BOSTON UNIVERSITY

Boston University College of Engineering
Department of Electrical & Computer Engineering

Annual Report 2013-2014

This report provides a look into the Department of Electrical & Computer Engineering at Boston University during the 2013-2014 academic year. Instructional activities are reported from Fall 2013 through Summer 2014 semesters while scholarly activities and budget informaton are reported from July 1, 2013 to June 30, 2014.

For more information or to download this report as a PDF, please visit our website at www.bu.edu/ece.
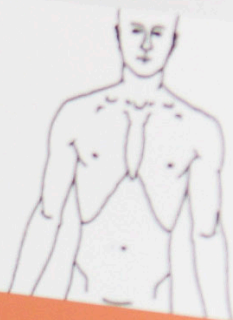
Inside

Boston University's ECE Department saw continued enhancement of our research and academic programs this past academic year. In spite of the competitive funding climate, our funding base continued to grow, providing the needed resources for our expanding world-class research program that has seen a doubling in the size of our graduate program over the past three years.

Our faculty continue to receive significant professional recognition. Four of our members were elevated to IEEE Fellows: Ted Moustakas, Yannis Paschalidis, Vivek Goyal and Clem Karl. Karl was named inaugural Editor-in-Chief of a new journal, IEEE Transactions on Computational Imaging. Vivek Goyal was appointed Distinguished Lecturer for the IEEE Signal Processing Society, joining Siddharth Ramachandran who is serving as Distinguished Lecturer for the IEEE Photonics Society. Martin Herbordt served as General Chair of the 2014 IEEE Symposium on Field Programmable Custom Computing Machines, which was hosted in Boston by our ECE Department. Josh Semeter was appointed as Chair of the NSF CEDAR Science Steering Committee.

Our young faculty members are also receiving significant recognition. Jonathan Klamkin was awarded a prestigious NASA Early Career Award to develop integrated photonic circuits for space laser communications. Bobak Nazer received a prestigious best paper award jointly from the IEEE Communications Society and the IEEE Information Theory Society for his work in network coding. Doug Densmore continued his leadership in the field of design automation for synthetic biology, serving as president of the Biodesign Automation Consortium.

With respect to our research, we had several significant efforts that ramped up this year. Enrico Bellotti and Luca Dal Negro led our effort as part of the Alliance for the Computationally-Guided Design of Energy Efficient Electronic Materials, a research center sponsored by the Army Research Laboratory. Along with Computer Science, we began a major effort with public and private funding to build the Massachusetts Open Cloud, a novel, transformative marketplace model for public cloud offerings. Christos Cassandras and others are exploiting this to develop a smart-city cloud platform to strengthen multiple municipal functions, in partnership with the City of Boston. Venkatesh Saligrama, Clem Karl and I received a renewal of our Homeland Security Center for explosives detection. Ioannis Paschalidis led an interdisciplinary team to develop optimization algorithms for predicting complexes that form when proteins bind together.

Our academic programs continue to grow, too. This fall saw our largest incoming class of PhD students, 23, enroll in our programs, along with 139 new Masters Students. Our undergraduate enrollments are increasing, particularly in Computer Engineering. Our undergraduates were very active in regional and national competitions, hosting BU's first Hackathon, in addition to a new Boston area event: an innovation Career Fair catering to startup companies. Our recent graduates continue to see commercial success in their startup endeavors, from the novel LED-communications company Bytelight to personal devices such as the iPad based communications devices created by Verbal Care. Our senior design team won a national award from their development of a vehicle-mounted embedded system for detecting and reporting potholes.

We are looking forward to expanding our faculty this year. Manuel Egele and Tali Moreshet joined us this fall to strengthen our Computer Engineering program, with expertise in cybersecurity and computer architectures, respectively. Sahar Sharifzadeh also joined this fall, and will be a member of the Materials Science Division as well as our ECE Department. Sahar's expertise is in optoelectronic properties of materials, with a focus on organic semiconductors.

In summary, our ECE Department is continuing its strong growth path, thanks to the contributions of our faculty, students and staff. On a personal note, this will be my last year as Chair. It has been an honor to serve in this position, and I'm looking forward to our Department's continued evolution under new leadership next year.

David A. Castañón

David Castañón
Department Chair
October 2014

History of External Research Funding
(millions of dollars)

Faculty Publications

Books	3
Book Chapters	16
Journal Articles	176
Conference Papers	89
Invited Lectures	86
Patents & Patent Disclosures	11

ECE Faculty

1 Nobel Prize Winner
3 National Academy Members
2 Former Presidents of IEEE Societies
24 Professional Society Fellows
19 NSF CAREER Award Winners
19 IEEE Fellow Faculty Members

Editor-in-chief
Current:
• Horenstein, Journal of Electrostatics
• Karl, Editor-in-Chief, IEEE Transactions on Image Processing
• Mazumder, Co-Editor-in-Chief, Particulate Science and Technology
• Paschalidis, 2013-present Inaugural Editor-in-Chief, IEEE Trans actions on Control of Network Systems
• Unlu, Journal of Quantum Electronics

Former:
• Cassandras (1998-2009), IEEE Transactions on Autonomic Control
• Gray (2007-2012), Foundations and Trends in Signal Processing
• Gray (1981-1983), IEEE Transactions on Information Theory

Number of Degrees Awarded

Undergraduates:	112
MS:	33
MEng:	78
PhD:	16

Number of Students Enrolled

Undergraduates:	326
MS:	98
MEng:	104
PhD:	88

Research & Grants

Sensor Research Wins $1M NSF Award

Enhancing the functionality of cyber-physical systems — systems that integrate physical processes with networked computing — could significantly improve our quality of life, from reducing car collisions to upgrading robotic surgeries to mounting more effective search and rescue missions.

Recognizing Boston University as a key contributor to this effort, the National Science Foundation has awarded Professors Venkatesh Saligrama (ECE, SE) and David Castañón (ECE, SE), and Assistant Professor Mac Schwager (ME, SE), nearly $1M for their project, "CPS: Synergy: Data Driven Intelligent Controlled Sensing for Cyber Physical Systems."

Drawing on earlier work by Saligrama and Castañón investigating machine learning under cost and budget constraints, the researchers will focus on improving sensors that collect data in transportation, security and manufacturing applications. A key challenge in such applications is to choose the most effective physical sensors from the vast amount available and develop systems that can efficiently process large quantities of collected data.

"Many of these systems are energy-hungry," Saligrama explained. "The goal is to use such sensors only when they are needed by using feedback control of the sensing actions to obtain the best information possible given energy budget constraints."

Castañón, who has developed some of the leading theories used in controlled sensing studies, sees the project as "an opportunity to extend that theory to big data environments with high-dimensional measurements."

The team plans to validate its techniques through archaeological surveying, working with Associate Professor Chris Roosevelt (Archaeology). Determining where to deploy the sensors on a smaller scale — for example, finding where best to dig — could lead to far-reaching solutions for deep-sea exploration, firefighting and traffic monitoring.

By Rachel Harrington

Grant

Professors: Saligrama, Castañón, & Schwager
Source: NSF
Amount: $1 million

"Data Driven Intelligent Controlled Sensing for Cyber Physical Systems"
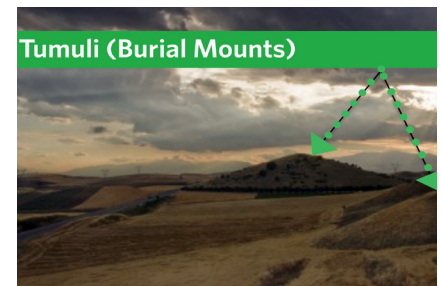
Potential features of interest include Tumuli, or burial mounds, which have a higher likelihood of containing archaeological artifacts than surrounding areas.
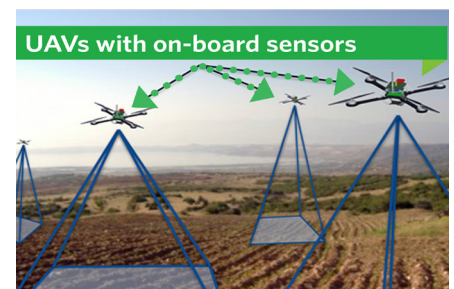
Intelligent information management methods will aid in archaeological field work: Archaeological surveys, such as the site in western Turkey shown here, can be scanned by a team of sensor-carrying UAVs to create topographical maps, and determine features of potential interest for later excavation.

Team Sheds Light on How Proteins Bind

Over the past six years, an interdisciplinary team of College of Engineering faculty members—Professor Sandor Vajda (BME, SE), Research Assistant Professor Dima Kozakov (BME), Professor Yannis Paschalidis (ECE, SE) and Associate Professor Pirooz Vakili (ME, SE)—have been developing a set of powerful optimization algorithms for predicting the structures of complexes that form when two proteins bind together—structures that, in some cases, generate erroneous cell signaling pathways that can trigger cancer and other inflammatory diseases.

Incorporated into Vajda's and Kozakov's protein-protein docking server ClusPro—a website to which any user can submit the three-dimensional coordinates of two proteins and receive a supercomputer-calculated prediction of the structure of the complex formed by those proteins—these algorithms have enabled more than 3,000 research groups across the globe to better understand the inner-workings of the cell and explore potential drug targets without having to run expensive, time-consuming lab experiments.

Now the research team behind these algorithms has, through lab experiments and computational analysis, obtained a sharper understanding of how two proteins come together to form a complex, and plans to apply that knowledge to boost the speed and accuracy of ClusPro's predictions. They and collaborators from the Hebrew University of Jerusalem and the National Institutes of Health (NIH) report on this new development in a new article in eLife, an open source journal for outstanding biomedical research.

A joint effort of Boston University's Center for Information and Systems Engineering and Biomolecular Engineering Research Center supported by a five-year, $1.6 million grant from the NIH, the project combines Paschalidis' and Vakili's expertise in optimization and systems theory with Vajda and Kozakov's knowledge of biophysics and bioinformatics. "The research was a beautiful combination of physics with mathematics," said Paschalidis. "We leveraged techniques popular in control systems developed to describe movement of complex 3-D objects, such as a robot arm, as well as machine learning methods used to analyze large data sets."

"Preventing proteins from binding to the wrong partners is an increasingly prominent concept in drug design," said Janna Wehrle, PhD, of the NIH National Institute of General Medical Sciences, which partially funded the research. "These new computational methods developed by the Boston University team will help researchers quickly discover both healthy protein pairs and disease-causing pairs that we might want to break up."

Until now, scientists were unable to characterize how protein-protein complexes form from two individual proteins—each analogous to a distinctly-shaped Lego block—because their interactions from the moment they come in contact to the moment they "snap into place" were too fast to detect. But an emerging nuclear magnetic resonance (NMR) technique has made it possible to track their rapidly changing configurations from rendezvous to docking using radio waves.

Applying this technique, the College of Engineering team determined that its protein-protein docking algorithms were already generating these exact transitional states, but labelling them as "false positives" alongside the correctly identified final protein-protein complex.
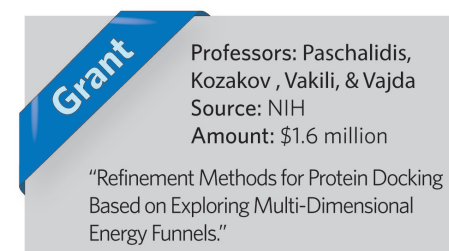
"What we have so far been calling false positives are 'transient encounter complexes,' temporary structures the proteins form as they 'search' for the one orientation that will enable them to bind successfully," said Paschalidis.

All protein-protein encounter complexes are characterized by low energy, with the lowest energy expected to occur at the final, stable complex. By systematically analyzing the energy values corresponding to the transient complexes, the researchers found that with each successive interaction, the intersecting proteins have fewer and fewer ways to twist and turn, thereby accelerating their path to binding. This explains how two proteins can dock very quickly despite the many nooks and crannies that must line up to seal the deal.

The team next aims to exploit its findings to make its docking algorithms faster and more accurate. The researchers also plan to examine the implications of their work for protein-DNA and protein-small molecule interactions that are important in genetic regulation and drug discovery, respectively.

By Mark Dwortzan

Grant

Professors: Paschalidis, Kozakov , Vakili, & Vajda
Source: NIH
Amount: $1.6 million

"Refinement Methods for Protein Docking Based on Exploring Multi-Dimensional Energy Funnels."

Self-Cleaning System Boosts Efficiency of Solar Panels

A creative solution to a costly problem

The energy from the sun that hits the Earth in a single hour could power the planet for an entire year, according to the US Department of Energy. One of the best places to harness that free, abundant, and environmentally friendly energy is a desert, but deserts, it turns out, come with a nemesis to solar panels: sand. The particulate matter that constantly blows across deserts settles on solar panels, decreasing their efficiency by nearly 100 percent in the middle of a dust storm. The current solution is for solar field operators to spray the dust with desalinated, distilled water.

"That might not sound like a big deal, but if you have millions of square feet of solar panels out in a desert, it ends up being costly—especially if water is a scarce resource," says John Noah Hudelson (ENG'14), one of several graduate students working to find a better solution with eletrical and computer engineering (ECE) professor Malay Mazumder, who also works in the materials science and engineering department, and ECE professor Mark Horenstein. "We're looking to use just a small amount of electricity to statically push the dust off the surface of the solar panel or the solar mirror."

The BU team's answer, called a transparent electrodynamic system (EDS), is a self-cleaning technology that can be embedded in the solar device or silkscreen-printed onto a transparent film adhered to the solar panel or mirror. The EDS exposes the dust particles to an electrostatic field, which causes them to levitate, dipping and rising in alternating waves (the way a beach ball bounces along the upturned hands of fans in a packed stadium) as the electric charge fluctuates.

The entire process takes seconds and uses a minuscule amount of power, generated by the solar device itself—about 1/100th of what it produces daily. In its final version, the EDS will be programmable or will automatically detect the presence of surface dust and switch on. "There's nothing like this on the market," Horenstein says.

Leslie Friday, *BU Today* on 3/24/2014
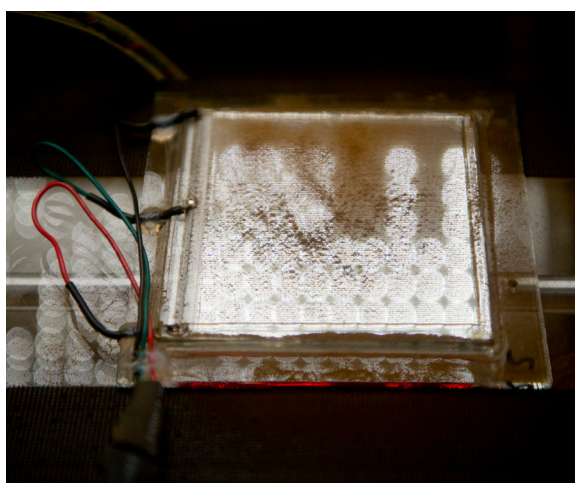
Within seconds, the transparent EDS sweeps away at least 90 percent of dust and sand atop a solar panel. Photo by Jackie Ricciardi

Stark (left) and Hudelson taking a specular reflection reading last year on mirrors they installed at Sandia National Laboratories in Albuquerque, N.M. Photo courtesy of Jeremy Stark

Faculty

Cassandras Delivers 2014 College of Engineering Distinguished Scholar Lecture

Professor Christos Cassandras (ECE, SE) (2nd from left) with Dean Kenneth R. Lutchen (2nd from right) and two previous recipients of the Distinguished Scholar Award, Professors Theodore Moustakas (ECE, MSE, 2011) (left) and Irving Bigio (BME, 2010) (right), at post-lecture reception

On March 19, Christos Cassandras, professor of electrical and computer engineering and Head of the Division of Systems Engineering, shared some of the most powerful techniques in his problem-solving toolkit in the 2014 College of Engineering Distinguished Scholar Lecture, entitled "Complexity Made Simple* (*at a Small Price)."

Speaking from the podium at the Boston University Photonics Center Auditorium, he addressed students, faculty and researchers from throughout the BU academic community and beyond.

Focusing his remarks on the optimal design, control and management of complex dynamic systems, Cassandras highlighted methods he's developed to solve difficult problems by exploiting their specific structure and asking the "right" questions. He demonstrated how these methods outshine conventional engineering approaches, resulting in time and cost savings, enhanced security and other benefits.

Cassandras first challenged the effectiveness of "brute force" trial-and-error techniques, which are often used to systematically learn and predict the behavior of a complex system, but are invariably slow, inefficient and intrusive.

He showed how this learning could be achieved far more quickly through simple "thought experiments" constructed at a "small price." For example, rather than expend hundreds of years of manpower manually testing different alternative configurations of a manufacturing transfer line to improve its efficiency, he explained, one could model the system's performance with algorithms that evaluate multiple scenarios in less than an hour in a single, low-cost run.

Cassandras concluded the lecture by highlighting his ongoing efforts to design Smart Cities that collect data, process information, make decisions and control and optimize actions aimed at making urban life easier, safer and more efficient.

By Mark Dwortzan

2014 Excellence in Teaching Award:
Professor Ajay Joshi

Professor Joshi was selected for his exceptional contributions to the Department's teaching mission.

Klamkin Wins NASA Early Career Faculty Award to Improve Deep Space Communication

Assistant Professor Jonathan Klamkin of the Department of Electrical and Computer Engineering and the Division of Materials Science and Engineering is one of seven university researchers nationwide to receive the 2014 NASA Early Career Faculty Award. The recognition honors early career faculty focused on space technology that address critical needs in the U.S. space program.

Since joining Boston University in 2013, Klamkin's impressive accomplishments include winning the College of Engineering Dean's Catalyst Award in 2013 and being elevated to Senior Member status of the IEEE in 2014.

Klamkin caught NASA's attention with a proposal to develop integrated laser transmitter technology for deep space communications. NASA recently completed a mission, the Lunar Laser Communication Demonstration (LLCD), which demonstrated high-rate laser communication between Earth and the Moon. Now NASA wants to further this technology for future missions to Mars, and Klamkin will develop technology to allow for such deep space communication.

High-rate space communication is made possible by laser communication transmitters. The laser sends data to Earth through space similar to how ground-based lasers send data over fiber-optic cables for the Internet.

With funding from the NASA grant and partnerships with MIT Lincoln Laboratory and Jet Propulsion Laboratory, Klamkin expects to apply photonic integrated circuit technology to reduce the size, weight, and power of space laser transmitters.

Photonic integration is a means to integrate several photonic functions on a chip in a manner analogous to integrating transistors in an electronic integrated circuit. Klamkin hopes that this technology will inspire new design methodologies for space laser transmitter hardware.

NASA's Early Career Faculty Award will serve as a benchmark to measure the achievements to come for Professor Klamkin. To put the award into perspective, Michael Gazarik of NASA Space Technology Mission Directorate said, "Technology drives exploration, and these researchers will provide fuel for NASA's innovation engine."

By Gabriella McNevin
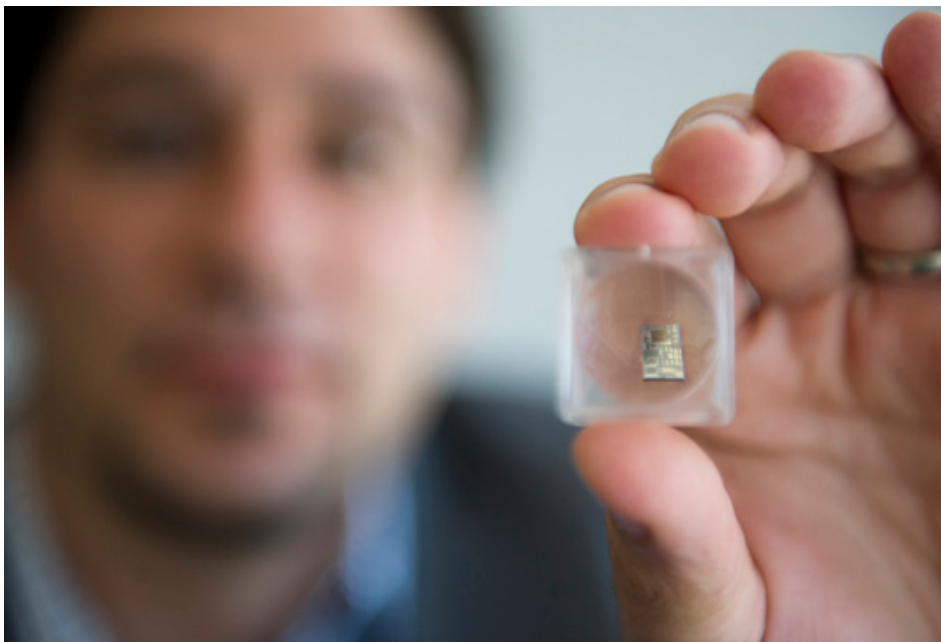
Klamkin leads BU's Integrated Photonics Laboratory, where he and his team research how to consolidate several photonic functions onto a single chip. Photo by Cydney Scott

4 ECE Professors Named IEEE Fellows
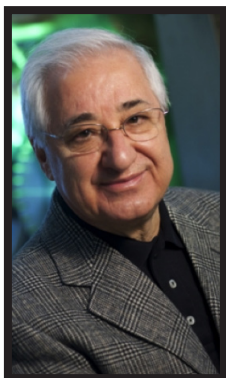
Theodore Moustakas

Moustakas was recognized for his contributions to "the epitaxial growth of nitride semiconductors." He is a trailblazer in molecular beam epitaxy, a versatile and advanced thin-film growth technique used to make high-precision, nitride (nitrogen compound-based) semiconductor materials used in fiber-optic, cellular, satellite and other applications.

His most notable achievements include pioneering the nucleation steps for the growth of gallium nitride on sapphire and other substrates, an essential process for the manufacture of blue LEDs, which are widely used in solid state lighting applications; and developing highly-efficient, deep ultraviolet (UV) LEDs, which are expected to provide environmentally friendly water and air purification.

By Mark Dwortzan

W. Clem Karl

Karl was recognized for his contributions to "statistical signal processing and image reconstruction." He has developed several statistical models for the extraction of information from diverse data sources in the presence of uncertainty, and applied them in projects that include automatic target detection and recognition for synthetic aperture radar; locating oil deposits and analyzing the earth's atmosphere; and monitoring medical conditions using tomography and MRI.

Karl currently serves as the Editor-in-Chief of the IEEE Transactions on Image Processing.

By Mark Dwortzan

Yannis Paschalidis

Paschalidis was recognized for his contributions to "the control and optimization of communication and sensor networks, manufacturing systems and biological systems." Since joining the Department of Electrical and Computer Engineering and the Division of Systems Engineering in 1996, he has developed sophisticated algorithms for everything from a homeland security early warning sensor network to a next-generation electronic healthcare management system. Currently, Paschalidis serves as the Director of the Center for Information and Systems Engineering at Boston University. He is also the inaugural Editor-in-Chief of the IEEE Transactions on Control of Network Systems.

By Mark Dwortzan

Vivek Goyal

Goyal was recognized for contributions to "information representations and their applications in acquisition, communication, and estimation." Goyal joined the Department of Electrical and Computer Engineering faculty at Boston University in January 2014.

In 2002, Goyal began receiving attention for developing methods for information representation suitable for lossy, packetized communication, such as communication over the Internet. He was awarded the 2002 IEEE Signal Processing Society Magazine Award for paper entitled "Multiple Description Coding: Compression Meets the Network." Goyal is recognized for co-inventing WEBRC, the first receiver-driven, multiple-rate congestion control protocol that is now an Internet standard for IP multicast. Additionally, Goyal led the team that developed *first photon imaging*, a method for acquiring reflectance and 3D structure of a scene from only one detected photon per pixel, even in the presence of significant ambient light.

By Gabriella McNevin

Bobak Nazer Wins IEEE Joint Paper Award

Bobak Nazer

When it comes to wireless communications, interference between users is an obstacle to avoid. When multiple users transmit on the same frequency band, nearby receivers only see the superposition of their signals, which makes it hard to discern the individual packets of data.

Work by Assistant Professor Bobak Nazer (ECE) and Professor Michael Gastpar, who holds positions at the École Polytechnique Fédérale de Lausanne in Switzerland and the University of California, Berkeley, is causing other researchers to rethink that notion.

A paper by them titled, "Compute-and-Forward: Harnessing Interference Through Structured Codes," explores the possibility of exploiting the algebraic structure of interference to achieve higher data rates.

Their framework makes it possible for a receiver to recover linear combinations of packets from superimposed signals. Recovering the original packets is simply a matter of collecting enough equations to solve for the unknowns. Ultimately, this technique may enable wireless networks to operate at significantly higher throughputs by allowing several users to simultaneously occupy the same channel.

"Much of the prior work has focused on the statistical aspects of the interference problem," said Nazer. "One of the main emphases of this paper is that there is a benefit to thinking about algebraic structure as well."

In recognition of their work, the IEEE Communications Society and the IEEE Information Theory Society awarded a 2013 Joint Paper Award to Nazer and Gastpar.

"I was very happy to hear about the award and really appreciate the recognition from the communications and information theory communities," said Nazer. "This is a project we've been working on for a long time. More than anything it's nice to see that others are getting as excited about the work as we've been."

In July, Nazer and Gastpar were recognized with a plaque and honorarium at the IEEE International Symposium on Information Theory in Istanbul, Turkey.

By Rachel Harrington

In July, Assistant Professor Bobak Nazer (ECE) (right) and Professor Michael Gastpar of EPFL and UC Berkeley (left), received a 2013 Joint Paper Award from the IEEE Communications Society and IEEE Information Theory Society.

Douglas Densmore, a Leader in Synthetic Biology

Since joining the ECE Department in 2009, Assistant Professor Douglas Densmore has continued to make novel advancements in synthetic biology research. His research applies computer engineering methodologies to life science queries, and his most recent accomplishments distinguish him as a leader in the field.

Douglas Densmore

BU Center of Synthetic Biology

The College of Engineering launched the BU Center of Synthetic Biology (CoSBi), and aptly appointed Densmore as a core faculty member. CoSBi unites interdisciplinary Boston University researchers working to benefit systems biology. The program is expected to attract substantial government funding and major industrial collaborators. Researchers in the program will work on large-scale, collaborative projects.

Hariri Research Award

Boston University's Rafik B. Hariri Institute for Computing and Computational Science & Engineering presented Densmore with the Hariri Research Award. Densmore's work entitled "Computational Synthetic Biological Microfluidics," made him the stand-out applicant for the award, which was established to support university researchers secure with resources and funding for computer-based research.

NAE U.S. Frontiers of Engineering Symposium

Densmore was selected to be one of the 81 engineers under the age of 45 to participate in the U.S. Frontiers of Engineering Symposium. "The Frontiers of Engineering programs give some of our most talented early career innovators the opportunity to create interdisciplinary relationships that are critical to shaping and advancing the future," said NAE President Charles M. Vest. Boston University President Robert A. Brown nominated Densmore to the symposium applicant pool of 310 professionals from industry, academia and government.

Published in Nature Methods

Densmore and BU Researcher Evan Appleton were published in Nature Methods, one of the most respected scientific journals in the field. The research paper, entitled "Interactive Assembly Algorithms for Molecular Cloning" illuminates automated DNA assembly and how software can provide optimized assembly plans for genetic constructs made from numerous DNA segments.

While in pursuit of his research goals, Densmore maintained involvement in ECE student academic programs. As the director of the Cross-disciplinary Integration of Design Automation Research (CIDAR) group, his team works to develop computational and experimental tools for synthetic biology. He also taught several courses in the ECE Department, including Introduction to Software Engineering (EC327) and Advanced Digital Design with Verilog and FPGA (EC551).

Students

Sophomores Win 1st Place in a Boston Marathon Hackathon

Hacking for a Good Cause

A year after the Boston Marathon Bombings, mobile application development firm Intrepid Pursuits organized HackBostonStrong, a hackathon to encourage technological advancements to improve the community.

On April 19th, three BU students and one UMass Lowell student were named the winners of the hackathon. Winston Chen (ECE '16), Dean Shi (ECE '16), Huy Le (CAS '16), and Corey Prak (UMass Lowell '15) joined the ranks of industry professionals and student-hackers to show their support for the city. The team was one of the few groups that worked through the night to take advantage of the 26.2 hours alloted to each team.

Intrepid Pursuits Director of Marketing Andrea Garvey noted that the judges were impressed by Echo Can for being "an elegant solution to a common problem."

Echo Can is a bin that sorts recyclable waste from unrecyclable waste by tracking the audio signals of objects being dropped into a trashcan.

Echo Can activates when a piece of trash is dropped into the device. The trash lands on a flap that is equipped with a microphone and is motorized by a lever. As the trash hits the flap, the microphone measures the sound. The sound is analyzed to indicate the trash is recyclable or non-recyclable. This distinction prompts the motor to pivot the flap in a specific direction (imagine a motorized-seesaw). The trash then rolls off the flap either into the trash bin or recycling bin.

Participants were judged on four criteria, innovation, design, impact, and execution and were expected to create a practical design that would feasibly solve a serious problem. Le believes his team was different from his impressive competitors because the team "fulfilled the criteria in an interesting way." Echo Can addresses a common aversion to recycling and offers a solution that is convenient to potential users.

This win may be the first highlight for the young hackers' recycling initiative. In addition to winning $2,000, Intrepid Pursuits put the team in touch with BigBelly Solar, the company that created the sustainability solar cans found on BU's campus, to help the students going forward.

By Gabriella McNevin & Donald Rock (COM '17)

Noteworthy Accomplishments:

2014 Graduate Teaching Fellow of the Year: Lake Bu

Lake Bu received the 2014 Graduate Teaching Fellow of the Year Award for his outstanding support to undergraduate academic programs.

Ging S. Lee Community Service Award: Habib Mohammed Khan

Societal Impact Capstone Project Award, 3rd Place:
"EPIC / EpiPen(r) Calls"
The team members that engineered "EPIC / EpiPen(r) Calls" include Elvin Cako, Anne Michelle DuBois, Benjamin Howard Nichols, Evan Michael Praetorius, and Heather Taylor Towey.

Michael F. Ruane Award for Excellence in Senior Capstone Design:
Samuel Howes

Senior Honors Thesis Award:
Julie Frish, "Development of Low Loss Waveguides for Mid-Infrared Integrated Photonic Circuits"

Center for Space Physics Undergraduate Research Award:
Andrew Kelley

EE Seniors Win GizmoSphere Contest

Projects Automates Pothole Detection & Management

The impact of a long and stormy winter continues to be felt on the roads. According to the Boston Globe, this year the City of Boston has already filled more than 8,800 potholes, primarily reported by drivers, including one that sent a man to the hospital. Taking a more proactive approach could prevent vehicular damage, injuries and claims against the city while saving time and money for all concerned.

Now a vehicle mounted pothole detection system developed by Electrical Engineering seniors as part of their senior design project aims to do just that. Instead of relying on citizens to report potholes or paying crews to look for them, the system, known as AutoScan, could enable city vehicles to detect them automatically as they go about their daily routes. Coupled with tracking and scheduling software and incorporating a low-cost, embedded technology development platform called a Gizmo board, the system could provide a comprehensive and economical road repair tracking system.

Reviewers at GizmoSphere, which makes the Gizmo board, agree. Dazzled by a $1,000 prototype of AutoScan, they awarded the team first prize in a video contest.

"The low cost, achieved through the extensive use of open source solutions, made it compelling to the Gizmo community," said Scott Hoot, president of GizmoSphere. "But the idea of how seamlessly this idea fit into the Internet of Things, made the BU project a winner. Clearly this is a project that takes close to real-time measurements in the physical world, and utilizes those measurements through the open standards available in the Internet."

The AutoScan senior design team consists of Austen Schmidt (systems integration), Vinny DeGenova (image processing), Nandheesh Prasad (power engineering), Charlie Vincent (networking and GPS) and Stuart Minshull (Web application). The EE seniors developed their prototype under the supervision of ECE Adjunct Professor Babak Kia, who often assumed the role of prospective customer.

While there are several solutions available that can quickly measure potholes on a mobile platform, ranging from lasers to accelerometers, the EE team focused on a "time-of-flight" infrared camera that determines distance between the camera and various points in its field of view.

"Our system is basically an onboard computer that mounts to the bottom of a city vehicle, such as a bus," said Schmidt. "As the bus goes along, it uses the infrared camera to scan the road for potholes and computes their depth, and sends the data collected on each pothole—volume, GPS coordinates, time and date—over a cellular network to a database hosted by a website. The website interprets data coming in from multiple scanners, displays it on a Google map and updates a Web-accessible road repair schedule."

Exploiting the Gizmo board and open source software, the team has advanced a prototype of a system that promises to cost a few thousand dollars, far cheaper than alternatives that can range from $10,000 to $100,000. The only sacrifice is a bit of accuracy.

"Our system is a little less accurate than our competitors, because they focus on applications where you really need high-fidelity detection, such as airport tarmacs or bridges," said Minshull. "We wanted a cheaper way for potholes to be detected without having to worry about tracking millimeter-line cracks in the road."

To put AutoScan to the test, the team used cardboard boxes to create an elevated road surface with cutouts of different volumes representing potholes. Tests showed that the system accurately measured the volume of each cutout and successfully relayed collected data to the website. Next steps include conducting high-speed tests beyond the lab environment, and finding a way to protect the unit against vibration and adverse weather conditions.

By Mark Dwortzan
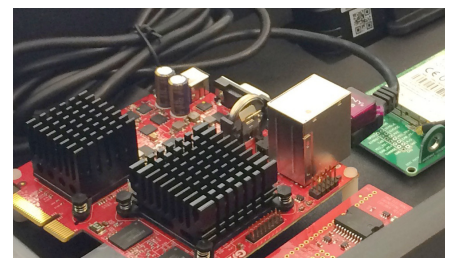
The AutoScan prototype consists of a Gizmo board, depth sensing camera, system battery and other components. The system is designed to be mounted under the front bumper of a city vehicle and scan the road for potholes.

Seniors with Intention to Improve Societal Issues

Senior Design Project

ECE seniors must complete a team-based, two-semester capstone senior design project to graduate. Teams prototype an electronic device, and/or software system for real-life customers. Customers are drawn from industry, or are BU faculty members. Throughout the year, students learn design methods, project management, team dynamics, communication skills, and legal and ethical principles. Seniors spend their second semester in the Senior Project Laboratory. During this phase, students make presentations to their customer, write inter- and intra-office memos, design their project to meet customer specifications, manage the project budget, and deliver their working prototype that includes an instruction manual. Project records are maintained in personal design logbooks. Teams have 24/7 access to a fully equipped laboratory bench; professional CAD; and prototyping tools for circuits, embedded systems, and software development. The final projects are presented to BU faculty, clients, students, and family members at ECE Day. A panel of ECE alumni judges nominate a winner for a number of ECE Day award categories.


From left to right: Senior Lecturer Babak Kia Montazam, Associate Professor of the Practice Alan Pisano, Vinny DeGenova, Austen Schmidt, Charlie Vincent, Nandheesh Prasad, Stuart Minshull, and Professor David Castañón. Photo by Chitose Suzuki.

The 2014 Best Senior Design Project Award: AutoScan, A Pothole Detection System
Customer: Senior Lecturer Babak Kia Montazam, Boston University
Winner of ECE Day's top award, AutoScan is a pothole detection system to help repair damage around the city that occurs as result of winter weather. The AutoScan hardware attaches to the bottom of a city bus, scans for road damage and reports the findings to a database. With this information, the database software can pinpoint the damage and track damage-repair status. The device also promotes city safety by helping city officials detect areas prone to damage.
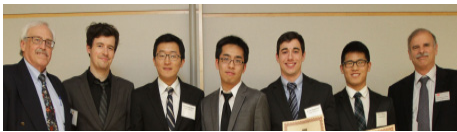
From left to right: Associate Professor of the Practice Alan Pisano, Alex Wiles, Hyunsung Kim, Jason Shum, Evan Sapienza, Steve Hwang, and David Castañón. Photo by Chitose Suzuki.

The 2014 Entrepreneurial Award: Snowflake, A Cloud 3D Scanner
Customer: George Matthews, Microsoft
ECE seniors concluded that many potential 3D printer users are deterred from using the technology because it is expensive and complicated. This inspired the students to improve the marketplace by developing less expensive and complex technology. The team developed Snowflake, a reasonably priced and user friendly approach to 3D printing. It is based on cloud technology and utilizes a 3D home scanner. The system allows users to upload a design to the cloud and send it to a 3D printer. It also provides the user access to the community of users, with the ability to preview other designs.

From left to right: Senior Lecturer Babak Kia Montazam, Associate Professor of the Practice Alan Pisano, Rubing Jin, Audrey Lewis, Aidyn Shaikhov, Kumiszhan Dybyspayeva, Matthew Beardsworth, and Professor David Castañón. Photo by Chitose Suzuki.

The 2014 Design Excellence Award: The Cement Impedance Analyzer
Customer: Simone Musso, Schlumberger-Doll Research
Oil spills cause devastating effects to the environment; and still, oil drilling remains a large industry in the US. Five ECE seniors developed the software and hardware to test the adequacy of the cement barrier that encloses the steel pipes in oil wells to decrease potential harms of oil drilling. The Cement Impedance Analyzer takes cylinder-shaped samples of the cement walls and tests for cracks and structural damage. The unique system can survey multiple cement samples, which makes the prototype more efficient than current technologies that are testing oil drilling utilities.

From left to right: Associate Professor of the Practice Alan Pisano, Benjamin Havey, Andy Mo, Caroline Ekchian, Christopher Woodall, Thomas Nadovich, and Professor David Castañón. Photo by Chitose Suzuki.

The 2014 Design Excellence Award: dDOSI Spectrum Analysis Unit (dSAU)
Customer: Assistant Professor Darren Roblyer (BME), Boston University
In an interdisciplinary project, ECE seniors developed a digital Diffuse Optical Spectroscopic Imaging (dDOSI) Spectrum Analysis Unit (SAU) that will assist Biomedical Engineering Professor Darren Roblyer in monitoring the effects of chemotherapy on breast tumors. The team's final prototype combines complex hardware and software design that will be used to help develop advanced Point-of-Care (POC) equipment to monitor patients undergoing chemotherapy treatment. The device utilizes near-infrared lasers to measure concentrations of lipids, hemoglobin, and water in tissue cells.

A 24-Hour Hackathon at Boston University

Taking the Initiative to Hack
On March 21-22, more than 120 students entered the first Boston Universty hackathon organized by ECE students. It was a 24-hour event that included informational lectures, free food and mentoring from industry experts. Ultimately, 17 projects were submitted and five awards were presented. The hackathon planning team, known as Make_BU, host smaller weekly hackathons.

The group plans to work with the Department of Electrical and Computer Engineering to host their second University-wide hackathon in Fall 2014. Make_BU hopes to host a city-wide hackathon in Spring 2015.

Newbie Award Winner
"Feel Good BU" – a mobile application to sell grilled cheese sandwiches. Chris Yip (SAR '17), Kyle Mann(CAS '17), and Joe Cho (CAS '17)

Mobile Award Winner
"Buzy" – An application that monitors the busyness of a public location, such as a student center or dormitory. Kanav Dhir (ENG '15), Alex Wong (ENG '15), Deven Dayal (ENG '15) and Clement Su (ENG '15).

Web Award Winner
"Duster" – A service that determines which Facebook friends an individual interacts with least, and suggests those friends are deleted. Carter Wheatley (ENG '15) and Adlai Gordon (CAS '16).

Mobile App Developers Win College's Imagineering Competition

The team members Timothy Chong (BME/CE'16), Luke Sorenson (CE/EE'16), John Moore (CE'16), Nick Sorenson (SMG'14) and Barron Roth (CE'16) (not pictured here).

Downtyme, an app that makes it easier for college students and other overscheduled people to get together offline, won the $2,500 first prize at the College of Engineering's third annual Imagineering Competition.

Held April 17-18 at Ingalls Engineering Resource Center, the competition fielded entries from nine undergraduate engineering students or student teams that applied their creativity and entrepreneurial skills to build working prototypes of technologies aimed at improving the quality of life. Developed in the Singh Imagineering Lab and other on-campus facilities, this year's projects ranged from a lab-crafted electric guitar to a stairway safety monitor for senior citizens.

Downtyme enables Facebook friends with free time to find each other by uploading their calendars, selecting one friend or group of friends who are free and close by during a specified window of time, and inviting them to share a meal, study, play basketball, hang out, and more. Incorporating more than 25,000 lines of code, the app displays friends on your screen in order of proximity and closeness of their relationship to you.

"We think there's a discrepancy between the time people spend on social media and the time they'd like to spend interacting in the real world," said Luke Sorenson (CE/EE'16), who developed Downtyme in the past four months with teammates John Moore (CE'16), Timothy Chong (BME/CE'16) and Barron Roth (CE'16).

"Our solution was to make a smartphone app that saves you from your smartphone," added Moore. "Our idea is that you take out your phone, go to the App Store, and 30 seconds later you make plans with your friends."

After the team launched a startup (Downtyme LLC) and rolled out a Beta version of the app for iPhones and Android mobile devices this spring, more than 1,200 users (mostly college students in Greater Boston) downloaded it and are now putting it to the test. The team plans to market the app to college students around the country, companies seeking to coordinate meetings, and other users looking for a convenient way to transact face-to-face connections.

"The Downtyme mobile app shows a highly developed awareness of how important personal contact is in an increasingly digital world," said Rosen. "All three winning projects show how our students are becoming Societal Engineers as they apply their engineering skills, creativity and entrepreneurship to improve the quality of life."

By Mark Dwortzan

Alumni

Kevin Mader Joins ETH Zürich as Lecturer

As a master's candidate studying Photonics at Boston University, Kevin Mader (ECE '08, MS '08) decided to become an Undergraduate Teaching Fellow, a position that allowed him to work with students and help them master difficult concepts.

"I felt like I could help students because I had just struggled with learning the concepts a year before and could relate well to what they were going through," he said.

The experience made Mader realize he wanted to become a teacher and today, he is a lecturer at ETH Zürich in Switzerland, where he is hoping to inspire the next generation to get excited about engineering.

"I think that a lot of students lose interest in science and engineering early on because it becomes too technical before it gets interesting," he said. "I hope to try and make it exciting without watering it down too much."

As an undergraduate studying Electrical Engineering at BU, Mader worked closely with Senior Lecturer, Babak Kia, on his senior design project. Like in Switzerland, Mader never had any problems finding other researchers he could collaborate with effortlessly.

"He was a very effective team player, espousing a humble leadership style and patiently sharing his thoughts and ideas with his team," said Kia, who served as Mader's customer during senior design.

After earning his bachelor's degree, Mader decided to continue his studies by pursuing a master's in Photonics at BU.

Mader had completed a summer internship at the Center for Biophotonics at the University of California, Davis, where he looked at how cellular spectroscopy and imaging could be used to detect cancer. Upon returning to BU, he decided to build upon what he learned by taking a course on imaging and microscopy with Professor Jerome Mertz (BME).

Because Mader was drawn to Mertz's passion for his own research, he decided to work on his master's thesis in Mertz's laboratory, where he worked on improving bioluminescence imaging so that a small group of cells, like a tumor, could be detected without using lasers or X-rays.

Since completing his master's, Mader has taken more steps toward eventually becoming a professor, including earning a Ph.D. in Electrical Engineering and Biomechanics from ETH Zürich.

He has also earned a Pioneer Fellowship from the university, which will allow him to work toward pairing microscopes, MRIs and CT-scanners with tools that will turn pictures into meaningful statistics.

"There seems to be sufficient industrial interest. The real challenge will be connecting with the right people at the right times." he said.

As Mader balances research with teaching, he continues to give his all in both.

Learn more about Mader's new company, www.4Quant.com

By Rachel Harrington

Kevin Mader (ECE '08, MS '08), who is teaching at ETH Zürich, bikes in one of the side valleys of Engadin in the Swiss Alps.

Alum Boosts Customer Loyalty with Indoor Location Technology

Imagine you're strolling through the aisles of a supermarket and just as you approach your favorite pasta sauce, a virtual "buy one, get one free" coupon for the product, redeemable at checkout, appears on your smartphone. Rather than having you page through a weekly compilation of in-store offers—that's so 20th century—the store has delivered the coupon directly to your phone based on your current location and shopping history.

Making this possible are standard overhead LED lights that not only illuminate the room but also function as an indoor GPS. Enhanced with microchips, the bulbs contain sophisticated software that causes them to flicker fast enough to transmit a distinctive, information-rich signal that a smartphone camera can detect and a retailer's mobile app can decode.

In just three years, the Boston-based startup that developed the software, ByteLight, has become a market leader in indoor location solutions, a burgeoning industry enabling mobile device users to access discounts, directions, and other highly targeted services at precise locations within buildings. Energized by a recent influx of $3 million from investors, ByteLight is piloting its technology at several global retailers, including 3 of the top 10 big-box stores, as well as at 100 stores in China.

Spearheading this success story is ByteLight's CEO, Daniel Ryan (ENG'10), who cofounded the company with classmate Aaron Ganick (ENG'10) in 2011 based on concepts they studied and implemented as research assistants in ENG professor of electrical and computer engineering Thomas Little's NSF Smart Lighting Engineering Research Center. Inspired to pursue careers in electrical engineering by childhood visits to Boston's Museum of Science, Ryan and Ganick devised ByteLight's core technology in the lab, developed a prototype and business plan in the technology incubator space at the BU Photonics Center and Highland Capital Partner's Summer Program, and then raised sufficient capital to launch the company. While Ganick moved on last year to pursue other endeavors, Ryan continues to grow ByteLight to meet a surging demand for its unique indoor location solution.

LED lights equipped with ByteLight software can pinpoint a mobile device user's location to within one meter in less than a second—far outpacing the performance of other indoor positioning systems developed by Apple and Google. Unlike other solutions that require additional hardware such as WiFi hotspots or Bluetooth beacons, ByteLight software exploits an existing and ubiquitous infrastructure: overhead lighting.

ByteLight not only uses light waves to transmit useful information to smartphone-toting customers at specific locations, but also to quickly and securely verify their presence for loyalty programs, mobile payments, and more at "tap-and-go" check-in and check-out locations equipped with the company's Light Field Communication readers. Compatible with all smartphones, the ByteLight readers cost five percent as much as the increasingly popular Near Field Communication (NFC) readers, which use radio signals to process such transactions and work only with a limited set of mobile devices. ByteLight's primary focus is on the retail industry, but the company's technology could also be deployed in venues ranging from museums— including Boston's Museum of Science, where ByteLight is used in one exhibit to display location-sensitive content—to factories to airplanes. To expand the company's repertoire, ByteLight provides its customers with a software development kit they can use to invent new applications for the software-enhanced lights. In the coming years, as the use of LED lighting and mobile devices continues to grow, Ryan envisions integrating ByteLight technology into stadiums, conference centers, schools, office buildings, hospitals, and other domains.

By Mark Dwortzan

CEO of ByteLight Daniel Ryan (ENG'10) (left) & Manny Malandrakis, (ENG'10) one of the first ENG alumni to become an employee at the company. Photo by Dan Watkins

Distinguished Alumni Awards for Exceptional ECE Graduates

Dean Kenneth R. Lutchen (left) with Anton Papp (EE '90) (right), photo by Dave Green.

In a ceremony held October 25 at the Boston University Photonics Center, the College of Engineering celebrated its alumni and announced the 2013 Distinguished Alumni Awards. Presented by Dean Kenneth R. Lutchen following a buffet dinner and champagne toast, the awards recognized individuals who have made significant contributions to their alma mater, community and profession. Lutchen commended the recipients for bringing honor to the College through their careers, commitment to the highest standards of excellence, and devotion to the College.

Anton Papp (EE '90), vice president for Corporate Development at Teradata, received the Service to Alma Mater award, which honors alumni who have enhanced the College of Engineering's stature through voluntary service to BU. At Teradata Papp oversees, evaluates and executes investments, mergers and acquisitions, and strategy. Prior to joining Teradata, he served as vice president of Corporate Development & Global Alliances at Aprimo and held numerous investment banking positions. A graduate of the prestigious US Navy Fighter Weapons School (TOPGUN), Papp attended BU on a Naval ROTC scholarship and served as a Naval Officer and F-14 Tomcat Flight Instructor. He also earned an MBA in Finance from Columbia Business School. Papp serves on the College of Engineering Dean's Advisory Board, the ENG West Coast Alumni Leadership Council, and the BU West Coast Regional Campaign Committee. He has been the leading supporter for the ENG/SMG Summer Leadership Institute program, and part of the College's efforts to recruit top undergraduates.

Dan Ryan and Aaron Ganick (both ECE '10), cofounders of the telecommunications company ByteLight, received the Distinguished Young Alumni award, which honors outstanding alumni within 10 years of graduation for outstanding service to their profession or community. A startup that emerged out of the Smart Lighting Engineering Research Center at BU, ByteLight has produced a system that's similar to an indoor GPS. Special LED lights provided by Bytelight enable your smartphone to determine your location and to bring up location-based information ranging from store coupons to museum exhibit descriptions.

By Mark Dwortzan

Changing the Workout Experience

There is no universal solution to become more healthy. For this reason, wearable health tracking technologies, such as Jawbone and Nike Fuel band, have emerged to monitor individual health progress.

Atlas is Jawbone and Nike Fuel's newest competitor. Founded by Mike Kasparian (ECE '12, MS '13) and friend from preschool, Peter Li, Atlas tracks and identifies exercises, counts reps, calculates burned calories, and evaluates form. It also displays workouts live and is compatible with many popular fitness apps such as MapMyFitness.

Atlas first found support from a company called Techstars, a startup accelerator in Austin, Texas. Techstars provided office space, funding, and mentorship. Kasparian and Li gained additional funding through a campaign on Indiegogo, which is a web platform that helps people raise money for new ideas and products.

The company surpassed the campaign fundraising goal of $125,000. They raised over $450K.

Kasparian attributes the Department of Electrical & Computer Engineering's senior design course as having a significant impact on his career. He said, "It was really the first time I was able to fully apply all of the technical skills from my coursework toward a legitimate project."

Professor Bakak Kia and Professor Ajay Joshi (ECE) provided Kasparian the academic support and guidance needed to succeed professionally. Joshi believes "the fitness band market is just picking up."

By Gabriella McNevin and Chelsea Hermond (SMG '15)

Alums' App Helps Speech-Challenged Communicate

Every year, more than seven million people are affected by conditions that prevent them from speaking or understanding language. The disability may mean that stroke victims can't tell a nurse that they need to use the bathroom, can't share with their spouse that they are hungry, or can't simply ask to please change the channel because they are about to watch a fourth straight episode of Law & Order.

To the rescue comes an iPad app designed by College of Engineering alumni Nick Dougherty, Eric Hsiao, and Gregory Zoeller (all CE '12). Verbal Care, their creation, helps nonverbal patients communicate desires for things like food, medicine, and pain relief by touching one of the large picture-based icons. After creating a few iterations of the software over the course of a year and testing in beta, the latest version of the app is now available in the iTunes store.

"Our goal is to bridge the communication gap between patients and caregivers," says Dougherty, CEO of Verbal Applications, the alums' new company. "Patients will receive custom care faster, and hospitals will get money back in Medicare and Medicaid reimbursements because of higher patient satisfaction scores." Verbal Care must be downloaded and loaded onto an iPad. Once opened, the user is asked, "What would you like to say?" as nine icons pop up on the screen, among them "pain scale," "food," "bathroom," and "entertainment." Each category is subdivided into requests for certain

types of food, for example, or a specific television station. Caregivers, who can receive the request on an iPad, can confirm requests with a "yes or no" module, and the app can also act as a rudimentary translation tool. Based on the needs of the patient, caregivers can add their own text, voice recordings, and images ("If the patient's favorite food is Oreos, they can add that personal icon," Zoeller says).

After graduating, Dougherty, Hsiao, and Zoeller formed their business venture. Their research, shadowing nurses and speech pathologists at Massachusetts General Hospital, revealed some similar devices targeted specifically for aphasia patients, ALS patients, and stroke victims, but with price tags upwards of $7,500. Verbal Care was designed as a far more affordable app for all types of communications disorders. Currently the app is free, but Dougherty says it may be priced at around $10 a month, or $99 a year. The three alums also learned the importance of user-friendly design, which they achieved by using hard contrast, brighter colors, and very simple icons for patients with lower visibility, Hsiao says.

Verbal Care was selected both for the School of Management's 2013 ITEC New Venture Competition, taking the People's Choice Award, and the MassChallenge, an annual $1 million global accelerator program, two start-up camps where they could get excellent advice from experienced mentors. And while that advice is certainly helpful, Dougherty says, one

of the most important lessons was learned while he was still a student.

"You have to be able to totally burn what you have and start over," says Dougherty, who also founded the popular campus nonprofit Project Mailbox. "We've done Verbal over maybe four times. Every time it's like a phoenix, where it crumbles to ashes and then rises out of the flames. I think there's a lot to learn from that, and that's the benefit of being a younger entrepreneur."
The latest version of Verbal Care will be launched in the iTunes store on August 12, 2013.

Amy Laskowski, *BU Today* 8/8/2013

Nick Dougherty (ENG'12) (from left), Gregory Zoeller (ENG'12), and Eric Hsiao (ENG'12) founded Verbal Care, which was selected for both the School of Management's 2013 ITEC New Venture Competition and the MassChallenge. Photo by Kelly Davidson.

Transforming the Classroom through Digital Learning Technology

Boston University launched a Digital Learning Initiative (DLI) last year to spearhead innovative projects in online learning at all of its schools and colleges. The DLI recently awarded $80,000 to fund a College of Engineering proposal to enhance two core undergraduate engineering courses, EK127 (Introduction to Engineering Computation) and EK307 (Electric Circuits), with a suite of classroom-flipping, studio-based educational technologies and techniques. Lessons learned from this pilot program could be used to upgrade the learning experience in other engineering courses.

Professor Thomas Little (ECE, SE), the College of Engineering's associate dean for Educational Initiatives, sees these pilot projects as part of a broader College-wide effort to use digital learning technologies—from tablets to Massively Open Online Courses (MOOCs)—to bring engineering education into the 21st century. "Inspired by the success of these technologies in other disciplines and energized by the support and training that the DLI is providing, we are developing new ways to improve what's important to the student: learning; retention; and career preparation," said Little.

In both EK127 and EK307, instructors and teaching assistants funded by the DLI grant will develop course content using edX, a non-profit online platform that offers interactive online classes and MOOCs—not as a vehicle to reach large numbers of students via the Internet, but as a tool to boost active learning in the classroom. For each class meeting, they will record a video on the material students need to learn for that class, make it accessible through the edX platform, use edX assessment tools to set up online quizzes, and design active learning exercises.

The instructor for EK127, 2014 Metcalf Cup and Prize winner Assistant Professor Stormy Attaway (ME), has been gradually flipping the course over the last three years. With the new funding—and support by "course builders" such as Declan Bowman (BME'15), one of the first students in the College's STEM Educator-Engineer Program (STEEP)—she aims to completely flip the course. Once all course content is placed online along with assessments, Attaway will devote all classroom time to active learning in Photonics Room 117, an instructional space that the College is converting into an active learning studio complete with round tables and modern electronic displays.

"At this point there is ample evidence that flipped classes with active learning environments work; the focus is now on how to get faculty to adopt these best practices," she said, noting that transforming a traditional lecture into an online course module—breaking it into bite-sized chunks, recording the video and hosting it on the edX platform—can take up to 20 hours. "Although my primary goal is to improve the learning experience for my students, my secondary goal is to be a resource for my colleagues so that I can help them transform their courses."

With his portion of the DLI funding, Professor Mark Horenstein (ECE) is developing a series of 30-minute course modules to aid fellow EK307 instructors who wish to flip their classrooms or enhance them with online instruction. Always available to students and consisting of animated, voiced-over PowerPoint and/or videotaped lectures, the modules are intended to provide an interactive learning tool to supplement traditional textbooks, lectures, discussions and lab work.

By Mark Dwortzan

PhD Dissertations

Student Name	Dissertation Advisor	Dissertation Title
Jie Meng	Ayse Coskun	Modeling and Optimization of High-Performance Many-core Systems for Energy-efficient and Reliable Computing
Jing Li	Aaron Schmidt (ME)	Ultrafast Thermoreflectance Microscopy
Nathaniel Lawrence	Luca Dal Negro	Engineering Photonic and Plasmonic Light Emission Enhancement
Kirill Trapezenikov	Venkatesh Saligrama	Machine Learning on a Budget
Alex Reddington	Selim Ünlü	Instrument Design and Optimixation of Interfeometric Reflectance Imaging Sensors for In-Vitro Diagnostics
Arif Cetin	Hatice Altug	Engineering of Plasmonic Excitations for Hand-Held and Ultra-Sensitive Biosensors
Jeffrey DiMaria	Roberto Paiella	Plasmonic Control of Light Emission for Enhanced Efficiency and Beam Shaping
Cicek Boztug	Roberto Paiella	Tensiley Strained Germanium Nanomembrances for Infrared Light Emitting Devices
Ke Chen	David Castañón	Reconstruction Algorithms for Multispectral Diffraction Imaging
Johnathan Schuster	Enrico Bellotti	Advanced Numerical Modeling and Hybridization Techniques for Third-Generation Infrared Dectector Pixel Array
Chao Chen	Ajay Joshi	Energy-Efficient Electrical and Silicon-Photonic Networks in Manycore Systems
Ahmet Tuysuzoglu	Selim Ünlü	Robust Inversion and Detection Techniques for Improved Imaging Performance

Additional PhD Dissertations with ECE Advisors

2014 Best Dissertation
Jie Meng

| Student Name	Dissertation Advisor	Dissertation Title
Zheng Jiefu (SE)	David Castañón	Stochastic Network Interdiction Games
Wei Zhang (MSE)	Theodore Moustakas	Development of Aluminum Gallium Nitride Based Optoelectronic Devices Operating in Deep UV
Adam Moldawer (MSE)	Theodore Moustakas	Growth of Polar and Non-polar Nitride Semiconductor Quasi-substrates by Hydride Vapor Phase Epittaxy for the Development of Optoelectronic Devices by Molecular Beam Epitaxy

Professors

Enrico Belloti

Irving Bigio

David Bishop
Head of the Division
of Materials Science
& Engineering

Richard Brower
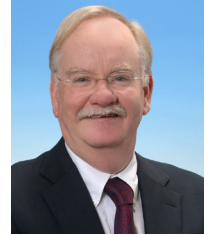
Robert Brown
President

Christos Cassandras
Head of the Division of
Systems Engineering

David Castañón
Department Chair

Roscoe Giles

Mark Horenstein

Allyn Hubbard

W. Clem Karl

Mark Karpovsky

Ronald Knepper

Janusz Konrad

Min-Chang Lee

Lev Levitin
Distinguished Professor

Thomas Little
Associate Dean of
Educational Initiatives,
NSF Smart Lighting
ERC Associate Director

**Theodore
Moustakas**

S. Hamid Nawab
Graduate Studies
Associate Chair

Ioannis Paschalidis
Center for Information
& Systems Engineering
Co-Director

**Siddharth
Ramachandran**

**Venkatesh
Saligrama**

Eric Schwartz

Joshua Semeter
Center for Space Physics
Associate Director

Alexander Sergienko

David Starobinski

Ari Trachtenberg

Selim Ünlü
Associate Dean for Research
& Graduate Programs

Associate Professors

Murat Alanyali

Jeffrey Carruthers

Luca Dal Negro

Martin Herbordt

Prakash Ishwar

Robert Kotiuga

Roberto Paiella

Alan Pisano
Associate Professor of the
Practice

Anna Swan

Assistant Professors

Ayse Coskun

Douglas Densmore

Vivek Goyal

Ajay Joshi

Jonathan Klamkin

Bobak Nazer

Michelle Sander

Affiliated Faculty

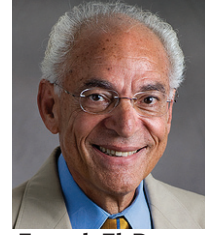**John Baillieul**
Professor, Mechanical Engineering

Calin Belta
Associate Professor, Mechanical Engineering

Carlo De Luca
Professor, Biomedical Engineering; Research Professor, Neurology

Solomon Eisenberg
Professor and Chair, Biomedical Engineering; Joint Faculty Member (BME, ECE)

Farouk El-Baz
Director, Center for Remote Sensing; Research Professor, Archaeology

Theodore Fritz
Professor, Astronomy

Bennett Goldberg
Professor, Physics and Biomedical Engineering

Lee Goldstein
Associate Professor, Biomedical Engineering

William Klein
Professor, Physics; Joint Faculty Member (ECE, Physics)

Michael Mendillo
Professor, Astronomy

Jerome Mertz
Professor, Biomedical Engineering

William Skocpol
Professor, Physics

Research Faculty

Swapnil Bhatia
Research Assistant Professor

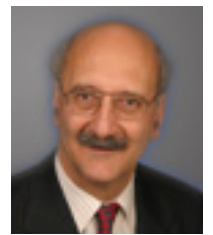**Robert Gray**
Research Professor

Gerd Keiser
Research Professor

Carlos Lopez
Research Assistant Professor

Malay Mazumder
Research Professor

Dimitris Pavlidis
Research Professor

Daniel Tsui
Research Professor

Emeritus Faculty

Thomas Kincaid **Theodore Morse** **David Perreault**   **Michael Ruane**   **Bahaa Saleh**   **Malvin Teich**   **Richard Vidale**

Adjunct Faculty

Vladimir Kleptsyn
Senior Lecturer

Babak Kia Montazam
Senior Lecturer

David Freedman
Adjunct Assistant Professor

Thomas Skinner
Adjunct Associate Professor

Administrative Staff

Department Director
Wayne Rennie (Retired April, 2014)

Senior Programs Coordinator
Cali Stephens

Assistant Department Director
Maureen Tarantino

Financial Administrator
Solaris Bujor

Assistant to the Chair
Becky Bell (Left October, 2013)
Chirstine Geurard (Started February, 2014)

Financial Administrator
Ryan Flament

Academic Programs Manager
Austin Alexander

Publications, New Media, & Promotions Administrator
Rachel Harrington (Left January, 2014)
Gabriella McNevin (Started April, 2014)

Technical Staff

Instructional Technology & Desktop Systems Manager (ENG IT – ECE Contact)
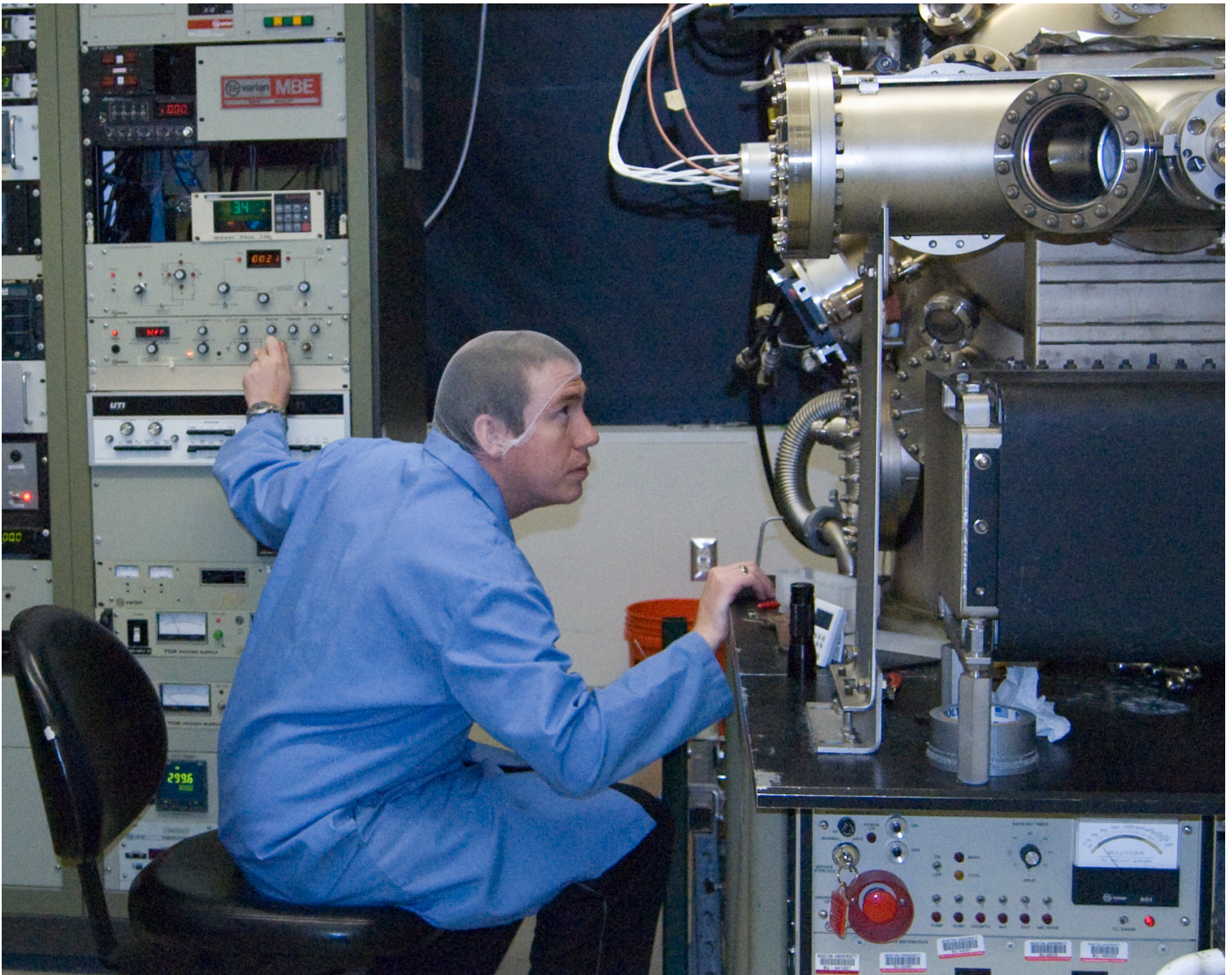James Goebel

Manager, Electronics/Circuits Lab
Vladimir Kleptsyn

Laboratory Manager
Alexey Nikiforov

Manager, Instructional Labs
Ilyas Hamdi

Boston University College of Engineering
Department of Electrical & Computer Engineering

8 Saint Mary's Street, Room 324
Boston, MA 02215

617-353-2811
ece@bu.edu
www.bu.edu/ece