraduate students who helped with capstone events.

After hours of diligent work our panel of judges selected these top ten projects:

FIRST PLACE
(awarded $700, sponsored by 7x24 Exchange Metro New York Chapter)
Project S17-34: English Leaps to Sign Language
Team members: **Nicholas Frost, William Grant, Kien Nguyen, Parth Parikh**
Advisor: **Anand Sarwate**

SECOND PLACE
(awarded $500, sponsored by JP Morgan Chase)
Project S17-26: Real-Time Candlestick Pattern Recognition and Financial Analysis for Intraday & Short-Term Trading (C.P.R & F.I.S.T)
Team members: **Subramhanya Shankara Prasad, Mehul Vora, Christopher Steinert, Andrew Chan, Brandon Dunlap**
Advisors: **Maryam Dehnavi, Daniel Arkins** (BlackRock Inc.), and **Jon Pucila** (BlackRock Inc.)

THIRD PLACE
(awarded $300, sponsored by Qualcomm)
Project S17-15: P2D: Physical to Digital Scanner App
Team members: **Danica Sapit, Annie Antony, Nishtha Sharma, Gloria Leung**
Advisor: **Kristin Dana**

FOURTH PLACE ($100)
Project S17-35: Augmented Reality Assisted Cooking using Microsoft HoloLens
Team members: **Alessandro Orsini, Glen Huang, Grisam Shah, Glen Huang, Niral Shah, Gautam Venkatesan**
Advisor: **Kristin Dana**

FIFTH PLACE ($100)
Project S17-55: Car Occupancy Reporter
Team members: **Peri Akiva, Subu Shankar**
Advisors: **Ivan Seskar** (WINLAB) and **Hubertus Franke** (IBM)

SIXTH PLACE ($100)
Project S17-11: Parking Management
Team members: **Daniel Maas, Jacob Voorhees, Nil Patel, Jasel Patel**
Advisor: **Vishal M. Patel**

SEVENTH PLACE ($100)
Project S17-23: User Authenticated Smart Gun System
Team members: **Cedric Blake, Vineet Sepaha, Brian Chu, Harshil Patel**
Advisor: **Phillip Southard** (Harris)

EIGHTH PLACE ($100)
Project S17-49: ARM (Automated Retail Monitor)
Team members: **Kevin Horlavadi, Govindaraj Muthukrisnan**
Advisor: **Hana Godrich**

NINTH PLACE ($100)
Project S17-48: Design and Analysis of RF-Frequency Tuning Devices
Team members: **Jinjing Han, Yifan Wu**
Advisors: **Yicheng Lu** and **Pavel Reyes**

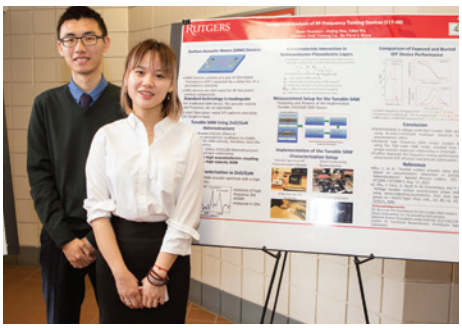
TENTH PLACE ($100)
Project S17-20: Solar-Powered Car Jumpstarter
Team members: **Lee J. Matalon, Zachary Montone, Adam Plotzker**
Advisors: **Samuel Ramrajkar** and **Hana Godrich**

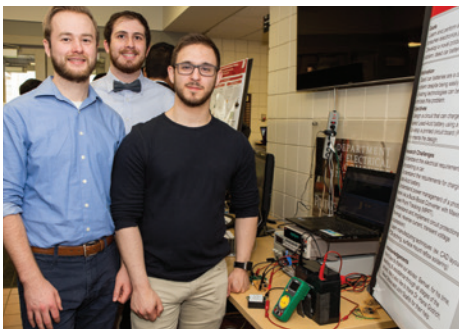
STUDENTS FAVORITE AWARD
(awarded $200, sponsored by Siemens)
Project S17-43: Smart Pet Food Box
Team members: **Xiaoyi Tang, Feng Rong, Zhe Chang, Jingxuan Chen, Rong Zhang**
Advisor: **Hana Godrich**

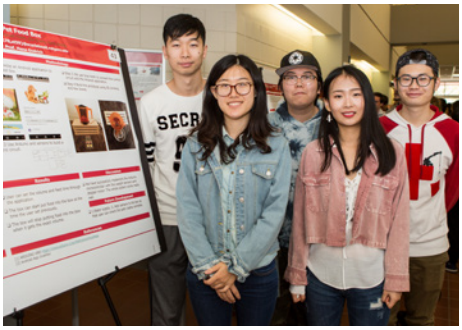
Congratulations to the students and advisors!!!









ECE Hosts TARGET VI Summer Pre-College Program

TARGET (The Academy at Rutgers for Girls in Engineering & Technology) is a summer pre-college program designed to increase awareness in middle and high school girls about the career opportunities available in engineering. The objectives of TARGET are to familiarize girls in high school with different engineering disciplines and to destroy negative stereotypes concerning their ability to do well in math and science.

The TARGET VI students have a unique experience in that they work on one research project under the guidance of a female graduate student over the course of the week they are on campus. **Nabeela Khan**, an ECE graduate student in the Rutgers Device Group designed a project for her team that involved mostly hands-on experience based on her research, including layout design, FEA simulation, fabrication (E-Beam deposition and lithography) and assisted her team in developing a final presentation. The student participants **Serena Evans** and **Sanjana Shukla** both are currently in 12th Grade and attend Lutterodt, Mount Saint Mary Academy and John P. Stevens High School respectively. Professors **Yicheng Lu** and **Jaeseok Jeon** accommodated the students in their respective labs - Microelectronics Research Laboratory (MERL) & Devices Laboratory. Dr. **Pavel Reyes** (Associate Director of MERL) conducted the safety training at MERL. **Candiece White**, Assistant Dean of Undergraduate Education/Student Services co-ordinated the TARGET program.

Vishal Patel's Work on De-Raining In The News

Professor **Vishal Patel**'s recent work on de-raining is featured in the publication *The Outline.* Along with his PhD students **He Zhang** and **Vishwanath Sindagi,** Professor Patel has recently developed an algorithm for de-raining rainy images using a deep learning method based on conditional generative adversarial networks. In the article entitled "Computers are learning how to see in the rain" Dr. Patel and his students have devised algorithms that can remove rain and snow from images using machine learning.

New Faculty


Y. Chen


S. El Rouayheb


M. Wu

Yingying Chen joined Rutgers ECE as a Full Professor in September 2017. She leads the Data Analysis and Information Security (DAISY) Lab, an inter-disciplinary research group working on a diverse set of projects related to mobile health, security and privacy. Specifically, she is using machine learning techniques and data mining methods to classify and model healthcare, security, system and network related problems. Besides algorithm development, her work has a strong emphasis on system implementation and validation in real-world scenarios. She is a recipient of several prestigious ACM best paper awards, is an NJ Hall of Fame Inventor and her work has been featured in numerous media outlets such as Wall Street Journal, CNN and the Tonight Show among others.

Dr. Chen who received her PhD degree from Rutgers in Computer Science has co-authored the books Securing Emerging Wireless Systems (Springer 2009) and Pervasive Wireless Environments: Detecting and Localizing User Spoofing (Springer 2014). She published over 100 journal articles and referred conference papers. Prior to joining Rutgers University she had worked at Stevens Institute of Technology and Alcatel-Lucent at Holmdel & Murray Hill, New Jersey.

Salim El Rouayheb joined Rutgers ECE as an Assistant Professor in September 2017. His research interests lie in the areas of information theory, coding theory and their application to data security and privacy. In particular, he has been recently working on problems related to private information retrieval and search in coded data, on secure distributed computing algorithms, and on novel algorithms for data synchronization and deduplication in distributed systems. Dr. El Rouyaheb, who received his Ph.D. degree in electrical engineering from Texas A&M University, has held faculty positions at Illinois Institute of Technology (IIT), Princeton University and the University of California, Berkeley He received the NSF CAREER award in 2016.

Chung-Tse Michael Wu joined Rutgers ECE as an Assistant Professor in September 2017. His research interests include applied electromagnetics, antennas, passive/active microwave and millimeter-wave components, RF systems and metamaterials. Dr. Wu who received his Ph.D. degree in electrical engineering from the University of California at Los Angeles (UCLA) has held faculty positions at Wayne State University, Michigan and National Chung Hsing University, Taichung, Taiwan. He received the NSF CAREER award in 2016 and is also a recipient of several best paper awards at IEEE Microwave conferences.

The iREDEFINE Project

iREDEFINE ECE (Improving the Diversity of Faculty in Electrical and Computer Engineering) aims at increasing the numbers of women and under-represented minorities (W-URM) in faculty positions at ECE departments. The project was spearheaded by Prof. **Athina Petropulu**, and was funded by the National Science Foundation (NSF), through a $100K grant awarded to Prof. Petropulu. The project is also supported by ECEDHA (ECE Department Heads Association).

iREDEFINE's vision is to redefine the field of ECE by making it more diverse at the professorial level, so that it can benefit from new ideas and new perspectives. The project includes the iREDEFINE workshop and follow up mentoring activities for W-URM at the graduate student level. The first iREDERFINE workshop was held with great success on March 17-18, as part of the 2017 ECEDHA (ECE Department Heads Association) Annual Conference and Expo, in Miramar Beach, Florida, with Prof. A. Petropulu as the general chair.

ECEDHA has been in existence for more than 50 years and maintains an active membership of nearly 300 chairs from across the United States and Canada. ECEDHA's four-day Annual Conference is the only program of its kind for department heads in electrical and computer engineering. It brings together prominent figures from academia, government, and industry to deliver presentations on emerging key technologies, the latest teaching innovations, and sessions addressing the most pressing issues facing ECE. The ECEDHA Annual Conference was deemed as a unique opportunity to bring together W-URM students and chairs, thus allowing chairs to get to know the pool of diverse students interested in academic positions, and giving the students an opportunity to network and receive comments and helpful hints on job searching.

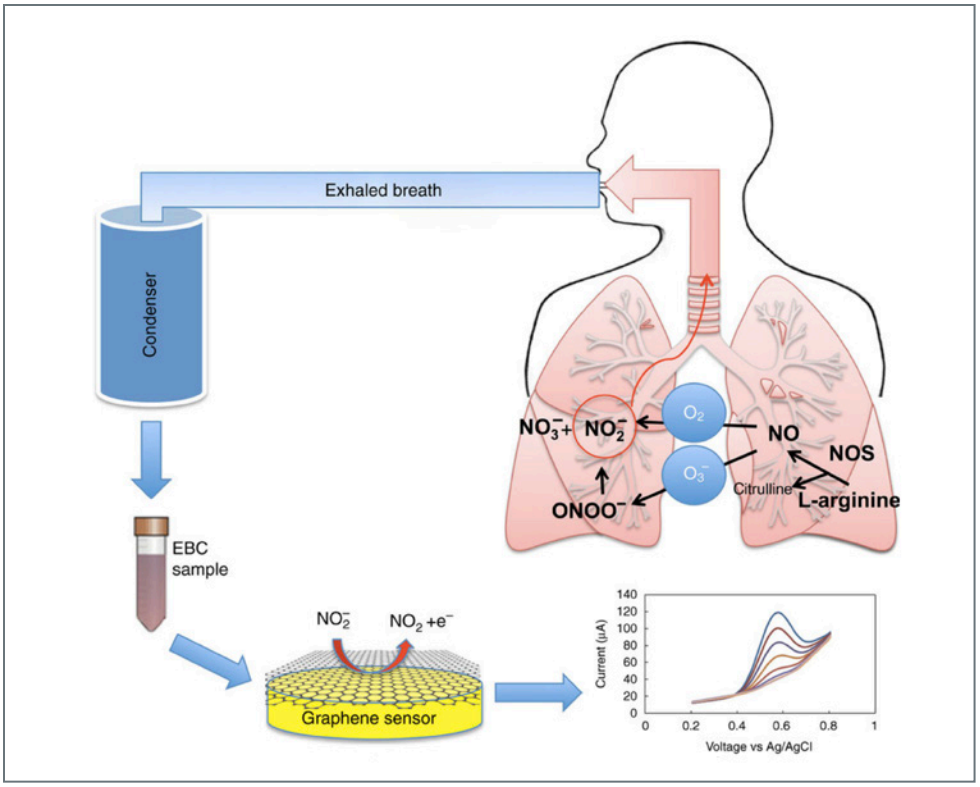
The 2017 iREDEFINE workshop provided students with a glimpse of the life and career of an ECE faculty member, helpful tools for an academic job search, and opportunities to network with their peers and the ECE chairs. The workshop started with a 3-hour course on basic negotiations, problem solving and conflict resolution, delivered by a professional company. In the remainder of the first day, the program featured a talk on teaching methods for active learning, by Prof. **John Booske** of the University of Wisconsin-Madison, a presentation about funding agencies and how to seek funding, by Dr. **Elliot Douglas**, Program Director of Engineering Education at NSF, a presentation about unconscious bias, delivered by Prof. **Nayda Santiago** of the University of Puerto Rico at Mayague, a panel discussion on the different types of schools, by Profs. **Stella Batalama**, University at Buffalo, John Booske, University of Wisconsin-Madison, **Susan Lord**, University of San Diego, and **Miguel Velez-Reyes**, University of Texas at El Paso. There was also a presentation by **Teresa Kostenbauer**, Arrow Electronics on how to build ties with industry. Throughput the day there were networking breaks, and in the evening there was a networking reception for workshop attendees and ECE chairs. During the second day, the workshop attendees had the opportunity to attend the sessions of the ECEDHA conference, and also presented posters on their work.

The first follow up e-meeting was conducted in May. Prior to the meeting the students submitted faculty job applications materials, and iREDEFINE faculty, serving as mentors provided comments and suggestions.

The NSF grant provided travel funding for 13 students, referred to as iREDEFINE Fellows. The Fellows were selected from a pool of applicants by the project organizing committee, based on their potential to be an academic, as gleaned from their academic accomplishments and also a statement the students provided with their thoughts about an academic job. In addition to targeting students who are already seeking academic positions, the project also includes junior students, in an effort to motivate them to think about a career in academia. In response to very strong interest in attending the workshop by a large number of applicants, 30 additional students were invited and attended the workshop, supported by their own chairs.

The 2018 iREDEFINE Workshop will be held as part of the 2018 ECEDHA conference and Expo, during March 15-16 in Monterey California. The application process will open in November 2017.

Wearable Electronic Devices for Personalized Health Monitoring

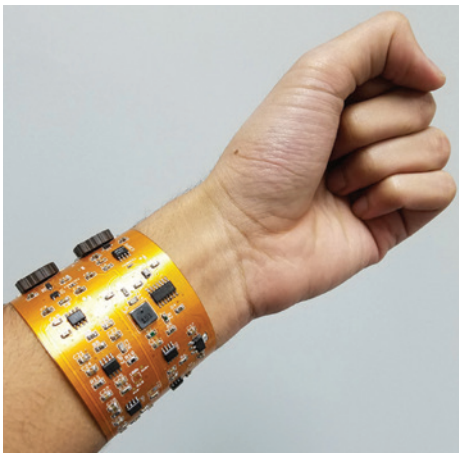


In collaboration with colleagues in Material Science and the medical school, Dr. **Mehdi Javanmard**'s group has created a graphene-based sensor that could lead to earlier detection of forthcoming asthma attacks and can improve the management of asthma and other respiratory diseases. This can have a huge impact on healthcare, and prevent hospitalizations and deaths. We envision development of a wearable device that resembles fitness trackers like the Fitbit wirelessly coupled to a smartphone, as we have achieved this previously. People could wear these devices, blow onto them periodically and then know when and at what dosage to take their medication. This advances the field of precision and personalized medicine: to prescribe a course of treatment to patients based on their physiological molecular information, rather than based on outward symptoms alone.

Inflammatory diseases and autoimmune diseases are significantly on the rise. Better tools are needed for continuously monitoring health. As an example, asthma causes inflammation of the airway and obstructs airflow. It currently affects about 300 million people worldwide. About 17.7 million adults and 6.3 million children in the United States were diagnosed with asthma in 2014. Typically this is diagnosed by looking at outward symptoms such as coughing, wheezing, shortness of breath, and chest tightness. The methods used today for diagnosing asthma are limited in their ability to characterize the nature and degree of inflammation of the airway, requiring bulky instruments that cannot be easily carried around by patients.

Dr. Javanmard and his group are taking a new approach by leveraging skills in Electrical Engineering to build tiny sensors that can measuring biomarkers in exhaled breath condensate – tiny liquid droplets discharged during breathing. These biomarkers can contribute to understanding asthma at the molecular level and lead to targeted treatment and better disease management. The team miniaturized the electrochemical sensor accurately and measured nitrite in exhaled breath condensate using reduced graphene oxide. Graphene is a very unusual material. You could almost say it's magical in that it gives you the best properties of different metals, while having the disadvantages of none. Reduced graphene oxide resists corrosion, has superior electrical properties and is very accurate in detecting small molecules. Graphene is a material we see in everyday life, it's the thin layer of the graphite used in pencils. Graphene is a single atomic layer thick.

Measuring the levels of nitrite in the breath condensate has proved to be a promising biomarker signaling inflammation in the respiratory tract. Just looking at coughing, wheezing and other outward symptoms, diagnosis accuracy is often poor, so that's why this idea of monitoring biomarkers continuously can result in a paradigm shift. The ability to perform label-free quantification of nitrite content in exhaled breath condensate in a single step without any sample pre-treatment resolves a key bottleneck to enabling portable asthma management. The next step is to develop a portable, wearable system, and also expanding the number of inflammation biomarkers that a device could measure and detect.



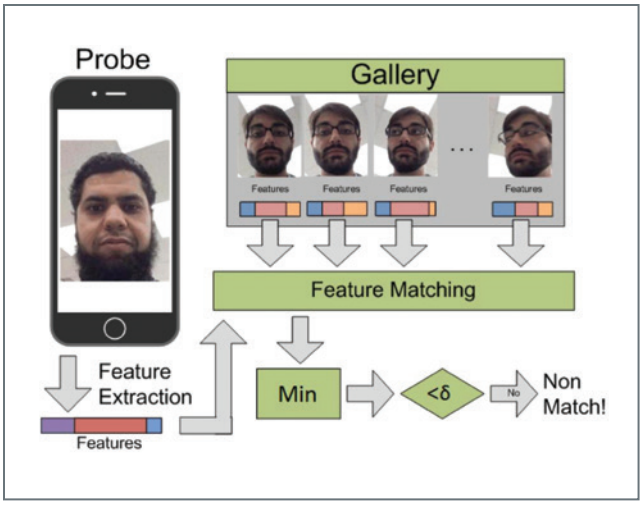
A wearable wristband with an electronic biochip for personalized biomolecular health monitoring.

Dr. Javanmard's work on nanoelectronic barcoding for health monitoring is also featured on the cover of the Royal Society of Chemistry journal Lab on a Chip. He and his graduate student **Pengfei Xie** have developed a biosensor – known as a lab on a chip – that could be used in hand-held or wearable devices to monitor health and exposure to dangerous bacteria, viruses and pollutants. Their work has also received attention in other media outlets such a Huffington Post.

Vishal Patel's Active Biometric Authentication On CBS This Morning Saturday Program

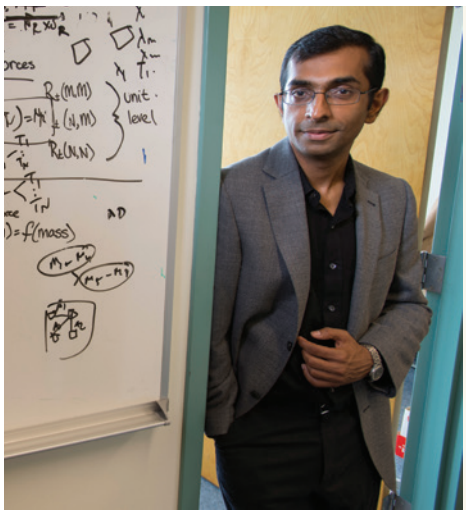
Assistant Professor **Vishal Patel**'s research on Active Biometric Authentication was featured in Saturday's (July 8th) CBS This Morning Saturday program.

Active Authentication is a recently proposed technology where a mobile device continuously monitors the behavior of the user through mobile sensor observations and continuously authenticates the user. This is done by comparing features of obtained sensor observations with a pre-collected feature gallery set as shown in the Figure. This technology is proposed as an alternative to password based traditional mobile authentication methods that have been proven to be vulnerable to various forms of security attacks. In our work we introduce improvements to various aspects of Active Authentication technology with the aim of providing better user experience whilst ensuring high degree of device security. One of our works attempts on improving authentication accuracy in AA system by focusing on getting marginal decisions correct through explicit statistical modeling. This solution is generic enough to be implement on any existing AA system to boost up its performance. In another project, we have developed statistical methods to extend Active Authentication into multiple user scenarios while maintaining the same level of security. This innovation is vital for AA to succeed as a technology in the wild as it's very common for mobile devices to be shared among multiple users. We have further studied the importance of optimal sensor sampling considering memory and energy constraints of mobile devices. To this end, we have proposed an optimal sampling mechanism for AA along with a statistical decision making method to produce decisions of high accuracy with low latency.



Prof. Lindqvist group studies human behavior in their daily lives

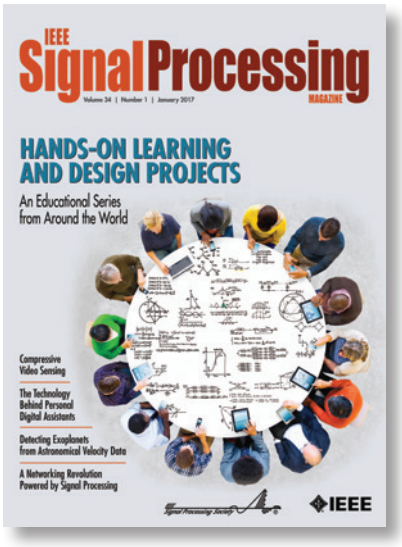
Prof. **Janne Lindqvist** and students in his group have been developing methods to study human behavior in their daily lives utilizing smartphones.The group have developed approaches towards the end of studying security and privacy behavior and people's busyness. This work has led to several interdisciplinary collaborations. Prof. Lindqvist and his student **Fengpeng Yuan** (CS PhD, now at Amazon) and **Xianyi Gao** (ECE PhD candidate), have been collaborating with Prof. **Eddie Selby**'s group (Clinical Psychology, Rutgers) on Ecological Momentary Assessment (EMA) of nonsuicidal self-injury (NSSI) behavior. The first paper out of this collaboration was just published by Suicide and Life-Threatening Behavior Journal "An Ecological Investigation of the Emotional Context Surrounding Nonsuicidal Self-Injurious Thoughts and Behaviors in Adolescents and Young Adults Authors". Similarly, Prof. Lindqvist is collaborating with a group of sociologists to study implicit racism experiences during people's daily lives.



DOE Advanced Scientific Computing Research Award

Professor **Shantenu Jha** is the PI of a Department of Energy (DOE) ASCR award to Rutgers, along with Brookhaven National Laboratory (lead), Oak Ridge National Laboratory and University of Texas for the project titled, "Workflow Management on Titan for High Energy and Nuclear Physics and for Future Extreme Scale Scientific Applications". The 2 year project is funded at $2M, and Rutgers will receive $565K and be responsible for research into workload management and placement. Working with the ATLAS experiment – one of two major experiments at CERN in Geneva, this project will investigate new and scalable high-performance and distributed computing methods to federate DOE leadership computing facilities with the Large Hadron Collider (LHC) Grid. The research outcomes and solutions from this project are likely to guide the design and implementation of future computing infrastructure that CERN will employ as it plans for Run 3 and Run 4 of the LHC, producing thousands to million times greater volumes of complex data.

Advancing Undergraduate Studies: Promoting IEEE Signal Processing Education Initiatives



As educators and mentors, we continuously seek to improve students' experience and learning by developing and implementing new successful teaching methods that advance effective ways for skill development. Schools need to constantly assess and restructure the manner in which they prepare students to the growing demands from the engineering workforce. Educators are faced with the greater challenge of preparing their undergraduate students to deal with real-life engineering problems as early as possible in their education while not compromising on the required theoretical knowledge base.

Recognizing the need for innovation in teaching techniques, the IEEE Signal Processing magazine (SPM) endorsed a Special Article Series on Signal Processing Education via Hands-On and Design Projects. The Guest editorial for this issue was led by Dr. **Hana Godrich** from the ECE department at Rutgers along with Dr. Arye Nehorai (Washington University in St. Louis, USA), Dr. Ali Tajer (Rensselaer Polytechnic Institute, USA), Dr. Maria Sabrina Greco (University of Pisa, Italy), and Dr. Changshui Zhang (Tsinghua University, Beijing, China).

In an era of unprecedented technology refresh rate, engineering programs need to find an effective way to incorporate application aspects into teaching, achievable, among others, through full scale engineering design projects.

In such projects, students need to collaborate on complex engineering problems that integrate a larger set of tools and disciplines and work under realistic constraints. The diversity in engineering applications that utilize signal and information processing opens many possibilities when it comes to the choice of experiments and projects that will keep students engaged in learning. This is further supported by extensive offerings of low-cost hardware platforms that incorporate significant on-board computation capabilities along with access to sensors, actuators and open source software tools.

The special article series offers educators and students an opportunity to share progresses and innovation made in undergraduate engineering education. An insight into the implementation challenges of design projects and experimental platforms from freshmen through senior year students and solutions adopted to address them are offered in the January 2017 IEEE SPM issue through a series of articles contributions from around the world (Special Article Series). As part of this special article session, IEEE SPM worked with SigPort on a SPM student design project series documents (SigPort SPM). Undergraduate students and their advisors shared information on relevant engineering projects. The submitted projects had an overall of more than 400 downloads, showcasing interest in the community for such information. The goal of this initiative was to start a discussion on the role of experimental and project-based practices in modern signal and data processing education and support fast-track progress by sharing "know-how" experience. The first wave of contributions from around the world cover diverse fields and projects reflecting signal and information processing opportunities and applications. These submissions were summarized by Dr. Godrich in a first highlights article "Students' Design Project Series: Sharing Experiences" that was included in the January 2017 issue (Design Projects Highlights).

The introduction of this special series on education gained interest that resulted with the establishment of a periodic 'SP Education Column'. Dr. Godrich continues to support this effort as an Associate Editor and as a member of the IEEE SPS Education Committee.

Novice2expert Coding Club Organized Two Workshops For Middle School Students

The Novice-to-Expert (N2E) Coding Club and Rutgers Residence Life organized MIT App Inventor workshops on January 14-15, 2017. This event was sponsored by a Google outreach grant. MIT App Inventor http://ai2.appinventor.mit.edu/ is a web application for developing apps for android devices. The simple drag and drop operations make it fun to learn basics of programming.

The workshops took place in ECE the Computer Lab and were led by **Parneet Kaur** (graduate student, ECE) and **Umama Ahmed** (sophomore, ECE). **Hsiu-fen Lin**, an apartment assistant with Rutgers Residence Life, coordinated the event. The workshops were attended by 15 students (ages 9-14) and their parents who learned basics of programming and developed three fun apps along with the instructors. The students were given 3 weeks to develop their own apps, which they showcased in a competition held on February 4, 2017. Besides the instructors, **Parul Pandey** (graduate student, ECE) was invited as an additional judge to select the winners. All the students impressed the judges with their apps and three students with most creative apps were selected as winners. The three winners were:

1. **Dima-Al Quzwini** (4th grade), App: Learning for Kids
2. **Younis R. Mazin** (7th grade), App: Shoot the Bird
3. **Namisha Shrvastava** (9th grade), App: General Knowledge Quiz

N2E coding club is a student-run club with Prof. **Kristin Dana** as its faculty advisor. For more information about the club, please email n2ecodingclub@gmail.com

Connected Vehicle Technologies for more Robust Automated Driving Systems


M. Gruteser

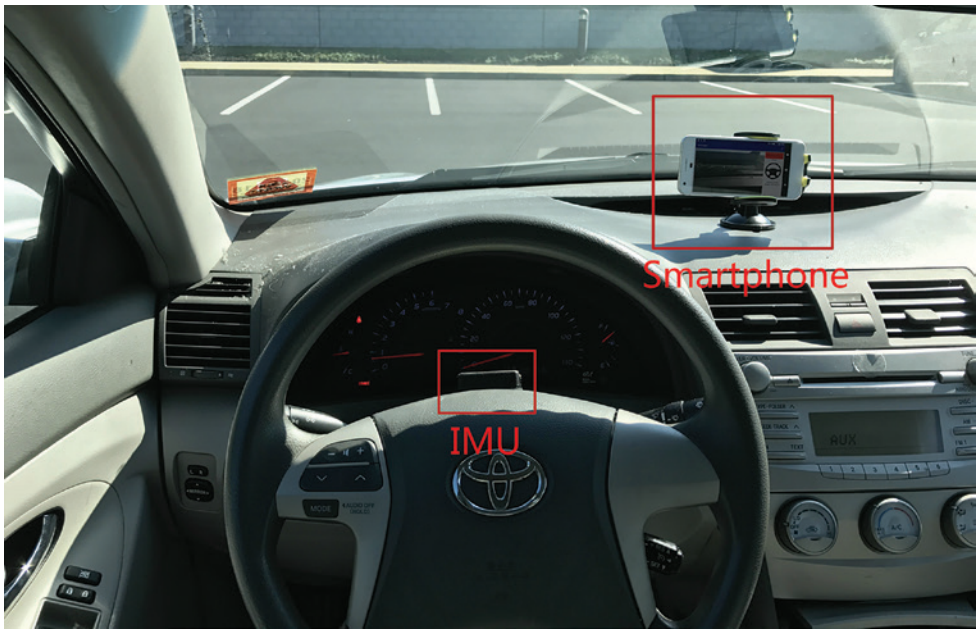
Advanced driver assistance systems and, in particular, automated driving offer an unprecedented opportunity to transform the safety, efficiency, comfort, and economics of road travel. This has led many organizations in the computing and transportation domains to focusing on self-driving technology research. While this has resulted in a number of prototypes with impressive performance, it remains widely recognized that ensuring dependability under varied traffic and road conditions remains a key challenge.

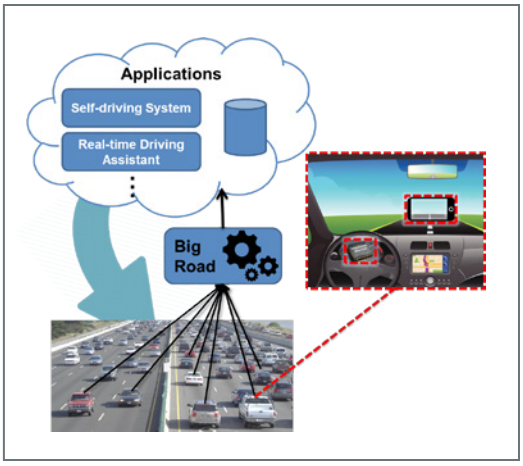
Prof. **Marco Gruteser**'s group at WINLAB designs and evaluates connected vehicles technologies that seek to enhance the robustness of such technologies and thereby improve safety. Vehicles are increasingly equipped with multiple wireless communications technologies, including cellular connectivity with the cloud, WiFi hotspots inside the vehicle, and Dedicated Short Range Communications (DSRC) that allow vehicles to directly exchange information with other nearby traffic participants. Such networks can be used to collect information about challenging road situations that vehicles encountered, which can then be used to improve vehicle safety technologies. Such networks can also act as a virtual sensor that provides redundancy to the existing RADAR and camera sensors as well as extra information about the traffic situation beyond the immediate line-of-sight of a vehicle.

A recent project studies whether driving data useful for self-driving can be gathered with only minimal instrumentation of vehicles. Self-driving vehicles have to operate safely even under unusual or rare traffic events that are challenging to address and could lead to potential accidents. Developing such technology therefore requires an understanding of not just common highway and city traffic situations but also a plethora of widely different unusual events (e.g., objects on the road-way, a pedestrian crossing highway, deer standing next to the road, etc.). While each such event may be rare, in aggregate they represent a significant risk that technology must address to develop truly dependable automated driving and traffic safety technologies. The average human driver achieves on the order of almost 100 million vehicle miles traveled per fatality. Demonstrating driving performance at an above-average, advanced human driver level will therefore require successfully avoiding fatalities with unusual events that might be encountered within a billion miles of driving. This motivates the need for massive driving datasets that cover billions of miles of driving so that they contain a representative set of such unusual and rare events.

A minimal vehicle instrumentation approach would enable massive crowdsourcing by capturing events from tens of thousands of vehicles rather than only attempting to collect data with a few highly instrumented vehicles, as is common practice today. A key challenge in creating such minimal instrumentation is the heterogeneity of vehicle designs and the proprietary nature of in-vehicle systems. To be useful for driver assistance and automated driving applications, the dataset should capture the surrounding traffic situation of the vehicle and how the vehicle was driven through this traffic scenario (i.e., it's precise trajectory and the necessary driver input). The latter is especially important for approaches relying on machine learning, which is increasingly used in such systems. Here, the driver input data provides labels for both positive and negative training examples that allow the system to learn how to react to traffic situations. It is also useful for system validation, since it allows automated comparisons of the response of automated driving algorithms with those of a human driver. Any significant deviations can then be more closely examined.

Prof. Gruteser's group is also working with car makers on the design and evaluation of reliable

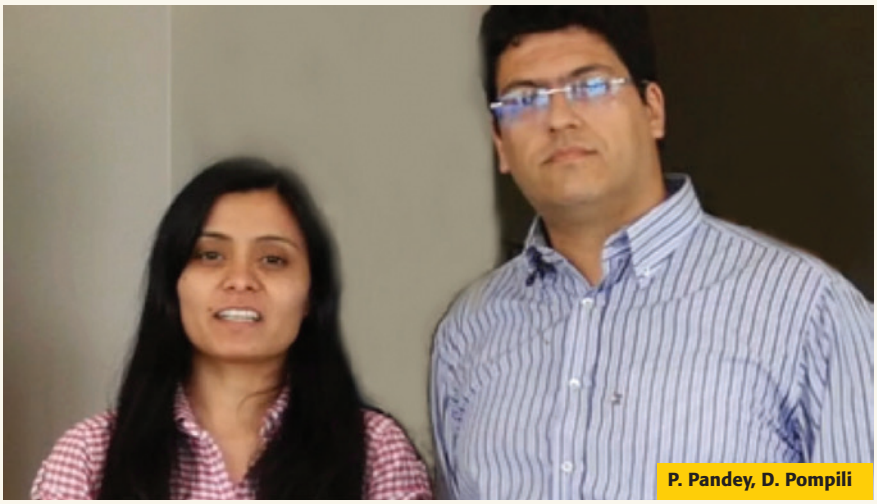




direct communications protocols that enable wireless sharing of data among nearby traffic participants. Such communications can improve situational awareness, in particular in situations where buildings or other vehicles block line-of-sight between traffic participants. Current vehicle sensors such as RADAR, LIDAR, and camera systems largely require line-of-sight for detection and tracking of other traffic participants. By sharing information, vehicles can extend their awareness range and virtually see around corners to mitigate and avoid an even larger amount of dangerous traffic situations. A key challenge is ensuring reliable communications under the potentially high density of simultaneously active wireless transmitters, which can reach thousands in communication range of a single vehicle. To address this, his group is designing congestion control and context-aware prioritization strategies. It also embarked on a multi-year effort to cross-validate large-scale vehicular network experiments with hundreds of Dedicated Short Range Communications IEEE 802.11p transmitters through simulations models. These precisely calibrated and validated models can then serve as reference models for further research in the field.

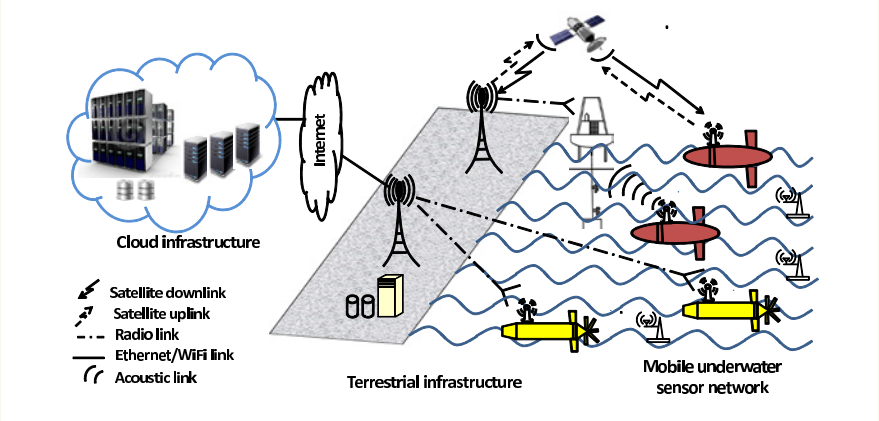
Taken together, these efforts should contribute to a safer, increasingly efficient, and more comfortable future travel experience.

Dario Pompili and Parul Pandey win 2016 IEEE Transactions on Automation Science Engineering Best Paper Award


P. Pandey, D. Pompili

Professor **Dario Pompili** and ECE PhD student **Parul Pandey** have won the 2016 Googol T-ASE Best Applications Paper Award, for their IEEE Transactions on Automation Science and Engineering (T-ASE) article titled "Dynamic Collaboration between Networked Robots and Clouds in Resource-Constrained Environments." The article is co-authored with Dr. **Jingang Yi** from the Department of Mechanical and Aerospace Engineering at Rutgers. The authors received the award, which included a certificate and 500 USD prize, at the 12th IEEE International Conference on Automation Science and Engineering (CASE), held in Fort Worth, TX.

The authors address the design of mobile clouds in underwater mobile sensor networks such as Autonomous Underwater Vehicles (AUVs) or robots that enable oceanographic data collection for environmental and pollution monitoring, offshore exploration, and distributed tactical surveillance. These applications require running compute- and data-intensive algorithms that go beyond the capabilities of the individual AUVs that are involved in a mission and are supported by a mobile cloud with novel resource provisioning.



Heterogeneous computing pool constituting "local resources" (static sensors/teams of Autonomous Underwater Vehicles (AUVs)) and "remote resources" (Public Clouds, on-shore station, satellites) to enable near-real-time computation-intensive underwater applications.

Rethinking Engineering Education at Rutgers for iGen Students

Waheed Bajwa

These are interesting times for being an engineering educator. The Millennials are finally out of the academic pipeline, having been replaced by the iGeneration (iGen)—students who came of age as the world around us exploded with smartphones, tablets, laptops, and social media such as Facebook, Twitter, Instagram, YouTube, and Vimeo. If there is one thing that defines iGen students, it is that they love technology. We, as instructors, can either view this as a hindrance to students' learning or we can leverage this to enhance their learning experience. At Rutgers, we are reimagining engineering education for iGen students by thinking of technology as a friend, rather than a foe. In this article, I detail some of the efforts that I personally have made in this direction, with encouragement and support from many of my colleagues at Rutgers in general and from Rutgers Electrical and Computer Engineering Department in particular. First, based on recent works of education researchers as well as my discussions with iGen students and colleagues, I have whole-heartedly embraced social media as an integral component of my course offerings. This involves the use of Twitter (@SigProcessing) for outside classroom discussions using course-specific hashtags (e.g., #RUECE346 and #RUECE521), use of Piazza (http://piazza.com) for student-led discussions, and use of YouTube for archiving of my video lectures (www.youtube.com/c/SigProcessing) for later referencing by the students. Students' end-of-semester feedback and the viewing statistics of my YouTube channel (7,750+ hours of viewing since 2013) give me confidence that the strategy of incorporation of social media within my classes has been having a hugely positive impact on students' learning.

Second, since 2015, I have been exploring the possibility that a carefully "flipped" classroom can be used to replace a traditional lecture-based classroom with minimal time, cost, and infrastructure overhead, even for large classes with 100's of iGen students. In a traditional classroom—perhaps better suited for pre-iGen students, the instructor transfers knowledge to the students by delivering weekly lectures during assigned class periods. The students are then expected to master the covered material outside the classroom by working on assigned homework exercises and reaching out to the instructor during assigned office hours for any clarifications. Traditional classrooms, unfortunately, do not work equally well for all students. A flipped classroom (also referred to as an inverted classroom) literally flips the traditional learning paradigm on its head (see Figure 1). Specifically, the knowledge transfer component of the course in a flipped classroom is moved outside the class; this typically involves the use of video lessons. The freed-up time during the assigned class periods is then used for carefully designed activities and collaborative exercises that help students master the course material. This "flipping" not only helps the students clarify any confusions in real time, but it also enables the instructor to personalize instructions to individual students based on their own gaps in understanding. The findings reported in this article are mostly based on my seminal 15-week flipped offering of a junior-level signal processing class with final enrollment of 133 students in the ECE department at Rutgers in Spring 2016 Semester.

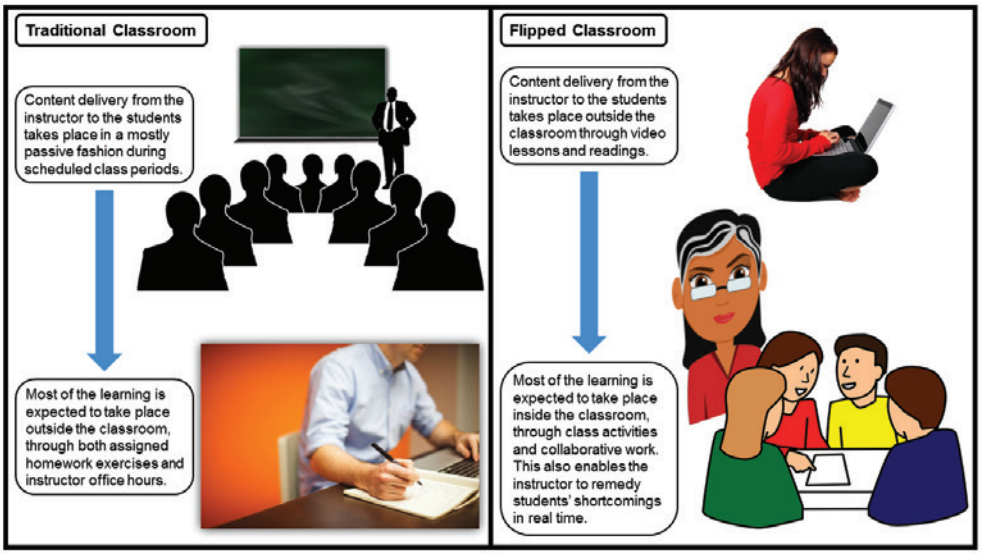


Figure 1. A side-by-side comparison of a typical lecture-based classroom and a flipped classroom. Because of the nature of these two modes of instruction, lecture-based learning and flipped learning are sometimes also referred to as passive learning and active learning, respectively.

ECE 346: Digital Signal Processing is a required course at Rutgers for students majoring in electrical engineering. It is offered every year in spring semester, with an average final enrollment of 100+ students in the last five years. Traditionally, more than two-thirds of the students enrolling in this course are juniors who took ECE 345: Linear Systems and Signals in the immediately preceding semester, while the rest are seniors who did not or could not enroll earlier in the signal processing course for various personal or academic reasons. I have been teaching this course since Spring 2012, with his first offering very much in the mold of traditional lecture and chalkboard format. This first offering would be considered a success by most academic standards; the course quality received an average rating of 4.33 (out of 5) from 56% of the enrolled students and there were more than a handful of students who had

truly mastered the course material by the end of the semester. Despite its seeming success, this first offering also laid bare to me many of the limitations of the lecture format, especially in relation to large core courses for iGen students. In particular, the struggles of students who did not conform to assumptions of the lecture format were all too palpable during the semester. I made several tweaks to his first offering in the ensuing semesters in an attempt to make his offerings more equitable to students. These tweaks included experimenting with presentation slides in lieu of chalkboard text, video archiving of class lectures, grade-based incentives for class participation, and different attendance policies. Some of these tweaks appeared to be helpful to students' learning (e.g., video archiving), while other tweaks seemed to have either little effect (e.g., mandatory attendance) or negative effect (e.g., presentation slides) on students' learning. And none of the tweaks seemed to directly confront the challenges of academic, behavioral, and learning variations among students. It was during this time, when I was exploring different means of teaching signal processing, that the term "flipped clasroom" entered in his lexicon in 2013; and I spent the next two years discussing with other educators means by which large core engineering courses could possibly be flipped using minimal time, cost, and infrastructure overhead. My seminal flipped offering of the signal processing class physically met for 80 minutes each at 8:40 a.m. on Mondays and Thursdays. In addition, enrolled students were divided into three recitation groups, with each group attending one 80-minutes recitation (led by a graduate teaching assistant) per week. There were three main categories of activities within this offering that fundamentally differentiated it from a traditional offering. These categories, referred to as home activities, in-class activities, and recitation activities in the offering's parlance, accounted for 29% of a student's final grade. In order to achieve the learning objectives of this offering, which included comprehensive understanding of sampling theory, discrete-time processing of continuous-time signals, discrete Fourier transform, spectral analysis, and design of digital filters, I organized the three sets of course activities as follows.

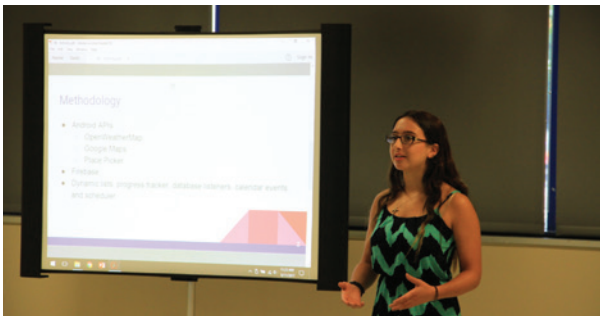
There are four data points from the perspective of an instructor that seem to suggest that my seminal flipped offering was a success. First, the number of students attending each scheduled class period as well as the general body language of the students seemed to suggest the students were—on average—much more engaged in the flipped offering compared to my previous four traditional offerings. Second, the students' performance on in-class activities as well as the depth of their in-class queries suggested that the students internalized the course material better than in my previous offerings. Third, the sophistication of students' term projects in the flipped offering, on average, exceeded that of the projects in my traditional offerings. A possible explanation for this improvement is that students enrolled in the flipped classroom mastered the material better than in previous years. Finally, it used to be relatively straightforward for me in previous years to map students' numerical grades to letter grades. But the assignment of letter grades in the flipped offering became quite a chore due to the lack of significant gaps in the distribution of students' numerical grades. A possible explanation for this phenomenon is that fewer students were being left behind in terms of their understanding as part of the flipped offering. In particular, the most noticeable aspects of my flipped offering—in comparison to the previous four years—are the significantly higher percentage of A grades and the significantly lower percentage of D grades.

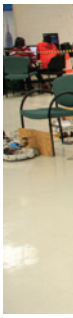
In summary, my seminal (Spring 2016) and the subsequent (Spring 2017) flipped offerings have me convinced that an appropriately adapted flipped classroom is one way to reach out to iGen students. After having experimented with the flipped classroom and having seen the outcomes of this experiment for two years in a row, I am not planning to revert back to the traditional lecture-based format for my undergraduate signal processing class. My next flipped offering of the signal processing class will be in Spring 2018 and I invite you to audit it in person for one of the sessions to experience the joy of flipping!

Step #	Activity Category	Activity Details	Grading Details
1-1	Home Activity	Viewing of assigned YouTube video lessons (∼30–70 minutes per class)	Ungraded
1-2	Home Activity	Completion of assigned textbook reading (if applicable)	Ungraded
1-3	Home Activity	Completion of online assessment (due by 7 a.m. on the day of each class)	∼5% of the final grade
2-1	In-Class Activity	Review of key concepts by the instructor (∼10–15 minutes per class)	Ungraded
2-2	In-Class Activity	Short polling questions (∼2–5 questions, with each worth two points)	15% of the final grade
2-3	In-Class Activity	Paper-and-pencil problems (∼1–3 problems, with each worth 4–12 points)	(25% points for an attempt)
3-1	Home Activity	Paper-and-pencil problems (∼1–3 problems assigned after some classes)	∼2% of the final grade
4-1	Recitation Activity	Problem solving by the GTA (∼30–35 minutes and ∼3–5 problems)	Ungraded
4-2	Recitation Activity	Paper-and-pencil problems (∼3–5 problems, with each worth 4–10 points)	7% of the final grade

winlabnews

Summer Internship Program





For over 25 years, WINLAB has enjoyed success conducting research on wireless data networks, using the combined resources of government, industry, and academia. Enterprising students who take part in the summer internship program get the opportunity to tap into the accumulated expertise, and begin (or continue) their own forays into networking technology.

"As a high school intern, WINLAB has been a wonderful opportunity to affirm my desire to study electrical engineering," says **Joseph Florentine**, "I have been able to work with PHD students, fellow interns, and work on projects ranging from VHDL processor design to analog circuits with PCB design. Such opportunities before college even starts are few and I am certain what I have learned here will be of great use in the future."

Florentine was joined by 49 students (10 high school, 14 undergraduate, and 25 graduate) this year; each joins an active research group, consisting of a mix of graduate and undergraduate students, with a faculty mentor. Their projects are designed to be completed in a summer, but can be extended and built upon after the fact.

"The WINLAB Internship program exposes the students to engineering challenges in diverse fields, including robotics, sensing, interface design, augmented reality, networking and cryptography," says **Rich Martin,** an Associate Professor of Rutgers' Department of Computer Science, "The students have wide leeway in meeting these challenges, and their creativity always produces new and innovative approaches to solving hard problems."

Not all of the 13 projects were designed with the new students in mind. As **Nicholas Cooper,** an undergraduate, reports: "At the beginning of the summer, I proposed some of my own projects and was able to pursue both of them! This made th`e work I was doing much more interesting and engaging to me, and as a result I feel I have accomplished a great deal this summer."

Whether the students are assigned to or propose their own projects, they are responsible for dividing the work- both into stages, and among themselves, managing their time and resources. In addition, they make weekly presentations to their research group of peers and professors, to receive feedback on their progress, ideas, and public speaking skills. They also maintain a wiki page and website for their projects, ensuring that they can be replicated and expanded in future sessions.

The projects posed a range of challenges for the interns to work on, in particular perhaps, for high school students: "I've had some experience with coding in Java before, but I was not prepared for the advanced techniques used in this project and thus I spent most of my time learning and researching, rather than actually coding," says **Sreya Das.** "Throughout the course of this project, I learned about many things that I did not know before... not only by looking up things on my own, but also by observing my more experienced teammates."

Finding roadblocks during research is normal, and instructive for the students, issues ranging from uncooperative compilers to 3d printing fabrication failures. They worked though the issues, with new successes each week. Eventually, the projects took shape.

"As the summer progressed, the questions I received grew both less frequent, and more in depth, as the interns got into the meat of their projects." Says WINLAB Engineer **Michael Sherman,** "Eventually I only had to point them at resources for more information."

The program culminated on August 11th with an Open House at WINLAB, with over 100 visitors attending. Each group presented their work, followed by demos and poster presentations. The visitors went from group to group, and after a while the interns mingled and discovered each others' final results.

Past students have gone on to show their work in competitions, and credited the program with helping their academic or job prospects. Their posters stay up from the time of their final presentation until the following year, and receive interest from visiting academics and industry representatives.

Mason Llewellyn reports, "I have truly enjoyed my time as an intern at WINLAB. Before I came here I only practiced computer programming at home where I didn't have access to even half as many resources in terms of hardware or people to help me when I wasn't sure what to do. Overall my internship at WINLAB has given me more confidence to try new things and explore new topics in computer science."

Best Demo Award at ACM/IEEE IoTDI 2017

The WINLAB team – **Jiachen Chen, Sugang Li** and **Yanyong Zhang** – received the Best Demo Award at the 2nd ACM/IEEE International Conference on Internet of Things - Design and Implementation (IoTDI), held this week in Pittsburgh. The demo is entitled "Motion Triggered Surveillance Camera using MF-IoT."

The advent of new Internet of Things (IoT) devices has posed challenges to the underlying network design. IoT network requires global reachability, mobility support, richer communication patterns and resource efficiency. MobilityFirst (MF [1]) is a clean-slate network architecture that has the potential to satisfy the requirements of the new IoT network.

Best Paper Award at International Workshop on Research Advancements in Future Networking Technologies

A WINLAB team received the Best Paper Award at the 2nd International Workshop on Research Advancements in Future Networking Technologies (RAFNET) at the IEEE Vehicular Technology Conference (VTC'2017) now being held in Sydney.

The paper is entitled: Evaluating 5G Multihoming Services in the MobilityFirst Future Internet Architecture, and is authored by **Parishad Karimi, Michael Sherman, Ivan Seskar, Francesco Bronzino, Abhimanyu Gosain** (BBN/Raytheon) and **D. Raychaudhuri.**

Best Paper Award at Visible Light Communications Workshop at ACM Mobicom 2016

A team from WINLAB received the best paper award for their paper "Visible light based activity sensing using ceiling photosensors" at the ACM Workshop on Visible Light Communication Systems (VLCS) held with the ACM MobiCom 2016 conference in New York, in October 2016. The team comprising graduates students **Viet Nguyen***(ECE), **Mohamed Ibrahim***(CS), **Siddharth Rupavatharam** (ECE) and **Minitha Jawahar** (ECE) was advised by Professors **Marco Gruteser** and **Rich Howard**.
* joint first authors

The work in the paper explores the feasibility of tracking motion and activities of humans using visible light sensors embedded in ceiling lights. It employs communication among light bulbs to coordinate signaling and sensitive difference measurement techniques to detect and infer motion from shadows cast on the floor.

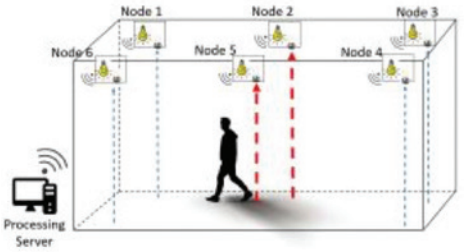


Figure 1: Conceptual Diagram. Node 2 and node 5 detect shadow caused by the person in the room, while other nodes do not. All data is wirelessly snt to processing server.

facultynews

Dipankar Raychaudhuri Named 2017 School of Engineering Faculty of The Year


D. Raychaudhuri

Distinguished Professor **Dipankar Raychaudhuri** has received the 2017 School of Engineering (SoE) Faculty of the Year Award. This award recognizes exceptional contributions of a SoE faculty member to the School of Engineering, the University, the engineering profession, the scientific community and/or society at largelarge and carries a monetary award in the amount of $5,000 to be used to support his continued research and scholarship activities.

Active in technology entrepreneurship, Dr. Raychaudhuri is the technical advisor for several government organizations and companies. He has written over 200 journal and conference papers, as well as 10 book chapters, on research areas that include future network architectures and protocols, wireless systems and technology, experimental prototyping and network research testbeds. In addition, he has coauthored Wireless Technologies and the Future Mobile Internet, published in 2011. He holds 15 patents on topics including broadband wireless networks, MAC protocols, digital video, and VSAT networks.


V. Patel

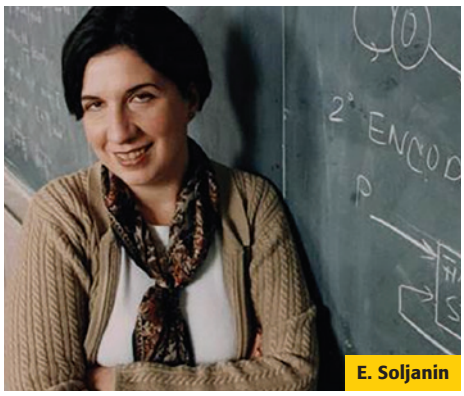
Vishal Patel Receives 2016 Jimmy H. C. Lin Award for Invention at University of Maryland

Professor **Vishal Patel** is a co-recipient of the 2016 Jimmy H. C. Lin Award for Invention at University of Maryland for his work on the HyperFace algorithm. Dr. Patel and his collaborator at University of Maryland, Dr. **Rajeev Ranjan**, developed HyperFace 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 using deep learning networks. Its applications include automatic face tagging, mobile active authentication, automatic monitoring through surveillance cameras, face identification, affective computing, and expression analysis for medical applications, such as automatic pain and fatigue detection, facial emotion analysis, and many more.

Grigore Burdea Receives 2017 IEEE Virtual Reality Career Award

Professor **Grigore Burdea** is the recipient of the 2017 IEEE Virtual Reality Career Award given by the Visualization and Graphic Technical Committee of the IEEE. This award established in 2005, is given every year to an individual to honor that person's lifetime contribution to virtual and/or augmented reality and is the highest award in this field. Professor Burdea is noted for his invention of the Rutgers Master, the first force feedback glove as well as Virtual Reality Therapy to improve symptoms related to chronic pain, dementia, and chronic stroke. Dr. Burdea joins a list of luminaries who have shaped the field of virtual reality and have been recognized with this award over the years.


G. Burdea


E. Soljanin

Emina Soljanin Receives 2017 Outstanding Engineering Alumni Award From Texas A&M University

Professor **Emina Soljanin** has received the 2017 Outstanding Engineering Alumni Award from the College of Engineering at Texas A&M University. The citation for the award reads: "In recognition of her preeminent research in coding theory, information theory and network coding; for her contributions to

major breakthroughs in the design and analysis of efficient, reliable and secure networking and storage systems; for designing the first distance enhancing codes for commercial magnetic storage devices, forward error correction for optical transmission schemes, algorithms for quantum computation, and link error prediction methods for cellular network standards."

Athina Petropulu Promoted to Distinguished Professor

The Board of Governors has approved Dr. **Athina Petropulu**'s promotion to Distinguished Professor effective July 1, 2017. Congratulations on this well deserved accomplishment Athina!

A. Petropulu

Athina P. Petropulu received her undergraduate degree from the National Technical University of Athens, Greece, and the M.Sc. and Ph.D. degrees from Northeastern University, Boston MA, all in Electrical and Computer Engineering. She is Professor at the Electrical and Computer Engineering (ECE) Department at Rutgers, having served as chair of the department during 2010-2016. Before joining Rutgers in 2010, she was faculty at Drexel University. She held Visiting Scholar appointments at SUPELEC, Universite' Paris Sud, Princeton University and University of Southern California.

Dr. Petropulu's research spans the area of statistical signal processing and wireless communications. She has made fundamental contributions in the area of cooperative approaches for wireless communications, physical layer security, MIMO radars using sparse sensing, and blind system identification using higher-order statistics. Her research has been funded by various government industry sponsors including the National Science Foundation, the Office of Naval research, the US Army, the National Institute of Health, the Whitaker Foundation, Lockheed Martin and Raytheon.

Dr. Petropulu is Fellow of IEEE and recipient of the 1995 Presidential Faculty Fellow Award given by NSF and the White House. She has served as Editor-in-Chief of the IEEE Transactions on Signal Processing, IEEE Signal Processing Society Vice President-Conferences and member-at-large of the IEEE Signal Processing Board of Governors. She was the General Chair of the 2005 International Conference on Acoustics Speech and Signal Processing (ICASSP-05), Philadelphia PA, and is General co-Chair of the 2018 IEEE International Workshop on Signal Processing Advances in Wireless Communications (SPAWC), Kalamata, Greece. In 2005 she received the IEEE Signal Processing Magazine Best Paper Award, and in 2012 the IEEE Signal Processing Society Meritorious Service Award for "exemplary service in technical leadership capacities". She is currently IEEE Distinguished Lecturer for the Signal Processing Society. In 2016 she served as president of the ECE Department Heads Association (ECEDHA).

Marco Gruteser elected Chair of ACM SIGMOBILE

Professor **Marco Gruteser** has been elected chair of the Association for Computing Machinery (ACM) Special Interest Group on Mobile Computing (ACM SIGMOBILE). ACM SIGMOBILE is the international professional organization for scientists, engineers, executives, educators, and students dedicated to all things mobile.

M. Gruteser

As exemplified by the inaugural test-of-time awards, its members have pioneered: medium access mechanisms that underpin Wi-Fi and IoT sensor communications, positioning systems used in factories and every smart phone, file system caching techniques that inspired Dropbox, as well as congestion control and mesh networking techniques for faster and more ubiquitous wireless broadband data access.

SIGMOBILE also sponsors and is responsible for a series of highly selective international conferences in the field of mobile computing, including MobiCom, MobiSys, MobiHoc, UbiComp, and Sensys.

Peter Meer Recognized Among Top Most Influential Scholars in Computer Vision

Professor **Peter Meer** has been recognized as a 2016 AMiner Most Influential Scholar for his outstanding and vibrant contributions to the field of Computer Vision!

The AMiner Most Influential Scholar Annual List names the world's top-cited research scholars from the fields of science and engineering. The list is conferred in recognition of outstanding technical achievements with lasting contribution and impact to the research community. The 2016 winners are among the most-cited scholars from the top venues of their respective subject fields as of 2016. Recipients are automatically determined by a computer algorithm deployed in the AMiner system that tracks and ranks scholars based on citation counts collected by top-venue publications. The full list of the most influential scholars can be found here: https://aminer.org/mostinfluentialscholar/cv.

AMiner (https://aminer.org) is a free online service for academic social network analysis and mining. As of 2016, the system has collected information on over 136 million researchers, 230 million publication papers, and 300,000 venues. The system has been in operation on the Internet since 2006 and has been visited by nearly 8.32 million independent IP accesses. It provides various search/mining services for publishers, NSFC, and research venues such as ACM/IEEE Transactions, ACM SIGKDD, ACM WSDM, and IEEE ICDM.

Guaranteeing Rigorous Privacy in Future Data Collection and Sharing

Assistant Professor Anand D. Sarwate, enjoying the privacy of the woods.

We are living in an era in which unprecedented amounts of information about us is collected, processed, and shared, often without our knowledge. Although we often come across invasive results of this sharing (think about creepy ads you see while browsing), in many cases we may benefit. For example, the US Census collects information about the population which is then used to inform public policy, software companies rely on automatic monitoring to learn about malware and other security problems, and medical researchers can share patient or subject information to get a better understanding of human health. In many of these applications, the information about individuals is private and sensitive, such as household incomes, browser logs, and medical histories. At Rutgers, ECE Assistant Professor **Anand D. Sarwate** and his research collaborators develop privacy-sensitive methods for collecting, sharing, and learning from this data.

In order to give individuals more control over their data and how it is used, it's useful to think about the data as being owned by individuals. An institution wanting to use this data should then provide some guarantees on how the data will be collected, protected, and used. For example, Census forms are anonymous to guarantee privacy to individual households. Simple "anonymization" or "de-identification" schemes may not be enough; more sophisticated inference attacks can re-identify individuals and reconstruct their data. The *differential privacy* model is a framework for understanding privacy risks in data collection and processing that has rapidly gained traction in the last decade. Differentially private algorithms use randomness to provide a measurable level of privacy protections to individuals. In particular, it guarantees a kind of "plausible deniability" prevents reliable inferences about individuals. Sharing private data involves some risk: the only way to guarantee perfect privacy is to share nothing. Differential privacy lets algorithms establish a tradeoff between privacy risk and the usefulness, or utility, of the algorithm's output. Differentially private algorithms often require more data to achieve the same utility as non-private methods; this overhead is the cost of privacy.

Professor Sarwate has worked on several different aspects of privacy-preserving data collection and analysis supported by grants from the NSF, NIH, DHS, and DARPA. One challenge with differential privacy is that it makes very conservative assumptions about the data being analyzed. This leads to a worst-case analysis which makes the privacy-utility tradeoff seem pessimistic from a privacy perspective. However, in more typical settings the tradeoff can be much better. On the theoretical side, he has worked on understanding how to incorporate prior knowledge so that we can understand the behavior of the typical case. Another way to improve the tradeoff is to consider simpler data models; these simple models could be used to generate synthetic data that can act as a surrogate for the real data. Finally, Professor Sarwate is working with security experts on how to use differential privacy when operating on encrypted data. Networked devices in homes, "smart" buildings and infrastructure, and wearable devices all generate large volumes of data from sensing their local environment. Wireless networks could easily be overwhelmed by traffic if all of these devices constantly upload their data to the cloud. This provides another potential opportunity for protecting privacy. The goal of this study is to understand the cost of privacy and how to manage network resources in these future systems.

In applications such as medical research, there are strong ethical and legal constraints on how and when data can be shared. However, many human health studies suffer from having a small number of subjects; studies are expensive and some conditions are rare. This is particularly true in mental health research. Recently, a number of compelling studies suggest that some disorders are associated with physiological and genetic markers. To understand these effects, researchers want to be able to jointly analyze data from multiple studies across different research groups. Simply sharing the raw data (e.g. brain scans) is not allowed, so Sarwate's group is collaborating with neuroimaging researchers to develop computational methods for collectively learning from decentralized private data.

Professor Sarwate remains optimistic that by finding situations where we can guarantee reasonable privacy and utility we will be able to understand when technological solutions to protecting privacy are appropriate and when policy rules are needed. Learning from private data involves assessing the costs to individuals and the benefits to society. By doing so we can make more informed decisions about where and balance those costs and benefits.

Athina Petropulu Receives 2017 ECEDHA Diversity Award

Distinguished Professor **Athina Petropulu** has won the 2017 Electrical and Computer Engineering Department Heads Association (ECEDHA) Diversity Award.

The Diversity Award is given to individuals or departments in recognition of proactive efforts to increase cultural, ethnic, and gender diversity within the ECE student body and among ECE faculty, that go well beyond and above the normal institutional recruiting practices. The award recognized Professor Petropulu's leadership in continually identifying and enhancing opportunities for women and underrepresented minorities nationwide in the field of electrical and computer engineering, through recruiting, mentoring, and advocating.

The award was given to Prof. Petropulu at the ECEDHA Awards Banquet during the 2017 ECEDHA Annual Conference, which was held at the Hilton Sandestin Beach Resort & Spa in Miramar Beach, Florida

Professor Petropulu is seen with ECEDHA President Prof. Khalil Najafi, EECS Chair, University of Michigan (left), and Prof. Zhihua Qu, ECEDHA Awards Committee Chair and Chair of ECE at University of Central Florida (right)

Waheed Bajwa and Hana Godrich Win Presidential Awards

Professors **Waheed Bajwa** and **Hana Godrich** have been awarded Rutgers Presidential Awards for Excellence in Teaching for 2017. Professor Godrich was selected to receive the Presidential Award for Excellence in Teaching and Professor Bajwa was selected to receive the Presidential Fellowship for Teaching Excellence. Each award carries an honorarium of $1000. These awards are a wonderful recognition of the teaching excellence of Professor Godrich and Bajwa, and also reflects the great pride and efforts that ECE faculty members put into their teaching.

Professor Bajwa and Professor Godrich are seen with ECE Department Chair Professor Mandayam at the Awards Ceremony

Pedda and Suseela Sannuti Scholarship at Rutgers

Peddapullaiah "Pedda" Sannuti, Professor of Electrical and Computer Engineering at the School of Engineering at Rutgers University has been instrumental in the development and growth of the institution for over four decades. Dr. Sannuti who retired from Rutgers this summer, and his wife Mrs. Suseela Sannuti, have created an endowed scholarship for $100,000 to support students majoring in Electrical and Computer Engineering.

Scholarships are to be awarded to full time undergraduate students based on academic merit and financial need as determined by University rules in effect on the date of the award. Preference will be given to sophomore, junior and senior students majoring in Electrical and Computer Engineering.

P. Sannuti

Dr. Sannuti who came to Rutgers ECE right after his Ph.D degree from the University of Illinois in 1968, was truly a pioneer of this department. He came to Rutgers at a time when Rutgers Engineering was "still finding its research legs," and he was among the first faculty members in ECE to establish himself as a world class researcher. He has made seminal contributions to the field of controls and systems theory and was one of the first ECE faculty members who were elevated to IEEE Fellow status. He also served the ECE department in one of its most important roles, that of undergraduate program director, for over 25 years and he did so without ever letting on what a demanding job it was. In the true spirit of how much Dr. Sannuti cared about Rutgers ECE, he leaves a lasting legacy of ECE undergraduate students support. All his colleagues wish him a wonderful and well earned life after Rutgers ECE!

newgrants

Waheed Bajwa on his new Army Research Office (ARO) award for the project titled "Robust, Decentralized Feature Learning From Big Data." This is a three year $420,000 project.

Jiachen Chen received NIST grant for project "Modeling and Development of Resilient Communication for First Responders in Disaster Management". This is $1.2 million project with 4 partners: UC Riverside, Rutgers, UIC, UCF. Rutgers' share of this award is $260,000.

Yingying Chen has received NSF award for the project titled "Exploiting Physical Properties in Wireless Networks for Implicit Authentication." This is a three year $499,950 collaborative effort between Rutgers University (Yingying Chen, PI, lead institute) and Indiana University. Rutgers' share of this award is $339,950.

Kristin Dana received a new NSF award for the project titled "Seeing Surfaces: Actionable Surface Properties from Vision." This is a three year $500,000 collaborative effort between Rutgers University (Kristin Dana, PI) and Drexel University. Rutgers' share of this award is $249,931.00

Dr. Dana received IARPA CORE 3D, "DANESFIELD, Data Nexus for Estimating Semantics and Inferring Exterior Layers in 3D", in collaboration with Kitware, Raytheon, Columbia University, Purdue University. Rutgers share: Phase 1A: $230,000 renewable to $875,000.

Also, Dr. Dana receieved grant from Lockheed Martin for the project "Pattern Recognition and Classification in RCS Signals", Phase 2, 06/01/2017-01/31/2018, $55,000.

Maryam Mehri Dehnavi is the PI on a new NSF grant entitled "Performance-in-Depth Sparse Solvers for Heterogeneous Parallel Platforms." This is a two year project totaling $175,000 and is supported under the Computer and Information Science and Engineering (CISE) Research Initiation Initiative (CRII).

Mehdi Javanmard received a DARPA ElectRx Program award for the project titled "The Proteomic Smartpatch Phase IB: Transcutaneous Monitoring of Molecular Biomarkers in Blood Using Flexible and Natural Substrates." This is a six month $200,000 collaborative effort between Rutgers University (Mehdi Javanmard, PI) and University of Pennsylvania. Rutgers' share of this award is $100,000.

Also, Javanmard is the recipient of a new NSF award for the project titled "A Microfluidic-CMOS Cross-cut Approach Enabling Tri-Modal Biorecognition for Highly Accurate Viral Diagnostics." This is a three year $450,000 collaborative effort between Rutgers University (Mehdi Javanmard, PI) and Princeton University (Kaushik Sengupta, PI). Rutgers' share for this award is $225,000.

Shantenu Jha is co-PI on a new SBIR grant from the Department of Energy "Fast fingerprinting and detection of materials using portable/hand-held devices and high performance computing for use in manufacturing and supply chain applications." This is a 1 year $270K project in collaboration with Chemical and Biochemical Engineering faculty members Marianthi Ierapetritou (PI) and Rohit Ramachandran and Optimal Solutions Inc.

Also, Dr. Jha received new NSF award for the project titled "ICEBERG: Imagery Cyberinfrastructure and Extensible Building-Blocks to Enhance Research in the Geosciences." This is a three year $1.85M collaborative project between Rutgers, Stony Brook (lead), UC Santa Barbara and UC Boulder. Rutgers share of the project is $620,000.

Narayan Mandayam and **Janne Lindqvist** along with Professor Arnold Glass from Psychology has received an Early Concept Grant for Exploratory Research (EAGER) award from the NSF for a project titled "Simulated and Synthetic Data for Interdependent Communications and Energy Critical Infrastructures." This is a 2 year $200,000 project in collaboration with Florida International University (FIU), with Rutgers' share of the award being $100,000.

Athina Petropulu received an NSF award for the project titled "Improving the Diversity of Faculty in Electrical and Computer Engineering (iREDEFINE ECE)." This is a two year $100,000 grant, supported by the EEC Div. of Engineering Education and Centers, ENG Directorate for Engineering.

Dario Pompili received a new NSF award for the project titled "Robust, scalable, distributed semantic mapping for search-and-rescue and manufacturing co-robots." This is a three-year $850,000 collaborative effort between Boston University and Rutgers University. Rutgers' share of this award is $426,161.

Dr. **Dario Pompili**, received a new NSF grant from the Cyber-Physical Systems (CPS) Program. The title of the project is "Enabling Real-time Dynamic Control and Adaptation of Networked Robots in Resource-constrained and Uncertain Environments" and the award amount is $999,904. This project is in collaboration with Co-PIs Javier Diez and Jingang Yi, faculty members in the Department of Mechanical and Aerospace Engineering (MAE).

Emina Soljanin received a new NSF award for the project titled "Codes for Data Storage with Queues for Data Access." This is a three year $500,000 collaborative effort between Rutgers University (Emina Soljanin, PI) and Texas A&M University. Rutgers' share of this award is $309,236.

Roy Yates received a new NSF award for the project titled "Timely Updating: Principles and Applications." As part of this groundbreaking project, Roy will study the foundations of timely updating of information. This is a three year $500,000 project.

Saman Zonouz, Mehdi Javanmard and **Athina Petropulu** received an NSF grant for a project entitled "Trustworthy Cyber-Physical Additive Manufacturing with Untrusted Controllers." This is collaborative project with Georgia Tech, with Rutgers in the lead. It is a 3 year $1M grant, and the Rutgers part is $666,000.

Saman Zonouz is PI on an NSF grant "Privacy-Aware Trustworthy Control-As-A-Service for the IoT" in collaboration with UCLA. This is four year $1.2M grant with Rutgers share $350,000.

Dr. Zonouz received a Siemens grant "Symbolic Execution Engine Based on the Siemens CT SE System on SCL Code". Two year $216,000 grant with co-PI Honggang Wang from Rutgers.

Also, Dr. Zonouz received an NSF grant for "I-Corps - Improved University-Industry Transition in Job Market through Data Analytics and Automated Candidate Assessment". This is a 1 year $50,000 grant.

alumninews

Thomas Kennedy - Rutgers 250 Fellow

Thomas Kennedy, '77, B.S. Electrical Engineering, Chairman and Chief Executive Officer, Raytheon Company was selected as a Rutgers 250 Fellow.

On its 250th birthday in November 2016, the Rutgers University community statewide focused on many provocative subjects as it hosted 80 of its alumni, noted for their thought leadership and innovation, for "A Day of Revolutionary Thinking"

The university invited ECE graduate Thomas Kennedy a cybersecurity CEO who revolutionized the industry. Given the increase in cybersecurity and the number of everyday items with network connectivity, securing the "internet of things" is imperative, stressed Kennedy, chairman and CEO of Raytheon Company, which specializes in defense, civil government and cybersecurity solutions. "This is expanding exponentially with the number of things connected online," he says. "Everything – smartphones, cars, industrial controls, ATMs, TVs and security systems to name a few – is suddenly vulnerable."

Dr. Thomas A. Kennedy is Chairman and Chief Executive Officer (CEO) for Raytheon Company. Raytheon Company, with 2016 sales of $24 billion and 63,000 employees, is a technology and innovation leader specializing in defense, civil government, and cyber security solutions. Raytheon is headquartered in Waltham, Mass.


T. Kennedy

Dr. Kennedy joined Raytheon in 1983, starting off in engineering on radar development, and during his more than 30 years with the company, has developed a deep understanding of the company's operations, technologies, and customers through leadership positions in many different locations and functions. Before adding the responsibilities of chairman to his position in October 2014, Dr. Kennedy became CEO in March 2014, and was elected to Raytheon's Board of Directors in January 2014.

Prior to his current roles, Dr. Kennedy was executive vice president and chief operating officer, leading the consolidation of Raytheon's six businesses to four to enhance productivity, agility, and affordability of company operations, and increasing international business. He also provided direct leadership to Raytheon business presidents and enterprise functional leaders including Engineering, Technology, and Mission Assurance; Contracts and Supply Chain; Business Development; and Global Business Services. Previously, Dr. Kennedy served as a Raytheon Company vice president and president of the Integrated Defense Systems (IDS) business, overseeing a broad portfolio of weapons, sensors, and integration systems spanning multiple mission areas and provided to a range of domestic and international customers. Before leading IDS, Dr. Kennedy served as vice president of Tactical Airborne Systems (TAS) for the Raytheon Space and Airborne Systems (SAS) business. At TAS, he was responsible for overall strategic direction and operation of the organization. He also served as Mission Systems Integration vice president with responsibility for the U.K. Ministry of Defence Airborne Stand-Off Radar program.

Earlier in his Raytheon career, Dr. Kennedy was a new business leader and program manager for several radar and electronic warfare systems development programs. He holds several patents related to those technologies. In 2003, he received the Aviation Week Laureate Award for his achievements on the Active Electronically Scanned Array program.

During his military service, Dr. Kennedy attained the rank of captain in the U.S. Air Force, with responsibility for managing satellite launch vehicle avionics development and production programs. Dr. Kennedy holds a doctorate in engineering from the University of California, Los Angeles; and bachelor's and master's degrees in Electrical Engineering from Rutgers University and the Air Force Institute of Technology, respectively.

Rutgers School of Engineering Announces 2017 Alumni Achievement Honorees

The Rutgers University School of Engineering recognized the achievements of five alumni honorees at the annual Medal of Excellence and Distinguished Alumni awards event on October 5, 2017. Established in 2006, the awards recognize School of Engineering graduates who have distinguished themselves since graduation through professional or societal achievement. The 2017 awardees will celebrate Rutgers engineering graduates for their accomplishments and contributions in the areas of technology and asset management, automotive safety research, telecommunications advancements, and aerospace innovation.

Awards include the Medal of Excellence for lifetime achievement, Distinguished Achievement in Industry, Distinguished Achievement in Research, and Distinguished Young Alumnus, along with the Rutgers Engineering Society's Distinguished Engineer Award which recognizes lifetime technical achievement.


R. Pacewicz


E. Oguh

"The 2017 honorees showcase the outstanding achievements of the school's alumni and also demonstrate the diversity of careers that encompass an engineering degree," said **Thomas N. Farris**, Rutgers School of Engineering dean. "Rutgers University's engineering graduates make an important impact, sparking innovation that strengthens our economy and enhances lives around the globe."

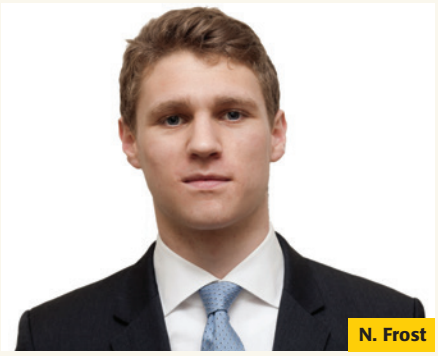
The 2017 Medal of Excellence honorees include two ECE alumni. **Roman P. Pacewicz** received the Distinguished Achievement in Industry Award and **Emeka O. Oguh** was honored as Distinguished Young Alumnus.

Roman Pacewicz is the senior vice president of marketing and global strategy for AT&T Business, leading core marketing functions from advertising to global business development. Since joining AT&T in 1988, he has held an array of leadership positions in product management, systems development, engineering, and more. Pacewicz is currently leading the creation of AT&T's Network on Demand portfolio, the industry's first Software Defined Networking (SDN) enabled carrier grade portfolio of services. Pacewicz holds a bachelor's in electrical engineering from Rutgers University and an MBA from University of Pennsylvania's Wharton School of Business

Emeka Oguh is the founder and CEO of PeopleJoy, a benefits platform company that provides employee retention solutions focused on financial wellness. He previously founded a mobile app publishing company that was acquired in 2015. Prior to that, he worked as director of product at a venture-backed financial technology startup and as a Wall Street analyst at Merrill Lynch. He is a Huffington Post contributor, providing articles related to financial wellness and managing student debt. He also volunteers with MLT Ascend, a mentoring program for first-generation, low-income college students. In addition to his Rutgers electrical engineering degree, Oguh earned an MBA from Harvard Business School.

My experience at Rutgers ECE

Nicholas Frost


N. Frost

When I graduated from high school in 2014 I chose to attend the Rutgers Engineering School. Fortunately I was welcomed by being featured in a an article in Rutgers Today (http://news.rutgers.edu/news-release/class-2018-diverse-accomplished-and-largest-ever/20140901#.WYfRAoTyvDe) and was given support from admissions and the ECE department. Within a week of being at school I had decided to study ECE and due to a large amount of AP credits and support from the engineering faculty, I was able to skip my freshman year and jump right into my major courses. One of the most significant aspects of the ECE program is that it provides an excellent foundation for a wide range of STEM careers or graduate school. The emphasis on programming courses, probability, and math in addition to traditional electronics studies make it a great launching point to pursue a wide range of electrical engineering professions and also many other options. With only a few additional classes I could easily find opportunities for graduate school in Math, Physics, Statistics, Photonics, or Computer Science. My personal interests lie within Quantitative Finance which has a strong overlap with many electrical engineerings disciplines so I tailored my degree to build skills for a career in this area. While at Rutgers I further pursued an array of extracurricular activities. I served as the Vice President of Rutgers' International Society of Photonics Engineers, Vice President of the Electrical Engineering Honor Society, and President of the Quantitative Finance Club. During the summers I was able to do research at Princeton University for two summers and hold internships at Goldman Sachs for two summers. As a piece of advice to younger students, I highly recommend the ECE curriculum and program as a starting point for future work in engineering or science. With very few exceptions, the ECE program is a perfect start for many STEM based further studies and a very wide range of careers.
In terms of my future plans, I am currently enrolled in the Masters of Science in Computational Finance program at Carnegie Mellon University. Although I have just started this program I feel that RU has provided me an outstanding foundation for the advanced math and computer programming required.
I am extremely proud to be a Rutgers Electrical Engineering graduate and am confident the education has and will set me up extremely well moving forward in my career. Thank you.

advisoryboard

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.

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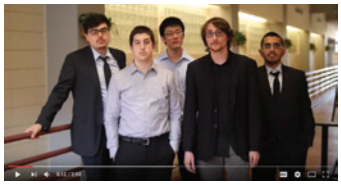
ECE Video Profile #1



www.youtube.com/watch?v=uWWI6t_7CVY

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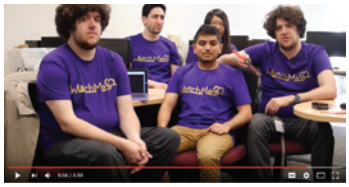

https://www.youtube.com/watch?v=4LoShx2q-Hc

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