

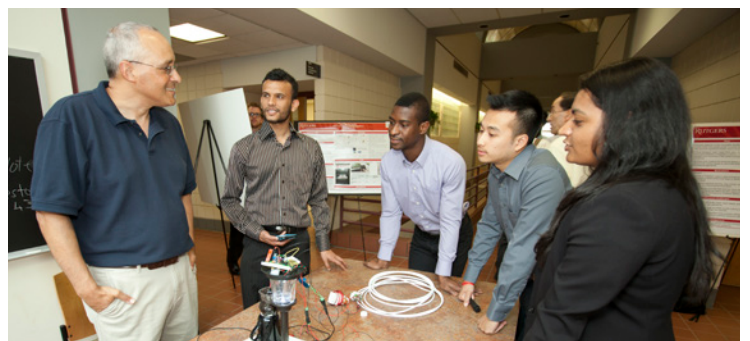
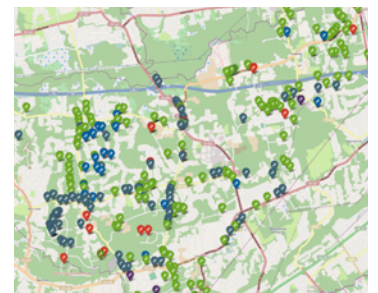
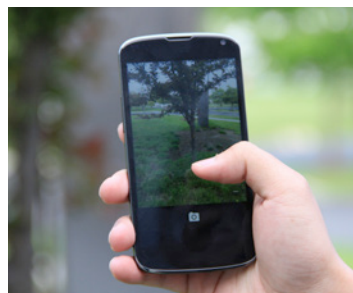
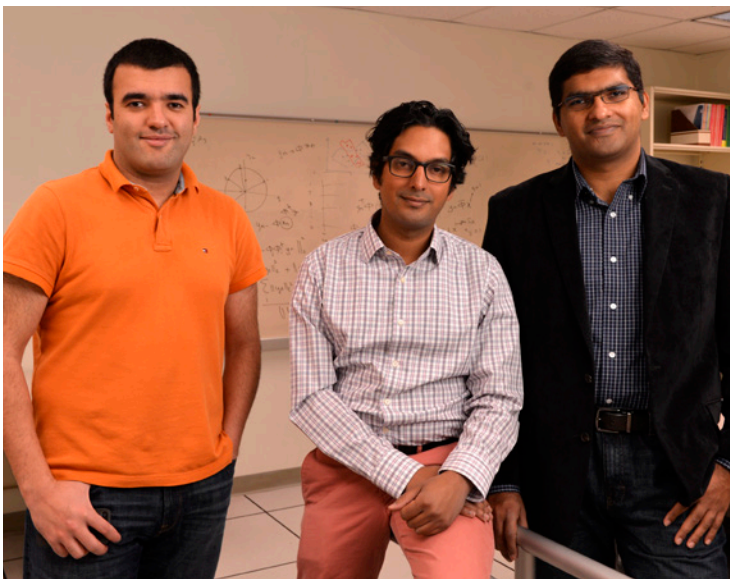


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Three NSF CAREER awards! page 16

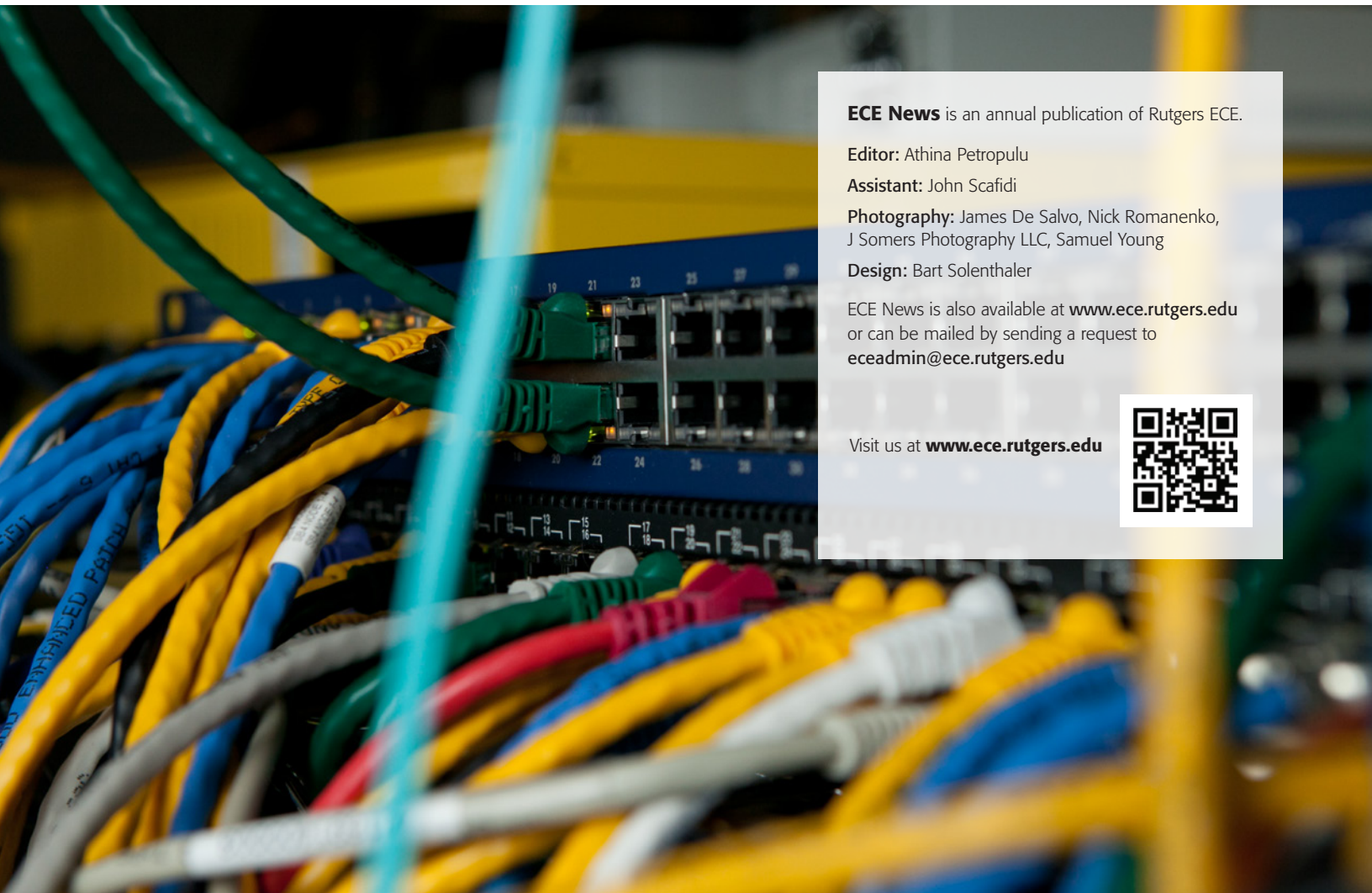
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**Sustainable Jersey Creativity
& Innovation Award with
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or can be mailed by sending a request to
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Visit us at www.ece.rutgers.edu



message from the Chair



A. Petropulu

It is my pleasure to share with you some exciting news about my department during the academic year 2014-2015.

Over the last five years, 11 new faculty have joined the ECE department, contributing expertise in important emerging areas, such as signal and information processing, security, privacy, cyberphysical systems, bioelectrical engineering and high performance computing. Last year we welcomed two new Assistant Professors, Mehdi Javanmard and Saman Zonouz. This Fall we welcomed two more Assistant Professors, Maryam Dehnavi and Vishal Patel (meet them on page 15).

The achievements of ECE students and faculty over the past year set a new record. Highlights include three National Science Foundation (NSF) CAREER Awards, given to ECE Assistant Professors Waheed Bajwa, Anand Sarwate and Saman Zonouz, and the 2015 IEEE Communications Society (COMSOC) Award for Advances in Communication, given to ECE Distinguished Professor Narayan Mandayam; this is the highest paper award given by the COMSOC and is given to an outstanding paper published in any IEEE Communications Society publication in the previous 15 calendar years. Also, Professor Marco

Gruteser was elevated to Association for Computing Machinery (ACM) Distinguished Scientist, and Assistant Professor Janne Lindqvist's research 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 (see page 28).

Our students amassed a large number of awards, including the NSF Graduate Research Fellowship Program (GFRP) Award, won by ECE PhD student Xianyi Gao, the National Defense Science and Engineering Graduate (NDSEG) Fellowship, won by ECE PhD student Gradeigh Clark, and the Science, Mathematics And Research for Transformation (SMART) Scholarship, won by ECE undergraduate student Nicole DiLeo. ECE PhD student Gabriel Salles-Loustau, received a Google Security Award and his name was added in the Google Hall of Fame Website. Further, R. Kappera received the Gold/Silver Graduate student award at the 2014 MRS symposium, S. Jain received the Best Presentation Award at the PhD Forum of 2105 ACM MobiSys, P. Bharad and E. K. Lee received Best Demo Award at the 2014 IEEE International Conference on Mobile Ad hoc and Sensor Systems (MASS), X. Gao, S. Sugrim, V. Kaiser-Pendergrast and Y. Yang received Best Paper Nominee Award at the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp). Further, our students received a large number of competitive travel grants to conferences from professional societies.

Our enrollment continued to climb, with ECE becoming the top choice among new undergraduate engineering students. In the last academic year our sophomore enrollment was by 27% higher than the year before, bringing to our department the largest share of the freshmen engineering class. Our new international program with a top tier university in China brought us 43 students over the past 2 years, with 23 more joining this Fall.

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-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 feel from up close the vibrancy of this department.

Sincerely,

A stylized, handwritten signature in black ink, appearing to read 'Athina'.

Athina Petropulu
Professor and Chair

ECE Numbers (2014-2015)

- 33 Tenure-Track Faculty
- 3 Non Tenure-Track Faculty
- 8 Part-Time Lecturers
- 600 Undergraduate Students
- 350 Graduate Students
- Space: 40,000 sq. ft.
- Research Expenditures: \$7,000,000
- New Research Grants: \$11,000,000

ecefaculty

Waheed U. Bajwa

Assistant 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

Kristin Dana

Associate Professor

NSF Career Award

Research Interests: Computer vision, pattern recognition, machine learning, convex optimization, novel cameras, computational photography, computer graphics, robotics

Maryam Mehri Dehnavi

Assistant Professor

Research Interests: High-performance computing, machine learning, numerical analysis, compilers, and parallel systems

Zoran Gajic

Professor and Graduate Director

Research Interests: Power control of wireless networks

Hana Godrich

Assistant Research Professor

Research Interests: Signal processing, radar systems, power systems

Marco Gruteser

Professor

NSF Career Award

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

Wei Jiang

Associate Professor

DARPA Young Faculty Award

Research Interests: Silicon nanophotonics: modulators, switches, light emission Photonic crystals: devices & physics (e.g. slow light, superprism) silicon photonic microsystems: optical phased arrays, spatial light modulators, on-chip optical interconnects, optical information processing microsystems. Nanoimprint and molding plasmonics and metamaterials; disordered and quasi-periodic media **Other interests:** polymer photonics; fiber optics; laser beam steering; gratings; liquid crystals; phased array antennas

Naghmeh Karimi

Assistant Teaching Professor

Research Interests: VLSI testing and design-for-testability, fault tolerance and design-for-reliability, hardware security and design-for-trust, microprocessor testing, computer architecture, computer aided design

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: Communications and information processing, neural networks

Narayan Mandayam

Distinguished Professor

Associate Director of WINLAB

IEEE Fellow, Distinguished Lecturer of IEEE, NSF Career Award

Research Interests: Cognitive radio networks and spectrum policy radio resource management network coding for wireless networks

Ivan Marsic

Professor

Research Interests: Mobile computing, software engineering, computer networks

Sigrid McAfee

Associate Professor

Research Interests: Defects in semiconductors, nanotechnology, financial Engineering

Peter Meer

Professor

IEEE Fellow

Research Interests: Statistical approaches to computer vision

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

Sophocles Orfanidis

Associate Professor

Research Interests: Statistical and adaptive signal processing, audio signal processing, electromagnetic waves and antennas

Vishal Patel

Assistant Professor

Research Interests: Signal processing, computer vision, pattern recognition with applications in biometrics and imaging

Athina Petropulu

Professor & Department Chair

IEEE Fellow, 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

Distinguished Professor

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 and Undergraduate Director

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 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

Research Interests: Scientific visualization, computer graphics

Predrag Spasojevic

Associate Professor

Research Interests: Communication and information theory, coding and sequence theory, signal processing and representation, cellular and wireless lan systems, ad-hoc and sensor networks

Wade Trappe

Professor & Associate Director of WINLAB

IEEE Fellow

Research Interests: Multimedia security, wireless security, wireless networking and cryptography

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

Assistant 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

Michael Caggiano

Professor Emeritus

Research Interests: Electrical Packaging and microwave packaging

Nagi Naganathan

Part-time Lecturer

Principal Engineer at Avago Technologies

Expertise: Computer engineering, VLSI Design, embedded systems

Saad Khan

Part-time Lecturer

**Managing Senior Research Scientist,
Educational Testing Service**

Expertise: Computer Vision and Machine Learning

Shiyu Zhou

Part-time Lecturer

Expertise: Design and analysis of data structures and algorithm, computational complexity, information theory

Abraham Borno

Part-time Lecturer

Expertise: Optimal control, large-scale systems, Markov chains, parallel algorithms

Alessia Polemi

Part-time Lecturer

Expertise: Bandgap structures, antenna design, RFID systems, photonic crystals, photovoltaics

studentnews

X. Gao receives 2015 NSF Graduate Research Fellowship

Xianyi Gao received a 2015 National Science Foundation (NSF) Graduate Research Fellowship Program (GRFP) Award. Xianyi is pursuing a PhD under the supervision of Prof. **Janne Lindqvist**, and has an undergraduate degree from ECE Rutgers.

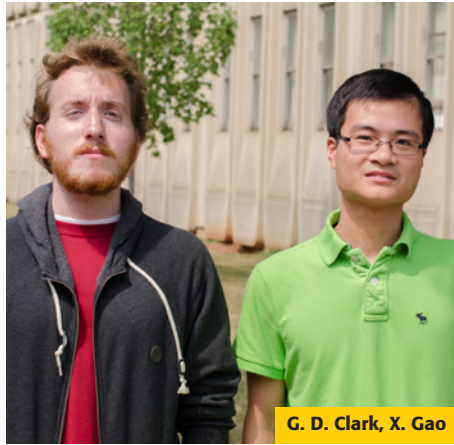


The GRFP stipend is \$34,000 per year for a maximum of three years, and Rutgers will receive a \$12,000 Cost

of Education Allowance in lieu of all required tuition. Xianyi's major research interests include driving privacy, security engineering, crowdsourcing, online privacy, and other topics in human-computer interaction.

Xianyi immigrated to the United States a few years ago from China. He first attended the Middlesex County College in Edison, NJ, where he took some engineering classes and graduated with an Associate Degree in science. He subsequently received a BS in ECE from Rutgers.

"During my undergraduate studies I participated in a research experience program hosted by Rutgers Aresty Research Center. I worked on the underwater acoustic communication project under Dr. Waheed Bajwa's guidance. I have also worked in WINLAB research center in a summer internship. Our group, supervised by Dr. Janne Lindqvist and Dr. Marco Gruteser, developed an Android Sensor Library in Java with a demo app showing the simplicity of applying our library to manipulate Android phone sensors and extracting sensor data. It can be a great tool for researchers and developers who need massive amount of sensor data to analyze motions and activities. My undergraduate research experience motivated me to continue for PhD study in Rutgers University" said Xianyi.



G. D. Clark receives 2015 NDSEG Award

ECE student **Gradeigh D. Clark** received a 2015 National Defense Science and Engineering Graduate (NDSEG) Fellowship. Gradeigh is pursuing a PhD under the supervision of Dr. **Janne Lindqvist** and has an undergraduate degree from ECE Rutgers.

The NDSEG Fellowship is sponsored and funded by the Department of Defense



(DoD) and is awarded to U.S. citizens and nationals who intend to pursue a doctoral degree in one of fifteen supported disciplines. It lasts for

three years and pay for full tuition and all mandatory fees, a monthly stipend, and up to \$1,000 a year in medical insurance.

Gradeigh's thesis work focuses on a full characterization of gesture passwords as an authentication method for touch-screen based devices. He has published two works so far -- one in the Mobisys conference and one in the IEEE Pervasive Computing Magazine; the first deals with an attempt to quantify the security of a free-form drawing through the use of mutual information and the second lays out a case for building recognizers for authentication rather than recognition. More work is being planned for submission in upcoming months on refining the security analysis of the password space and studying usability & memorability with these passwords.

Gradeigh received his BS from Rutgers ECE.

"In the ECE Department, the breadth of work done by the faculty spans a surprising number of disciplines which gives students ample opportunities to explore their interests. As an undergraduate, I did research work with: (1) WINLAB on a software sensor library, (2) Wei Jiang on nanophotonics topics, and (3) smart room modeling with computer vision at Rensselaer Polytechnic Institute. Clearly, there are many chances to explore interesting things as an undergraduate at Rutgers if one puts the effort to find them. Rutgers certainly opens many doors for students who start early and self-search - it is not at all like breaking a butterfly upon a wheel, because there is so much to be gained" said Gradeigh.

N. M. DiLeo receives SMART Scholarship

Nicole M. DiLeo received the Science, Mathematics And Research for Transformation (SMART) Scholarship. The Science, Mathematics And Research for Transformation (SMART) Scholarship for Service Program (see smart.asee.org) has been established by the Department of Defense (DoD) to support undergraduate and

graduate students pursuing degrees in Science, Technology, Engineering and Mathematics (STEM) disciplines. The program aims to increase the number of civilian scientists and engineers working at DoD laboratories.

The SMART Scholarship provides a \$25,000



annual stipend and also covers tuition. during summers and after her graduation.

Nicole is a junior in Electrical and Computer Engineering and minoring in Mathematics. In summer 2015 she did a research internship at WINLAB. Her project goal was to implement radio frequency spectrum sensing using software-defined radio (SDR), as opposed to the usual hardware implementation.

"My summer internship was a great learning experience. I became much more familiar with Linux than I would have thought, and I also had the opportunity to become familiar with the ORBIT testbed at WINLAB" said Nicole.

Nicole's plans for the future include interning at Picatinny Arsenal in Wharton, NJ in EOD (Explosive Ordinance Disposal) on the army base. Then, the summer following her graduation, she will begin working at Picatinny Arsenal full-time for two years.

Best Presentation Award at the PhD Forum of 2015 ACM MobiSys

Shubham Jain received the Best Presentation Award at the PhD Forum held at this year's ACM MobiSys conference in Florence, Italy. Shubham is a PhD student in Prof. **Marco Gruteser's** research group and she presented her dissertation ideas on 'Gradient Profiling for Pedestrian Services'.



S. Jain

Shubham's trip was also supported by a Student Travel Grant from the MobiSys conference.

Shubham's research focusses on the cause of pedestrian safety. Technology distractions are

having a negative impact on pedestrian safety in urban environments. To this end, she is developing LookUp!, a solution that warns distracted pedestrians when they are potentially at risk. She explored the advantages and limitations of smartphone-based solutions in a paper published at the MARS 2014 workshop. Her MobiSys 2015 paper discusses a shoe-based gradient profiling approach that can identify when a pedestrian is entering the street. LookUp also received the Large Organization Recognition Award at the AT&T Connected Intersections challenge. Other projects include building a

sensing framework for the vehicular environment and sidewalk-level localization in urban environments.

Best Demo Award at IEEE MASS 2014



P. Bharad, E-K Lee

Priyank Bharad and **Eun Kyung Lee** received Best Demo Award at the IEEE International Conference on Mobile Ad hoc and Sensor Systems (MASS). The demo title was "Towards Reconfigurable Cyber Physical Systems".

Priyank Bharad is an MS students and Eun Kyung Lee is a PhD students, both working under the supervision of Prof. **Dario Pompili**.

Gold/Silver Graduate student award at the 2014 MRS symposium

Rajesh Kappera (2015 PhD) received the Gold/Silver Graduate student award at the 2014 MRS fall symposium in Boston, MA, for his paper entitled "Phase engineered



R. Kappera

low resistance contacts for high performance MoS2 transistors."

Rajesh worked under the supervision of Prof. **Manish Chhowalla** and is currently a research fellow at Los Alamos National laboratory.

Another version of his award winning paper was published in Nature materials in 2014.

UbiComp 2014 Best Paper Nominee Award

Xianyi Gao, Bernhard Firner, Shridatt Sugrim, Víctor Kaiser-Pendergrast, Yulong Yang, and Prof. **Janne Lindqvist**

received the Best Paper Nominee Award at ACM UbiComp 2014, for their work on "Elastic Pathing: Your Speed is Enough to Track You." Only 4% (19 papers) received the Best Paper Nominee award.

The paper showed that drivers can be tracked by merely knowing their home location, and speed data with an accuracy that constitutes privacy intrusion. This result has practical implications due to so called "usage-based insurance policies." Today people have the opportunity to opt-in to usage-based automotive insurances for reduced premiums by allowing companies to monitor their driving behavior. Several companies claim to measure only speed data to preserve privacy; the elastic pathing project showed this is not the case.

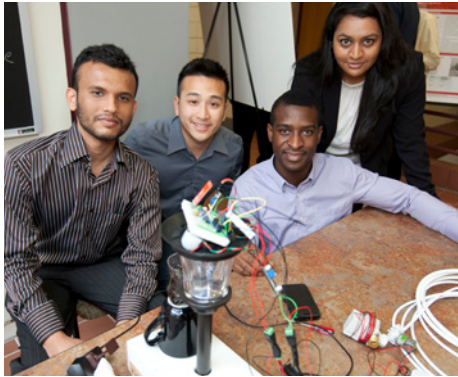


Salles-Loustau receives Google Security Award

Gabriel Salles-Loustau, a Ph.D. candidate in Dr. **Saman Zonouz's** 4N6 Research Group, received the Google Security Award. During his research, Gabriel discovered a serious security vulnerability in Google's Android ecosystem that would allow malicious parties without any initial access to perform unauthorized code injection on millions of smartphones and tablets with the current and several past versions of Android. The vulnerability affects several versions of the Google Play Store app and its update process. Google awarded Gabriel a \$10K check for his discovery. They also put Gabriel's name and the ECE Department name on the Google Hall of Fame Website.

Gabriel is working towards his PhD on data protection and data flow analysis.

Capstone Team wins the 7x24 Exchange Metro New York University Challenge



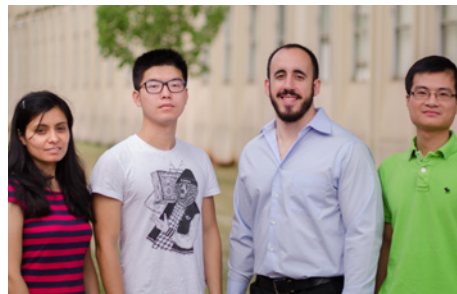
ECE Capstone team won \$10K at the 7x24 Exchange Metro New York University Challenge! The 7x24 Exchange Metro New York put in place a senior year design project (capstone project) competition with theme datacenter energy efficiency. The event took place today at Credit Suisse offices in NYC.

ECE Rutgers participated with the project "A Mesh Network of Reactive Lights for Energy Savings and Security Awareness", by ECE students **Aeon Brown, Parth Kanani, Alam Lam, and Aesha Patel**. The faculty advisor is Prof. **Hana Godrich**. This project was based on the group's 2015 Capstone Design project entitled "A Mesh Network of Reactive Lights for Energy Savings and Security Awareness".

LED technology offers significant energy savings. For larger buildings/infrastructures, such as data centers, use of LED can offer high savings and increase energy efficiency. An additional prospective for savings is described in the US DOE guidelines for "Best practices Guide for Energy-Efficient Data Center Design," from 2011. It points out the advantage of increased selectivity of lighting systems beyond zone-based occupancy to lighting load reduction and a secondary saving stemming from decrease in cooling load. The proposed reactive lighting system is offering a simple, low cost, retrofit to existing infrastructure with the use of LED, operating in an event-based approach. Additional features, beyond surface lighting, make for a better return on investment and can potentially drive faster implementation in the Data Center space

ECE students receive numerous competitive travel grants

Luis Garcia, a Ph.D. candidate in Prof. Saman Zonouz's research group, received an NSF Travel Grant to attend the 2015 CPS Week in Seattle WA. Luis works on cyber-physical system analysis and formal verification. In summer 2015, he interned at Siemens Research Labs NJ where he worked on programmable logic controller security.

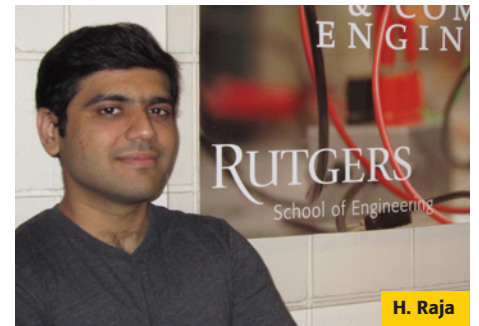


From the left: P. Pandey, Z. Lin, L. Garcia, X. Gao

Parul Pandey, a PhD candidate working under the supervision of Dr. **Dario Pompili** at the ECE Department, Rutgers University has received a travel grant of \$750 to attend CRA-W 2015 Early-Career Mentoring Workshop (CMW) at the Federated Computing Research Conference (FCRC). CRA-W Early CMW workshops bring junior researchers and educators together with women already established in their field.

Pengfei Xie and **Zhongtian Lin** won travel grant of \$500 each to present their papers at the 59th International Conference on Electron, Ion, Photon Beam Technology and Nanofabrication (EIPBN) in San Diego, CA. Pengfei and Zhongtian are both ECE graduate students working under the supervision of Dr. **Mehdi Javanmard**. Their two papers are entitled "Impedance Cytometry Based on Multi-fingered Interdigitated Electrodes" and "Electronic Quantification of Protein Biomarkers Based on Bead Aggregate Sizing". EIPBN, the "3-Beams" Conference, is the premier conference on the science and technology of nanopatterning. Both Zhongtian and Pengfei are focused on exploiting cutting edge nanofabrication techniques to build novel devices for medical diagnostic applications

Haroon Raja was awarded \$750 by the ISIT Organizing Committee as part of 2015 IEEE ISIT Student Travel Award. Haroon presented a paper entitled "A Convergence Analysis of Distributed Dictionary Learning Based on the K-SVD Algorithm" at ISIT in Hong Kong. Haroon is a PhD student working under the supervision of Professor **Waheed Bajwa**.



Janice Gu, an NSF Research Experience for Undergraduates (REU) undergraduate research assistant in Prof. **Janne Lindqvist's** group, received the USENIX 24th USENIX Security Symposium Grant for Women. The \$700 award is sponsored by Google and Craigslist and assists the recipients in attending the conference. The conference, which takes place in Washington D.C., unites researchers, practitioners, systems programmers and engineers, and others interested in the latest advances in the security of computer systems and networks.

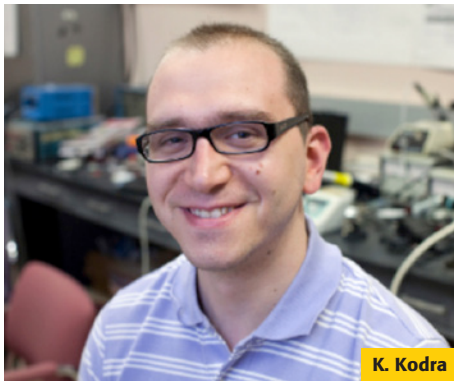
Gradeigh D. Clark, a PhD student in Prof. **Janne Lindqvist's** group, received a student travel grant for the 24th USENIX Security Symposium for \$400.

Xianyi Gao, a PhD student in Prof. **Janne Lindqvist's** group, received several travel awards and grants. He received the 2014 Ubicomp Travel Grant: This is a \$500 student travel grant to attend the 2014 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2014), which was held in Seattle, Washington, US in Sep. 13-17, 2014. Xianyi presented the paper "Elastic Pathing: Your Speed is Enough to Track You" written with **Bernhard Firner** (ECE PhD), **Shridatt Sugrim** (ECE MS, ECE PhD student), **Victor Kaiser-Pendergrast**, **Yulong Yang** (ECE PhD candidate), and Prof. **Janne Lindqvist**. The paper received the Best Paper Nominee Award (4% of papers). Xianyi also received 2015 SOUPS Travel Grant, which was \$750

to attend the 2015 Symposium On Usable Privacy and Security (SOUPS 2015) held in Ottawa, Canada in July 22-24, 2015. Finally, Xianyi received the 2015 USENIX Security Travel Grant: The grant includes \$100 travel expenses and a \$400 registration discount.

Kliti Kodra receives the Paul Panayotatos Scholarship

Kliti Kodra becomes the first ever recipient of Paul Panayotatos Endowed Scholarship. His hard work, dedication to his research, and academic achievements has earned him this award. Kliti Kodra is currently a PhD student studying under the guidance of Prof. **Zoran Gajic**.



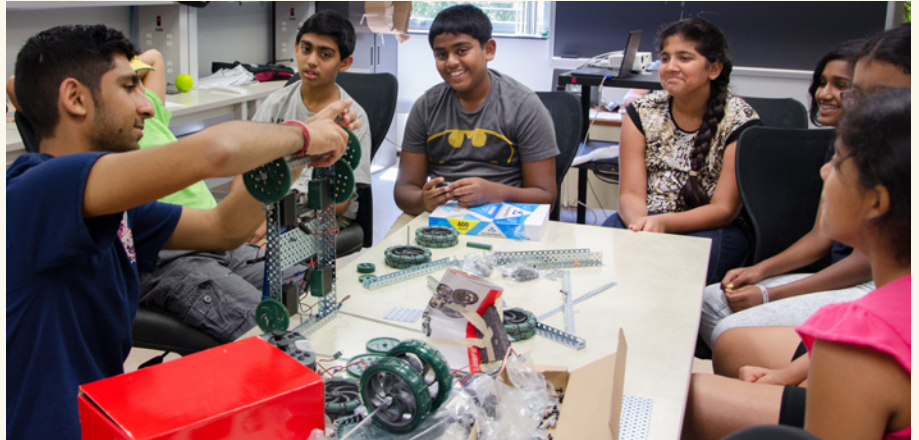
K. Kodra

His research focuses on order reduction of large-scale microgrid models as well as control-theoretic methods for cyber-physical security in smart grid infrastructures using singular perturbation techniques. His prior work involved research on reduced-order controller design for fuel cells used in the automotive industry.

Paul Panayotatos Endowed

Scholarship was recently established in memory of Professor Paul Panayotatos who served for 30 years as a professor in the Department of Electrical and Computer Engineering (ECE). The Scholarship is awarded to graduate students demonstrating academic excellence and pursuing advanced degree in the sustainable energy areas including renewable energy, energy efficiency, energy conversion or a related area. The award for this year is \$5,000, but it could be a lesser amount in future years and could be awarded to more than one person.

ECE Students Offer VEX Robotics Design and Engineering Summer Camp



As technology continues to develop at a rapid pace, there is a constant need to prepare the next generation of engineers and scientists to continue the development and advancement of future technologies. This past summer 3 undergraduate students, **Ajay Srivastava** (Junior), **Samuel Yang** (Junior), and **Robert Marrs** (Senior) took up the challenge of equipping young students to be the engineers of our future. Over the course of 2 weeks, the ECE Department partnered with the local Thomas Edison Energysmart Charter School [based in Somerset] to introduce 7 middle school students to the world of STEM.

The camp began with the intention of readying the students to compete in the VEX Robotics Competition, with participating students varying in grade level from middle school to high school. The VEX Robotics Competition is the world's largest and fastest-growing robotics competition and boasts over 10,000 teams from 32 countries competing in over 750 tournaments annually. With the diversity in both ages and origins of the thousands of students involved this program, the 7 young students, along with the remainder of their team, certainly have some tough competition ahead in their attempt to qualify for the VEX Robotics World Championship event.



In preparation for the major engineering task set before this group of students, they were presented with a variety of design challenges throughout the camp. One of their favorite design challenges involved constructing the highest free standing tower given only 4 sheets of paper and a 1 foot length of masking tape. The students faced off in a competition where they were not only racing against one another, but also against the clock. The challenge was intended to simulate real world engineering projects where projects would need to the best of their ability while under the pressure of a looming deadline. The students performed admirably through their implementation of the design process.

By the end of the camp, the students were given the space of 2 days to design and prototype their own mechanisms to launch foam balls a distance of 8 feet. Under the guidance and supervision of the 3 ECE students, they completed preliminary designs that they will continue to test and perfect throughout the upcoming school year as they push for success in the VEX Robotics Competition.

Meet an ECE Student

By Dionysios Kalogierias

I am a senior PhD student advised by Prof. **Athina Petropulu**, and a member of the Communications & Signal Processing Laboratory (CSPL), working in the areas of Statistical Estimation and Detection, Optimization, and Stochastic Control & Decision Making, with interesting and novel applications in wireless networks. Before I came to Rutgers, I received my Diploma (B.Sc. & Master's) in Computer Engineering and Informatics (2010), and my M.Sc. in Signal Processing and Communications Systems (2012), both from the University of Patras, Greece. I was born in the beautiful island of Zakynthos, Greece, in 1986.



D. Kalogierias

In the Department of Electrical & Computer Engineering, I had the pleasure to meet and interact with lots of delightful and interesting people, including our faculty as well as our administrative staff. From the technical point of view, I was lucky to be able to attend several well designed graduate courses, taught by expert individuals in the respective field, which helped me significantly towards my professional development as a researcher. On top of that, the Department of ECE provides excellent opportunities for professional success, both in the industry and in academia as well.

My research focuses on motion control in autonomous mobile robotic communication networks, eventually provide the essential information theoretic framework for enhancing communication in modern wireless networks in various aspects, such as in order to satisfy certain constraints for maintaining quality of service, or for improving physical layer security. During my time at Rutgers, I and my advisor have published two papers in the top-tier journal "IEEE Transactions on Signal Processing", and we have presented more than 10 papers in leading conferences and workshops in our field, such as "ICASSP", "SPAWC", "Allerton", "Asilomar", etc. And there is more to come. In addition to the above, in 2015, I was senior personnel on the successful proposal for a three-year CIF NSF \$500K grant for the project "Spatiotemporally Varying Channel Map Estimation and Tracking in Wireless Networks", with Prof. Athina Petropulu and Prof. W. Trappe being the principal investigators.

By Parul Pandey

I am a Ph.D. candidate in the department of electrical and computer engineering advised by Dr. **Dario Pompili**. I am currently working in the area of mobile computing. I received my MS degree, also in electrical



P. Pandey

and computer engineering from the University of Utah. The lab, in which I work, Cyber-Physical Systems Laboratory, directed by Dr. Pompili, works on many diverse and interesting areas such as underwater acoustic communications, thermal management of datacenters, mobile computing, mobile sensing, and cloud radio access networks. In spite of this diversity, as a group we discuss and help each other in formulating a research problem and designing novel solutions to solve them. In the past, my lab members and I have guided many undergraduate students on their senior projects which are sometimes spin-offs of our main research or interesting ideas suggested by undergraduate students.

In the recent years we have seen amazing advancements in technology which has overcome limitations in human perceptions, for example, high speed photography and time-lapse film, by which we can appreciate and understand processes not visible to human eye, Google Earth has helped us to visualize information not naturally visible to human senses, and activity tracking via wearable devices has revolutionized the health care industry. I am working towards bringing this rich knowledge in different domains to mobile devices. To this end, my research focusses on designing innovative algorithms to overcome the inherent limitations of the mobile devices, such as limited battery power, space, and computing power to enable these new applications on mobile devices. To see my work being accepted by peers in the research community is very fulfilling and encourages me to do better.

By Nikhil Shenoy

I am a fourth-year undergraduate in the ECE department with interests in data science, machine learning algorithms, and high performance computing. I enjoy



N. Shenoy

looking for patterns of data in daily life, such as examining how much a high first serve percentage contributes to the outcome of a tennis match, as well as the insight those patterns provide. As an ECE student, I currently serve as the president of Rutgers' IEEE Student Branch and work tirelessly to provide technical projects and professional opportunities with which club members can improve themselves. I hope to make the Student Branch a place where talented technical people can connect, build, and innovate together. I am currently an undergraduate researcher working with Prof. **Jha** and the RADICAL team to design and implement libraries for scientific applications on high-performance computers. My work is supported by an NSF Research Experience for Undergraduate (REU) award. During this past summer, I participated in the Army High Performance Computing Research Center's Summer Institute, which is a research program for undergraduates hosted by Stanford University. As part of the

program, I worked with Professor Eric Darve's group to develop visualizations of the Inverse Fast Multipole Method, which is an efficient, direct-solver for large linear systems that can only be solved on supercomputers. After graduation, I plan on completing a Master's degree in applied and computational mathematics with the eventual goal of becoming a top-notch data scientist.

By Janice Gu

I'm a sophomore double majoring in computer engineering and computer science, as well as minoring in entrepreneurship. During the fall semester of my freshman year, I started researching with Professor **Janne Lindqvist** in the Human-Computer Interaction group. I work with Prof. Lindqvist and his Ph.D. student, Gradeigh Clark, on projects relating to mobile security. That turned into a summer internship, which was supported by the NSF's Research Experiences for Undergraduates (REU) program. At the end of my internship, I applied to and was awarded a travel grant to attend the USENIX Security Symposium in Washington D.C. I presented a poster about our work towards usable and secure smartphone authentication.



J. Gu



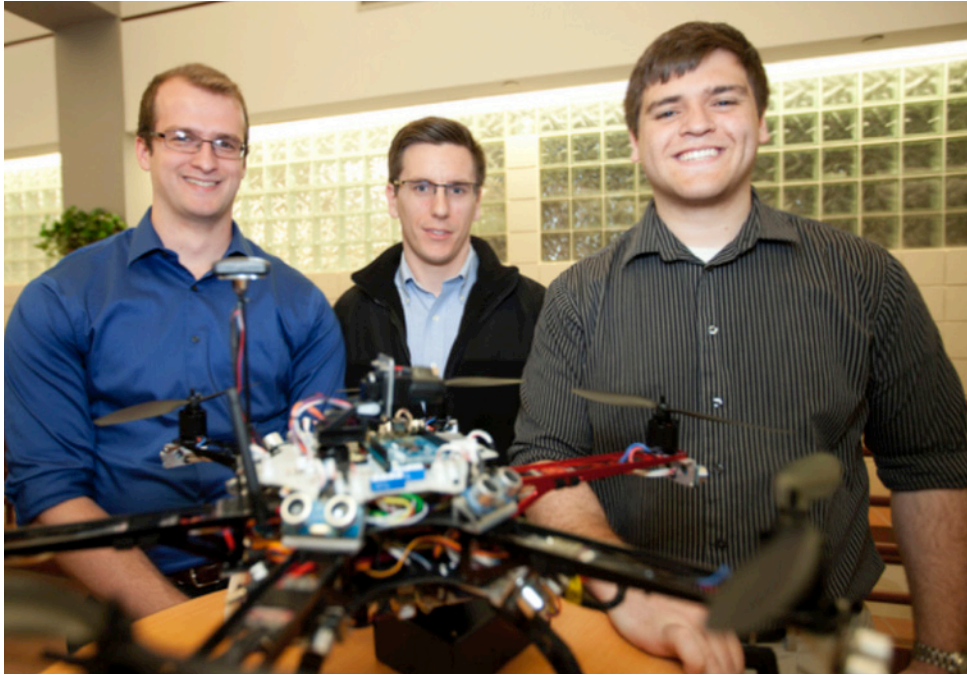
H. Kumar

By Harshat Kumar

I am a junior, majoring in Computer Engineering and Mathematics. I began working with Dr. **Petropulu** in the Communications and Signal Processing Laboratory (CSPL) during the fall semester of my sophomore year. I first worked with Ph.D. student Valerie Yang on a project which used an application of the Sparse Fourier Transform to improve accuracy and decrease cost of Multiple Input Multiple Output (MIMO) Radar Systems. This summer, I started research with Ph.D. student Bo Li on a project funded by Raytheon which aims to decrease interference between MIMO Radar and communication systems. What I love most about research is the learning. There is a different type of thinking and learning that comes with the experience of research which cannot be taught in the classroom. I am always excited by each new discovery. I hope to continue contributing to and learning with the CSPL group so I may apply the knowledge to my future work.

Capstone Projects 2015

By Hana Godrich



Engineering design projects, or capstone projects, mark an important milestone in our undergraduate students' education at the ECE department. Senior year students engage in a one-semester long design project held in the spring semester. Teams of three to four students work on real-life problems, focused on putting fundamental knowledge accumulated along the years with know-hows of engineering. Students get an opportunity to develop an engineering project from idea inception to a fully operational product. A faculty advisor, at times in collaboration with the industry or other departments, works with the students on design and implementation of cutting-edge technology and research.

The capstone program is designed to build experience and skills that will prepare the students for success in the work environment. This year the engineering learning experience has been enriched in aspects related to ideation, project management and teamwork. Fast-track workshop on projects management based on the SMART (Specific, Measurable, Achievable, Relevant and Timely) way has been added to the curricula

along with an introduction to the use of project management tools. Fall semester activities have been introduced to cover all these topics. Industrial partner involvement in capstone activities has been increased through the introduction of panel talks, guest lectures, and project collaborations. We would like to acknowledge and thank the following industrial partners and their representatives for their contributions to these activities:

John Liddy, Schweitzer Engineering Inc., **Arne Ballantine**, Bloom Energy, **Ali Zaringhalam**, Juniper Networks, **Rajesh Kalyanpur**, J.P. Morgan, **Jeff Steele**, National Instruments, **Nagi Naganathan**, Avago Technologies and **Kfir Godrich**, BlackRock.

During the fall spring semester, 173 students have formed 47 teams with diverse topics and applications spanning information security, healthcare technology, electrical power, communications, networking, imaging, big data, mobile platforms, information and signal processing, control, IoT, integrated electronics, energy efficiency, smart homes, and smart cities. A dedicated team of ECE faculty advisors supported the successful

execution of capstone program and the completion of top-tier projects. Setting projects' milestones and deadlines for the teams along with budget constraints and required presentations sessions set in place working habit that will come useful in a workplace. In addition to the ECE faculty advisors, we would like to recognize the following advisors who supported the department this year: **Dr. Anthony Tobia**, Robert Wood Johnson Medical School, **Dr. Dunbar P. Birnie**, department of Material Science and Engineering, **Dr. Melike Baycal-Gursoy**, Industrial and System engineering, **Dr. Rich Howard**, **Dr. Pavel Reyes**, **Mr. Rick Anderson**, **Mr. Rajesh Kalyanpur**, **J.P. Morgan**, and **Mr. Michael Salcone**, TAKEcharge Power LLC.

The climax of the capstone project is Poster Day that was held this year on Wednesday, April 22. This event celebrates our students! Their hard work, creativity, skills and knowledge. A large crowd filled the ECE department corridors on this day when fellow students, faculty, alumni, and industry came together for a showcase of engineering capabilities. Every year a panel of judges is nominated to choose the top-ten capstone projects and this year was no exception. They faced the hard task of recognizing the best in class from a large number of exciting projects. We would like to acknowledge and thank the twelve judges that participated this year:

Barry Novick, BlackRock; **Gene Fernandez**, JP Morgan; **Stephen Wilkus**, Spectrum Financial Partners; **Kumar Ramaswamy**, Iqolgi Inc.; **Thomas Davidson**, DLB Associates; **Ed Cordero**, JP Morgan; **Manny Rodriguez**, Lutron Electronics; **Sri Gollamudi**, TwoSigma; **David Katz**, Credit Suisse; **Brian Hadley**, Bloom Energy; **Gradeigh Clark**, Rutgers ECE Department; and **Xianyi Gao**, Rutgers ECE Department.

For the first time this year, we introduced a voting system that enabled students of all years to vote for their favorite capstone project. The winners of this award are:

Title: "Multistage Battery Coilgun"

Team members: **Thomas Slonaker**, **Matthew D'Angiolillo**, **Sharlina Keshava**, and **Anthony Yang**. Advisor: **Dr. Richard E. Howard**

We would like to acknowledge and thank the ECE department advisory board for their continuous support of the capstone program. They made themselves available for the program in ample of ways including participation in talks, judging panels,

project ideas, and projects sponsorship, to name a few.

As the coordinator of the capstone projects this year I would like to thank everyone who volunteered their time and resources to take part in this important program and contribute to its success.



The top-ten projects for 2015 are:

FIRST PRIZE (\$400)

Title: “qAuth: Mutual 2 Factor Authentication Using Trusted Services” Team members: David Patrzeba, David Karivalis, and Jesse Ziegler. Advisor: Dr. Janne Lindqvist

SECOND PRIZE (\$300)

Title: “Military Focused Autonomous Unmanned Aerial Vehicle (UAV)” Team members: Douglas Stanjeski, Bryan Marshall, and Jeremy Bower. Advisor: Dr. Waheed Bajwa

THIRD PRIZE (\$200)

Title: “Free-Space Optical Communications” Team members: Brennan Young and Sivaramhar Siva. Advisor: Dr. Predrag Spasojevic

Title: “Smart Garden Lights” Team members: Aeon Brown, Alan Lam, Parth Kanani, and Aesha Patel. Advisor: Dr. Hana Godrich

Title: “Smart Panels” Team members: Christopher Mancuso, Vinay Panjabi, Cole Abramson, and Eric Jacob. Advisor: Dr. Yanyong Zhang

Title: “ScannerBot” Team members: Neil Shah, Kalpesh Jogani, Soyab Khatumbra, Micah Moore, and Jainil Patel. Advisor: Dr. Bernhard Firner

Title: “SigX” Team members: Kshipra Attarde, Aayush Shah, Prashanth Sankaran, Jay Bajaj, and Radhika Saksena. Advisors: Rajesh Kalyanpur (JP Morgan)

Title: “Consumer Solar –Simple By Design” Team members: Holly Remaly, Robert Chiu, Anthony Remo, and Yitao Wang. Advisor: Dr. Michael Caggiano

Title: “Distributed FM Radio System” Team members: Jordan Tepper, Wei Chen, Mike Toriello, and Marlon Orellana. Advisor: Dr. Predrag Spasojevic

Title: “Transportation Analytics and Optimization with 802.11 Probe Tracking” Team members: Daniel Su, Peter Zhang, Syedur Rahman, and Jason Scatena. Advisor: Dr. Narayan Mandayam

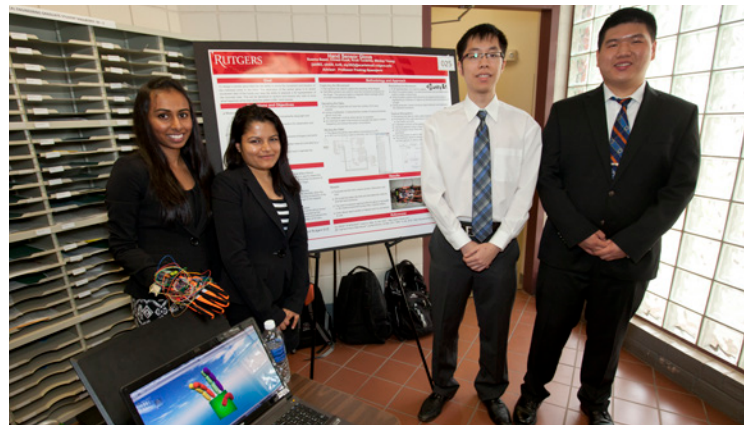
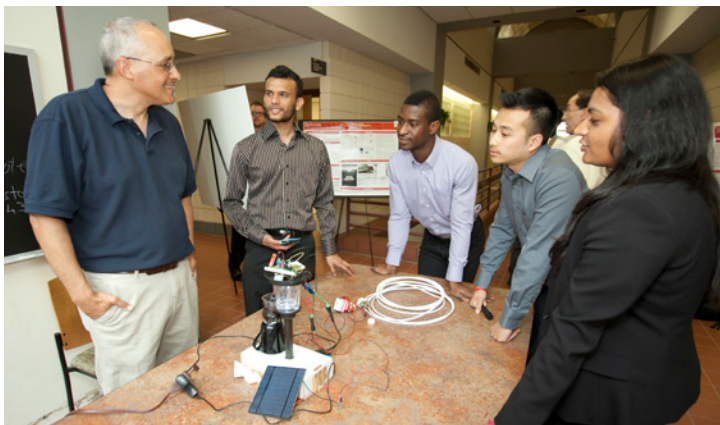
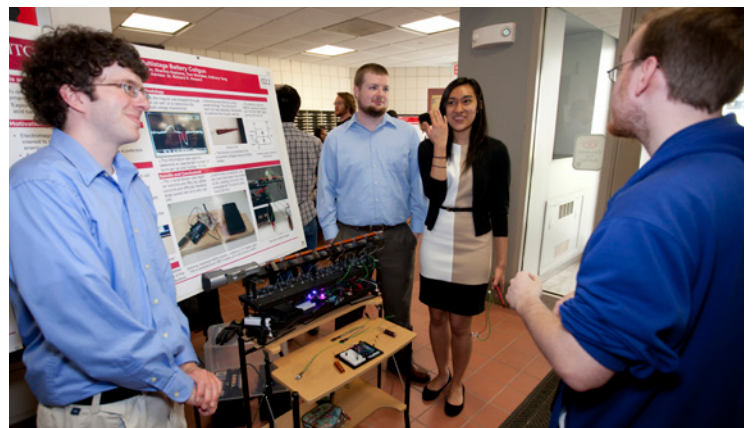
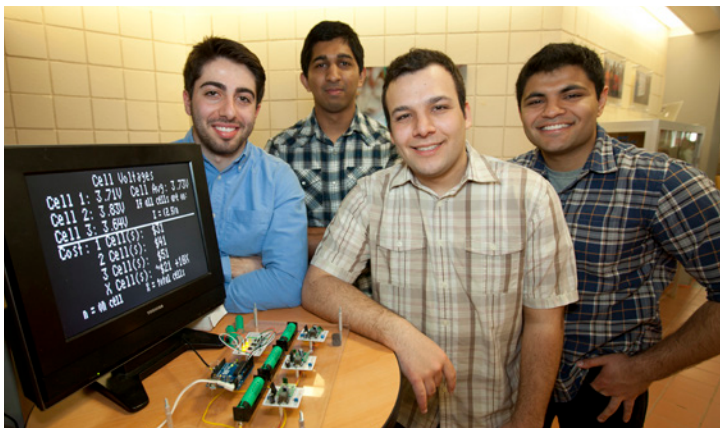
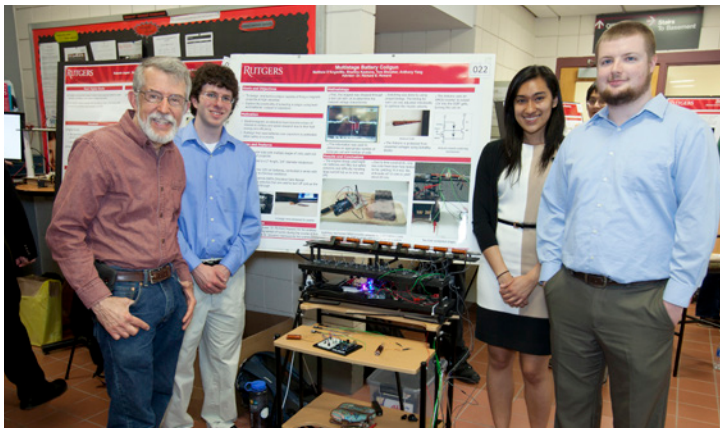


Dr. H. Godrich (front row, third from left) with poster competition judges

David Patrzeba, David Karivalis,
Jesse Ziegler, first prize winning
capstone team.

links to videos and the winning posters can be found
at www.ece.rutgers.edu/Capstone_2015_Awards





New Faculty Hires



M. M. Dehnavi

Maryam Mehri Dehnavi received her Ph.D. in Electrical and Computer Engineering from McGill University in 2012, her M.S. in Computer Engineering from University of Calgary in 2007 and her B.S. degree in Electrical Engineering from Isfahan University of Technology in 2005.

Before joining Rutgers she was postdoctoral fellow at the Computer Science and Artificial Intelligence Laboratory at MIT. Her research interests include high-performance computing, machine learning, numerical analysis, data mining, scientific computing, computational biology and compilers.



V. Patel

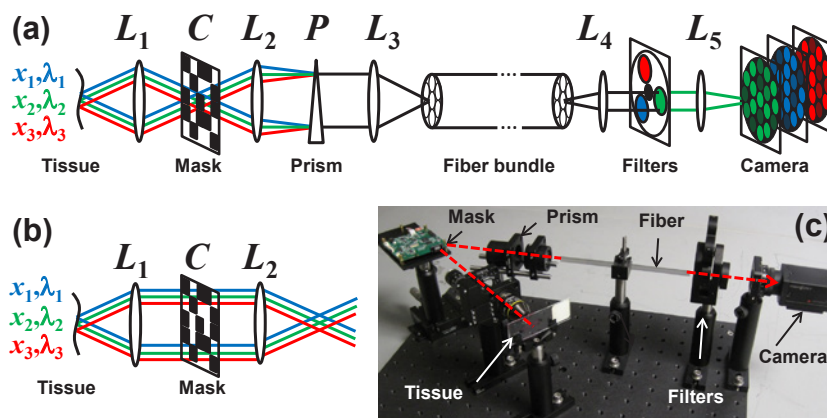
Vishal M. Patel received his Ph.D. in Electrical Engineering from the University of Maryland, College Park, MD, in 2010, and his B.S. degrees in Electrical Engineering and Applied Mathematics (with honors) and the M.S. degree in Applied Mathematics from North Carolina State University, Raleigh, NC, in 2004 and 2005, respectively. Before joining Rutgers he was member of the research faculty at the University of Maryland Institute for Advanced Computer Studies (UMIACS). His research interests include signal processing, computer vision, and pattern recognition with applications in biometrics and imaging. He was a recipient of the ORAU postdoctoral fellowship in 2010.

Signal Processing–Optics Co-Design for In Vivo Optical Biopsy

For cancer, detecting early stage disease is the most critical factor in successfully curing patients and improving long-term survival rates. Current clinical practice involves taking biopsy samples from suspicious sites, followed by tissue processing and microscopic examination for abnormalities. This is a low yield, expensive, painful, and slow process.

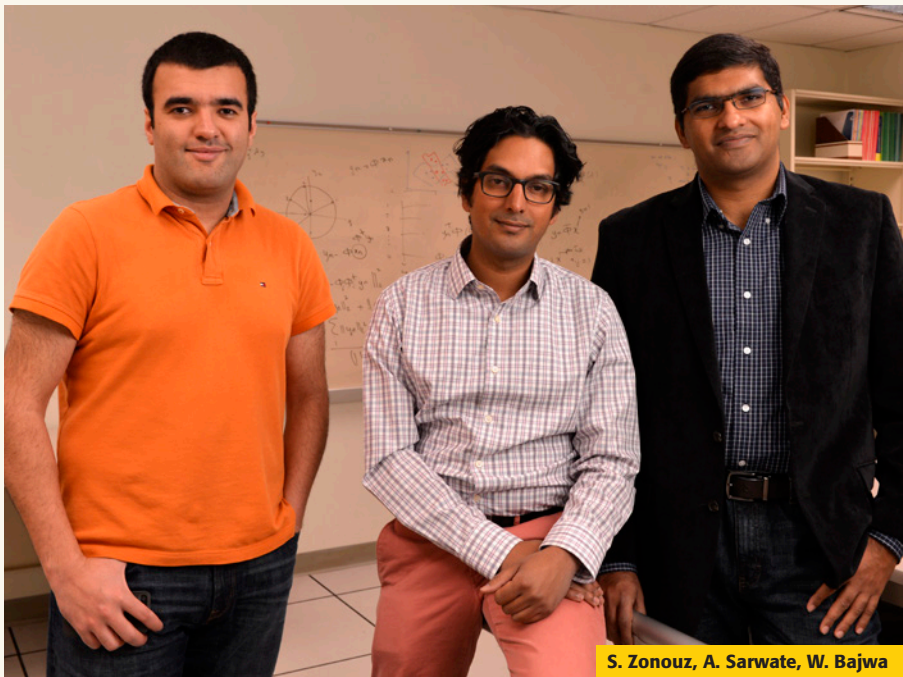
Waheed Bajwa, Assistant Professor of Electrical and Computer Engineering, and his collaborator, Mark Pierce, Assistant Professor of Biomedical Engineering, will instead develop a new approach for microscopic imaging of living cells and tissues within the body in real time, which will improve the ability of physicians to detect early stage disease. This involves breaking conventional resolution limitations in fiber-optic imaging to deliver a real-time “optical biopsy.” Bajwa and Pierce will accomplish this through integration of mathematical concepts from the compressive sensing field with hardware design and engineering of fiber-optic-based endomicroscopy for the clinical setting. This work of Bajwa and Pierce will also greatly increase the number of diagnostically useful biopsies being collected, improve the accuracy of margin identification during surgical resection, and permit non-invasive monitoring of post-surgical sites for recurrence. Lowering costs associated with unnecessary biopsies, multiple clinic visits, and repeat surgeries due to undetected residual disease will also positively impact the economics of healthcare delivery in the US.

Bajwa and Pierce will thus advance the medical imaging field by developing new signal processing techniques to increase resolution and field-of-view that do not require additional breakthroughs in microfabrication methods. Bajwa in particular will also advance the signal processing field by introducing new algorithms to solve missing data problems, address ill-posed inverse problems, and implement compressive sensing theory, all at previously unexplored length scale. However, the most transformative aspect of this work by Bajwa and Pierce is that it has the potential to change clinical practices from reliance on 100 year old pathology practices to real-time information on tissue status at the patient’s bedside.



Three ECE Faculty Receive NSF CAREER Awards

The Department of Electrical and Computer Engineering congratulates the following faculty for being recognized with the prestigious National Science Foundation (NSF) CAREER Award in 2015.



Waheed Bajwa, NSF CAREER Award for the project "Signal Processing Through the Lens of Geometry". The grant has been awarded by the CCF division of CISE directorate. The total award is \$550K and its duration is five years.



Anand Sarwate, NSF CAREER Award for the project "Privacy-preserving learning for distributed data". The grant has been awarded by the CCF-SaTC division of CISE directorate. The total award is \$540K and its duration is five years.



Saman Zonouz, NSF CAREER Award for the project "Trustworthy and Adaptive Intrusion Tolerance Capabilities in Cyber-Physical Critical Infrastructures". The grant has been awarded by the CNS division of CISE directorate. The total award is \$508K and its duration is five years.

Modeling and Analysis of Big Data

Bajwa is seeking to develop and analyze a new class of signal/data models and associated inference algorithms that can be leveraged for robust and efficient processing of massively-large, "dirty," distributed data sets. Bajwa will accomplish this goal by taking a geometric viewpoint of the problem and undertaking an agenda that revolves around two major themes: (i) a novel geometric signal/data model that results in improved inference from big data, even in the presence of dirty data, because of the model's ability to faithfully capture the "ambient Riemannian geometry" of big data; and (ii) novel collaborative processing

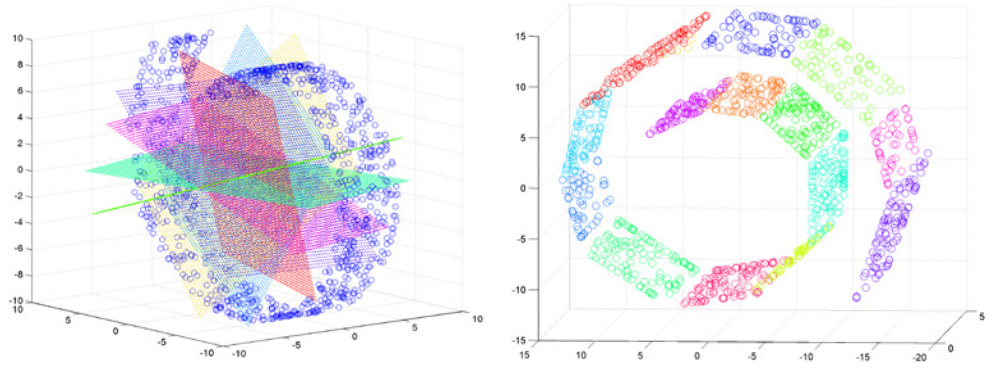
Privacy-preserving distributed algorithms

Sarwate's works on both the theory and applications of privacy-preserving algorithms for data analytics and learning. The primary application of his research is on collaborative learning with distributed data. Current technologies such as imaging and sequencing make it possible to gather massive amounts of information at increasingly lower costs. This research seeks to understand how to analyze and learn from sensitive data held at different locations (such as medical centers) in a way that quantifiably and rigorously protects the privacy of the data. Research groups studying

Protecting Cyber-Physical Critical Infrastructures

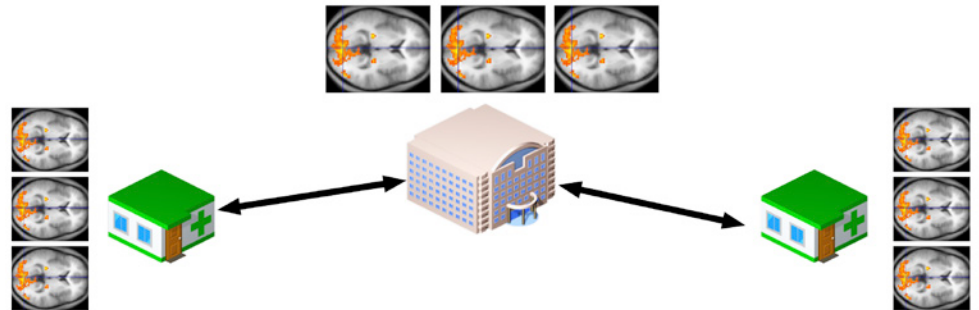
By developing trustworthy and adaptive intrusion tolerant capabilities in projecting power grids from cyber-physical attacks, Zonouz plans to develop prevention, detection, and tolerance solutions. These solutions will consider the complex interdependencies among computational components and physical processes in real-time through integrated automated methods. Intrusion prevention techniques will minimize how attackable the power grid is through the use of built-in secure soft/hardware architectures;

algorithms that build on top of the proposed model for improved inference from big, dirty data distributed across the world. Because of the increasingly data-driven nature of our world, Bajwa's work has numerous applications. Bajwa will in particular demonstrate the significance of this work through its applications to early cancer detection using in vivo fiber-bundle microendoscopy data, activity recognition in chaotic trauma bays using received signal strength indicator data, and collaborative digital pathology using histopathology data. Bajwa will also leverage this project for planning of STEM retention activities and training of data scientists through curriculum modernization and student mentoring.



Transformation of “data to knowledge to action” requires an accurate knowledge of the geometry of data, which is the focus of Bajwa’s research as part of this project.

a disease (for example, schizophrenia) may form a consortium to collaborate. However, researchers cannot share raw patient or subject data due to privacy constraints. Sarvate’s work is to understand the fundamental limits of private data sharing, design algorithms that make private approximations, create rules for combining these algorithms, and understand the consequences of sites having more complex privacy and sharing restrictions. The methods used to address these problems are a mix of mathematical techniques from statistics, computer science, and electrical engineering. He is collaborating with neuroimaging researchers to implement these algorithms into new systems for collaborative research.



A major challenge in this work is how multiple sites, each with a large amount of data about a small number of patients, can collaborate to collectively learn while preserving privacy.

intrusion detection methods will monitor unusual events within operating systems and power system components to identify malicious behaviors in case an attack occurs; and control-theoretic intrusion tolerance algorithms will adapt to determine the optimal countermeasures to restart an infrastructure’s safe operations. Cyber-physical critical infrastructures provide the society with essential services, and the goal of Zonouz’s work will be to establish trustworthy operation of the next generation of complex power critical infrastructures.



Optimal Control vs. Safety Redlines

Half-wavelength-pitch waveguide array for high-density silicon photonic chips

Professor **Wei Jiang** and his students have created a method of integrating denser elements on optical chips. This technology may one day be used to make computer chips and data centers run faster and more cost-effective. As silicon integrated circuits (ICs) have transformed our life, silicon photonic chips are anticipated to open a new chapter for the information technology, providing novel means for communications and processing data.

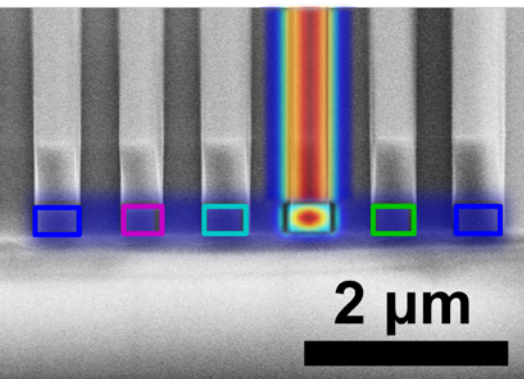


Image of a waveguide superlattice under a high-resolution electron microscope, artificially colored to show the optical field confined in one waveguide.

Ever increasing integration density, which has proven key to the success of silicon ICs as encapsulated in the Moore's law, will also be crucial to emerging silicon photonic chips development.

Towards this goal recently reported a high-density waveguide integration technology for silicon photonic chips that can lead to ultra-dense broadband optical interconnects, drastic cost-reduction for certain silicon photonic chips, and wide-angle, energy-efficient laser beam steering.

The work was reported in *Nature Communications* on May 11th and was completed in collaboration with Brookhaven National Laboratory, Stanford University, University of Central Florida, and Nanjing University.

Waveguide Integration Density

Higher integration density for integrated circuits means to cram more electronic devices into a given chip area. This method produces more powerful computing chips and lowers cost per device. For photonic integrated circuits on a silicon chip, this has been challenging.

The most ubiquitous components in photonic circuits – silicon waveguides – could not be made very dense mainly due to strong crosstalk or signal interference when waveguides are getting too close. This issue has been known for decades. No practical solution existed to minimize crosstalk for silicon waveguides with subwavelength pitches.

Jiang created a structure called waveguide superlattice to solve the problem. Essentially, the structure comprises a small sub-array of waveguides of different widths periodically replicated in space to form a superlattice of waveguides. The widths of the waveguides in each sub-array are engineered to deter the inter-coupling between nearby waveguides.

As the waveguide pitch is reduced to half-wavelength, even second-, third-, and farther neighbors in a array can inter-couple. Jiang unraveled the mathematics of such complex coupling and developed a set of superlattice design principles to minimize crosstalk of all channels.

Fabrication of such a dense waveguide array with high-perfection was difficult.

As the final high density waveguides fill 50% of the space with only tiny gaps, a single tiny imperfection could “short circuit” two waveguides and ruin the entire structure. “Often we needed to measure more than 100 crosstalk channels. Sometime, an accidental bad crosstalk channel appeared after measuring the first 90 good channels. Weeks of efforts wasted...that was heart-wrenching,” said Jiang.

The team improved the fabrication quality and reliability, developed efficient testing schemes, and eventually, demonstrated a high-density waveguide superlattice with half-wavelength-pitch in early 2013 before Song's graduation.

Such high-density waveguides can find many applications. They can be employed to significantly improve the wavelength resolution of spectrometers, increase the data transmission bandwidth in a microprocessor, and enlarge the laser beam steering range for optical phased arrays. Ming Lu and Aaron Stein of Brookhaven, MURI team member Stanford Professor Fabian Pease's group, Rutgers Research Associate Professor Warren Lai, and Professor Demetrios N. Christodoulides of the CREOL at University of Central Florida, and Rutgers students Robert Gatlula and Siamak Abbaslou contributed to the research.

The research was made possible by support from Air Force Office of Scientific Research, DARPA, and Department of Energy.



S. Abbaslou, W. Jiang, R. Gatlula

The Power of Many: A RADICAL View of High-Performance Computing

By Shantenu Jha, ECE Associate Professor

The National Strategic Computing Initiative was signed by President Obama in July 2015 provides renewed emphasis on the importance of High-Performance Computing in general. Of special interest is part of the order which speaks to the “.. increasing coherence between the technology base used for modeling and simulation and that used for data analytic computing”.

The RADICAL group is at the forefront of unifying the hitherto distinct technology bases for these domains. Through a series of National Science Foundation (NSF) and Department of Energy (DoE) grants the RADICAL group, led by Prof. Jha is developing a series of innovative and scalable software systems that will across domains as well as provide “abstractions” that will enable a conceptual unification.

The advances are primarily in the understanding of task-level parallelism – which is the ability to develop applications so as to support many-many concurrent “tasks”. At the heart of these advances are RADICAL-Cybertools, and in particular

RADICAL-Pilot, which provides the software system for executing many tasks.

RADICAL-Pilot is engineered to provide scalable and flexible execution for a range of constraints: thanks to engineering advances in the

“agent” and mechanism to integrate with system software found on supercomputers, RADICAL-Pilot can now support thousands of large-scale jobs concurrently. In the near future, tens-of-thousands of concurrent tasks will be supported. Importantly these advances are not confined to just one class of supercomputers but a range of supercomputing platforms – architectures and software systems.



The Blue Waters Supercomputer at the National Center for Supercomputing Applications (NCSA) is one of the world's most powerful supercomputers. The RADICAL team is developing middleware for such supercomputers to advance our ability to answer fundamental questions in science and engineering by unifying our modeling and analysis capabilities.

A recent NSF “PetaScale Resource Allocation” award for 1.5M node-hours on NSF’s flagship machine – Blue Waters, will help bring these advances to solve problems of societal and technical importance faster and at larger scales than is currently possible. This project will support several new applications to utilize the Blue Waters Supercomputer include applications ranging from protein conformations to polar sciences, to data-intensive sciences.

RADICAL-Pilot is being used for the simulation and modeling of many important biophysical systems. For example, in order to “adequately sample” the dynamics of N-methyl-D-aspartate receptor (NMDAr), a member of the glutamate receptor family of proteins (work done in conjunction with collaborators at Rice University), the total number of tasks that will be need to be completed over the duration of the is close to 8×10^7 , i.e. nearly 80 million tasks! While each individual ensemble member will run on only a handful of nodes, the large number $O(10^3-10^4)$ of concurrent ensembles will require at least around 20% of the mammoth machine with nearly a million cores!

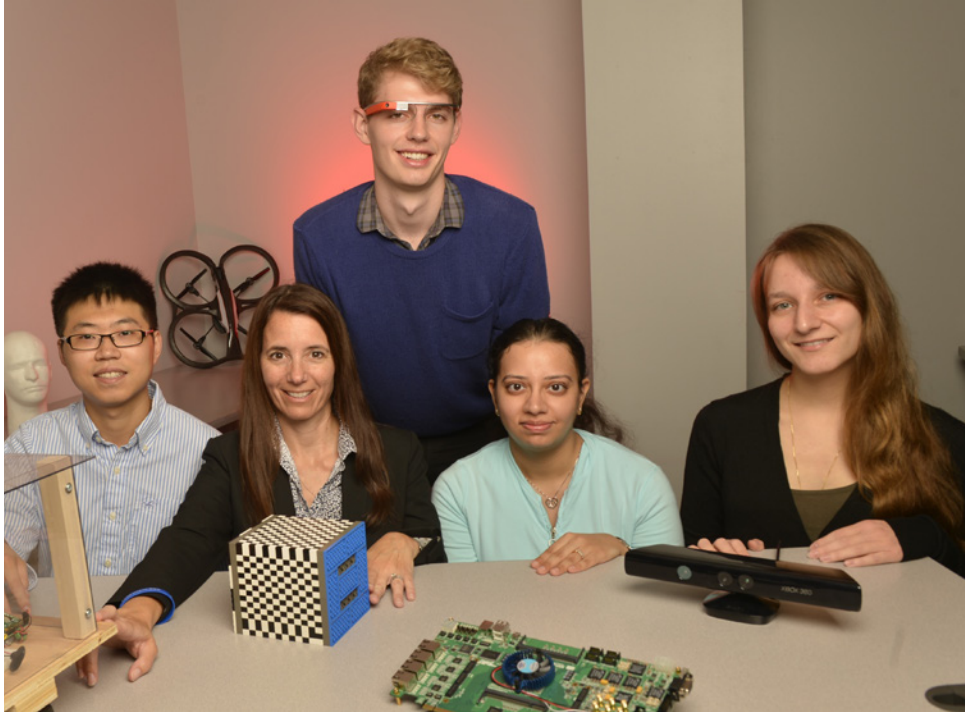
The data considerations – volumes (the volume of data produced by the simulations easily exceed 1PB), management and transfer rates, of analyzing the output of these simulations demands the use of high-performance/high-end computing infrastructure. Consistent with the President’s National Strategic Computing Initiative, the RADICAL team is extending advances in simulation & modeling towards an unifying approach to data-intensive analysis. Specifically, the team is leading the development of MIDAS – Middleware for Data-Intensive Analysis and Science, which will enable the design, development and testing of multiple new algorithms, middleware and methods, so as to reach scales that are scientifically needed but simply not possible otherwise or elsewhere.

This is just one of the ways in which the RADICAL team comprised of graduate students – Mark, Giannis, Vivek and Antons, along with research scientists Matteo and Andre are testing and taking “the power of many” tasks approach to high-performance computing to the extreme! For more information see the RADICAL team webpages at <http://radical.rutgers.edu>.



S. Jha

Prof. Kristin Dana's Computer Vision Lab



Dr. Dana (second from the left) with her research group

Rutgers ECE Computer Vision lab is directed by Dr. **Kristin Dana** (www.ece.rutgers.edu/vision). Computer vision is a research area with the broad goal of enabling computers to "see" in the manner that humans do. A subfield of her work is Computational Photography and Intelligent Cameras which leverages optics and signal processing to redesign cameras in order to capture scene information that the human eye is not capable of seeing. Current PhD students in this lab include **Parneet Kaur, Eric Wengrowski, Hang Zhang** and **Jia Xue**.

Her lab has developed several novel camera systems and recently received NSF funding with Drexel University for MatCam: A Camera that Sees Materials, \$500,000 for a three year grant. In the everyday real world, there are a vast number of materials that are useful to discern including concrete, metal, plastic, velvet, satin, water layer on asphalt, carpet, tile, skin, hair, wood and marble. An in-hand device for identifying these materials has important implications in developing new

algorithms and new technologies for a broad set of application domains. For example, a mobile robot can use MatCam to determine whether the terrain is grass, gravel, pavement, or snow in order to optimize mechanical control. The material composition of objects can be tagged for an e-commerce inventory. The potential applications are in areas such as robotics, digital architecture, human-computer interaction, intelligent vehicles and advanced manufacturing. The first stage of this work titled "Reflectance Hashing for Material Recognition" was presented at IEEE CVPR 2015 [1].

In bio-image computing, Dr. Dana's goal is to use computer vision to find a link between appearance and microbiology. Recent advances in microbiology research have led to the concept of quantitative dermatology based on the skin microbiome. One major challenge for microbiome measurement is the expense associated with genetic sequencing of bacteria. Dr. Dana's new work in this area integrates her prior work on visual

appearance modeling with microbiome data. The underlying question: Can computational photography be used to infer microbiology, without using microscopic imaging or gene sequencing? Her group has developed methods to infer the composition of the skin microbiome from quantitative studies of skin appearance using calibrated photography and statistical modeling. The first phase results

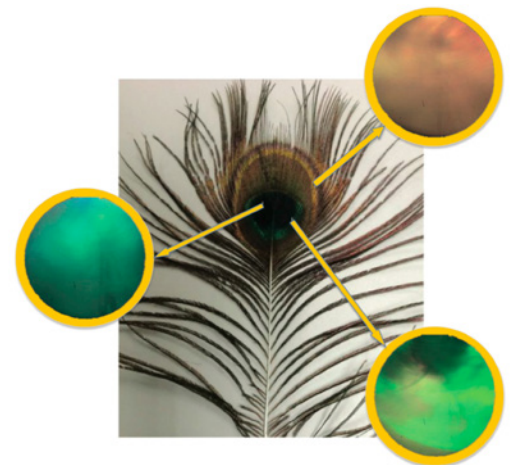


Figure 1: Reflectance disks provide a snapshot of the reflectance function for spot samples on the surface. For this example of a peacock feather, iridescence causes a large variation of intensity with viewing direction as revealed in the three reflectance disks.

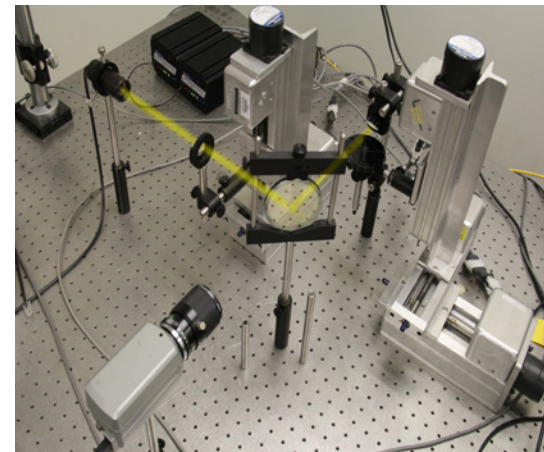


Figure 2: Prototype of the camera for reflectance disk capture.

The Virtual Reality Laboratory

have been published in "From Photography to Microbiology", at the Bioimage Computing Workshop at CVPR 2015 [2].

In the area of visible light communications, Dr. Dana is part of an interdisciplinary research program between computer vision and wireless communications at Rutgers Winlab that has been funded by the NSF. The group develops methods for communication between cameras and ordinary light displays such as billboards, computers, tablets, signage, kiosks and even vehicle lights [3,4,5]. Messages are encoded in the display images that are undetectable to the eye but decodable by a camera. The idea is similar to QR-codes but the message is time varying and the message is hidden. The approach has also been extended to enable depth cameras. The concept became the first phase messaging array to communicate to time-of-flight depth cameras and the work was selected as an oral presentation at the IEEE International Conference on Computational Photography (ICCP 2014) held at Intel's campus in Santa Clara, CA [3].



Rutgers was the first New Jersey University to offer a course in Virtual Reality about 20 years ago. The course, taught by Prof. **Grigore Burdea**, uses the Virtual Reality Educational Laboratory to teach the art of real-time programming, so that students can create realistic and interactive synthetic environments.

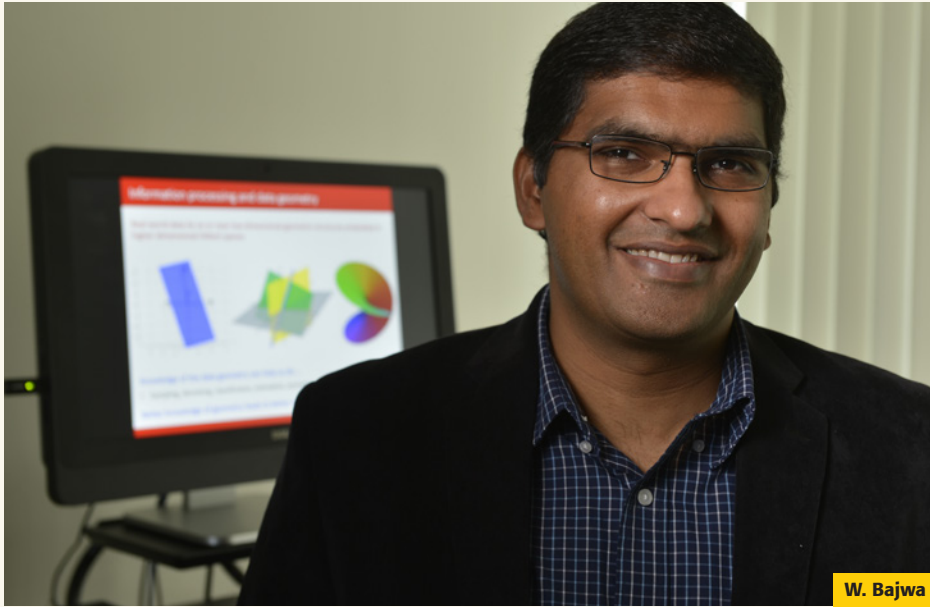
Since Virtual Reality is a fast-changing field of computer engineering, the Laboratory has gone through two evolutions since its creation, with the most recent one being completed in 2015. The upgrading on the laboratory involved a newly renovated space in the ECE Building, new hardware and programming software. The new hardware consists of high-end HP graphics workstations with accelerator cards needed to render fast graphics. In addition the students use 3D glasses, the Novint Falcon force feedback interface, Razer Hydra bimanual 3D game controllers as well as 3D sound USB sticks. The resulting simulations are therefore multimodal, involving sight, sound and touch.

The students learn to create virtual worlds using the latest version of Unity 3D Professional. Since Unity is optimized for mobile computing, the programming knowledge the students gain to complete their term projects will serve them well after graduation. The laboratory was established with support from the ECE department and also through a donation it received from **Cristian** and **Andrea Francu**, two former graduate students. It supports the undergraduate courses 14:332:376 Virtual Reality, 378 Virtual Reality Laboratory as well as the graduate course 16:332:571 Virtual Reality Technology. In addition the laboratory supports Capstone projects and independent studies.

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3. Wenjia Yuan, Richard Howard, Kristin Dana, Ashwin Ashok, Ramesh Raskar, Marco Gruteser, and Narayan Mandayam, "Phase Messaging Method for Time-of-flight Cameras", in ICCP: Proceedings of IEEE International Conference on Computational Photography, oral presentation, 2014
4. Wenjia Yuan, Kristin Dana, Ashwin Ashok, Marco Gruteser, Narayan Mandayam, "Spatially Varying Radiometric Calibration for Camera-Display Messaging", IEEE Conference on Global Signal and Information Processing, Austin, Texas, December 2013
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Congressman Frank Pallone announces research grant to Dr. Waheed Bajwa



W. Bajwa

Congressman Pallone Announces Grant to Rutgers for Development of Breakthrough Medical Technology, Highlights Importance of Funding Research Agencies

WASHINGTON, DC - Today, as Congress begins the appropriations process, Congressman Frank Pallone, Jr. (NJ-06) highlighted the importance of

funding research agencies by announcing a \$359,986 federal grant from the National Science Foundation to Rutgers University New Brunswick. The grant is for a project to design "a fiber-optic probe that will enable examination of tissue for signs of disease in real-time, non-invasively, at the level of traditional pathology." Through this technology, a doctor could perform a biopsy (i.e. potentially on cancerous tissue)

without having to remove any tissue from the body. This would be less invasive and would likely cut down on the costs of medical care.

"Rutgers University is at the cutting edge of medical research, and grants like this that foster innovation will help and our state and country continue down the path to a healthier future," said Congressman Pallone. "As we debate appropriations that fund our research organizations, this grant represents why agencies like the National Science Foundation and the National Institutes of Health are so critically important."

"We very much appreciate the NSF grant for this exciting work and Congressman Pallone's continued support for research at Rutgers," said Athina Petropulu, Rutgers School of Engineering, Professor and Chair of Electrical and Computer Engineering Department. "Professors Bajwa and Pierce are developing a technology with great potential to help cancer patients by reducing the need for invasive biopsies and improving treatment through enhanced diagnostics. This technology could improve the quality of life for cancer patients while positively impacting the cost of medical care."

Professor Marco Gruteser elevated to Association for Computing Machinery (ACM) Distinguished Scientist

Professor **Marco Gruteser** was elevated to Association for Computing Machinery (ACM) Distinguished Scientist. This is a very competitive process with only 49 ACM members selected this year in recognition of their "singular impact to the field of computing".

According to the ACM press release, the 2014 Distinguished Members are from universities in Austria, Germany, Switzerland, Netherlands, Sweden, Japan, India, the

United Kingdom and North America, and from leading international corporations and research institutions. Their achievements in critical computing areas include innovative instruction and curriculum design, systems design and architecture, critical systems security, Internet structure and security, high performance computing, human-computer interaction, programming languages, mobile and wireless networks, database research and management, and software engineering.



M. Gruteser

Professor Wade Trappe elected Vice Chair of the IEEE Information Forensics and Security Technical Committee

Professor Wade Trappe was elected Vice Chair of the IEEE Information Forensics and Security Technical Committee. The one-year term of Vice Chair started on 2015/1/1. The Vice Chair position automatically succeeds to the position of Chair (2016-2017) then Past Chair.



This is a very visible position in the IEEE Signal Processing Society, in an area that has been attracting increasing interest. Dr. Trappe's election is testament of the recognition that he enjoys by the technical community in that field.

Professor Greg Burdea received the 2014 New Jersey Immigrant Entrepreneur of the Year Award.



Professor **Greg Burdea** received the 2014 New Jersey Immigrant Entrepreneur of the Year Award. This is in recognition of his Life Sustainability work on the BrightBrainer system. Use of games to rejuvenate the brain is now considered a disruptive technology to standard pharma and behavioral approaches.

N. Mandayam received 2015 IEEE Communications Society (COMSOC) Award for Advances in Communication

Dr. **Narayan Mandayam**, Distinguished Professor of ECE and Associate Director, WINLAB is the recipient of the 2015 IEEE Communications Society (COMSOC) Award for Advances in Communication for his paper "Efficient Power Control via Pricing in Wireless Data Networks," that appeared in the IEEE Trans. on Communications, vol. 50, No. 2, pp. 291-303, February 2002. The Advances in Communication Award is the highest paper award given by the COMSOC and is given to an outstanding paper published in any IEEE Communications Society publication in the previous 15 calendar years. Specifically, this award seeks to recognize work that has truly opened new lines of work, envisioned bold approaches to the analysis/design of communications systems, formulated new problems to solve, and essentially enlarged the field of communications engineering. Dr. Mandayam co-authored this seminal paper with Dr. Cem Saraydar and Dr. David Goodman. Their work pioneered the application of microeconomic principles such as Nash Equilibrium and Pareto efficiency to the efficient design of power

control algorithms in wireless data networks. Specifically, they were the first to relate attributes like power, rate and throughput performance of wireless data networks to microeconomic notions of user and system utility. This also enabled the design of distributed radio resource allocation algorithms that can achieve Nash equilibria of such systems, and offer Pareto improvements when such equilibria are inefficient. Using the theoretical framework of noncooperative as well as supermodular game theory, their work showed that such new approaches result in much higher wireless data system efficiencies (bits/Joule) when compared to techniques that had been optimized for voice only communications. Dr. Saraydar, who was Dr. Mandayam's very first PhD advisee, is currently Director of Electrical and Control Systems research at GM and Dr. Goodman, who was the Founding Director of WINLAB is Professor Emeritus at NYU. Dr. Mandayam and Dr. Goodman were honored with this award in London during the 2015 IEEE International Communications Conference (ICC) in June, 2015.



Dr. Mandayam (first from the right) and Dr. Goodman (second from the left) at the IEEE COMSOC Awards Luncheon at ICC, London in June 2015

M. Gruteser and Y. Zhang promoted to Professors

Marco Gruteser is Professor of Electrical and Computer Engineering as well as Computer Science (by courtesy) at Rutgers University's Wireless Information Network Laboratory (WINLAB). He directs research in mobile computing, is a pioneer in the area of location privacy and recognized for his work on connected vehicles. Beyond these topics, his more than hundred peer-reviewed articles and patents span a wide range of wireless, mobile systems, and pervasive computing issues. He has served as program co-chair or vice-chair for conferences such as ACM MobiSys, ACM WiSec, IEEE VNC and IEEE Percom. He has delivered seven conference and workshop keynotes, served as panel moderator at ACM MobiCom, and as panelist at ACM MobiSys, IEEE Infocom, and IEEE ICC. He was elected treasurer and member of the executive committee of ACM SIGMOBILE. He received his MS and PhD degrees from the University of Colorado in 2000 and 2004, respectively, and has held research and visiting positions at the IBM T. J. Watson Research Center and Carnegie Mellon



M. Gruteser

University. His recognitions include an NSF CAREER award, a Rutgers Board of Trustees Research Fellowship for Scholarly Excellence, a Rutgers Outstanding Engineering Faculty Award, as well as best paper awards at ACM MobiCom 2012, ACM MobiCom 2011 and ACM MobiSys 2010. His work has been regularly featured in the media, including NPR, the New York Times, Fox News TV, and CNN TV. He is an ACM Distinguished Scientist.

Yanyong Zhang is Professor in the Electrical and Computer Engineering Department at Rutgers University. She is also a member



Y. Zhang

of the Wireless Information Networks Laboratory (Winlab). She has 18 years of research experience in the areas of sensor networks, mobile computing and high-performance computing, and has published more than 90 technical papers in these fields. Her current research interests are in future Internet and pervasive computing. Her research is mainly funded by the National Science Foundation, including an NSF CAREER award. She is current the Associate Editor for IEEE Transactions on Mobile Computing and IEEE Transactions on Services Computing.

N. Karimi promoted to Assistant Teaching Professor

Naghmeh Karimi received a Ph.D. degree in Electrical Engineering from University of Tehran in 2010. She was a visiting researcher at Yale University between 2007 and 2009, a Postdoctoral researcher at Duke University in 2011 and a visiting Assistant Professor at New York University between 2012 and 2014. Her research interests include Design-for-Testability, Design-for-Reliability, Design-for-Security, Hardware Security, and VLSI.



N. Karimi

A. Petropulu chaired the 2015 ECEDHA Annual Conference and ECExpo

Professor and Chair **Athina Petropulu** was Committee Chair of the 2015 Atlantic ECE Department Heads Association (ECEDHA) Annual Conference and ECExpo, which took place March 13-17, 2015 at the Westin Hilton Head Island Resort & Spa on Hilton Head Island, South Carolina.

The ECEDHA Annual Conference and ECExpo is a premier annual event bringing together ECE department heads, deans, lab managers, and faculty from throughout the United States and Canada. Professor Petropulu currently serves as the ECEDHA President.



A. Petropulu

ECE hosted the Mid-Atlantic ECEDHA summer meeting

ECE chair **Athina Petropulu** hosted the Mid-Atlantic ECEDHA meeting during July 17-18. The meeting provide a nice forum for exchange of ideas and best practices.

In memoriam: David Daut

David G. Daut, Professor of Electrical and Computer died on Saturday, January 24, 2015.

David G. Daut received the B.S.E.E. from the New Jersey Institute of Technology and the M.S.E.E. and Ph.D. degrees from Rensselaer Polytechnic Institute. He joined Rutgers University in 1980. His teaching and research activities were in the areas of communications and information systems, focusing on data/bandwidth compression techniques in the context of image coding and transmission. He had authored numerous journal and conference papers and was a co-recipient of the 1984 IEEE Communications Society Rice Prize Paper Award. He provide important service to his professional society. He had served as an elected member of the IEEE Board of Directors (Division III) during 1998 and 1999. In 2009 he served as General Co-Chair for the IEEE Sarnoff Symposium, Princeton, NJ. In 2013 he was recognized with the Joseph LoCicero Award for Exemplary Service "for outstanding service and dedication to the IEEE Communications Society as Publications Editor for the IEEE Transactions on Communications." He was member of Sigma Xi, Tau Beta Pi, Eta Kappa Nu as well as the Association for Computing Machinery, Optical Society of America, and the Society of Photo Optical Instrumentation Engineers.



D. Daut

During his 35 year career at Rutgers, Professor Daut was a valuable contributor to the ECE Department and the University. He served as Director of the ECE Graduate Program (1991-1999) and as Director of the Engineering Computer Center (1989-1998). He served as Chair of the Electrical and Computer Engineering Department twice, from 1986 to 1988 and again from 1997 to 2006.

Dr. Daut was a beloved student advisor and mentor. He has graduated over 15 doctoral students, many of whom followed careers at national universities and research

labs. He was also an "awesome" teacher, often receiving perfect marks from the students for the courses that he taught. His classes included a perfect blend of theory and laboratory component, focusing on applications. In the Fall 2014 survey, regarding his "Communications System Design" course, the students commented "This has been the most hands-on course I've taken and it's really helped me learn how to apply the theoretical concepts that we've learned". In response to what should be done differently in the course, the students commented "None, this was an excellent course, my favorite! Thanks!," "Stay the same Prof Daut! Great having u as a professor!", "Stay Awesome Professor". "I was fortunate to work with Prof. David Daut, a good person and

scholar who was very supportive, kind, and friendly towards me. I will never forget what he has done for me. My condolences to his family, and the faculty and students of the ECE Department of Rutgers" said Ozan K. Tonguz, Professor of Electrical and Computer Engineering at Carnegie Mellon, who received his PhD from ECE Rutgers under Dr. Daut's supervision.

Dr. Daut is survived by his wife Panxi Daut and his daughter Cynthia Daut.

The following site has been set up for faculty and students to pay tribute to Professor Daut <http://daviddaut.rutgers.edu>

Resolution for David G. Daut

From The 2015 IEEE Technical Activities Board

The IEEE Technical Activities Board expresses its sorrow and regret at the untimely death of Dr. David G. Daut, Publications Editor, IEEE Transactions on Communications 1988 – 2012; Chair, TAB Magazines and Newsletters Committee, 2011 – Present; and 1998- 1999 IEEE Division III Director.

It also acknowledges the other outstanding contributions of Dr. David G. Daut over his long career as a volunteer with the IEEE.



R. Yates received the 2015 Teaching Award for Electrical and Computer Engineering



R. Yates

The undergraduate students of the School of Engineering awarded Prof. **Roy Yates** the 2015 Teaching Award for Electrical and Computer Engineering. This award is given out to a professor in each department who the students feel have done an excellent job in teaching this past academic year.

Professor Yates, a Distinguished Professor of Electrical and Computer Engineering, has made fundamental research contributions to wireless networks. He has also been an active mentor to undergraduate and graduate students as the supervisor of 19 completed Ph.D. theses. Among these,

four of his former PhD students (S. Ulukus at Univ. of Maryland, A. Yener at Penn State, M. Saquib at Univ. of Texas at Dallas). In 2011 he was recognized with the Rutgers University Faculty Scholar-Teacher Award.

Professors S. Jha and D. Pompili named Chancellor's Scholars

Professors **Shantenu Jha** and **Dario Pompili** were named Chancellor's Scholars. The Chancellor's Scholar initiative was created through the New Brunswick Strategic Plan to recognize truly outstanding and highly promising scholars at Rutgers University-New Brunswick.

Dr. Jha leads the RADICAL – Research in Applied Distributed Computing and Applications Laboratory – which is involved in research at the triple point of Cyberinfrastructure, Applied Computing and Computational Science. His team has collaborated with high-energy physicists, climate scientists, and bio-molecular scientists to develop and apply advanced computing techniques. His research is supported by DOE and NSF awards. He is an NSF CAREER Awardee.

Dr. Pompili is an internationally recognized researcher in the area of Cyber-Physical

Systems with quantifiable contributions in wireless ad hoc and sensor networks, underwater communications, and mobile cloud computing. He has received significant recognition for his research including the NSF CAREER award, the ONR Young Investigator Program (YIP) award, and the DARPA Young Faculty Award (YFA).



S. Jha



D. Pompili

In memoriam: James Flanagan

James L. Flanagan received the Doctor of Science degree in Electrical Engineering from the Massachusetts Institute of Technology, and then joined the research division of AT&T Bell Laboratories. He served 33 years at Bell Labs, retiring in 1990 as Director, Information Principles Research. His near 200



archival publications, two books, and 50 US patents reflect his technical activities in this interval. His work on automatic speech recognition, machine synthesis of speech, and efficient signal

coding influenced today's human-machine capabilities and mobile technologies. Under his aegis, electro-acoustic devices evolved, notably electret transducers and auto-directive arrays for teleconferencing. He was elected to the National Academy of Engineering and to the National Academy of Sciences.

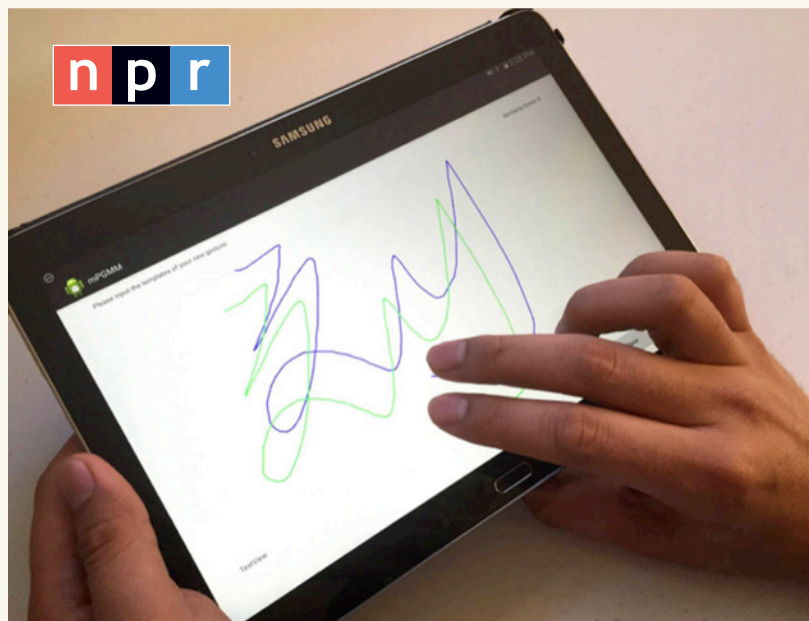
Subsequent to Bell Laboratories, Flanagan served 15 years as Board of Governors Professor and university Vice President for Research at Rutgers University. His responsibilities embraced industry-sponsored and governmental contract research, spanning computing, communications, medical engineering, signal processing, and graduate education. Among his awards are the National Medal of Science, presented

at the White House by the US President, and the L. M. Ericsson International Prize in Telecommunications, presented in Stockholm by the King of Sweden.

For his groundbreaking contributions IEEE established The IEEE James L. Flanagan Speech and Audio Processing award in 2002. The award is sponsored by the IEEE Signal Processing Society and is awarded to individuals for an outstanding contribution to the advancement of speech and/or audio signal processing.

Dr. Flanagan is survived by his wife, Mildred Bell Flanagan, by his three sons, Stephen, James and Aubrey, and his five grandchildren.

Prof. Lindqvist's work featured on NPR



Prof. **Janne Lindqvist**'s work was featured in NPR and the syndicated radio stations both online and in radio broadcasts during October 2014. The radio stations include NHPR, NCPR, WUNC, Iowa Public Radio, Indiana Talks, WVPE, WAMU, WNYC, WBAA among others. The work "User-Generated Free-Form Gestures for Authentication: Security and Memorability" was formally published in MobiSys'14. In the work, Lindqvist's group and collaborators studied how using one or more fingers to draw figures (gestures) can be used to authenticate to a device. The work is part of Prof. Lindqvist's on-going research agenda for usable and secure smartphone authentication.

Prior to NPR and other national radio stations, the work had received media attention worldwide including Fortune, Scientific American, CBS Radio News, Daily Mail (2nd largest daily newspaper in the UK), International Business Times, and notable blogs such as Richard Dawkins Foundation.

Sustainable Jersey Creativity & Innovation Award with Warren Township

Prof. **Janne Lindqvist** received with Warren Township the Sustainable Jersey Creativity & Innovation Award 2014 for Lindqvist group's work on the Hazard Tracker App

The Warren Township Committee announced the results of the Township Utility Hazard Inventory and Remediation Project conducted by a group of volunteers known as the "Warren Township Utility Advisory Committee (WTUAC)."

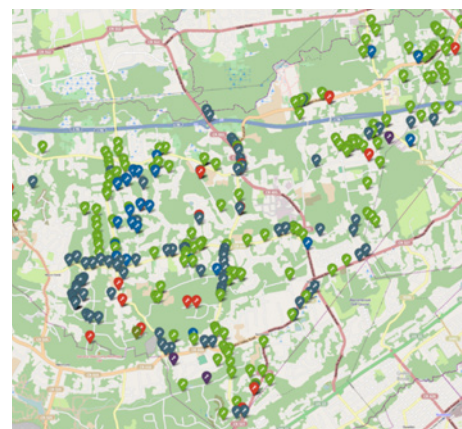
With the Hazard Tracker app implemented by Prof. Lindqvist's group in cooperation with the WTUAC, the Hazard Inventory was conducted in the fall of 2013 to:

- 1) Document potential threats (hazards) to the townships electrical delivery system,
- 2) Report the hazards to the utility companies (JCP&L, PSEG),
- 3) Develop and implement a remediation plan to address the hazard list .

More than 250 miles of the electrical system were reviewed. As a result of the hazard inventory conducted during the fall of 2013, 351 hazards were documented and reported to the utility companies. All these hazards were later fixed.

This work was formally published in the IEEE Global Humanitarian Technology Conference in 2014, and featured in the popular media such as Engineering for Change website, WHYY Radio, Newsworks, Communications of the ACM, R&D Magazine, Jersey Tribune, and the National Science Foundations (NSF) website.

"This is a public policy innovation as well," Prof. Lindqvist said in an interview to WHYY Radio. "When problems are clearly documented and presented to the utilities, they have to check the problems and deal with them. They can't say after a disaster that they weren't aware of them."



newgrants

Waheed Bajwa and Mark Pierce

(Biomedical Engineering) received a 3-year grant of \$359,986 from NSF for a project, entitled "Signal Processing—Optics Co-Design for In Vivo Optical Biopsy."

Shantenu Jha received an NSF ECCS grant of \$1.25M for the project "Middleware and High Performance Analytics Libraries for Scalable Data Science". This grant is part of a \$5M grant led by Geoffrey Fox of Indiana University, for which Dr. Jha is the middleware architect and lead.

Also, **Dr. Jha** received a grant from NSF entitled, "EarthCube: Research Coordination Network for High-Performance Computing in the Polar Sciences". This is a \$300K grant; the Rutgers share of funding is \$200K.

Also, **Dr. Jha** received a grant from NSF entitled, "Cybermanufacturing: Advanced Modeling and Information Management in Pharmaceutical Manufacturing" with colleagues in CBE (Rutgers). The award is for \$285K for two years.

Also, **Dr. Jha** was a co-PI on two coordinated awards by NSF and DOE for a study on, "Streaming and Steering Applications: Requirements and Infrastructure". These awards are in collaboration with Berkeley and Indiana. The total value of the awards is \$150K.

Dr. Jha was the PI on a NSF award, "The Power of Many: Scalable Compute and Data-Intensive Science on Blue Waters". In addition to \$15K, this award is for 1.5M node-hours on NSF's largest supercomputer. He was also awarded \$15K from the NSF for "Designing and assessing effective 'hands-on' training for computational science."

Mehdi Javanmard received a seed grant for \$15,000 from the Environmental Occupational Health Safety Institute of Rutgers. The project will be the beginning of a formal collaboration with the Environmental and Occupational Health Sciences Institute.

Janne Lindqvist, in collaboration with Rutgers Sociology faculty, received an NSF grant of \$51,847 for a project titled "Developing an Application for Assessing Respondent Experiences of Their Surroundings in Real Time".

Narayan Mandayam, Janne Lindqvist and Arnold Glass (Psychology) received a 3-year NSF award from the Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP) program for a project titled "Towards Resilient Smart Cities." This is a collaborative project with Virginia Tech and Florida International University. The total award amount is \$2.5M and the Rutgers share is \$900K.

Narayan Mandayam and Yanyong Zhang received a \$498K NSF grant for their project titled "Realizing Green Communication Through Transmit Only Networks."

Also, **Dr. Mandayam and Ivan Seskar** of WINLAB received a grant from ONR entitled "A Software Defined Framework for Opportunistic Networking and Spectrum Management". This is a \$1M grant for three years and is joint effort with the Naval Research Laboratories. The Rutgers share of funding is \$790K.

Laleh Najafizadeh received a four year \$323,134 grant from Siemens for the project titled "Towards Characterizing Brain Communication Mechanisms via Multi-Modal Imaging".

Athina Petropulu and Wade Trappe received a \$500K three year NSF CIF grant for the project "Spatiotemporally Varying Channel Map Estimation and Tracking in Wireless Networks". ECE PhD student Dionysios Kalođerias is senior personnel on the grant.

Drs. **Petropulu and Trappe** also received a grant of \$50K for 6 months from Raytheon for the project "Spectrum Sharing Between Radar and Communication Systems".

Dipankar Raychaudhuri, Wade Tappe and Ivan Seskar received a \$2.275M ORBIT Gen3 award. This grant supports construction of a unique cloud processing cluster for the ORBIT radio grid and will enable new categories of experiments including cooperative PHY, cloud RAN and network MIMO.

Also, **Drs. Raychaudhuri, Wade Tappe and Ivan Seskar** won a contract from the Army (funded in collaboration with DSCI) titled "Directional Network Waveform". The funding for the contract is \$112,149 with a performance period of May 21, 2015 to September 30, 2015.

Anand Sarwate received an NIH R01 grant for the project "COINSTAC: Decentralized Scalable Analysis of Loosely Coupled Data". The lead on the project is Vince Calhoun (Mind Research Network, Albuquerque, NM). The Rutgers subaward is \$840K.

Drs. Sarwate and Bajwa received a 1-year \$160,000 grant from NSF CIF for the project entitled "Active data screening for efficient feature learning".

Saman Zonouz received a 3-year \$579,486 NSF grant for the project "Distributed Just-Ahead-Of-Time Verification of Cyber-Physical Critical Infrastructures".

Saman Zonouz and Dario Pompili received a 2.5-year grant \$576K grant from the Department of Homeland Security for a project entitled "Dynamic Context-Aware Data Protection Through Virtual Micro Security-Perimeters in Smartphones and Wearable Devices"

Saman Zonouz received a 5-year grant of \$500K from DOE for a project entitled "Cyber Resilient Energy Delivery Consortium".

Dr. **Zonouz** also received a 3-year grant of \$572K from ONR for a project entitled "Runtime Optimal Semantic Gap-Filling System Security Monitoring via Offline Automated Executable Profile Generation and Dynamic Sensor Deployment"

Northrop Grumman Names Nicholas G. Paraskevopoulos Vice President of Engineering, Manufacturing and Logistics for its Electronic Systems Sector

Northrop Grumman Corporation (NYSE: NOC) has named **Nicholas G. Paraskevopoulos** vice president and general manager of engineering, manufacturing and logistics (EM&L) for the company's Electronic Systems sector.

In his new position, Paraskevopoulos will have executive responsibility for all engineering, manufacturing and logistics processes, services and systems across the sector. This will include the EM&L homeroom, which provides sector-wide integrated technical support from product design and development through production and delivery, including full product life-cycle support.

Paraskevopoulos joined Northrop Grumman in 2003 and has held a number of leadership positions in the Electronic Systems sector. Most recently, he served as vice president, advanced maritime and IAMD (integrated air and missile defense) systems. Previously, he served as business development manager for advanced aperture technologies and architectures,

director of advanced technologies and systems, vice president of Electronic systems engineering, and vice president of eastern region engineering and logistics.

Prior to coming to Northrop Grumman, Paraskevopoulos was vice president of research and development and engineering for Terk Technologies, a consumer electronics company. There he was responsible for the development of a variety of products ranging from a multi-satellite television dish to one of the first satellite radio car antennas. Paraskevopoulos received a bachelor's degree from the University of Pennsylvania and both master's and doctoral degrees in Electrical Engineering from Rutgers University.

Northrop Grumman is a leading global security company providing innovative systems, products and solutions in unmanned systems, cyber, C4ISR, and logistics and modernization to government and commercial customers worldwide.

Class of 2014 W. Juan joins Google



Wenjia Yuan joined ECE of Rutgers in 2008 as a graduate assistant, advised by Prof. Dana. Her research area spans computer vision and computational photography. Her expertise and interests also include image processing, machine learning, and computational photography. Wenjia received her PhD in 2014. Her thesis is titled "Computer Vision Methods for Camera-Display Communication Systems" and her primary advisor was Professor Kristin Dana. Her research was part of the project "Visual MIMO", which was funded by the National Science Foundation. Wenjia visited the Media Lab at Massachusetts Institute of Technology in 2013 for collaborative research on phase-messaging to time-of-flight cameras. According to her advisor, Kristin J. Dana, "Wenjia was instrumental in developing the first phase-messaging array for communication with time-of-flight cameras. Her pioneering work in camera-display messaging is an important step in visible light communications between ordinary displays and hand-held cameras." She interned at Qualcomm and Google in 2012 and 2014 respectively. She was awarded "Teaching Assistant of the Year" in 2009, and "Research Excellence Award" in 2013 from ECE Rutgers.

Wenjia Yuan is currently a software engineer with Google, Inc. in New York City



Nicholas G. Paraskevopoulos (left) talking to ECE students during his recent visit.

A. Yener elevated to IEEE Fellow for contributions to wireless communication theory and wireless information security

Aylin Yener received the B.Sc. degree in electrical and electronics engineering, and the B.Sc. degree in physics, from Bogazici University, Istanbul, Turkey; and the M.S. and Ph.D. degrees in electrical and computer engineering from Wireless Information Network Laboratory (WINLAB), Rutgers



A. Yener

University, New Brunswick, NJ. She is a professor of Electrical Engineering at The Pennsylvania State University, University Park, PA since 2010, where she joined the faculty as an assistant professor in

2002. During the academic year 2008-2009, she was a Visiting Associate Professor with the Department of Electrical Engineering, Stanford University, CA. Her research interests are in information theory, communication theory and network science with recent emphasis on green communications and information security. She received the NSF CAREER award in 2003, the best paper award in Communication Theory in the IEEE International Conference on Communications in 2010, the Penn State Engineering Alumni Society (PSEAS) Outstanding Research Award in 2010, the IEEE Marconi Prize paper award in 2014, the PSEAS Premier Research Award in 2014, and the Leonard A. Doggett Award for Outstanding Writing in Electrical Engineering at Penn State in 2014. She is a fellow of the IEEE.

Dr. Yener is currently a member of the board of governors of the IEEE Information Theory Society where she was previously the treasurer (2012-2014). She served as the student committee chair for the IEEE Information Theory Society 2007-2011, and was the co-founder of the Annual School of Information Theory in North America co-organizing the school in 2008, 2009 and 2010. She was a technical (co)-chair for various symposia/tracks at IEEE ICC, PIMRC,

VTC, WCNC and Asilomar (2005-2014), and served as an editor for IEEE Transactions on Communications (2009-2012), an editor and an editorial advisory board member for IEEE Transactions on Wireless Communications (2001-2012), a guest editor for IEEE Transactions on Information Forensics and Security (2011) and a guest editor for IEEE Journal on Selected Areas in Communications (2015).

C.-N. Chuah elevated to IEEE Fellow for contributions to MIMO communications and network management

Chen-Nee Chuah is a Professor in the Electrical and Computer Engineering Department at the University of California, Davis. She received her B.S. in Electrical Engineering from Rutgers University, and her M. S. and Ph.D. in Electrical Engineering

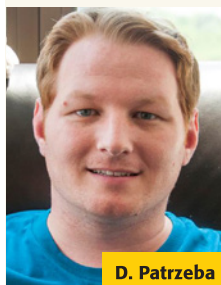
and Computer Sciences from the University of California, Berkeley. Before joining UC Davis in 2002, she spent 9 months as a visiting researcher at Sprint Advanced Technology Laboratories. Her research interests include Internet measurements, network management, anomaly detection, online social networks, and vehicular ad hoc networks. Chuah is a Fellow of the IEEE and an ACM Distinguished Scientist. She received the NSF CAREER Award in 2003, and the Outstanding Junior Faculty Award from the UC Davis College of Engineering in 2004. In 2008, she was named a Chancellor's Fellow of UC Davis. She has served on the executive/technical program committee of several ACM and IEEE conferences. She was an Associate Editor for IEEE/ACM Transactions on Networking from 2008 to 2012.



C.-N. Chuah

Class of 2015 D. Patrzeba joins Microsoft

David Patrzeba graduated this past spring with highest honors and Bachelors of Science degrees in Electrical & Computer Engineering and Computer Science. Before he even stepped foot



D. Patrzeba

into the classroom for his senior year, David had offers from top companies like Google, Amazon, and Microsoft. David went on to work at Microsoft post-graduation where he works as part of the newly formed Windows and Devices Groups, an amalgamation of the Operating Systems and Microsoft Devices groups. David has been working as a part of the new Windows as a Service initiative and has already been making an impact on his team.

David's success is probably not a surprise to anyone that knows him: He held various roles as a part of the Rutgers IEEE student branch and Eta Kappa Nu IEEE honor society during

his four years at Rutgers. He had internships at Amazon and Fog Creek Software, and he served seven years as a United States Army Ranger deploying eight times in support of Operations Iraqi and Enduring Freedom.

In spite of all these accomplishments David said "I didn't get to where I am today on my own....Rutgers University, the ECE and CS departments, and the support systems around Rutgers were instrumental in my success."

David draws special attention to the mentorship and guidance that Prof. Janne Lindqvist provided through the multiple classes that he took with Prof. Lindqvist and through Prof. Lindqvist acting as David's capstone advisor. David's capstone, Mutual 2 Factor Authentication Using Trusted Services, went on to take first prize as award by a combination of industry and academic judges. David also mentioned the superb job of Col. Steve Abel and Robert Bright running the Rutgers Veteran services and how that helped him transition into Rutgers.

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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