Electrical and Computer Engineering

Annual Report **2018 – 2019**

Tufts UNIVERSITY | School of Engineering

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On the Cover:
In the Renewable Energy and Applied Photonics (REAP) Labs, researchers like Ph.D. candidates Margaret Stevens and John McElearney, Jr. work with Associate Professor Tom Vandervelde to study how light fundamentally interacts with matter.

Principal Photography:
Anna Miller and Alonso Nichols/Tufts University

Design:
What Design, Inc.

Professor and Chair **Eric Miller**

From the Chair

Welcome to the 2019 Annual Report for the Tufts Department of Electrical and Computer Engineering (ECE). I am again happy to be able to share with you the many impressive accomplishments and successes of our students, alumni, and faculty. Our undergraduate enrollment remains strong with 96 electrical engineering and computer engineering majors heading into the 2019-2020 academic year. The same is true for the ECE Ph.D. program, where 44 students are currently working with the faculty in the department. Our master's degree programs are growing substantially with about 70 students spread across programs in electrical engineering, computer engineering, data science, and human-robot interaction.

This year has seen strong developments in a number of department focus areas. **Professors Usman Khan** and **Shuchin Aeron** both received interdisciplinary research awards exploring different aspects of **autonomous systems**. In collaboration with faculty from the Departments of Mechanical Engineering and Civil and Environmental Engineering, with funding from the National Science Foundation, Professor Khan will be developing state-of-the-art probabilistic control and processing methods as the core component of a "smart," mobile, robotic system to vastly improve our ability to monitor critical civil infrastructure. As part of a group from across the School of Engineering, the U.S. Air Force is supporting work by Professor Aeron focused on advanced machine learning methods for classifying the mental state of an individual, with the aim of improving the interaction of teams comprised of both humans and robots.

This has also been a great year for **Professor Sameer Sonkusale**, whose work on **nano-scale bio-sensing devices** has garnered much attention. From smart bandages used to monitor wound healing to smart chemical-sensitive threads, Professor Sonkusale is a world leader in this emerging field of research. His microneedle technology for drug delivery provided the technical basis for this year's Stephen and Geraldine Ricci Interdisciplinary Prize winning team at the Tufts $100k New Ventures Competition. The successful Hero Patch team included ECE alum Robert Treiber III, E18.

Complementing the department's research effort, 2019 has also been a strong year in terms of instruction. Having joined ECE as a lecturer in September 2019, **Professor Steven Bell** has already had a huge impact on our programs, developing a number of classes to support our growing master's degree programs and totally re-designing and teaching the core digital circuits class, ES-4. In addition to the enthusiasm of the students for these contributions, we were gratified to learn that Professor Bell received a 2019 Tufts Teaching with Technology Award in recognition of his effective and meaningful use of technology in his academic courses. **Professor Ron Lasser** was the recipient of the Henry and Madeline Fischer Award from the School of Engineering. In and of itself, the Fischer Award is quite an achievement. Of special note here, though, is the remarkable fact that this is the third consecutive year the award has gone to Professor Lasser. Finally, we are pleased to welcome **Dr. Brian Aull** to the faculty starting in September 2019. Professor Aull, an expert in solid state devices and photonics and a long-time adjunct in our department, will be joining ECE as a lecturer teaching classes across the electrical engineering curriculum.

It is my hope that the balance of this report conveys the depth and breadth of the achievements of our faculty, students, and alumni this past year. Perhaps you will consider supporting the department financially. From professional development and research to instruction and equipment, a gift of any size to the department can have a tangible and immediate impact on our students and faculty. To donate, please visit go.tufts.edu/donateECE.

Best,

Eric Miller, Professor and Chair

Faculty News, Honors, and Awards

Bell recognized for use of technology

Lecturer Steven Bell, who joined the department in the fall of 2018, was selected as the recipient of a 2019 Tufts Teaching with Technology Award in recognition of his innovative use of technology in the classroom.

Lecturer
Steven Bell

Associate Professor
Usman Khan

Khan named associate editor of IEEE journal

Associate Professor Usman Khan was appointed an associate editor of *IEEE Transactions on Signal and Information Processing Over Networks*.

Lasser honored for teaching

For the fourth time in his career and the third consecutive year, Professor of the Practice Ronald Lasser received the Henry and Madeline Fischer Award for Teaching Excellence in the School of Engineering. The award recognizes teaching excellence and dedication to students, and nominees are selected by the senior class.

Professor of the Practice
Ronald Lasser

Professor and Dean of
Graduate Education
Karen Panetta

Panetta promotes engineering

Professor and Dean of Graduate Education Karen Panetta interviewed astronaut and former director of Johnson Space Center Ellen Ochoa for a Tufts podcast on Ochoa's experience as a woman in STEM fields. Panetta's research on developing algorithms for robot vision and imaging applications was featured in a *Mechanical Engineering* article (published by the American Society of Mechanical Engineers) on robotic interventions in the food industry. In addition, she spoke to the *Sacramento Bee* about the future of human remote monitoring of autonomous vehicles.

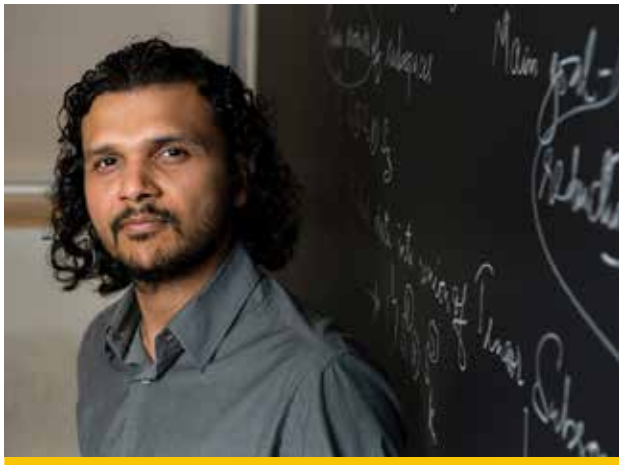
Professor
Sameer Sonkusale

Sonkusale named to advisory board

Professor Sameer Sonkusale was named to the Vice Chancellor's Advisory Board at SRM University, AP — Amaravati, in India. Research from Sonkusale's lab on a new "smart" bandage was featured on the National Institutes of Health (NIH) Director's Blog. It was also highlighted in a story by Boston's WCVB Channel 5 news and in *Mechanical Engineering* magazine.

Collaboration in multimodal data sets

Collaborative work leads to new representation of multimodal data sets that is both informationally and computationally efficient.



Associate Professor Shuchin Aeron

Associate Professor Shuchin Aeron partnered with faculty from the Departments of Mathematics at Tufts University and North Carolina State University to develop promising new methods for the analysis of high dimensional data sets found in problems ranging from facial recognition and geophysics to video processing and medical tomography. One of the central Big Data computational challenges is efficiently and accurately extracting the most relevant information from a large and noisy set of data. While well-established methods for this type of compression exist for Small Data cases, their generalization to larger problems is by no means obvious.

This is where the work of Aeron and collaborators is relevant. Combining ideas developed by Tufts Professor Misha Kilmer in the area of multi-linear algebra with random sampling methods, Aeron, Kilmer, and colleagues have developed the randomized tensor singular value decomposition (tSVD). This algorithm can be used to approximate the pieces of Kilmer's original tensor tSVD most needed for solving a given machine learning problem, but is more computationally efficient to generate, is highly parallelizable, and in the case of facial recognition, is as accurate as the original tSVD methods.

Moving forward, Aeron and collaborators hope to design more scalable methods of compression that can accommodate problems where new data is being streamed into an existing dataset. Learn more at go.tufts.edu/MultiModalDataSets

Course redesign

This year, Lecturer Steven Bell redesigned the ES4 course, Introduction to Digital Logic Circuits. While the fundamentals of digital logic are the same as they were thirty years ago, the availability and accessibility of low-cost field programmable gate arrays (FPGAs) provides an opportunity – and an imperative – to rethink how digital design is taught.

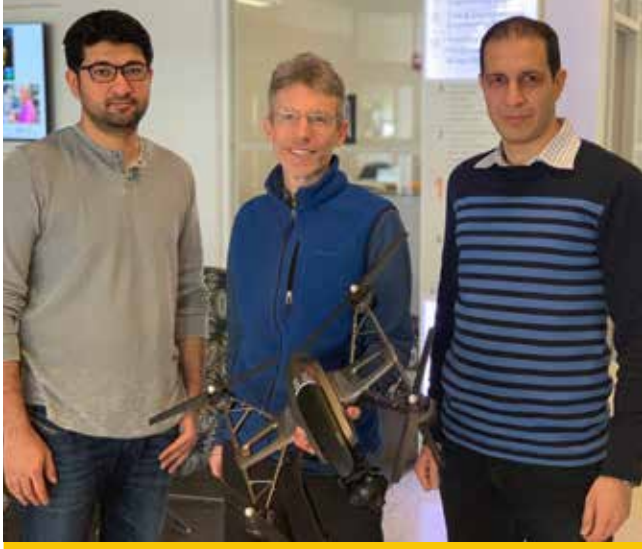
Student teams showed their work in the ES4 final project fair.

The new course focuses on building fun things with real hardware, including multiplexed LEDs, video game controllers, keyboards, and VGA displays. Logic design with VHSIC hardware description language (VHDL) is now a central focus of the course, woven through lectures, homework, and labs. Bell created a new web-based VHDL simulation tool, which allows students to practice coding on any device, at any time – even on a smartphone during an in-class exercise. He received a 2019 Tufts Teaching with Technology Award for this work.

Learn more at go.tufts.edu/ES4

Faculty and Student Research

Mobile sensor systems



Associate Professor Usman Khan (left) with collaborators and fellow associate professors Jason Rife and Babak Moaveni

The field of automated structural health monitoring is evolving as a complement to traditional visual inspection by structural engineers. Smart sensor networks might be deployed on infrastructure like buildings, bridges, or wind turbines to provide a real-time diagnosis of structural health. In NSF-funded research, Associate Professor Usman Khan is working with two School of Engineering colleagues to examine the potential benefits of mobile sensors for analyzing structural health. If sensors can be placed by robots, retrieved, and then placed in new locations, it may be possible to localize damage – like after an earthquake – much more precisely and much more quickly than would be possible with fixed sensors.

Professor and Chair
Eric Miller

Using sensors to monitor performance

The Center for Applied Brain and Cognitive Sciences (CABCS) is a cooperative research initiative between Tufts University and the U.S. Army CCDC Soldier Center. In collaboration with the CABCS, a number of Tufts researchers – including Associate Professor Shuchin Aeron and Professor and Chair Eric Miller – participated in a recent U.S. Army study that used sensors to monitor soldiers' cognitive performance and biomechanics during a training exercise. The study is helping researchers examine how the human body functions and identify which measures are the most important to track. It could lead to the development of better training for soldiers and enable more informed leadership decisions.

Associate Professor
Shuchin Aeron

Building a smarter bandage

A team of researchers in Professor Sameer Sonkusale's Nano Lab developed a prototype bandage designed to actively monitor chronic wounds and deliver drug treatments to improve the chances of healing. The research, published in the journal *Small*, is aimed at transforming bandaging from a traditionally passive treatment into a more active paradigm that can address a difficult medical challenge: wounds that overwhelm the regenerative capabilities of the skin. The researchers designed the bandages with heating elements and thermo-responsive drug carriers that can deliver tailored treatments in response to embedded pH and temperature sensors that track infection and inflammation.

Professor
Sameer Sonkusale

Power generation

Associate Professor Tom Vandervelde

Associate Professor Tom Vandervelde received an NSF grant to investigate new methods for solving inefficiencies in electricity production. His research focuses on thermophotovoltaic cells (TPVs), a new type of device that can reduce or eliminate inefficiencies in energy generation processes. Solar cells primarily absorb visible light, but TPV cells absorb infrared light (radiated heat) and could potentially be used to generate power from any heat source without moving parts. Vandervelde sees applications for this research in the improvement of existing energy conversion technologies, including natural gas, coal, and nuclear energy.

Catching waves

Associate Professor Mai Vu

In the context of ever-increasing demand for cellular and wireless communications, the millimeter wave spectra presents a promising alternative to the current frequency range for cellular use. It is able to simultaneously support both mobile communications and backhaul, or information moving between a cell phone and the cell tower as well as between the towers, and it's one of the key technologies for the upcoming 5G networks. With NSF funding, Associate Professor Mai Vu and Professor Sameer Sonkusale are bringing together hardware and software to address crucial obstacles that currently block the adoption of millimeter wave communication.

Professor Mohammed Nurul Afsar

Associate Professor Valencia Joyner Koomson

Next generation communications

As part of developing the components in a communication system for the millimeter wave spectra (see "Catching waves"), manufacturers or researchers need to apply a very thin film of material, the thickness of only a few atoms, onto a substrate surface. It's currently extremely challenging to deposit a film that is both high quality and can be manufactured at low cost. That's where Professor Mohammed Nurul Afsar's and Associate Professor Valencia Joyner Koomson's NSF-funded research proposal comes in. They're developing a hexagonal ferrite thin film preparation system that will be applicable to wide-bandgap semiconductors, which allow devices to operate at higher temperatures, frequencies, and voltages.

Antennae for Wifi applications

M.S. student Tolga Zeybek and part-time lecturer Khaled ElMahgoub published a paper at the 2018 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting (APS/URSI). The paper, titled "A Dual Band Modified Sierpinski Antenna for Wifi Applications," was first developed in a Tufts class on antennas. Zeybek and ElMahgoub proposed an antenna employing Sierpinski fractal geometry specifically designed to resonate both the 2.45 GHz and 5.8 GHz Wifi bands. Fractal antennae are particularly useful in designing multiband, small antennas with low profiles. Zeybek presented the paper at the symposium.

M.S. student Tolga Zeybek

Smartphone energy consumption

Associate Professor Mark Hempstead and collaborators analyzed variations in the performance of smartphones of the same model.

Associate Professor Mark Hempstead

In a paper published at the 2019 IEEE International Symposium on Performance Analysis of Systems and Software, Associate Professor Mark Hempstead worked with collaborators from the University of Buffalo, Google, and the University of Illinois to analyze the differences in the performance and energy consumption of smartphones of the same model.

Hempstead and collaborators developed a comprehensive method for consumers to test variations in their smartphone's transistors that may be responsible for lower performance than advertised or documented in reviews. The researchers have packaged the method and test into an app now available on the Google Play store.

Hempstead and colleagues performed this study after previously observing that they were unable to reproduce performance results while running a CPU-intensive benchmark test on different smartphones of the same model. The team believed that these differences are due to variations in the underlying transistors in the devices. Variation in transistors of the same model has risen over time due to increasing chip complexity and the accompanying reduction in transistor size.

The researchers found up to a 20% difference in the energy consumption and performance of smartphones that were the same model. They also found that the differences, caused by transistor variations, are exacerbated by temperature effects. Ambient temperature has a big effect on the performance of a phone; benchmark test scores showed a preference towards lower ambient temperature. The score of a bad CPU at a significantly lower temperature significantly out-performs the score of a good CPU using the same benchmark test. Previous studies showed that putting smartphones into refrigerators can improve scores by up to 60%.

Unintended unequal chip creation is an issue that pre-dates the development of smartphones, but the size and operation style of the smartphone poses a unique set of issues. Smartphone manufacturers use voltage binning to overcome transistor differences. All phones of a certain model are made to operate at a constant frequency while their voltage supply varies, to make sure that frequency is met and operation is stable. This means that some phones will have a higher energy demand, and some of this electrical energy is converted to thermal energy, which heats the device.

However, smart devices have a built-in thermal limit and, unlike laptops and desktops, smartphones are too small for most effective temperature regulators. Some devices have been shown to reach their heat limit within 10 seconds, at which point performance slows, leading consumers to believe their devices are malfunctioning.

Paper authors: Guru Prasad Srinivasa (University of Buffalo), Scott Haseley (Google), Mark Hempstead (Tufts University), and Geoffrey Challen (University of Illinois).

Student News

Creating an analog synthesizer

In the course Music and the Art of Engineering, two students used new skills to build a complex instrument.

Zev Pogrebin and Sam Cohen worked together to create an analog synthesizer in their class on music and engineering.

For Zev Pogrebin and Sam Cohen, both E22, working at the intersection of the arts and engineering was a natural fit. The two students took EN1: Music and the Art of Engineering with Professor Jeffrey Hopwood, and created an analog synthesizer from the ground up as their final project.

The synthesizer was designed with the capabilities of digital devices and the sonic qualities of analog synthesizers. The final product, the DMASS synthesizer, is composed of three subsystems: a microcontroller that receives and processes input from the keyboard and sends commands to the voltage controlled oscillator (VCO), which uses circuits to create a musical effect, and an output stage that amplifies the sound to an unbalanced line level.

M.S. student Jon Manninen

To conceive of and finish the synthesizer, Cohen and Pogrebin utilized the novel engineering approach taken by Hopwood. In the course, students were encouraged to design their instruments and implement those designs through hands-on learning. Using coding knowledge, circuit building skills, and audio concepts, the team created a device that illustrates their shared interests in music and electronics.

ECE students were recognized with a number of awards this year, including:

- School of Engineering Award for Commitment to the Practice of Engineering: Jon Manninen
- Harry Poole Burden Prize in Electrical Engineering: David Janowsky, Sabrina Miller, Ben Roover, Ben Santaus, Jonathan Traester
- Amos Emerson Dolbear Scholarship: Aubrey Anderson, Mathias Barth, Tyler Klein, Ely Novakoski, Benjamin Zager
- Morris and Sid Heyman Prize Scholarship: Bennett Brain, Aidan Fike, Kevin Naranjo, Ashwin Swar
- Class of 1942 Prize Scholarship: Mathias Barth
- Gregory H. Arabian, A54, Air Force Prize Fund: Ryan Friedman
- Howard Sample Prize Scholarship in Physics: Adam Lipson, Kevin Naranjo, Melissa Rowland

Alumni Highlights

A Jumbo sounds off

Alumnus Joey Cirone makes full use of his Tufts education as an acoustic systems engineer at Bose Corporation.

Joey Cirone

Joey Cirone, E17, knew Tufts University was the place for him when he had a chance encounter with an engineering student in the Granoff Music Center after his campus tour. Cirone, a musician himself, wanted to check out the practice rooms available to students. "We talked for a half hour and she told me that she was able to do music and it didn't conflict with her engineering schedule" says Cirone, "so I immediately thought, 'Wow, this is a pretty good school for me.'"

Cirone first majored in mechanical engineering, but switched to electrical engineering after taking Professor Jeffrey Hopwood's course on music and the art of engineering (see page 7). For their final project, students created a synthesizer to incorporate electrical engineering concepts with music. The experience led Cirone to think carefully about the synergies of music and engineering technology, and the professional opportunities available in the field.

"I interned at Bose Corporation between my junior and senior year, and I thought it would be a really good idea to have a mentor from industry," says Cirone. He reached out to a Bose researcher whose talent he admired, and together they explored how to create immersive audio experiences for augmented and virtual reality. Cirone used this exploratory period to develop his senior capstone project, TriPhonic, a spatialized audio prototype with head tracking for mobile devices. That hands-on work experience with a successful prototype differentiated him from his peers when he sought full-time employment at Bose, and he was hired the following summer.

Today, Cirone works as an acoustic systems engineer within the automotive systems division at Bose, providing premium audio systems to car manufacturers across the globe. He is responsible for the overall sound quality of these sound systems. He selects speakers, chooses where to place the speakers within the vehicle, and determines the software required to optimize the sound. Cirone often travels to automotive manufacturing plants around the world to take acoustic measurements of prototype vehicles.

"I have a pretty cool and unique position where I learn a lot about an entire product from beginning to end and work with a lot of different teams to put something together," says Cirone. Although he didn't study acoustics at Tufts, the foundational concepts from his early classes in electrical engineering, mechanical engineering, and physics have helped him to quickly pick up new concepts in the workplace.

From the perspective of someone who's done it himself, Cirone recommends combining engineering training with one's hobbies to build a career. He encourages students and alumni to reach out to Tufts alums in any type of industry and ask them about their experiences. "That's a really good way to make a connection with someone who can help you through the job process and can give you advice on how they found their niche," he says. In the next few years, Cirone is interested in earning an M.S. in Engineering Management from Tufts Gordon Institute, and he looks forward to continuing to pursue his passions at Bose.

Quick hits

Robert Treiber (fourth from left, back row) and his Hero Patch teammates with the group of $100k New Ventures Competition winners.

Filters in focus

With colleagues, Emir Salih Magden, E12, published findings in *Nature Communications* on a new on-chip optical filter that processes a wide spectra of optical signals.

Alumni recognized as top graduate students

Andrew Bourhis, E17, and Brian Rappaport, E18, were named Fellows in the 2019 National Science Foundation Graduate Research Fellowship Program. Bourhis is studying medical devices and systems in the Department of Electrical and Computer Engineering's Ph.D. program at UC San Diego. Rappaport is pursuing a Ph.D. in electrical and computer engineering at Cornell University.

Excellence in entrepreneurship

Robert Treiber III, E18, was part of the Hero Patch team, which won the Stephen and Geraldine Ricci Interdisciplinary Prize in the 2019 $100k New Ventures Competition.

Engineering a new route to pet adoptions

Alumnus Brian Eriksen, E92, helped develop an online service called Get Your Pet that links people surrendering their dogs and cats with those looking to adopt. Learn more at getyourpet.com

Digital revolution of 3D printing

In the fall of 2018, HP Labs' Keith Moore, E85, visited the Tufts campus and delivered a School of Engineering Dean's Lecture on advances in 3D printing.

Alumni launch start-up

Tom Baran and Matt Hirch, E04, created Lumii, a holographic print company that uses complex algorithms to place dots of ink to add depth, motion, and chromatic effects to packages and labels. Learn more at lumiidisplay.com

Brian Eriksen's son Nounn adopted Tuck through the Get Your Pet website

Keith Moore of HP Labs talked with students after delivering a Dean's Lecture on the 3D printing revolution.

Our Graduates

Ph.D. in Electrical Engineering

Long Bao
Dissertation: Computational Photo Aesthetic Processing, Enhancement, Quality Measure and Applications
Advisor: Professor and Dean of Graduate Education Karen Panetta

Meera Punjiya
Dissertation: Towards Integrated CMOS Microsystems for Single-Cell Transfection and Analysis
Advisor: Professor Sameer Sonkusale

Hamideh Rezaee
Dissertation: Fusion of Energy Resolved Scatter and Attenuation Data for Limited-view X-ray Tomography
Advisor: Professor and Chair Eric Miller

Fakhteh Saadatniaki
Dissertation: Networked Dynamical Systems: A Control-Theoretic Approach
Advisor: Associate Professor Usman Khan

Arash Samani
Dissertation: Spatial and Transform Domains Content-Specific Image Quality Metrics with Applications for Biomedical and Security Imaging Systems
Advisor: Professor and Dean of Graduate Education Karen Panetta

Qianwen Wan
Dissertation: Multi-Modal Analytic Systems and Applications Using Head-Mounted Eye-Tracking Technology and Augmented Reality
Advisor: Professor and Dean of Graduate Education Karen Panetta

Gang Wang
Dissertation: Equation-Free System-Level Modeling and Analytics in Energy Processing Systems
Advisor: Aleksandar Stankovic, Alvin H. Howell Endowed Professor in Electrical Engineering

Master of Science in Electrical Engineering:

Hexiao Bai
Lisa Fantini
Noel Hwang
Landry Kezebou
Ashton Knight
Connor Lansdale
Celia Lewis
Feilong Liu
Yushi Liu
Jon Manninen
Camila Menard
Yuan Ning
Richard Preston
Muhammad Qureshi
Huilin Tong
Tielin Wang
Chenlu Wu
Kenny Yau
Lu Yin
Ahmed Zayan
Tolga Zeybek
Yiran Zuo

Certificate in Microwave and Wireless Engineering:

Sadaf Ashraf

Bachelor of Science in Electrical Engineering

Aubrey Anderson
Mathias Barth
Nicholas Berger
Kenneth Brown
Liam Crowley
Victor Dinh
Zachary Faber Manning
Brendan Fahey
Anne Geheran
James Hoder
Harrison Kaiser
Tyler Klein
Nathan Krinsky
David Lackner
Joseph Meng
Ashish Neupane
Ely Novakoski
Emma Pannullo
Tenriaji Sjamsu
Jonathan Traester
Diana Whealan

Bachelor of Science in Computer Engineering

Joseph Bessette-Denwood
Vincent Bett
Haiting Chan
Matthew Chang
Samuel Gertler
Benjamin Holen
Ambika Jayakumar
Ashton Stephens
Winnie Zheng
Patrick Zwierzynski

New Ph.D. recipients were hooded by their advisors at the School of Engineering Graduate Programs Commencement Ceremony in May 2019.

Events

ECE Colloquium Series, Fall 2018

Rafia Malik, Tufts University
Robert Adams, Analog Devices
Alyssa Apsel, Cornell University
Edmund Yeh, Northeastern University
Julius Georgiou, University of Cyprus
Paolo Bonato, Spaulding Rehabilitation Hospital, Harvard Medical School
Joe Farkas, Collision Communications Inc.
Sarah Bargal, Boston University
Donald Richard Brown, Worcester Polytechnic Institute
Sanjay Krishna, Ohio State University
Yin Wang, Avigilon
Brad Gaynor, Systems & Technology Research (STR)
Carole-Jean Wu, Arizona State University, Facebook

ECE Colloquium Series, Spring 2019

Damon Hyde, Boston Children's Hospital
George Zavaliagkos, Sense Labs
Deji Akinwande, University of Texas at Austin
Gary Hatke, MIT Lincoln Laboratory
Seokheun Choi, SUNY Binghamton
Ulya Karpuzcu, University of Minnesota and Brown University
Corey Shemelya, University of Massachusetts-Lowell
Paul Simmonds, Boise State University
Rafael Jaramillo, Massachusetts Institute of Technology
Stephanie Law, University of Delaware
Aaron Mazzeo, Rutgers University
Susanna Thon, Johns Hopkins University
Paul Whatmough, ARM
Muyinatu Bell, Johns Hopkins University

External Advisory Board Members

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Draper Laboratory
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CACI
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Anthony Marinilli
Raytheon
Chief Hardware Engineer, Engineering, Technology, and Mission Assurance

Matt Murphy
Kleiner, Perkins, Caufield, Byers
Partner

Prem Natarajan
University of Southern California
Executive Director, Viterbi School of Engineering's Information Sciences Institute

Arye Nehorai
Washington University
Chair, Electrical and Systems Engineering

Thomas O'Dwyer
Analog Devices
Director of Healthcare Technology

John Roush
GSI Group
Chief Executive Officer

Robert Shin
MIT Lincoln Laboratory
Head of Intelligence, Surveillance, and Reconnaissance (ISR) and Tactical Systems Division

Bob Treiber
Boston Engineering
President

Michael Tzannes
Tzannes Patent Management, LLC
Founding Executive Manager

Jan van der Spiegel
University of Pennsylvania
Professor, Former Chair, Electrical and Computer Engineering

Matthew Verminski
Kiva Systems
Director of Hardware Engineering

Dmitri Volfson
Pfizer
Director of Statistics, Research Statistics, Neuroscience Unit

Our Faculty

DEPARTMENT CHAIR AND PROFESSOR

Eric Miller
Ph.D., Massachusetts Institute of Technology
Physics-based signal and image processing and inverse problems, Applications explored include medical imaging and image analysis, environmental monitoring and remediation, landmine and unexploded ordnance remediation, and automatic target detection and classification

PROFESSORS

Mohammed Nurul Afsar
Ph.D., University of London
Precision microwave, millimeter, submillimeter, terahertz, infrared wave; Solid, liquid, and gaseous state physics, spectroscopy

Jeffrey Hopwood
Ph.D., Michigan State University
Microwave circuit design for microplasma generation, Microplasma-based environmental sensors and other microsystem applications, Plasma diagnostic methods, characterization and modeling

Karen Panetta
Dean of Graduate Education, Tufts School of Engineering
Ph.D., Northeastern University
Image and signal processing for security and medical applications, Modeling and simulation, Multimedia

Douglas Preis
Ph.D., Utah State University
Signal analysis, Digital signal processing, Audio engineering, Electromagnetic theory

Sameer Sonkusale
Ph.D., University of Pennsylvania
Integrated circuits for sensors and instrumentation, Nanoelectrochemical systems on silicon, CMOS image sensors for scientific imaging, Analog to information converters, Active metamaterial circuits and systems, Terahertz integrated circuits, Metamaterials and plasmonics

Aleksandar Stanković
Alvin H. Howell Endowed Professor in Electrical Engineering
Ph.D., Massachusetts Institute of Technology
Modeling, control, and estimation in electric energy processing, Power electronics, Power systems, Electric drives

ASSOCIATE PROFESSORS

Shuchin Aeron
Ph.D., Boston University
Statistical signal Processing (SSP), Inverse problems, Compressed sensing, Information theory, Convex optimization, Machine learning

Chorng Hwa Chang
Ph.D., Drexel University
Computer architecture, Parallel processing, Computer networking, Hardware description languages, Simulation and programmable logic design, Engineering education

Usman Khan
Ph.D., Carnegie Mellon University
Robotics, Signal processing, Sensing in the context of distributed estimation and control algorithms, Distributed, iterative algorithms in random environments

Valencia Joyner Koomson
Ph.D., University of Cambridge
Design of silicon-based mixed-mode VLSI systems (analog, digital, RF, optical), Analog signal processing, Optoelectronic system-on-chip modeling and integration for applications in optical wireless communication and biomedical imaging

Mark Hempstead
Ph.D., Harvard University
Computer architecture, Computer systems, Power-aware computing, Embedded systems, Mobile computing

Tom Vandervelde
Ph.D., University of Virginia
Interaction of light with matter, Physics of nanostructures and interfaces, Semiconductor photonics and electronics, Epitaxial crystal growth, Materials and devices for energy and infrared applications

Mai Vu
Ph.D., Stanford University
Cognitive and cooperative communications, Energy-efficient communications, Wireless communications, Network information theory, Statistical signal processing, Convex optimization and applications

PROFESSORS OF THE PRACTICE

Ronald Lasser
Ph.D., Carnegie Mellon University
Digital image processing, Computer animation, Swarm robotics, Innovation, Engineering method & design

Brian Tracey
Ph.D., Massachusetts Institute of Technology
Imaging techniques and image processing, Computational acoustics and acoustical signal processing, Biomedical signal processing and medical device development

RESEARCH ASSISTANT PROFESSOR

Kevin A. Grossklaus
Ph.D., University of Michigan
Optoelectronics, Thin film deposition, Energy materials, Materials characterization, III-V semiconductors

LECTURERS

Brian Aull
Ph.D., Massachusetts Institute of Technology
Photon-counting imaging, Wavefront sensing, Low-light passive imaging

Steven Bell
Ph.D., Stanford University
Signal and image processing

Joel Grodstein
M.S.C.S., University of Utah
VLSI, Computer architecture, Computer-aided design and computing at the intersection of hardware and software, Interdisciplinary courses combining these topics with biology

Tufts UNIVERSITY | School of Engineering

Department of Electrical and
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Medford, MA 02155

Tufts electrical engineers and chemical engineers created 3D-printed metamaterials and novel optical devices, including an omnidirectional microwave antenna inspired by a moth's eye. The team members from ECE included Ph.D. student Aydin Sadeqi, postdoctoral fellow Hojatollah Rezaei Nejad, and Professor Sameer Sonkusale, and the research was published in *Microsystems & Nanoengineering*.