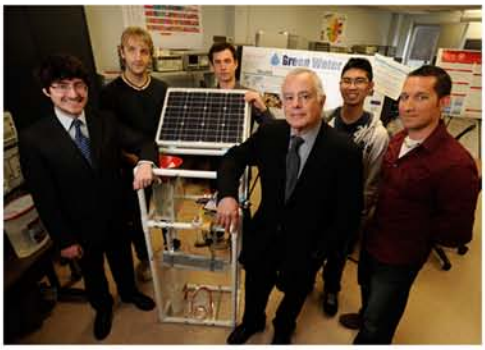
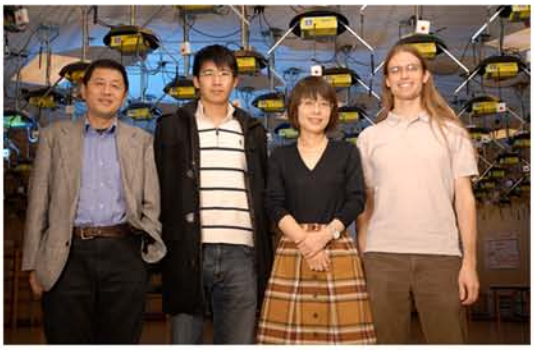
ECE News

RUTGERS DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING Issue 2011-2012





RUTGERS
School of Engineering





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Message From The Chair

I am delighted to share the highlights of yet another exciting year at the Electrical and Computer Engineering Department at Rutgers University.

The 2011-2012 academic year culminated with the graduation of 241 students with Electrical and Computer Engineer degrees. We are extremely proud of this success because it reflects the commitment we have to our students: we graduated 31% more students with a BS than in 2011, and 72 of the degrees we awarded were advanced Graduate degrees.

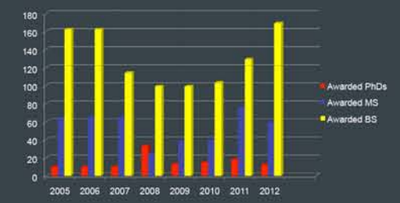
Our effort to improve the quality of education that we offer our students is also reflected in the successful effort we have had in expanding our faculty—over the past two years we have 6 new members to our faculty. In Fall 2011 we welcomed Assistant Professors Waheed Bajwa and Jaesok Jeon, and in Fall 2012 we welcomed Assistant Professor Laleh Najafizadeh. We are particularly excited by the promise that our junior faculty hold for our department.

In the past year, our students have received highly competitive graduate fellowships, including Moustafah Abdelbaky's IBM Fellowships and Christopher Smith's National Security Agency National Physical Science Consortium Fellowship. Our Capstone Design course featured many exciting projects, some of which were recognized with top honors at professional conferences and also in our capstone design competition. Additionally, several of our junior faculty members were recognized with prestigious awards, including Professor Dario Pompili's Office of Naval Research Young Investigator Award, and the two DARPA Young Faculty Awards, by Professors Wei Jiang and Dario Pompili. Our senior faculty has continued to accumulate recognition; Professor Peter Meer was elevated to IEEE Fellow, bringing the number of ECE faculty members who are IEEE Fellows to 11.

I hope you enjoy reading about our department's accomplishments. You can find out more about our program by visiting www.ece.rutgers.edu. Please do not hesitate to contact me should you have any questions or comments at athinap@rutgers.edu.

Athina Petropulu
Professor and Chair

ECE Degrees Awarded



ECE Faculty

WAHEED U. BAJWA
Assistant Professor
PhD, 2009 University of Wisconsin-Madison
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
PhD, 1987 New York University
NSF Initiation Award
Research Interests: Virtual rehabilitation, telerehabilitation, haptics, and virtual reality.

MICHAEL BUSHNELL
Professor
PhD, 1986 Carnegie Mellon University
IEEE Fellow
Research Interests: Computer Aided Design (CAD) of Very Large Scale Integrated (VLSI) Circuits.

KRISTIN DANA
Associate Professor
PhD, 1999 Columbia University
NSF Career Award
Research Interests: Computer vision, pattern recognition, machine learning, convex optimization, novel cameras, camera networks, computer graphics, robotics.

DAVID DAUT
Professor
PhD, 1981 Rensselaer Polytechnic Institute
Research Interests: Communications and information processing area. Special interests include stochastic processes in communication, detection and estimation theory, information theory and coding, multidimensional digital signal processing, optical communications systems.

ZORAN GAJIC
Professor and Graduate Director
PhD, 1984 Michigan State University
Research Interests: Power control of wireless networks.

MARCO GRUTESER
Associate Professor
PhD, 2004 University of Colorado
NSF Career Award
Research Interests: Location-aware systems, pervasive computing systems, privacy and security, mobile networking, sensor networks, performance evaluation.

JAESEOK JEON
Assistant Professor
PhD, 2011 University of California
Research Interests: Nanoelectronic materials, devices and processing technologies Nano-Electro-Mechanical Systems (NEMS).

SHANTENU JHA
Assistant Professor
PhD, 2004 Syracuse University
Research Interests: High-performance and distributed computing, computational and data-intensive science and engineering, large-scale cyberinfrastructure for science & engineering.

WEI JIANG
Assistant Professor
PhD, 2005 University of Texas at Austin
DARPA Young Faculty Award
Research Interests: Silicon nanophotonics, photonic crystals, silicon photonic microsystems, nanoimprint and molding, plasmonics and metamaterials, and disordered and quasi-periodic media.

WARREN LAI
Research Associate Professor
PhD 1980, California Institute of Technology
Research Interests: Micro- and nano-fabrication for applications in IC, electronics, photonics, MEMS, sensors and nanotechnology, including advanced process development, novel device integration, material engineering, metrology, characterization, reliability and manufacturability.

JANNE LINDQVIST
Research Assistant Professor
PhD, 2009 Helsinki University of Technology, Finland
Research Interests: Systems security and privacy, mobile systems, social computing, context-aware communication, human factors in computing systems.

YICHENG LU
Professor II, Director of MERI
PhD, 1998 University of Colorado
IEEE Fellow
Research Interests: Microelectronic materials and devices.

RICHARD MAMMONE
Professor
PhD, 1981 The City University of New York
Research Interests: Communications and information processing area.

NARAYAN MANDAYAM
Peter D. Cherasia Faculty Scholar and Associate Director of Winlab
PhD, 1994 Rice University
IEEE Fellow, Distinguished Lecturer of IEEE, Fred W. Ellersick Prize from the IEEE Communications Society
Research Interests: Cognitive radio networks and spectrum policy, radio resource management, and network coding for wireless networks.

IVAN MARSIC
Professor
PhD, 1994 Rutgers University
Research Interests: Mobile computing, software engineering, computer networks.

SIGRID MCAFEE
Associate Professor
PhD, 1976 Polytechnic Institute of Brooklyn
Research Interests: Defects in semiconductors, nanotechnology, financial Engineering

PETER MEER
Professor
DSc, 1986 Technion
IEEE Fellow, IEEE Longuet-Higgins Prize
Research Interests: Statistical approaches to computer vision.

LALEH NAJAFIZADEH
Assistant Professor
PhD 2009, Georgia Institute of Technology
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, system on chip, wireless IC design.

ECE Faculty

SOPHOCLES ORFANIDIS
Associate Professor
PhD, 1972 Yale University
Research Interests: Statistical and adaptive signal processing, audio signal processing, and electromagnetic waves and antennas.

PAUL PANAYOTATOS
Professor
ScD, 1979 Columbia University
Research Interests: Solar cells and optical interconnects.

MANISH PARASHAR
Professor, Director of CAC
PhD, 1994 Syracuse University
IEEE Fellow, NSF Career Award
Research Interests: Computational and data-intensive science and engineering, applied parallel & distributed domputing (cloud, grid, HPC), autonomic computing, extreme-scale computing, and pervasive computational ecosystems.

ATHINA PETROPULU
Professor, Department Chair
PhD, 1991 Northeastern University
IEEE Fellow, NSF Presidential Faculty Fellow
Research Interests: Statistical signal processing, networking, radar, and wireless communications.

DARIO POMPILI
Assistant Professor
PhD, 2007 Georgia Institute of Technology
NSF Career Award, ONR Young Investigator Program, DARPA Faculty Award
Research Interests: Wireless ad hoc/sensor networks, underwater communications and coordination of vehicles, green computing and mobile grids, and network optimization and control.

LAWRENCE RABINER
Professor II
PhD, 1967 Massachusetts Institute of Technology
IEEE Fellow, National Academy of Engineers, National Academy of Sciences, IEEE Kilby Medal, IEEE Piore Award, IEEE Millennium Medal
Research Interests: Digital signal processing, speech recognition, speech analysis, speaker recognition, and multimedia.

DIPANKAR RAYCHAUDHUR
Professor II and Director of Winlab
PhD, 1979 SUNY, Stony Brook, NY
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.

CHRISTOPHER ROSE
Professor
PhD, 1985 Massachusetts Institute of Technology
IEEE Fellow
Research Interests: Interference avoidance, cosmic communications, and communication theory as an organizing principle.

PEDDAPULLAIAH SANNUTI
Professor, Undergraduate Director
PhD, 1968 University of Illinois
IEEE Fellow
Research Interests: Simultaneous internal and external stabilization of linear time-invariant systems in the presence of constraints.

KUANG SHENG
Associate Professor
PhD, 1999 Heriot-Watt University
Research Interests: Power semiconductor devices, power integrated circuits, emerging material and technology, solar power conversion, power electronics circuits techniques, device-circuit interaction, and high temperature electronics.

DEBORAH SILVER
Professor
PhD, 1988 Princeton University
Research Interests: Scientific visualization and computer graphics.

PREDRAG SPASOJEVIC
Associate Professor
PhD, 1999 Texas A&M University
Research Interests: Communication and information theory, coding and sequence theory, signal processing and representation, cellular and wireless LAN systems, adhoc and sensor networks.

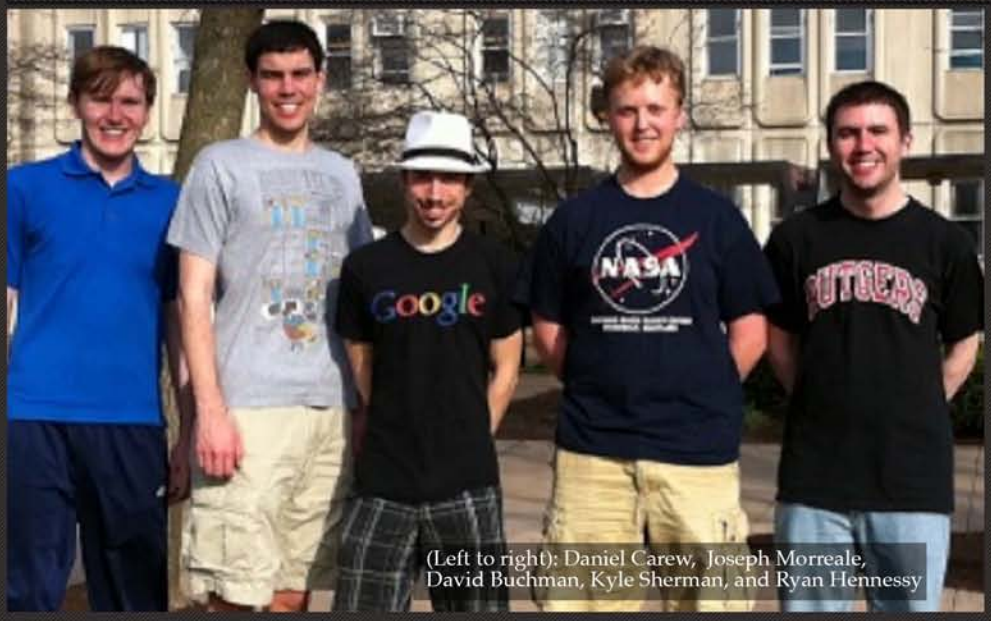
WADE TRAPPE
Associate Professor
PhD, 2002 University of Maryland
Research Interests: Multimedia security, wireless security, wireless networking, and cryptography.

JEFFREY S. WALLING
Assistant Professor
PhD, 2008 University of Washington
Research Interests: Design of RF and mixed-signal integrated circuits for low-power wireless sensor networks and high speed communication.

ROY YATES
Professor
PhD, 1990 Massachusetts Institute of Technology
IEEE Fellow
Research Interests: Resource management in wireless systems, dynamic spectrum access and spectrum regulation, information theory for wireless networks, future internet architectures.

YANYONG ZHANG
Associate Professor
PhD, 2002 Pennsylvania State University
NSF Career Award
Research Interests: Computer architecture, operating systems, parallel computing, cluster computer, performance evaluation, and sensor networks.

JIAN ZHAO
Professor
PhD, 1988 Carnegie Mellon University
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 single photon detectors, high temperature packaging, SiC power limiters/protector/circuit breakers, and SiC inverters/converters.



(Left to right): Daniel Carew, Joseph Morreale, David Buchman, Kyle Sherman, and Ryan Hennessy

Graduates from the ECE Class of 2011 created a dedicated iPhone application enabling users to navigate the University's numerous directories of information. The team, **Kyle Sherman, David Buchman, Joe Morreale, Dan Carew and Ryan Hennessey**, successfully designed, deployed and enhanced the all-in-one mobile application, RULost, which integrates six key University services into an intuitive interface and provides portal access to dozens more. Users can view dining hall meal offerings, plan bus trips quickly and easily, access departmental homepages, contact essential business and services, read the paper and integrate their mail accounts with the native iPhone Mail application. "We wanted to develop something that was cohesive and centralized to unify the decentralized Rutgers community," said Kyle Sherman, Project Lead. Software Engineer Joe Morreale hopes the application will make it easier for future generations of students to access the data that's important to them. "This application is aimed at incoming students who don't necessarily know how to access data like dining hall menus online, or even that such information is available online." He is quick to add that although new students are the most obvious users, alumni, visitors, returning students and even faculty stand to benefit from the wealth of information now at their fingertips.

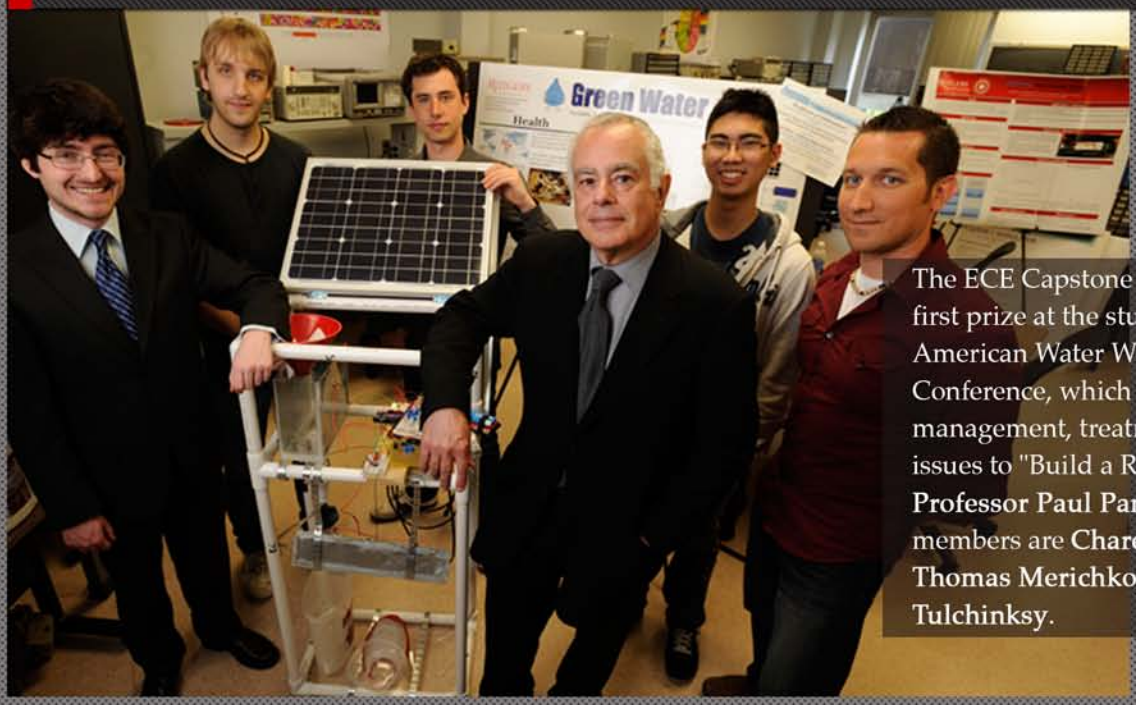
ECE graduate student **Sahir Ali** has been awarded a travel award ($2000) to attend USA-Sino Summer School in Vision, Learning, and Pattern Recognition, in Shanghai China. The theme of this year's school is Computer Vision in Biomedical Image Applications: From Micro to Macro. Sahir is advised by Professor Anant Madabhushi, Biomedical Engineering Professor and member of the ECE Graduate Faculty.

Sangeetha Siddegowda, an ECE Master's student and WINLAB member, earned runner-up recognition in Telcordia's recent contest to develop an application for Android and iPhones that will use Telcordia Mobile ID to assist users in identifying their next service provider. Sangeetha is pursuing a Master's thesis under the supervision of Professors Marco Gruteser and Janne Lindqvist, and also working on research in network layer multicast under the supervision of Professor D. Raychaudhuri.

The Rutgers Institute of Electrical and Electronics Engineers (RU-IEEE) competed in June at the 20th annual Intelligent Ground Vehicle Competition (IGVC) hosted in Rochester, Michigan. IGVC is an international collegiate robotics competition that requires each university to build a fully autonomous mobile ground vehicle capable of completing an outdoor navigation challenge. This vehicle must be able to complete three navigation challenges set in a road-like obstacle course riddled with painted-lane boundaries, potholes, and various types of traffic barriers. This year, NAVI the autonomous robot took second place in the overall design challenge. 47 teams registered to participate from universities across the United States and countries as far as Japan and India. Find more information about robotics at Rutgersplease visit at www.ieee.rutgers.edu.

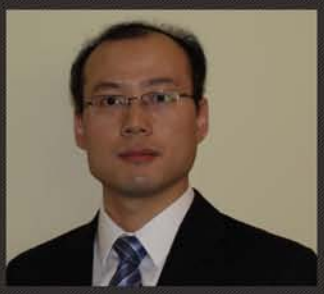
(Left to right): **Elie Rosen, Rohith Dronadula, Peter Vasilnak, Siva Yedithi, Michael Koval, Cody Schafer, Dave Patrzeba, and Wayne Chang)**

Student News



The ECE Capstone team working on Green Water won first prize at the student poster competition at the American Water Works Association 77th Annual Conference, which focused on important water management, treatment, distribution and operational issues to "Build a Resilient Future for Water". Advised by **Professor Paul Panayotatos**, the ECE Capstone team members are **Charead Alano, Alexander Chopyk, Thomas Merichko, Ryan Purdom** and **David Tulchinksy**.

ECE Student **Moustafa AbdelBaky** won the IBM Ph.D. Fellowship award for the second straight year. Moustafa is pursuing his PhD under the guidance of ECE Professor Manish Parashar and is a member of the Center for Autonomic Computing and the Applied Software Systems Laboratory.



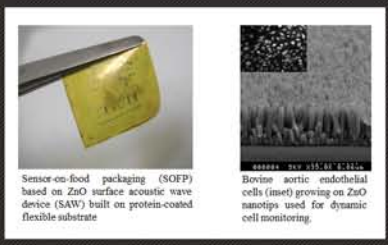
Dr. **Ziquin Duan** received the 2011-2012 School of Engineering Outstanding Graduate Student Award.

Ziqing completed his PhD under the supervision of Professor Lu. His research focused on the growth of oxide films and nanostructures for novel solar cells. Ziqing has published 12 refereed journal papers, and has submitted 6 journal papers. He will join Applied Materials (one of the Fortune 500 Companies) as a staff scientist.

ECE Student and WINLAB member **Christopher Mueller-Smith** was awarded the National Security Agency Physical Science Consortium Fellowship in support of his graduate studies. Mueller-Smith is working towards a PhD under the supervision of ECE Professors Wade Trappe and Predrag Spasojevic.

His current project focuses on machine learning for offensive and defensive communications, specifically focusing on securing or attacking physical layer wireless links in the face of intelligent adversaries. The communications system will classify and adapt to mitigate experienced interference or select a new attack through continuous evaluation of a selected response's effectiveness and learning from the success of its adaptations and the responses of the interfering systems, thereby ensuring tactical and strategic communications continuity.

Dr. **Pavel Reyes** won the 2012 Graduate School Award for Outstanding Research Accomplishments. Pavel completed his Ph.D in ECE under the guidance of Professor Yicheng Lu. His research focused on the field of ZnO nanostructure-based biosensors, a highly interdisciplinary research which involved Electrical and Computer Engineering (ECE), Biomedical Engineering (BME), Biochemistry, and Physics.



Sensor-on-food packaging (SOFP) based on ZnO surface acoustic wave device (SAW) built on protein-coated flexible substrate

Bovine aortic endothelial cells (inset) growing on ZnO nanotips used for dynamic cell monitoring.

Pavel was also one of the key contributors to a series of inventions of ZnO nanostructure-based biosensors, including the nano-SAW sensor on food package (SOFP), the nano-QCM and nano-TFBAR sensors for dynamic monitoring of cell adhesion and proliferation, and the TFT immunosensor. His research findings have resulted in 14 refereed journal articles in last 3 years (8 published, 6 submitted). Reyes is currently a postdoc at Rutgers.

Undergraduate Student Awards

On May 16th, 2012, the ECE Department hosted a special ceremony to honor its top undergraduate students with the following awards

The IEEE Princeton/Central New Jersey Section Award is given to that member of IEEE who promoted the ideals of IEEE while achieving high academic standing.

The award was presented this year to **Mr. Michael Koval**. Michael plans to pursue a Ph.D. in Robotics at Carnegie Mellon University in the Robotics Institute. He's already begun working this past summer, under Dr. Sidd Srinivasa in the Personal Robotics laboratory, on rearrangement planning for robotic manipulation.

The ECE Departmental Service Award is given to a student who best exhibited the leadership qualities and exemplified them through his or her service to the department and fellow students. This year the award was given to the IGVC (Intelligent Ground Vehicle Competition) team, with members:

Wayne Chang; Rohith Dronadula; Evgeniy Galustyants; Michael Koval; David Patrzeba; Phillip Quiza; Elie Rosen ; Jordan Romvary; Cody Schafer; Nitish Thatte; Peter Vasilnak; Siva Yed.

Read more about the team's work on page 3.

The Georg Goubau Memorial Prize is presented to a student who exhibited excellence in the study of Electromagnetic Phenomena. This year the award was presented to two students:

Mr. Neil Supnekar &
Mr. Ryan Pickett

The John B. Smith Memorial Prize is awarded to the highest ranking graduating senior. This year it was awarded to three students who had a perfect GPA of 4.00.

Craig Gutterman - Craig will be attending graduate school at Columbia University and plans to specialize in the area of communications.

Jordan Romvary - Jordan will be attending the graduate school at MIT. He plans to pursue research in information and coding theory. After obtaining his PhD, he hopes to enter academia as a university professor.

Andrew Rapport - Andrew is working as a Software Engineer for Barclays in New York. He plans to continue doing research with Professors Joseph Wilder and Gareth Russell on image recognition of coral reef fish species. He hopes to return to graduate school to pursue a higher degree in electrical and computer engineering within a few years.

The Graduate Committee selected the following Doctoral Graduates as the recipients of the 2011-2012 Academic Accomplishment Awards:

Dr. Ciprian Docan (Presently at Google | Advisor: M. Parashar)
"He completed his Ph.D. in the summer of 2011 and is since working for Google. He was an excellent and extremely motivated student with a strong conceptual foundation and technical skills and a solid research and publication record. His doctoral research focused on addressing large-scale data challenges, simulation-based science, and engineering; and he developed an advanced coordination and interaction framework, i.e., DataSpaces, that provides abstractions and mechanisms to support data-intensive application workflows. His research has led to software systems that are currently being used by a number of large DoE projects."
-Professor Manish Parashar

Dr. Sushil Mittal (Postdoc at Columbia University | Advisor: P. Meer)
The main contribution of the thesis of Dr. Sushil Mittal is a new method for discarding nonessential (outlier) points while estimating several essential (inlier) data structures.
The method is statistically valid, mathematically rigorous and applicable to nonlinear data structures, which appear in the majority of computer vision problems.

Dr. Pavel Reyes (Postdoc at Rutgers University | Advisor: Y. Lu). Learn more about Dr. Reyes on Page 4.

Undergraduate Student Awards

James L. Potter Award

This award is given to a person who has best exhibited the characteristics of original and independent investigation and creativity in his professional field and has obtained high academic standing. In the 2011-2012 academic year it was awarded to four students.

John Marcus

"John has done research with me for two years now. He stood out from the start in that he initiated research activities as a graduating sophomore. As a result of his research success, during the 2011 Summer , he was the youngest intern in the Duke University research group lead by Dean Calderbank, one of the leaders in compressed sensing and related topics. During his senior year, John worked on compressive sensing for blocked data, focusing on scaling analysis using advanced bounding tools like Hoeffding's Inequality. He supported the results with engaging simulation analysis, and generated results which would satisfy even the most demanding advisors."

-Professor Predrag Spasojevic

Aditya Deverakonda

"Aditya worked in my lab for over a year as a research assistant and is currently part of the Slade Scholar Program in the Department of Electrical and Computer Engineering. He is a very bright and extremely motivated student with a strong foundation and excellent technical skills.
He pursued a double major in Computer Engineering and Computer Science, and had been on the School of Engineering Dean's List since 2008. He received a number of scholarships and awards, including the Kuhl Memorial Engineering Fellowship (11'), Charles B. Longo Memorial Scholarship (11'), Rutgers SoE Academic Excellence Award (10') and the Hannah Sands Endowed Scholarship in Engineering (10')."

-Professor Manish Parashar

Nicolae Cecan

"Nic has been one of the most committed and productive undergraduate students who conducted research in my group so far. Together with a team of graduate students he worked on the project to detect driver phone use on smart-phones. Thanks in part to Nic's contributions, the resulting paper won the best paper award at the ACM International Conference on Mobile Computing and Networking (MobiCom) 2011, perhaps the most highly regarded publication venue in the field of mobile networking. Nic has also significantly contributed to other projects. Nic did a superb job on all these tasks."

-Professor Marco Gruteser

Daniel Litvin

"Daniel's Senior Design Project, entitled GUI Lite V2.5 – was an intuitive and forgiving Graphical User Interface development environment used for speech and image processing. I have personally used this GUI to create, modify, and embellish a set of about 60 MATLAB exercises for speech processing, which has and will continue to form the basis for my teaching, and supplementing the lectures for both my undergraduate and graduate classes in speech and image processing design and implementation. I hope to show this new software creation tool to people at MathWorks, with the goal of making this software somehow part of the MATLAB package—possibly as a separate tool and toolbox."

-- Professor Lawrence Rabiner

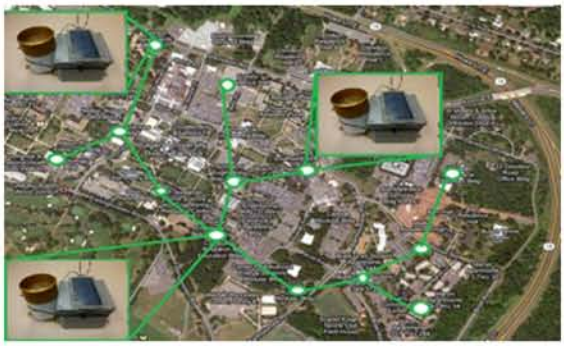
ECE 2012 Capstone Program

Our major revision of the E&CE Capstone Program during the 2011-2012 academic year culminated in a larger than ever E&CE Poster Day presentation where students got to "strut their stuff" by sharing their project posters and demos with faculty and each other. Unlike the original capstone design program, this year's version featured only five "sections" with virtually no prerequisites (other than being a senior ready to graduate) with the explicit intent of stimulating projects that spanned area boundaries. Of the many projects done by our students, 26 were nominated by faculty for awards. There were three winners:

Green Water ($400 first prize)
Rainfall Sensing Network ($300 second prize)
Piano-Playing Lego Mindstorm NXT Robot with iPhone ($200 third prize)

What was especially exciting about this year's version of capstone was the range of project ideas and types of expertise applied by both students and faculty. For example, the first prize winning "Green Water" project started with youthful student exuberance and desires to build "death rays" but was gently molded by Professor Paul Panayotatos into a multi-faceted multi-disciplinary project that addresses the grave worldwide need for in-situ-generated clean water. The Rainfall Sensing Network project, supervised by Professor Dario Pompili, combines a number of different emerging trends and technologies to enable detailed data collection about rainfall over a distributed geographic area. The whimsical yet technically sophisticated Piano-Playing Robot project, supervised by Professor Kristin Dana, combines what seem like a child's toy (Lego Robots) with an iPhone to produce a working system of actuators that use visual input to perform an immediately recognizable task -- with the obvious point being that a variety of other interesting cyberphysical system might be composed of such seemingly simple -- and increasingly inexpensive and ubiquitous -- equipment. All it takes is imagination and know-how. And this last notion -- the marriage of imagination and know-how -- is what E&CE Capstone is all about. Our faculty provides the technical tools and guidance, and what our students can achieve is limited only by their imaginations.

-Professor Christopther Rose
ECE Capstone Director



Left to right: Piano-Lego Project; Green Water; Rainfall Sensing

Additional photos and information on Capstone projects here:

Help support next year's capstone program by donating here:

Student News

Announcing New Internship Opportunities

The ECE Department is pleased to announce **two new Rutgers ECE - Northrop Grumman Fellowships** that support graduate studies through a combination of an ECE Fellowship with guaranteed income from a summer internship with Northrop Grumman at Linthicum (Baltimore).

Northrop Grumman is a leading global security company providing innovative systems, products and solutions in aerospace, electronics, information systems, and technical services to government and commercial customers worldwide. This opportunity is open to new master or PhD level ECE students with an interest in computer engineering, with FPGA expertise, and/or electrical engineering with digital design expertise. US Citizenship is required. Interested students should contact (john.mccarthy@rutgers.edu)

Awarded PhDs

Gautam Bhanage "Network Visualization on the Wireless Edge" (Oct. 2011) Advisor: D. Raychaurdhuri

Ciprian Docan "Enabling Dynamic Interactions in Large Scale Applications and Scientific Workflows using Semantically Specialized Shared Data Spaces" (Oct. 2011) Advisor: M. Parashar

Sushil Mittal "User-Independent Robust Statistics for Computer Vision" (Oct. 2011) Advisor: P. Meer

Jignesh S. Panchal "Inter-Operator Resource Sharing in 4G LTE Cellular Networks" (Oct. 2011) Advisor: R. Yates

Sanjit Krishnan Kaul "Vehicle-to-Vehicle Messaging for Enhancing Road Safety" (Oct. 2011) Advisor: M. Gruteser

Shengchao Yu "Robust Sentry-Based Schemes: Towards Long-Lived, Fault-Tolerant Wireless Sensor Networks" (Jan. 2012) Advisor: Y. Zhang

Rahul Radhakrishnan "A Monolithically Integrated Power JFET aaand Junction Barrier Schottky Diode in 4H Silicon Carbide" (Jan. 2012) Advisor: J. Zhao

Vamadevan Namboodiri "Low Complexity Iterative Receiver Design for OFDM Systems" (May 2012) Advisor: P. Spasojevic

Ziqing Duan "MOCVD Growth of MGxZN1-xO Polycrystalline Films and Nanostructures for Photovoltiacs" (May 2012) Advisor: Y. Lu

Pavel Ivanoff Reyes "Multifunctional Biosensors using ZnO and Its Nanonstructures" (May 2012) Advisor: Y. Lu

Sangho Oh "Implicit Coordination Techniques for Wireless Communication" (May 2012) Advisor: M. Gruteser

Faculty News

(Left to Right): Roy Yates, Dick Frenkiel, Maizie Frenkiel, and Narayan Mandayam, at the Medals of Excellence Dinner.

ECE Graduate Faculty and WINLAB member Richard Frenkiel has received the 2012 Rutgers School of Engineering Alumni Lifetime Achievement Medal. This award honors an alumnus who has made significant contributions to the field of engineering over the course of his lifetime. Richard Frenkiel received the Bachelor of Science Degree in Mechanical Engineering from Tufts University and the Master of Science Degree in Engineering Mechanics from Rutgers University in 1965. He joined Bell Laboratories in 1963, and soon afterward became involved in the design of cellular systems, an involvement which was to last for sixteen years. He was an author of the technical report on cellular which AT&T submitted to the FCC in 1971, and which became the basis for the first cellular systems. Mr. Frenkiel received the 1995 National Medal of Technology from the United States President for his involvement in the design of cellular systems.

Professor **Manish Parashar** presented a talk, "Moving Beyond IT Outsourcing -- Can Clouds Transform Science?" as the keynote speech at the 4th IEEE/ACM International Conference on Utility and Cloud Computing (UCC 2011) in Melbourne Australia.

Professor **Marco Gruteser** was selected to attend the National Academy of Engineering's Frontiers of Engineering Education (FOEE) Symposium. The FOEE Symposium brings together some of the nation's most engaged and innovative engineering educators in order to recognize, reward, and promote effective, substantive, and inspirational engineering education through a sustained dialogue within the emerging generation of innovative faculty. Prof. Gruteser was selected for his effort to engage students from all levels in multidisciplinary high-impact research projects with national and international visibility. The attendees were nominated by fellow engineers or deans and chosen from a highly competitive pool of applicants. This year's program focused on teaching leading-edge engineering knowledge, project-based learning, active and self-directed learning, and assessment of student learning and education innovation.

Professor **Athina Petropulu** was elected member of the IEEE Fellow Reference Committee for the Signal Processing Society. This committee rank-orders and writes recommendations to IEEE on the received Fellow nominations within Signal Processing, which then go to higher IEEE levels for final decisions.

Professor **Shantenu Jha** presented the keynote talk "Towards Scalable Distributed Health-Science Applications," at the 2012 HealthGrid conference. HealthGrid is known to be one of the premier conferences of its kind, focusing on applying distributed computing and advanced data informatics to Health Science and applications. Professor Jha's talk analyzed how and why it has been necessary to develop "effective abstractions" in order to successfully utilize production distributed computing infrastructure at scale. He also discussed the application of "effective abstractions" to support the infrastructure and algorithmic requirements of several Grand Challenge problems, including data-analytics for next-generation gene sequencing, enhanced sampling molecular algorithms, and in-silico personalized and predictive health-care.

Professor **Lawrence Rabiner's** 1989 IEEE Proceedings tutorial article on hidden Markov Models and speech recognition is the most downloaded Proceedings article during the last decade (35,278), and one of the most cited IEEE Proceedings articles (15,138, per Google Scholar's broad ambit).

Professor **Narayan Mandayam** was invited to attend the 10th Annual National Academies Keck Futures Initiative (NAKFI) Conference, The Informed Brain in a Digital World. NAKFI is a 15-year effort of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine to catalyze interdisciplinary inquiry and to enhance communication among researchers, funding organizations, universities, and the general public.

Senators Al Franken and Chris Coons urged OnStar to reconsider changes in their privacy policy, with a letter citing a WINLAB research paper. OnStar has since reversed the decision to track and sell customer's location information. The letter referred to the paper "On the Anonymity of Periodic Location Samples," written by **Professor Marco Gruteser** and his student **Baik Hoh**.

Professor **Manish Parashar** participated in a Congressional luncheon briefing in conjunction with the Congressional Research & Development Caucus last September. Representatives Judy Biggert and Rush Holt co-chaired the caucus, "The Cloud of Things: The Next Phase of Computing". This briefing addressed how cloud computing will accelerate developments such as the "Internet of things," sensor nets, online collaboration, virtual worlds and augmented reality. Another discussion topic was how federal agencies are playing a key role in developing new cloud technologies, standards, applications and policies for addressing challenges such as protecting privacy and security in the cloud.

The paper "ZnO Schottky Barriers and Ohmic Contacts" published in Journal of Applied Physics (06/2011) by Len Brillson and ECE **Professor Yicheng Lu** has been consistently ranked among the Top 20 Most Read Articles for the last 8 months according to the JAP website. Another paper of Professor Lu's, "ZnO thin film transistor immunosensor with high sensitivity and selectivity," published in Applied Physics Letters (Issue 98), has been selected as a featured article for the May 1, 2011 issue of Virtual Journal of Biological Physics Research.

Dario Pompili wins DARPA Young Fellow Award

Assistant Professor Dario Pompili received the 2012 DARPA Young Faculty Award (YFA) for his work on vital signs processing in mobile computing grids. The award amount is $300K over two years, and will support his project "Towards Real-time Vital Sign Data Processing in Mobile Computing Grids for Advanced Operational Neuroscience."

Dario Pompili also wins a ONR Young Investigator Award

Professor **Dario Pompili** has won a Young Investigator Program (YIP) grant from the Office of Naval Research (ONR), one of only 26 awarded nationwide in 2012, for his proposal titled: "Investigating Fundamental Problems for Real-time In-situ Data Processing in Heterogeneous Mobile Computing Grids". The YIP program invests in academic scientists and engineers who show exceptional promise for creative study.

The objective of his project is to enable real-time in-situ vital sign data processing while extracing non-measurable physiological parameters to interpret it under context, and to acquire actionable knowledge about the soldier's health. This research project focuses on the fundamental research challenges to organizing these resources into an elastic resource pool (a hybrid computing grid). One of the most significant challenges the project will address isthe inherent uncertainty in the environment, which can caused by unpredictable node mobility, varying rate of battery drain, and a high susceptibility to hardware failures. Dr. Pompili is site co-director of the Cloud and Autonomic Computing Center (CAC) and part of the Rutgers Discover Informatics Institute (RDI2).

Wei Jiang wins DARPA Young Fellow Award

Assistant Professor **Wei Jiang** received the Defense Advanced Research Project Agency (DARPA) 2012 Young Faculty Award. The research project Prof. Jiang proposed was entitled "High Speed Spatial Light Modulator with Flexible Processing." This project aims at developing a high speed spatial light modulator on a silicon chip. An innovative architecture is proposed to tackle the speed issues of spatial light modulators from a new angle, built upon Prof. Jiang's research expertise in silicon photonics and photonic crystals. Such a spatial light modulator can potentially have major impact on real-time signal/image processing, or even lead to a new paradigm of high performance optical computing. Prof. Jiang joined the Rutgers faculty in 2007. His research on the first silicon photonic crystal modulator was widely reported by EE Times, Nature Photonics, Laser Focus World, NASA Tech Brief, and many other media sources.

Peter Meer named IEEE Fellow

Professor **Peter Meer** has been elevated to the grade of IEEE Fellow for his "contributions to mean-shift and robust techniques in computer vision."

According to IEEE, the grade of IEEE Fellow recognizes unusual distinction in the profession, and shall be conferred only by invitation of the Board of Directors upon a person of outstanding and extraordinary qualifications and experience in IEEE-designated fields, and who has made important individual contributions to one or more of these fields. The number of new Fellows in any one year cannot exceed one-tenth percent of the total voting IEEE membership. Professor Meer joins several members of our faculty who are IEEE Fellows: Professors M. Bushnell, N. Mandayam, M. Parashar, A. Petropulu, L. Rabiner, R. Raychaudhuri, C. Rose, P. Sannuti, R. Yates, and J. Zhao.

Narayan Mandayam Selected as a 2012-13 Distinguished Lecturer of the IEEE Communications Society

The IEEE Distinguished Lecturers are engineering professionals who help lead their fields in new technical developments that shape the global community. These experts specialize in the field of interest of their Society/Council travel to various technical and regional groups, such as Society and Technical Council Chapters, to lecture at events.

Dr. Laleh Najafizadeh joined the ECE Faculty in Fall 2012

Dr. Laleh Najafizadeh joined our Department as a tenure-track Assistant Professor in Fall 2012. She earned her Ph.D. degree in Electrical Engineering from the Georgia Institute of Technology in 2009, and from 2009 to 2012, she was a postdoctoral research fellow with the Section on Analytical and Functional BioPhotonics at the National Institutes of Health (NIH) in Bethesda, Maryland. She has an undergraduate degree from Isfahan University of Technology in Iran, and an MS from University of Alberta in Canada, all in Electrical Engineering.

Dr. Najafizadeh has a broad range of research expertise that encompasses the fields of brain imaging, microelectronics and circuit design, signal processing, and biophotonics. Her research in the field of brain imaging has been focused on the design and implementation of a portable version of a functional Near Infrared Spectroscopy (fNIRS) system for monitoring cortical brain activations. In the future, she is planning to utilize her expertise in circuit design to miniaturize the electronics (optical transmitters and receivers, digital circuits, and wireless transceivers) required for the implementation of a portable fNIRS system.

In the fall of 2011 the ECE Department welcomed new faculty Waheed Bajwa and Jaesok Jeon

Assistant Prof. Jaeseok Jeon
PhD UC Berkeley

Research Interests:
Nano-electro-mechanical relay devices, neural relay devices and circuits for efficient design of neuromorphic systems, advanced materials, devices for energy-scavenging and storage.

Assistant Prof. Waheed Bajwa
PhD U Wisconsin-Madison

Research Interests:
High-dimensional inference &inverse problems, compressed sensing, statistical signal processing, wireless communications, complex networked systems, radar & image processing.

Research Highlights

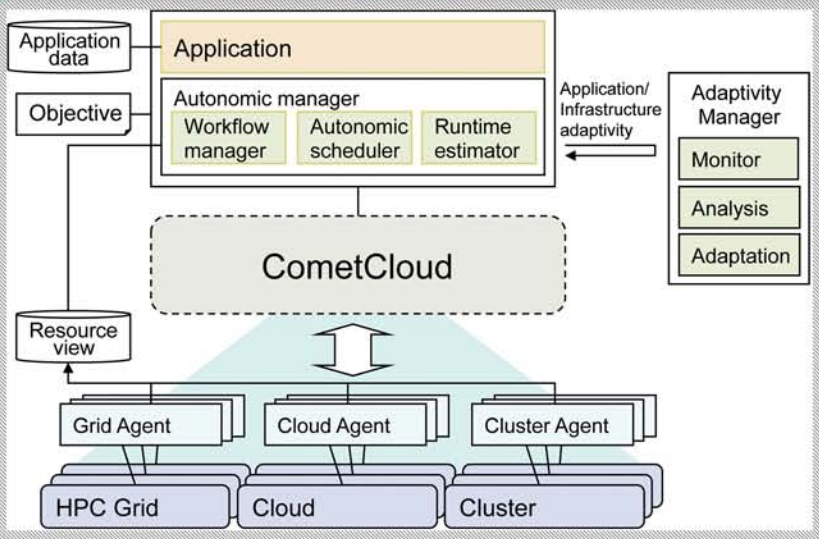
Cloud Computing Research

by Professor Manish Parashar

Cloud computing is revolutionizing the enterprise world, much as the Internet did not so long ago. Clouds are fundamentally changing how enterprises think about IT infrastructure, both internally and externally, by providing on-demand access to always-on computing utilities, an abstraction of unlimited resources, a potential for scale-up, scale-down and scale-out as needed, and for IT outsourcing and automation. Finally Clouds provide a usage-based payment model where users essentially "rent" virtual resources and pay for what they use. Underlying these Cloud services are typically consolidated and virtualized data centers that exploit economies of scale to provide attractive cost-benefit ratios.

At the same time that Cloud Computing is redefining IT, extreme data and compute scales are transforming science and engineering research by enabling new paradigms and practices – those that are fundamentally information/data-driven and collaborative. Complex computational and data-enabled science and engineering (CDS&E) applications are providing unprecedented opportunities for understanding and managing natural and engineered systems, and providing unique insights into complex problems.

It is expected that Cloud services will join more traditional research cyber infrastructure components, such as high-performance computing system, clusters and Grids, in supporting scientific exploration and discovery. Analogous to their role in enterprise IT, Clouds can enable the outsourcing of many of the mundane and tedious aspects research and education, such as deploying, configuring and managing infrastructure, and enable scientists to focus on the science. Cloud services and the associated standardization can also improve productivity, facilitate the sharing of research results, and enable the reproducibility of associated computations.



Furthermore, and once again analogous to the enterprise space, Clouds can democratize access to computational and data resources (by providing access to researchers who don't have adequate local infrastructure), which has been shown to significantly impact research productivity.

However, it is also critical to look beyond the benefits of outsourcing and understand application formulations and usage modes that are meaningful in a hybrid HPC/Grid + Cloud cyber infrastructure – for example, how emerging data and compute intensive application workflows can effectively utilize these resources, and also how this hybrid cyber infrastructure can enable new practices in science and engineering.

At the NSF Cloud and Autonomic Computing Center we are using the CometCloud framework developed at CAC, Rutgers to explore such usage modes. CometCloud is an autonomic computing engine that enables dynamic and on-demand federation of Clouds and grids as well as the deployment and robust execution of applications on these federated environments. It supports highly heterogeneous and dynamic Cloud/grid infrastructures, enabling the integration of public/private Clouds and autonomic Cloudbursts, i.e., dynamic scale-out to Clouds to address dynamic requirements for capability and/or capabilities, heterogeneous and dynamics workloads, spikes in demands, and other extreme requirements. We have used CometCloud to demonstrate how a hybrid HPC/Grid + Cloud cyber infrastructure can be effectively used to support real-world science and engineering applications on existing cyber infrastructure and public and private Clouds. Our experiments have explored a broad set of federated resources spanning existing public commodity Clouds, Grids, supercomputing resources, and local clusters. We also explored a broad set of applications classes including business intelligence, financial analytics, oil reservoir simulations, medical informatics, and document management. Our experiences have shown that there are real benefits in using Clouds and Cloud computing abstractions as part of a hybrid cyber infrastructure to support CDS&E, for example, to simplify the deployment of applications and the management of their execution, improve their efficiency, effectiveness and/or productivity, and provide more attractive cost/performance ratios. Additional information can be found at http://cometcloud.org.

AUV path planning for High-Resolution Localization of Marine Animals

Aerial photo of Rutgers Marine Field Station in Tuckerton, NJ

Assistant Professor **Waheed Bajwa** is pursuing joint research with Marine and Coastal Sciences Professor Thomas M. Grothues on autonomous underwater vehicles (AUV) path planning for high-resolution localization of marine animals.

This research project will increase our ability to understand the spatial distribution and movement of aquatic and marine animals in relation to their habitat by orders of magnitude in difficult and under-sampled habitats. The key enabling technology for this will be autonomous underwater vehicles (AUVs), fully integrated with hydrophones to detect acoustic transmitters (tags) and other sensors.

The goals of this interdisciplinary research project will be accomplished through a collaborative effort between Dr. Grothues, an expert in Marine Sciences, and Dr. Bajwa, an expert in Signal Processing.

Excalibur

The new supercomputer at Rutgers

On March 27, Rutgers announced the arrival of Excalibur, The Rutgers Discovery Informatics Institute's IBM Blue Gene/P supercomputer. The event also marked the launch of a new collaborative venture to create a high-performance computing center on New Brunswick campus.

The collaborative venture, spearheaded by ECE Professor and Rutgers Discovery Informatics Institute Director **Manish Parashar,** will focus on the application of "big data" analytics in life sciences, finance, and other industries. The collaboration is aimed at improving the economic competitiveness of New Jersey's public and private research organizations.

The Blue Gene/P is the second generation of the Blue Gene series of supercomputers. The design of the Blue Gene/P evolved from the earlier Blue Gene/L supercomputer. This supercomputer has 2048 quad-core processors, for a total of 8192 compute cores. Excalibur provides 28 TFlop/s of performance, making it the most powerful computer at Rutgers University. The announcement of Excalibur was featured on the front page of the Wall Street Journal's Technology Section on March 27th 2012. NJ Lt. Governor Kim Guadagno and Assemblyman Upendra Chivukula attended the announcement of Excalibur.

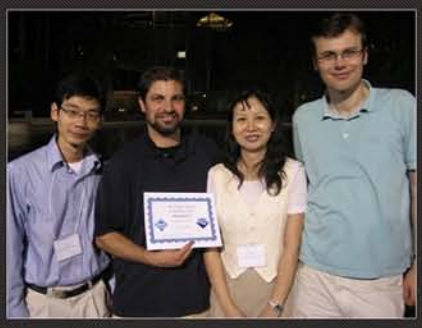
Professor Parashar (left) with NJ Lieutenant Governor Kim Guadagno during the Excalibur opening ceremony

Janne Lindqvist works with Carnegie Mellon University researchers on mobile phone privacy project

Dr. **Janne Lindqvis**, an assistant research professor in the ECE Department and a member of WINLAB, is working with colleagues Jason Hong and Joy Zhang at Carnegie Mellon University on a project to better educate smartphone users about what security risks they're taking when installing smartphone applications.

The project, recently featured in MIT Technology Review, uses novel crowd sourcing techniques and user interface designs to inform users about what they're disclosing when using their phones.

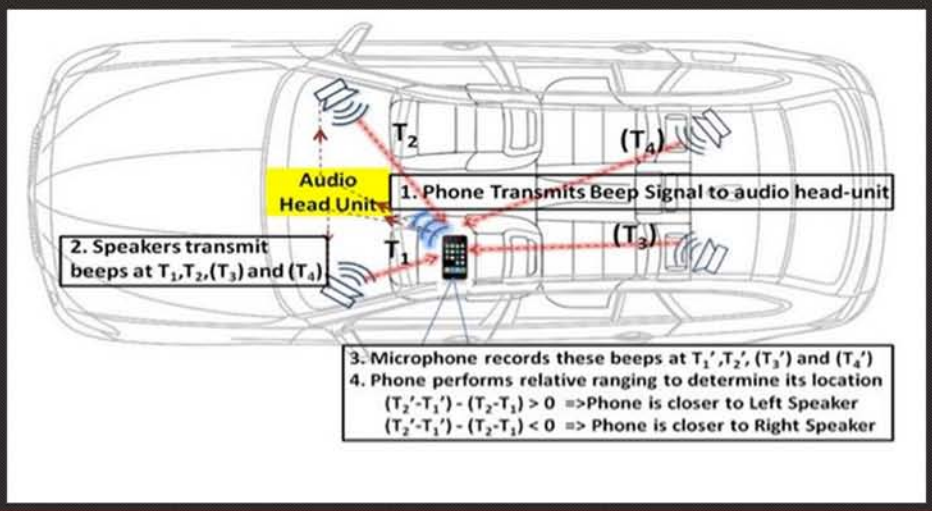
WINLAB Team Wins Best Paper at 2011 MobiCom



For a video demonstration of this work, visit http://www.insidescience.org/?q=content/technology-can-detect-driver-phone-use/523 or scan the QR code with your mobile device

A student team led by Professors **Marco Gruteser and Richard Martin** of WINLAB and Professor Yingying Chen of Stevens Institute of Technology received the best paper award at the 2011 ACM International Conference on Mobile Computing and Networking (MobiCom). The paper "Detecting Driver Phone Use Leveraging Car Speakers,"authored by **Jie Yang, Simon Sidhom, Gayathri Chandrasekharan, Tam Vu, Nicolae Cecan, Hongbo Liu, Yingying Chen, Marco Gruteser, and Richard Martin,** addresses the problem of sensing when a smartphone is used by a driver, with particular emphasis on distinguishing between a driver and passenger. This is a key milestone for enabling numerous driver safety and phone interface enhancements.

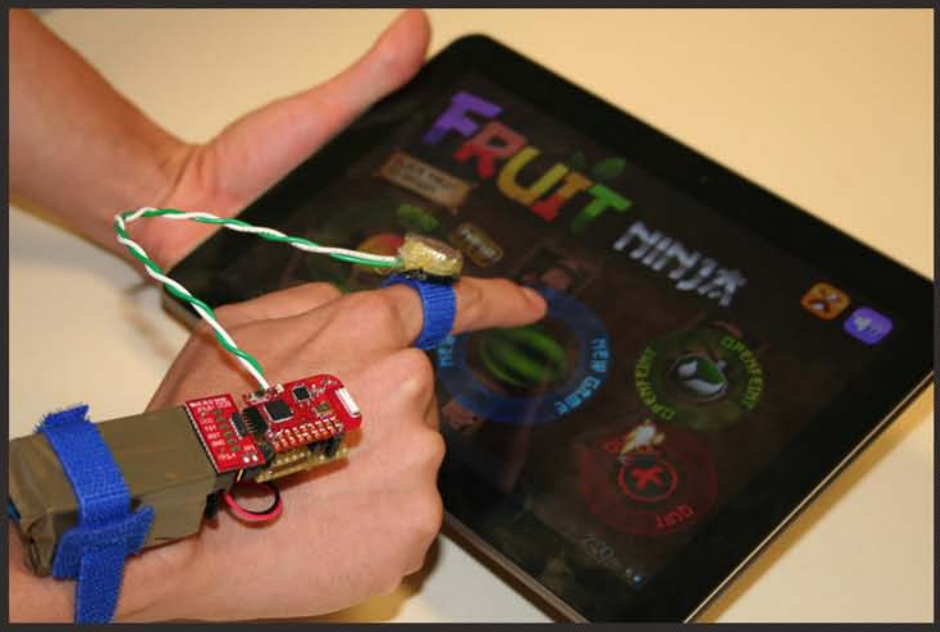
The project developed a detection system that leverages the existing car stereo infrastructure; in particular, the car speakers and hands-free Bluetooth system. It uses an acoustic ranging approach wherein the phone send a series of customized high frequency beeps via the car stereo. The beeps are spaced in time across the left, right, and, if available, front and rear speakers. After sampling the beeps, the phone times their arrival via a sequential change-point detection scheme, and then uses a differential ranging approach to estimate the phone's distance from the car's center. From these differences a passenger or driver classification can be made. Experiments with two different phones and two different cars showed that our customized beeps were imperceptible to most users, robust to background noise, and achieved a classification accuracy of 90-95 percent depending on the degree of calibration. The project also received considerable attention from the popular press. It featured into news stories on National Public Radio and was the basis of a joke in Jay Leno's Tonight Show monologue. It was also covered extensively by the MIT Technology Review, the online blog section of the Wall Street Journal, an Inside Science TV segment, CNET news, and numerous other online news services.



Professor Zhao begins groundbreaking Energy Research Project

Professor Zhao and SiCLAB have begun work on a 3-year project "First in Class Demonstration of A Completely New Type of SiC Bipolar Switch (15kV-20kV) for Utility Scale Interters." The project has been funded by the Department of Energy in the amount of $945K. Research from this project will focus on improving power switches and higher preforms in power converters. Simultaneous weight, size and, energy loss reduction up to 75% is possible, along with improved system reliability and lower costs, when the proposed power switch is developed for use in high voltage and high power systems. This high-risk, high reward program could find transformational applications to utility scale inverters, wind turbine, oil-free solid state transformers, railway traction, smart grid and other applications.

Prof. Gruteser and WINLAB Touch Communication Project win 2012 MobiCom award, featured in MIT Technology Review



The touch communications project that recently won the best paper award at the 2012 ACM MobiCom (with the abstract below) has been featured in MIT Tech Review.

The WINLAB team, led by **Prof. Marco Gruteser,** built a working prototype (pictured to the right). The method demonstrated by the WINLAB prototype "opens new directions in user interaction and authentication," says Romit Roy Choudhury, a computer scientist at Duke University familiar with the research.

The Abstract

As we are surrounded by an ever-larger variety of post-PC devices, the traditional methods for identifying and authenticating users have become cumbersome and time-consuming. This talk will present a capacitive communication method through which a device can recognize who is interacting with it. This method exploits the capacitive touchscreens, which are now used in laptops, phones, and tablets, as a signal receiver. The signal that identifies the user can be generated by a small transmitter embedded into a ring, watch, or other artifact carried on the human body.

We explore two example system designs with a low-power continuous transmitter that communicates through the skin and a signet ring that needs to be touched to the screen. Experiments with our prototype transmitter and tablet receiver show that capacitive commu- nication through a touchscreen is possible, even without hardware or firmware modifications on a receiver. This latter approach imposes severe limits on the data rate, but the rate is sufficient for differentiating users in multiplayer tablet games or parental control applications. Controlled experiments with a signal generator also indicate that future designs may be able to achieve datarates that are useful for providing less obtrusive authentication with similar assurance as PIN codes or swipe patterns commonly used on smartphones today.

Technology Review features WINLAB cognitive radio platform

Technology Review recently published an article featuring the Colorado/WINLAB/RTS cognitive radio platform developed by Dirk Grunwald, Ivan Seskar and Peter Wolniansky. The article cites **Dipankar Raychaudhuri**, ECE Professor and WINLAB Director. The cognitive radio (pictured here) can sense and rapidly switch between the widest-ever range of frequencies, at record speeds, while sending the equivalent of 20 HD movies at once.

As Prof. Raychauduri told the Review, "It's the most usable and versatile wideband radio the research community has ever had access to."

The article author, David Talbot, contined: "The device is the first that can operate from 100 megahertz to 7.5 gigahertz, meaning all the way from AM and FM bands though television and Wi-Fi and cellular frequencies. It can also sense available spectrum and switch between frequencies within at 50 microseconds, and in some cases as little as one microsecond...Finally, it can handle 400 megabits per second of data—about eight times what a typical home Wi-Fi system can do."

You can read the full article online:
http://www.technologyreview.com/news/428182/frequency-hopping-radio-wastes-less-spectrum/

SAGA Research

by Shantenu Jha

Improvements in algorithms, numerical methods, and Moore's Law have enabled computing to contribute to major advances in Science & Engineering (S&E).

In spite of impressive growths from each of these factors however, in order to effectively solve the next-generation of S&E challenges, more computational capacity will be required than is typically available locally, whilst concomitantly being able to utilize the increasing computational capacity in novel and interesting ways. This suggests the need for an advanced, balanced and comprehensive cyberinfrastructure (CI)--- comprised of software layers (the application capabilities, tools and services) and physical layers (grids, clouds, special purpose architecture and ``vanilla'' high-performance machines/clusters), along with scalable approaches to utilize the CI.

One way to provide the CI that can support novel usage modes and scaling ---scaling-out (the number of tasks) as well as scaling the number of resources—is to federate computing resources. Federation here refers not just to machines, but also to services and tools. The federation of previously independent and individual resources results in scalable capabilities that are more powerful than the simple sum of its parts. The set of techniques and technologies used to federate resources is collectively called Grid Computing.

Although federating resources is a great way to scale the number of usable resources, all too often the resources being federated are owned, operated and designed for different applications and usage modes, and thus inherently different. Federation therefore introduces the challenge of interoperability, arising from heterogeneity and complexity in software stacks, policies and resource performance, all of which result in barriers to interoperation at both the system and application levels.

Our approach to addressing the persistent and fundamental challenge of enabling applications and tools to interoperate across federated, and thereby heterogeneous resources, has been to design and develop a widely usable yet simplified interface---known as SAGA, which provides the most frequently required functionality, such as remote job-submission, remote file/data transfer, remote coordination, etc., to construct applications capable of utilizing distributed federated CI.

There are three functional levels to SAGA: at the upper-level there is the "public" interface; at the lowest-level there are adaptors that translate the semantics exposed by the public interface to the specific back-end systems on which the SAGA API will be used. In between these two levels is a library that dynamically invokes (loads) the appropriate adaptors for the desired back-end.

Adaptors are an important design consideration, as they ensure that the same public-interface can be utilized on different back-end resources, whilst ensuring that the complexity arising from heterogeneity is localized to the adaptor level and not the API or the library implementing it. The adaptor-based approach is thus critical as they ensure interoperability and extensibility to new and diverse "middleware," by insulating the application from any changes and churn at the middleware layers below.

SAGA is used by a variety of CI projects and a host of applications seeking to utilize CI in advanced and scalable ways. Here's a sampling: The KEK project in Japan in their studies of neutrinos; the scientists associated with CERN in the search for fundamental particles such as the Higgs; Airbus; and a multitude of scientists using NSF national-scale production infrastructure such as XSEDE and OSG to meet the need for scalable resources.

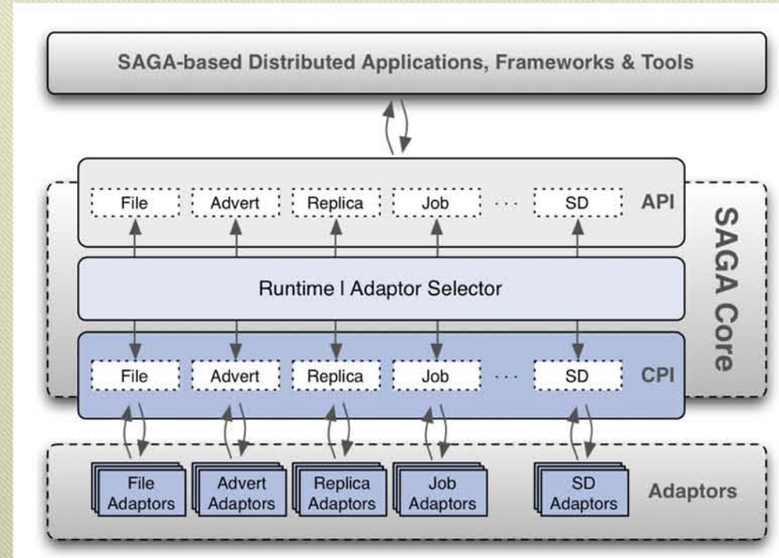
Here at Rutgers, as part of a prestigious NSF Cyber-enabled Discovery and Innovation award, several physical scientists are using SAGA to provide an efficient way of utilizing advanced computing infrastructure to implement and refine algorithms emanating in statistical-physics. Given the importance of federation of resources and the inherent complexity in accomplishing it, the use of SAGA by multiple S&E applications, tools and services is testimony to the effectiveness of both its design and implementation.

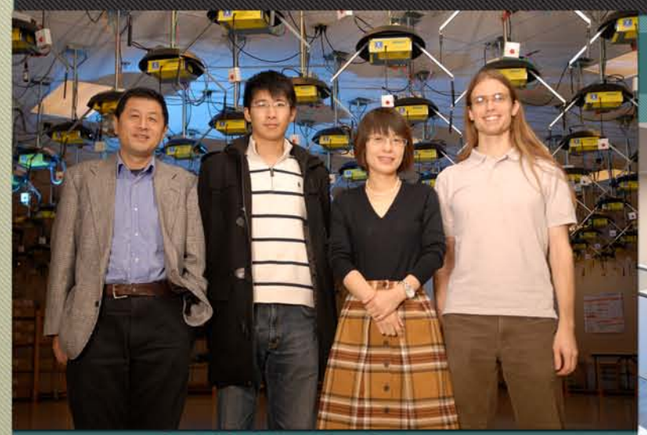
Given the challenge of supporting large-scale scientific projects and collaborations, SAGA has been developed to be "industrial strength," i.e., support multiple large-scale and production-grade science and engineering projects. In addition to requiring sophisticated software engineering, SAGA provides the provides the opportunity to address multiple research challenges in fundamental DCI as well as in distributed applications. For example, for HPDC applications, computational tasks have traditionally been assigned far in advance to the resources they will run on, i.e., static resource determination. But static execution is known to have limitations. For example, early assignment of resources is known to hinder the efficient and optimal matchmaking between available resources and tasks; this can be alleviated by dynamic and late-binding of tasks to resources. And so we must ask: what programming models best support such dynamic execution?

What abstractions--conceptual and software—are required to support a flexible and dynamic model of executing HPDC application? How can such abstractions be implemented to be interoperable and extensible? Many of these answers are being addressed as part of the SAGA project.

Interestingly, but not surprisingly, SAGA is now a global distributed computing standard and is being used by nearly every major production DCI the world over. The SAGA project has been funded by multiple international grants including from US NSF, EU, UK EPSRC and DoE.

For more information on SAGA and our research, please visit: http://saga-project.org and http://radical.rutgers.edu





(LtoR): J. Li, C. Xu,Y. Zhang, B. Firner

Best Poster at Sensys 2011

ECE Students **Chenren Xu and Ben Firner, and ECE Professor Yanyong Zhang** received a Best Poster Award at Sensys 2012, a major ACM conference on sensor networking, for the paper "Statistical Learning Strategies for RF-based Indoor Device Free Passive Localization."

The winning paper's abstract:

Radio frequency based device-free passive localization has been proposed as an alternative to indoor localization because it does not require subjects to wear a radio device. This technique observes how people disturb the pattern of radio waves in an indoor space and derives their positions accordingly. The well-known multipath effect makes this problem very challenging, because in a complex environment it is impractical to have enough knowledge to be able to accurately model the effects of a subject on the surrounding radio links.

In addition, even minor changes in the environment over time change radio propagation sufficiently to invalidate the datasets needed by simple fingerprint-based methods. The team developed a fingerprinting-based method using probabilistic classification approaches based on discriminant analysis. They also devised ways to mitigate the error caused by multipath effect in data collection, further boosting the classification likelihood. The team validated their method in a one-bedroom apartment that has 8 transmitters, 8 receivers, and a total of 32 cells that can be occupied. They showed that their method can correctly estimate the occupied cell with a likelihood of 97.2%. The method can be used to track a person in motion and to localize multiple people with high accuracies.

New Grants

Professor Waheed Bajwa has received $80K from the VPR's office to pursue joint research with Marine and Coastal Sciences Professor T. Grothues on autonomous underwater vehicles (AUV) path planning for high-resolution localization of marine animals.

Professor Waheed Bajwa has received a 3-year $167K NSF Division of CCF grant for his project, "High-Dimensional Linear Models? Bring 'Em On!"

Professor Shantenu Jha has received a 2-year $155K NSF grant for his project "Standards-based Cyberinfrastructure for Hydrometeorology (SCIHM)," and a $530K NSF grant for his 4-year project "CDI-Type II: Mapping Complex Biomolecular Reactions with Large Scale Replica Exchange Simulations on National Production Cyberinfrastructure."

Professor Shantenu Jha has received a $498K DOE award for his project, "An Integrated Middleware Framework to Enable Extreme Collaborative Science."

Professor Wei Jiang has received a $300K grant for his 2-year project "Broadband Agile Optical Phased Array on a Silicon Chip" from the Defense Advanced Research Projects Agency.

Professors Janne Lindqvist and Marco Gruteser have received a $530K 3-year award award from the NSF for their project "Collaborative Research: SoCS: Local Community Crowdsourcing of Physical-World Tasks with Myrmex." They've also been awarded a 2-year NSF grant for their project "TWC: Small: Redesigning Mobile Privacy: Helping Developers to Protect Users."

Professor Janne Lindqvist has been awarded a $400K NSF SaTC grant for "Capturing People's Expectations of Privacy with Mobile Apps by Combining Automated Scanning and Crowdsourcing Techniques,"as part of a collaborative project with CMU.

Professor Yicheng Lu has received a 3-year $263K grant for his project "Comprehensive Studies on ZnO -based Switching Matrix" from the National Institute of Standards and Technology.

Professor Manish Parashar has been awarded four grants: The project "Trusted Content and Context Aware Management and Processing of Managed Information Objects" was awarded $200K by the DoD as a 2-year project; The project "Scalable Data Management, Analysis, and Visualization (SDAV) Institute" was awarded $625K by the DoE as a 4-year project; The project "Combustion Exascale Co-Design Center" was awarded $300K by the DoE as a 5-year project; and the project "Partnership for Edge Physics Simulation (EPSI)" was awarded $325K by the DoE as a 3-year project.

Professors Athina Petropulu and Predrag Spasojevic have received a 2-year $354K grant from the Office of Naval Research for their project "Resource Aware Distributed Radar Systems."

Professor Dario Pompili has received a 3 -year $510K grant for his project "Investigating Fundamental Problems for Real-time In-situ Data Processing in Heterogeneous Mobile Computing Grids" from the ONR. He also received a $300K grant for his 2-year project "Towards Real-time Vital Sign Data Processing in Mobile Computing Grids for Advanced Operational Neuroscience" from the Defense Advanced Research Projects Agency.

Professor Dipankar Raychaudhuri has been awarded a 3-year $455K NSF grant for his project "SAVANT - High Performance Dynamic Spectrum Access via Inter Network Collaboration."

Professor Spasojevic has received industry grants from Toyota for $60K, NEC for $60K, and National Instruments for $80K.

Professor Wade Trappe has recieved a 3-year $100K grant for his project "NeTS: Small: Collaborative Research: OSTARA: An Optically-based Simultaneous Transmit And Receive Architecture for Enhancing Wireless Communications," and a 3-year $300K grant for "EARS: Collaborative Research: Big Bandwidth: Finding Anomalous Needles in the Spectrum Haystack," both from the NSF.

Professors Jeffrey Walling and Jaesok Jeon have received a grant for $45K for their project "Non-invasive Continuous Ocular Glucose Sensor" from Rutgers Faculty Research.

Professor Jian Zhao has received a 3 -year $945K grant from Advanced Research Projects for his project "First In Class Demonstration of a Completely New type of SIC Bipolar Switch for Utility Scale Inverters."

Patents

Dipankar Raychaudhuri

Deborah Silver

Yicheng Lu

Kristin Dana	#7,699,236 Issued: Apr. 20,2010	Method and Apparatus for Making and Detecting a Document Verification Indicator Using Optical Pattern Encryption
Yicheng Lu	#7,699,236 Issued: Apr. 20,2010	Method and Apparatus for Making and Detecting a Document Verification Indicator Using Optical Pattern Encryption
Yicheng Lu	#7,989,851 Issued: Aug. 2, 2011	Multifunctional biosensor based on ZnO nanostructures
Dipankar Raychaudhuri	#7,746,802 Issued: Jun. 29, 2010	Method and Apparatus for Channel State Feedback Using Arithmetic Coding
Deborah Silver	#RE42,638 Issued: Aug. 23, 2011	Resample and composite engine for real-time volume rendering

ECE Staff

This past year, the ECE Department welcomed three new staff members: **John P. McCarthy** as the Department Administer; **Ora Titus** as the Department and Undergraduate Administrative Assistant; and **Mayra Howell** as the Business Manager. **Noraida Martinez** was promoted to Graduate Program Administrative Assistant. **Barbara Klimkiewicz** retired from her position as the Graduate Secretary after 26 years of service.

Steve Orbine (Electronics Analyst and Undergraduate Lab Supervisor), John Scafidi (Systems Administrator), and **Robert Lorber** (Lab Facilities Specialist) continue to be instrumental to the success of the ECE Department.

Clockwise from Top Left: Robert Lorber, Noraida Martinez, Ora Titus, Steve Orbine, John P. McCarthy, John Scafidi, Mayra Howell

ECE Laboratories

In collaboration with **National Instruments**, ECE has formed a new Instructional Laboratory on Wireless Communications

Professor Spasojevic will work with National Instruments to develop a set of projects that will provide hands-on learning and experimenting to the ECE Graduate Course Digital Communication Systems. Driven by a National Instruments (NI) NI-USRP Software Defined Radio (SDR) platform, the Laboratory will enrich the Rutgers ECE graduate curriculum.

Virtual Reality Instructional Laboratory

ECE's Virtual Reality Instructional Laboratory is currently in the process of being upgraded to a state of the art facility. Thanks to a recent donation made by ECE Alumni Cristian and Andrea Francu, the Virtual Reality Instructional Laboratory will continue training students in the powerful authoring languages used today in game programming. The laboratory was first established in 2002 by Professor Greg Burdea via an equipment grant from the State of New Jersey.

Alumna Lalitha Sankar joins Arizona State University as Assistant Professor

Dr. Lalitha Sankar received the B.Tech degree from the Indian Institute of Technology, Bombay, the M.S. degree from the University of Maryland, and the Ph.D degree from ECE Rutgers in 2007, where she worked under the supervision of Professor Narayan Mandyam. Following her doctorate, Dr. Sankar was a recipient of a three-year Science and Technology Teaching Postdoctoral Fellowship from the Council on Science and Technology at Princeton University. Prior to her doctoral studies, she was a Senior Member of Technical Staff at AT&T Shannon Laboratories. Her research interests include information privacy and secrecy in distributed and cyber-physical systems, wireless communications, network information theory and its applications to model and study large data systems. For her doctoral work, she received the 2007-2008 Electrical Engineering Academic Achievement Award from Rutgers University. She received the IEEE Globecom 2011 Best Paper Award for her work on privacy of side-information in multi-user data systems.

Dr. Sankar spent much of her time at Rutgers in the Wireless Information Network Laboratory. She says that studying at WINLAB taught her how to do good research and interact successfully with her colleagues. The teamwork-oriented projects at WINLAB, combined with the individual research prepared her for the large interdisciplinary problems she has worked on at Princeton University (where she completed a three-year Postdoc Fellowship) and will soon work on at ASU. Dr. Sankar offered this advice for current students: "The game has changed"; present-day research is predominantly interdisciplinary, and students need to keep an open mind to learning new domains concepts to which they can apply their technical expertise, as she did.

Alumni Interviews

by Jennifer Shane ECE 2013

Dr. Reddy (1973)

Dr. Ram Reddy came to the Rutgers department of Electrical Engineering in 1967, and graduated in 1973 with his PhD. He did his research in the field of Optimal Control Systems under Professor Sannuti, who is currently the department's undergraduate director. After leaving Rutgers, Dr. Reddy began work in Boston at Dynamics Research Corporation (DRC), which inspired a lifetime of work in defense contracting companies.

At DRC, Dr. Reddy worked on gyroscopic and navigation systems for the United States Department of Defense, focusing specifically on projects for the US Navy. Working on various new technologies at DRC, Dr. Reddy began to gain recognition in his field and was then hired by another defense contractor, Litton Industries' Guidance and Controls Division, in 1978. There he worked on topics such as electronic intelligence and warfare and was again recognized for his hard work and dedication. In 1984, Dr. Reddy was awarded security access clearances by the government, so that he could work on high-security government contracts.

In 1985, Dr. Reddy used the connections he had forged during his years of experience working in the defense industry to start his own defense contracting company, called Apex Technology Inc. He ran his company for almost 20 years, managing up to 200 people, and worked in areas such as y2k compliance for several United States military systems. In 2004, Apex Technology Inc. partnered with Raytheon to work on a multimillion dollar contract with the Indian Army; after the completion of that contract, Dr. Reddy retired.

Dr. Reddy remained in retirement until 2007, when he became an angel investor for CommuniClique, a company that provides more efficient communication tools for business professionals. With Dr. Reddy's involvement, the company grew from making several hundred thousand dollars a year to making more than ten million dollars a year. The company also expanded its customer base from approximately 200 customers to twenty-five thousand paying customers, and more than a million free customers.

When looking back at his time as a student in the ECE department, Dr. Reddy says that the experience was invaluable. He learned lessons and skills that he was able apply through his entire career.

Dr. Kludze (1984)

Dr. Ave Kludze came to Rutgers after high school in Ghana. After earning his Bachelor's Degree from the ECE Dept., Kludze began a lifelong NASA career at Goddard Space Flight Center, becoming the first Ghanian to pilot a spacecraft when he piloted the Earth Radiation Budget Satellite.

He then went on to earn his PhD in Systems Engineering at George Washington University. Dr. Kludze is currently an Engineering Program Manager at NASA Headquarters, where he oversees many multidisciplinary projects and performs studies to collect information that will better inform decision-making at NASA. Dr. Kludze has received a number of awards, including NASA's Superior Accomplishment Award for outstanding performance. He has been a distinguished guest of the Ghanaian Government, and has been praised as a national hero and hailed as "Ghana's Rocket Man." Kludze is a visiting professor and adjunct faculty member at a number of universities including University of Maryland University College, the George Mason University and Strayer University where he teaches graduate and doctoral students. While a student at Rutgers, Dr. Kludze sharpened his research skills and gained valuable experience working in the independent study program with Dr. Gajic.

Dr. Cristina Comaniciu received the 2012 Rutgers School of Engineering Medal of Excellence for Distinguished Young Alumna

Cristina Comaniciu received the M.S. degree in electronics from the Polytechnic University of Bucharest in 1993, and the Ph.D. degree in electrical and computer engineering from Rutgers University in 2002. From 1998 to 2001 she was with the Wireless Information Network Laboratory (WINLAB), Rutgers University, and from 2002 to 2003 she was a postdoctoral fellow with the Department of Electrical Engineering, Princeton University. In 2003 she joined the faculty of Stevens Institute of Technology, Department of Electrical and Computer Engineering, where she is now an Associate Professor, also serving as the Electrical Engineering Graduate Program Director. In 2011 she was a visiting faculty fellow with the Department of Electrical Engineering at Princeton University.

Drs. Cristina and Dorin Comaniciu, with their daughter Alexandra, at the Medals of Excellence Dinner

She served as an associate editor for the IEEE Communication Letters Journal (2007-2011), and is currently a member of the IEEE Interest Group on Green Multimedia Communications.

Professor Comaniciu is a recipient of the 2007 IEEE Marconi Best Paper Prize Award in Wireless Communications for "On the Capacity of Mobile Ad Hoc Networks with Delay Constraints", co-authored with Vincent Poor.

She is a coauthor, with Vincent Poor and Narayan Mandayam, of the book "Wireless Networks: Multiuser Detection in Cross-Layer Design." Her research interests focus on energy efficient resource allocation for wireless networks, green wireless design, social based networking for opportunistic networks, dynamic spectrum management for cognitive radio networks, game theoretic approaches for cooperative algorithms in wireless networks, cross-layer design, and energy-security tradeoffs for wireless networks.

ECE Alum Dorin Comaniciu receives multiple honors

ECE Alumnus Dorin Comaniciu was named one of the New Jersey Inventors Hall of Fame's Inventors of the year for his work in computer vision, which helps cameras identify and track people or objects as they move.

Dr. Comaniciu was also elevated to the level of IEEE Fellow this year.

Dr. Comaniciu received his PhD from ECE Rutgers in 1999 and is currently Global Technology Head, Image Analytics and Informatics at Siemens Corporate Research.

The department wishes to thank Cristian and Andrea Francu for their recent donation of $21,000, which has gone towards the renovation of the Virtual Reality Laboratory.

After graduating from Rutgers, both Cristian and Andrea worked for Google, when the company was it its infancy.

The Francus decided to use their means to support various non-profits, including our department. They've been consistant supporters of the ECE department for almost a decade.

Supporting Rutgers ECE

Thank You

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The ECE Department wishes to thank all the donors above who supported us during the past academic year.

With your financial support we can continue to improve our research and education efforts, expand the financial opportunities available to our students, and improve the department's infrastructure.

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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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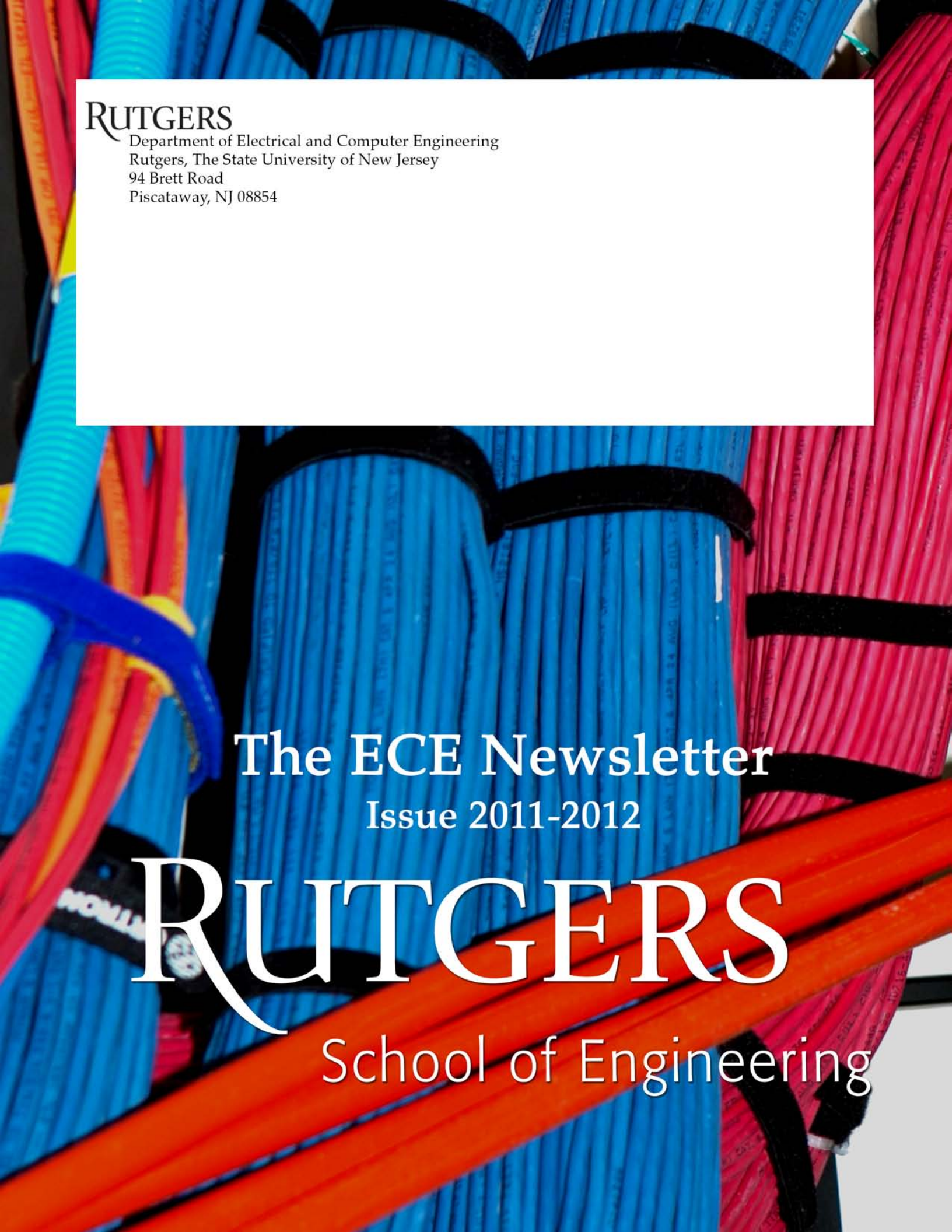

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