Department of Electrical Engineering and Computer Science

The Department of Electrical Engineering and Computer Science (EECS) is MIT's largest department, with 128 faculty conducting research in four affiliated labs: the Computer Science and Artificial Intelligence Laboratory, the Laboratory for Information and Decision Systems, the Microsystems Technology Laboratories, and the Research Laboratory of Electronics.

EECS is also home to a growing portion of MIT's student body. In the 2019–2020 academic year, 1,368 undergraduates, 271 master of engineering (MEng) students, and 742 graduate students were enrolled in the department.

This Report to the President covers department activity from July 1, 2019, through June 30, 2020.

EECS and the MIT Stephen A. Schwarzman College of Computing

As part of the founding of the MIT Stephen A. Schwarzman College of Computing, EECS—the largest academic unit at MIT—was restructured to provide a stronger base for enhancing existing programs, creating new opportunities, and increasing connections to other parts of the Institute, effective January 1, 2020.

Jointly part of the School of Engineering and the MIT Schwarzman College of Computing, EECS is now composed of three overlapping sub-units in electrical engineering, computer science, and artificial intelligence and decision making, the latter of which brings together computer science–heritage AI and machine learning with electrical engineering–heritage information and decision systems to exploit their significant synergies. The department will remain responsible for Course 6.

The organizational plan for EECS was developed over the summer based on the final report of the Working Group on Organizational Structure of the MIT Schwarzman College of Computing Task Force.

Distinguished Professor of Engineering Asu Ozdaglar, the newly appointed deputy dean of academics for theCollege of Computing, will remain the head of EECS, a position she has held since 2018. Joel Voldman, a professor of electrical engineering and computer science and a current associate department head at EECS, will be the faculty head for electrical engineering. Arvind, the Charles W. and Jennifer C. Johnson Professor in Computer Science and Engineering, will step into the role of faculty head

for computer science. Antonio Torralba, the Thomas and Gerd Perkins Professor of Electrical Engineering and Computer Science, has been named the faculty head for artificial intelligence and decision making.

EECS Faculty heads. Clockwise from upper left: Professor and department head Asu Ozdaglar, Professors and faculty heads Joel Voldman (electrical engineering), Arvind (computer science), and Antonio Torralba (artificial intelligence and decision making).
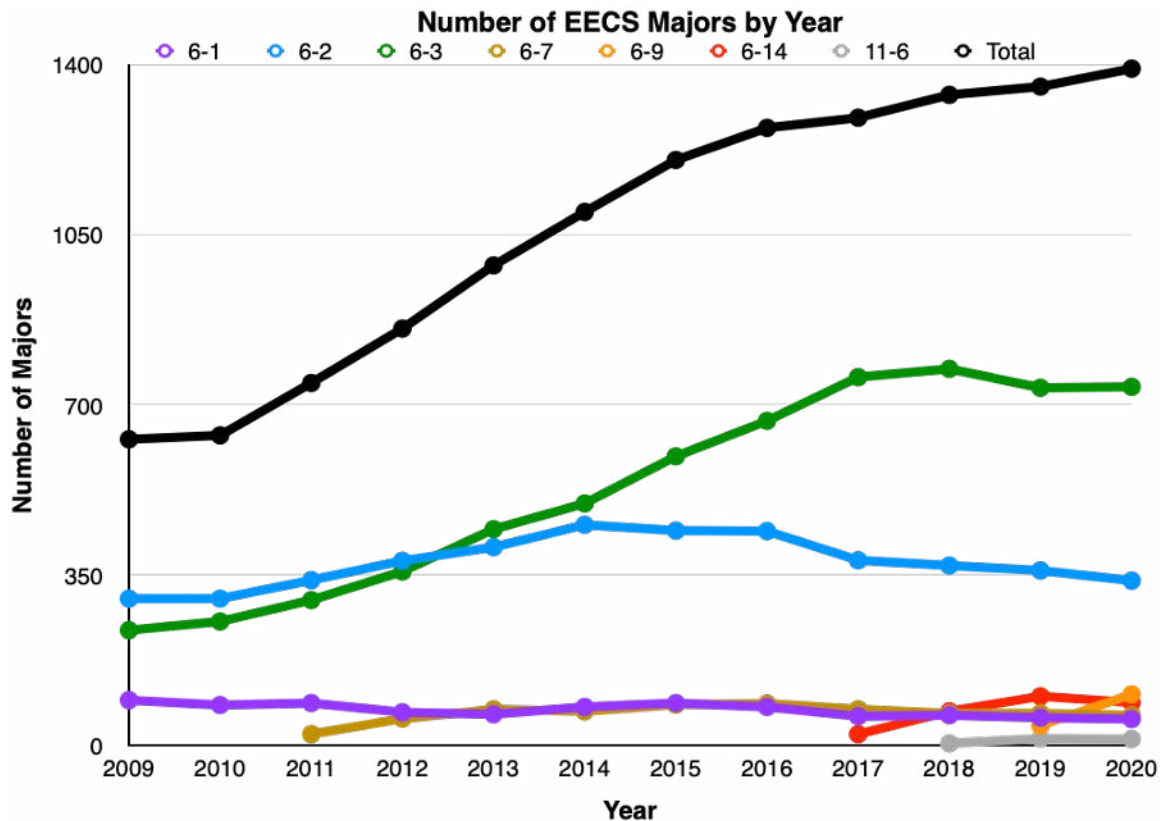
Undergraduate Program

Enrollment

In AY2020, 1,392 undergraduate students were enrolled in the department as of October 6, 2020, according to the Registrar Office's "Y" Report. The department also enrolled 259 MEng students (this figure includes participants in the 6-A MEng Thesis Program).

Undergraduate enrollment was split across the department's seven majors (percentages are rounded):

- 53 students (4%) in 6-1 (Electrical Science and Engineering)

- 338 students (24%) in 6-2 (Electrical Engineering and Computer Science)

- 737 students (53%) in 6-3 (Computer Science and Engineering)

- 61 students (4%) in 6-7 (Computer Science and Molecular Biology)

- 104 students (7%) in 6-9 (Computation and Cognition)

- 87 students (6%) in 6-14 (Computer Science, Economics, and Data Science)

- 12 students (1%) in 11-6 (Urban Science and Planning with Computer Science)

The 6-9 and 11-6 majors are administered by the undergraduate offices in Course 9 and Course 11, respectively.

Number of EECS majors, total and by program, AY2009–AY2020.

Undergraduate Office Updates

The Undergraduate Office hired two new staff members in 2019–2020: an academic administrator (replacing the previous administrator after her retirement) and a part-time administrative assistant (in addition to the existing full-time administrative assistant). These staffing changes, in addition to two new hires the prior year, have allowed the Undergraduate Office to completely transform its processes. The office has worked closely with Senior Lecturer Emeritus Christopher Terman to build numerous advising tools to support students and advisors. These tools—collectively known as "EECSIS"—include a new online audit, an administrative backend for the Undergraduate Office staff, and an online submission site for MEng theses.

EECSIS has made it easier for students and their advisors to track student progress and for the office staff to catch struggling students early. As a result, the Undergraduate Office saw a 75% reduction in the number of "problem cases" on the spring 2020 degree list.

EECSIS has also made it possible for the Undergraduate Office to continue supporting students remotely during the pandemic, both because the staff has easy access to information about students and because the time saved by using these tools has allowed the office to focus on community building and student counseling through online advising appointments.

Undergraduate Student Advisory Group

The department reconvened its Undergraduate Student Advisory Group in EECS (USAGE) in fall 2018. This group consists of roughly 20 students across the department from a variety of backgrounds. In AY2020, they were instrumental in advising EECS leadership on the state of the department, including how students were dealing with the pandemic, and helping the Undergraduate Office plan new initiatives. In AY2021, USAGE will begin to meet weekly, rather than monthly, in order to play a more integral role in the department.

Contributions to MITx

During the past year, EECS offered a variety of classes through the MITx online portal. Among the most popular were 6.00.1x Introduction to Computer Science and Programming Using Python and 6.00.2x Introduction to Computational Thinking and Data Science. A list of subjects follows, with the enrollment and completion numbers for each:

- 6.00.1x Introduction to Computer Science and Programming Using Python (registered: 240,310; explored: 20,952; completed: 7,273)

- 6.00.2x Introduction to Computational Thinking and Data Science (registered: 34,514; explored: 1,715; completed: 1,249)

- 6.431x Probability: The Science of Uncertainty and Data (registered: 85,090; explored: 5,977; completed: 2,554)

- 6.86x Machine Learning with Python: From Linear Models to Deep Learning (registered: 72,234; explored: 4,748; completed: 1,927)

- 6.002.1x Circuits and Electronics 1: Basic Circuit Analysis (registered: 61,254; explored: 4,209; completed: 240)

- 6.002.2x Circuits and Electronics 2: Amplification, Speed, and Delay (registered: 11,333; explored: 758; completed: 79)

- 6.002.3x Circuits and Electronics 3: Applications (registered: 10,821; explored: 466; completed: 62)

Departmental Exchange Programs

EECS has two departmental exchange programs: one with ETH Zürich and one with Imperial College London. Students in these programs spend one or both semesters of their junior year abroad, taking subjects that will transfer for core or restricted-elective subjects in EECS. In AY2020, seven students studied abroad on exchanges at ETH and Imperial. Because of the pandemic, students studying abroad in the spring were sent home early, and our study abroad programs for the current 2020–2021 academic year were suspended.

Accreditation

The department completed its Accreditation Board for Engineering and Technology (ABET) site visit in AY2020. EECS undergraduate officer Katrina LaCurts and EECS education officer Denny Freeman worked with the ABET accreditors in submitting follow-up documents to alleviate concerns about the department's continuous improvement process.

Department Teaching Laboratories

The EECS Department Teaching Laboratories supply faculty, students, and staff with the necessary work space and resources to apply theory from research and classes directly to practical implementation. They also contain one of the major campus makerspaces, providing students from across the Institute with access to facilities for printed circuit board (PCB) fabrication and testing, mechanical assembly, and three-dimensional (3D) printing, among many other hardware capabilities.

The 2020 academic year saw the continued growth of several new subjects, including 6.08 Introduction to EECS via Interconnected Embedded Systems and the popular first-year 6.A01 *Mens et Manus*: The Joy of MIT seminar. These classes continue to expose undergraduates to techniques and challenges in the design, manufacture, testing, and debugging of physical hardware in addition to traditional problem sets and exams.

More than 30 classes across the EECS spectrum use the teaching laboratories, with most students in those classes using the space several times each week. The 25,378-square-foot space remains accessible 11 hours a day, five days a week (hours have been reduced due to Covid-19), to serve as a regular classroom location and study area.

Students in Stefanie Mueller's 6.810 Engineering Interactive Technologies lab work with masks and in reduced numbers due to Covid-19.

During the academic year, EECS often highlights the teaching laboratories through alumni donor and prospective student tours, community outreach efforts, and industry events. The lab area stays active throughout the between-terms Independent Activities Period (IAP) with technical competitions such as MASLAB (Mobile Autonomous Systems), which provide students across campus an outlet to develop extensive systems that integrate both hardware and software. The Office of Engineering Outreach Programs offers several workshops and seminars during IAP and over the summer to engage local middle and high school students.

The teaching labs also support students engaged in individual practical work, whether informally, through a formal special projects course, or through a Sandbox-funded project. In these cases, lab staff work to coordinate safety and other concerns, find space, and establish guidelines for lab use.

Finally, the labs are critical to supporting the demonstration infrastructure in the department. They support the construction and storage of a large number of in-class demonstrations for classes such as 6.002 Circuits and Electronics; 6.003 Signals and Systems; 6.013 Electromagnetics and Applications; 6.014 Electromagnetic Fields, Forces, and Motion; and 6.302 Feedback System Design.

Engineering Design Studio

The Engineering Design Studio (EDS) within the Department Teaching Laboratories remains a campus hub for students to design and fabricate things that require

professional and high-power equipment. As a machine shop and makerspace tailored toward electrical engineering and computer science education, EDS continues to develop its in-house capabilities with additional 3D printers and milling machines for full printed circuit-board design and manufacturing.

EDS is unique in that it can be configured as a classroom for lecture-style classes but can simultaneously host equipment for testing and fabrication so that students can move back and forth seamlessly between practical work and instruction. This environment serves as a model for practical teaching spaces going forward. To that end, EDS reserves a number of high-quality testing elements that can be brought out and used in the space on request.

EDS continues to host an EECS-focused section of the popular class How to Make (Almost) Anything (offered under class number 6.943J). This 18-unit subject delves into technologies such as laser cutting, embedded programming, PCB design and fabrication, and large-format machining. It meets weekly in the fall with three other class sections across campus and at Harvard University, giving School of Engineering students exposure to peers with a variety of academic backgrounds. First-year students are engaged through the previously mentioned *Mens et Manus* seminar.

EDS has steadily received new visitors each year and continues to expand its reach. It has become home to many graduate students and Course 6 undergraduates as well as a diverse array of students from other majors who need more access to electrical materials than their home shops provide.

In order to better support remote classes, EDS and department teaching lab staff managed class component orders, kit assembly, and delivery to allow students a more seamless transition during such a difficult time. Thousands of components were ordered, organized, fabricated, and picked up by students (before remote learning began) or shipped across the country to their doorstep.

EECS faculty member Karl Berggren serves as the department's undergraduate laboratory officer.

Graduate Program

The EECS doctoral graduate program offers high-quality academics with a broad range of advanced course offerings. Moreover, our graduate students make leading contributions to an extremely wide range of research activities in all areas of science and nanoscience, health care and medical instrumentation and imaging, energy and energy efficiency, business, manufacturing, robotics, management of big data, and advances in technology. In areas impacted by computer science, implementation of machine learning with data from science, business, social networks, technology, medicine, and environmental sensing and monitoring is under intense investigation. The exciting research opportunities for our graduate students continue to attract outstanding and highly accomplished applicants striving to change the world in collaboration with their student peers and our faculty and research staff supervisors.

The EECS PhD program is a milestone-based advanced education with a limited number of requirements. Individuals entering after the bachelor's degree will be required to complete 66 units of graduate coursework along with a thesis research proposal and thesis to earn a master of science (SM) degree. Along with an SM degree, the doctoral-degree requirements are completion of the technical qualification evaluation (which consists of four EECS graduate subjects) and the research qualification examination, completion of a minor program (two coherently linked subjects), completion of a teaching assistantship, and completion of a doctoral thesis with a public thesis defense. A new PhD requirement, the Professional Perspective, was added in June 2019. This requirement is designed to assist graduate students with understanding the multitude of options that will be available to them upon graduation with an advanced degree. The Professional Perspective requires the completion of one unit for SM/MEng degrees or the completion of two units for PhD degrees. Completing the required units can be accomplished in a variety of ways, including industrial, academic, or government lab internships; attendance at industrial colloquia; participating in specialized training to prepare for an academic career; or participating in creating a company or collaboration with an industrial partner.

The 2020 admissions season resulted in 3,754 applications from all parts of the world and represents an increase in applications of 3.7% over 2019. Ultimately, 242 students were admitted into our graduate program representing roughly 6.4% of applications. In the fall 2020 semester, 137 new students will join the program, with 13 additional students joining in spring 2021. The 2020 class of PhD graduate students includes 41 women and 10 underrepresented minority students. Approximately 57% of the new students will be funded by fellowships, including MIT Presidential Fellowships, departmental fellowships sponsored by EECS alumni, and externally awarded fellowships such as National Science Foundation (NSF) Graduate Research Fellowships, industrially sponsored fellowships, and fellowships received from other countries. These internally and externally funded fellowships not only are important for financial support but also provide incoming graduate students with flexibility to select the desired research groups and projects to meet their interests and career goals. All students who are admitted into our graduate program are provided full financial support in the form of a fellowship, a research or teaching assistantship, or financial support from EECS. The support includes tuition, a monthly living allowance or stipend, and medical insurance for the first year.

As of June 30, there were 754 active EECS graduate students. Of these, 166 were women (22%) and 55% have international citizenship. The graduate student enrollment is 46% electrical engineering (23% women) and 54% computer science (21% women). Our graduate student body is highly accomplished, having received a wide assortment of fellowship awards. Roughly 210 current students (28%) are supported by fellowships, training grants, and internships.

In AY2020, EECS graduated students in September, February, and June. A total of 409 advanced degrees (down 8.7% from last year) were awarded: 217 MEng degrees, 107 SM degrees, and 85 PhD degrees.

Along with a graduate student body that is diverse in nationality, EECS strives to achieve a graduate student community that is diverse in gender, ethnicity, and race. To make inroads in supporting the diversity of applicants, the EECS Graduate Office staff and faculty regularly participate in Institute-wide recruiting efforts supporting MIT's Summer Research Program. Networking and mentoring seminars for women-identifying people are offered each fall (with reunions in the spring), and other events are held for individuals who may benefit from weekly group meetings and discussions. Three different networking seminars are currently offered for various groups of incoming graduate students.

Visit Days for Newly Admitted Graduate Students

EECS organizes a visit weekend for all students admitted to our graduate program. The weekend events provide a chance for admitted applicants to envision their lives as graduate students working on research and academics, and to view firsthand the multitude of opportunities provided by the MIT environment and Boston metropolitan area. Most important, the visit weekend allows admitted applicants to meet and interact with potential research supervisors, to view laboratories, to chat with research groups and potential classmates, and to see graduate dormitories and living spaces. One-on-one interactions are viewed as especially important during the visit weekend, hence a variety of opportunities for such interactions are highlighted in the weekend schedule.

In spring 2020, the visit weekend began with students arriving on campus on Thursday evening and attending a dinner and reception organized by the current EECS graduate student body. Formal sessions began on Friday with a research exchange dubbed "three-minute madness," in which EECS faculty and research staff each shared their research goals and philosophy as quickly as possible—in no more than three minutes. One-on-one meetings with faculty and research staff followed, giving admitted applicants their first experience of navigating MIT's "infinite corridor" as they moved from office to office meeting prospective research groups. Friday afternoon included a number of laboratory tours and a reception hosted by faculty and lab directors. The day ended with several dinners arranged by research area or group, offering more opportunities for informal interactions and discussions of research activities. On Saturday the EECS graduate officer described the program's academic requirements, and a panel of current graduate students discussed student life and responded to questions from the visitors.

Graduate Student Organizations

The graduate student body is very active, participating in organizations such as the EECS Graduate Student Association (GSA) and Graduate Women in Course 6 (GW6). Among other activities, the GSA offered an informational panel on the ins and outs of the research qualifying exam along with informal dinners with EECS faculty and guests. During the more relaxed summer months, the GSA organizes social events such as movie nights. GSA student volunteers are instrumental in the success of the EECS visit days and new student orientation in August, designing, organizing, and delivering a multitude of activities for newly admitted graduate students.

The Graduate Women of Course 6 is a women-identifying group that is active on campus, organizing numerous social, networking, and intellectual events. This past year,

GW6 welcomed EECS faculty to join in conversations at the Women in Tech breakfast series. Also, in collaboration with the EECS Communication Lab, GW6 members learned the art of the elevator pitch and practiced their communication skills. Social activities organized and offered by GW6 included a paint night, an outlet mall shopping excursion, a jewelry-making night, and kayaking and hiking trips. In addition, for the sixth year, GW6 organized the Graduate Women's Community Dinner in memory of Erin M. Aylward'06. The community dinner is an annual event to promote community and networking among graduate women in EECS.

This past year EECS initiated a new graduate student group, THRIVE (Tools for Honing Resilience and Inspiring Voices of Empowerment). THRIVE is a non-identifying intersectional organization that works to combat isolation and serves as a liaison to the senior MIT administration and the EECS departmental leadership to advance diversity, equity, and inclusion. THRIVE is also working to become a peer-to-peer support organization.

6-A Master of Engineering Thesis Program

The department's 6-A Master of Engineering Thesis Program, now in its 103rd year, is a partnership between MIT and some of the world's most innovative companies. It allows students to work on industry projects while simultaneously completing their MEng theses. Students typically join the program as juniors and seniors, completing three- and six-month assignments at their companies. Each participant is assigned both a faculty advisor and an industry mentor, and students' work for their companies is used toward their MEng thesis. In some cases, the program also covers the full tuition for the MEng degree and pays competitive salaries during students' work assignments. Students receive academic credit for assignments and are able to graduate with their class.

More than 2,500 alumni have completed the 6-A program over the years. The program currently has two tiers of industrial partners: core and affiliate partners. Core partners commit to supporting students during their internship at the company and their final term at MIT. Affiliate partners cover students' expenses only during their internship. Current core and affiliate partners include Analog Devices Inc., Applied Materials, Bose, Cadence, Cambridge Mobile Telematics, the Lawrence Livermore National Laboratory, and MIT Lincoln Laboratory.

The highly competitive program organizes two orientation sessions during the year, one in September and one in April. Fifty-nine EECS students applied during the fall recruitment and 15 during the spring. Seventeen students received offers from various 6-A companies, while two others were not matched with a 6-A company and 24 withdrew from the matching process for various reasons. Of the 17 students who accepted 6-A company offers and were admitted into the program, 10 were undergraduates on work assignments during the summer term. Seven MEng students were admitted in 2019 and will work on their assignments during the summer and fall 2020 terms. In addition, three students from the previous year have continued on to their MEng work assignments. In total, the program currently has nine undergraduates and 13 MEng graduate students. Sixteen 6-A MEng students completed the program and graduated in June 2020.

J. Francis Reintjes Excellence in 6-A Industrial Practice Awards were presented to two outstanding 6-A students: Lokhin Cheng and Matthew Hutchinson. Cheng completed three work assignments at Analog Devices in Santa Clara, CA, and Hutchinson completed two MEng work assignments at MIT Lincoln Laboratory. During their assignments, they demonstrated outstanding performance and truly impressed their mentors and advisors at their 6-A companies. Cheng has accepted a full-time engineering position at Analog Devices, while Hutchinson has received his commission as an officer in the United States Air Force and will be a developmental engineer at Ft. Meade in Maryland.

Professor Tomás Palacios serves as director of the 6-A program.

Educational and Outreach Activities

Curricular Innovation

Educational Innovations Motivated by Remote Teaching

The challenge of remote teaching has motivated educational innovations in a number of courses.

In 6.036 Introduction to Machine Learning, the large 80-student lab sections were replaced with multiple 10- to 15-student "pods." Each pod has one teaching assistant and one lab assistant, and each faculty instructor supervises about eight pods at a time. The intent is to strengthen the social contract between students and staff and among students in the class.

Several hands-on courses have developed lab kits that can be sent home, including 6.111 Introductory Digital Systems Laboratory, 6.301 Feedback System Design, and 6.131 Power Electronics Laboratory. Sometimes this has required substantial changes: 6.301 (Jacob White) now uses a Lego base, and 6.131 (Steven Leeb) has converted its hands-on labs from high power to low power so that they are safe without in-person lab supervision.

Other instructors have built new systems for highly interactive online teaching beyond simply screensharing over Zoom. In 6.881 Robotic Manipulation, Russell Tedrake is using remote slide presentations with embedded codes and simulations that run in students' browsers so that they can do experiments and interact with demos during lectures. In 6.849 Geometric Folding Algorithms, Comingle—a new system developed by course instructor Erik Demaine—allows students to work together on problems in "rooms" with shared tools such as whiteboards and video chats. In 6.031 Software Construction, Max Goldman and Rob Miller are teaching with Whoosh, a Zoom alternative designed and built by Goldman that allows students in large classes to be divided into pairs or small groups while they see videos from instructors, use web tools such as online clickers, and get live help from teaching assistants.

6.859 Interactive Data Visualization

The world is awash with increasing amounts of data, and we must keep afloat with our relatively constant perceptual and cognitive abilities. Visualization provides one means of combating information overload, as well-designed visual encoding can supplant cognitive calculations with simpler perceptual inferences and improve comprehension,

memory, and decision making. Moreover, visual representations may help engage more diverse audiences in the process of analytic thinking.

Developed by Arvind Satyanarayan, 6.859 (formerly 6.894) Interactive Data Visualization covers techniques and algorithms for creating effective visualizations using principles from graphic design, perceptual psychology, and cognitive science. Students learn the data analysis and visualization design process, and, through problem sets and a final project, they experience designing, implementing, and deploying an explanatory narrative visualization or visual analysis tool to address a concrete challenge. The course has seen rapid growth in popularity in its first two offerings under special subject number 6.894, rising from 80 students in the first offering to 120 students in the spring, and Professor Satyanarayan has earned high praise as a lecturer.

New Offerings in Reinforcement and Computational Sensorimotor Learning

Machine learning methods first revolutionized data analysis and are now having a major impact on robotics and autonomous systems: how can a robot learn from experience in a complex environment the best way to behave? MIT (through the work of Dimitri Bertsekas and John Tsitsiklis) was a leader in the development of foundational methods in this area. More recently, new Course 6 faculty member Pulkit Agrawal and Institute for Data, Systems, and Society/Course 2 faculty member Cathy Wu have begun developing and conducted the first pilots of new subjects in this area. The subjects build on our existing foundations and expand into exciting new horizons with connections to state-of-the-art research. These subjects have been highly popular among students.

Communication Lab: Engineers Helping Engineers

Launched as a peer-coaching resource in the department, the EECS Communication Lab (Comm Lab) served approximately 750 students and postdocs between September 2016 and June 2020, providing them with more than 1,500 free, one-on-one communication coaching sessions. In addition, the Comm Lab continues to offer a variety of events and resources to support communication growth. The lab's goal is to make a difference for students and postdocs working on their technical and professional communication skills, preparing them for roles as leaders, collaborators, and teachers in whatever careers they choose.

In September 2019, the Comm Lab welcomed a new manager, Deanna Montgomery.

During the fall 2019 semester, the Comm Lab partnered with Professor Saman Amarasinghe to provide the following workshops as part of 6.S899 Academic Job Search Seminar, a new class for PhD students and postdocs focusing on the faculty job market:

- Branding statement workshop
- Curriculum vitae writing workshop
- Research statement workshop
- Interpersonal communication skills workshop
- Teaching and diversity statement workshop
- Job talk practice workshop

During the 2020 academic year, the Comm Lab also held the following events to support communication in the department:

- A résumé blitz for the fall Career Fair, serving 55 students and postdocs with 15- or 30-minute rapid-fire coaching sessions

- How to Communicate in Grad School, a panel discussion about effective communication strategies for students beginning their PhD work

- A workshop for students taking 6.878 Computational Biology on crafting effective grants in accordance with National Institutes of Health standards

- A workshop on evaluating abstract submissions to the Microsystems Technology Laboratories Annual Research Conference (MARC) for student session chairs and reviewers

- A MARC poster and pitch workshop

- An MEng thesis proposal workshop

- A grant workshop

- An elevator pitch workshop for students and postdocs in the Laboratory for Information and Decision Systems

- Why You Should Be a Professor and How to Become One (virtual), a four-part seminar series for PhD students and postdocs who want to learn more about what it is like to be a professor and how they can prepare for a career on the tenure track

- Research qualifying examination workshop (virtual)

In March, the Comm Lab transitioned all activities to virtual learning and remote work while continuing to offer one-on-one and group coaching appointments via Zoom, virtual events, and other online content, including the launch of a blog on the Comm Lab website as an additional way to share communication tips and resources within and beyond the department.

SuperUROP at MIT: New Opportunities for Student Researchers

The Advanced Undergraduate Research Opportunities Program, better known as SuperUROP, continues to provide a more in-depth experience for juniors and seniors who have already completed a traditional undergraduate research opportunity program (UROP) project. It is open to all School of Engineering students. Through participation in graduate-level research and attendance at weekly guest lectures presented by distinguished speakers, the program prepares students for real-world research work in academia, industry, and start-ups. Each student is eligible to receive a named stipend that is funded by gifts from industry sources and alumni. The 12-credit 6.UAR Seminar in Undergraduate Advanced Research, offered in conjunction with SuperUROP, teaches students technical communication skills.

SuperUROP scholars describe their work at live events and also prepare a technical paper as an end-of-year capstone that is designed to emulate a real-world publication. Many SuperUROP scholars go on to present their work at professional conferences or publish in top journals in their fields.

The Poster Showcase held on December 5, 2019 was strongly supported not only by students and staff but also by outside delegates representing industrial sponsors and donors, with a total of 147 people in attendance. Much of the laboratory research work had been completed by mid-March 2020 when the COVID-19 statewide lockdown was imposed; thus, the program was able to successfully pivot to a remote implementation, although the in-person spring showcase had to be cancelled. Overall, approximately 90 students completed the program in 2019–2020.

Visitors and presenters at the SuperUROP fall 2019 Poster Showcase. (Photos by Gretchen Ertl)

Women's Technology Program: Introducing Young Women to Engineering

Founded in EECS in 2002, the Women's Technology Program (WTP) marked its 18th summer in 2019. The mission of this residential program is to encourage high school girls to pursue engineering and computer science through project-based, hands-on, college-level labs and classes. WTP allows them to learn more about their potential interest in and aptitude for these fields and shows them research being done at MIT.

WTP has two curriculum tracks (electrical engineering and computer science and mechanical engineering). The tracks have separate classes, staffs, and budgets, but share elements such as admissions, housing, staff training, and certain programming (e.g., orientation weekend and guest speaker events). Director Cynthia H. Skier '74, SM '81 (who is based in EECS), manages many administrative functions for the two tracks as well as all WTP-EECS operations.

For summer 2019, 60 students (40 for WTP-EECS and 20 for WTP-ME) were selected from a nationwide applicant pool of 620 high school juniors. WTP admits students with demonstrated math and science talent who do not have other opportunities to explore engineering before college. Many are at high schools with limited STEM (science, technology, engineering, and mathematics) resources or will be the first in their family to attend college.

The WTP-EECS curriculum includes courses in electrical engineering, computer science, and mathematics, all designed and taught by a dedicated staff of female MIT graduate

students and undergraduate students, who become inspiring female role models and mentors for the high school students.

In total, 706 students have attended WTP-EECS since it began. The 2019 summer students entered as first-year undergraduates in fall 2020. Over 88% of WTP-EECS alumnae are in STEM fields, and more than 66% have pursued engineering or computer science. Another 22% have majored in math or science fields. The remainder are in a variety of non-STEM fields including economics and management.

Typically, WTP students develop an interest in MIT while on campus (although this is not a stated goal). Over time, 38% of WTP-EECS alumnae have chosen to attend MIT. In summer 2019, two WTP-EECS staffers were WTP alumnae. Associate Professor Tamara Broderick, an alumna of the 2002 WTP program, speaks to students each year about her career path and her work in machine learning.

Exit surveys indicate that the program also has a significant short-term impact. One 2019 student summarized the experience: "I'm very thankful for the exposure I've gotten to electrical engineering, computer science, and math, but I think that WTP benefited me most by introducing me to new ways of thinking. I've learned to work harder and be more persistent and to work with other people, and my love of learning has increased as well. I'm extremely grateful for the collaborative environment here and everyone's excitement about learning new things." Another described her success in computer science class class: "When I got a part of the (Tetris final project) code to work, the rush of 'I did it' that followed made the struggle worth it! Seeing it come together made me realize exactly how far I had come and how much I had learned. It gave me a confidence boost that I needed at this point in my life."

Faculty Notes

Promotions

Associate Professor without Tenure

Mohammadyeza Alizadeh Attar (Mohammad Alizadeh)

Guy Bresler

Tamara A. Broderick

Stefanie Sabrina Jegelka

Luqiao Liu

Suvrit Sra

Associate Professor with Tenure

Daniel Sanchez Martin

Caroline Uhler

Virginia Williams

Full Professor

Wojciech Matusik

Other Updates

Faculty on Sabbatical Leave

Vincent W.S. Chan	James L. Kirtley Jr.
Adam Chlipala	Leslie Kolodziejski
Jesus del Alamo	Nancy A. Lynch
Dirk R. Englund	David J. Perreault
Polina Golland	Yury Polyanskiy
Tommi S. Jaakkola	Vinod Vaikuntanathan

Faculty on Junior Research Leave

Ruonan Han

Tim Kraska

Luqiao Liu

Stefanie Mueller

Faculty on Family Release

Vinod Vaikuntanathan

Faculty on Leave

Hari Balakrishnan	Silvio Micali
Shafrira Goldwasser	Nir Shavit
Samuel Madden	Caroline Uhler

Retired Faculty

Louis Braida

Departures

Michael Watts

Loss of Faculty

The department notes with sadness the passing of faculty members Corby Corbató, Campbell Searle, and Patrick Winston.

New Faculty

Seven new faculty members were hired during 2019–2020.

Pulkit Agrawal (PhD, University of California at Berkeley) joined MIT as an assistant professor in EECS in July 2019.

Jacob D. Andreas (PhD, University of California at Berkeley) joined MIT as an assistant professor in EECS in July 2019.

YuFeng (Kevin) Chen (PhD, Harvard University) joined EECS as an assistant professor in January 2020.

Daniel Huttenlocher (PhD, Massachusetts Insitute of Technology) joined MIT as a professor in EECS and the dean of the MIT Schwarzman College of Computing in September 2019.

William D. Oliver (PhD, Stanford University) joined the faculty as an associate professor without tenure in July 2019.

Jonathan Ragan-Kelley (PhD, MIT) joined EECS as an assistant professor in January 2020.

Mengjia Yan (PhD, University of Illinois at Urbana-Champaign) joined EECS as an assistant professor in November 2019.

Career Development Professorships

Pulkit Agrawal was appointed as Steven G. (1968) and Renee Finn Career Development Assistant Professor in EECS, starting Febuary 2020.

Jacob D. Andreas was appointed as X-Window Consortium Career Development Assistant Professor in EECS, starting Febuary 2020.

Adam M. Belay was appointed as Jamieson Career Development Assistant Professor in EECS starting January 2020.

Manya Ghobadi was appointed as TIBCO Career Development Assistant Professor in the School of Engineering, starting July 2019.

Kevin O'Brien was appointed as Emanuel E. Landsman (1958) Career Development Assistant Professor in EECS, starting January 2020.

Negar Reiskarimian was appointed as X-Window Consortium Career Development Assistant Professor in EECS, starting January 2020.

Suvrit Sra was appointed as Edgerton Career Development Associate Professor, starting July 2019.

Full Professorships

Marc A. Baldo was appointed as Dugald C. Jackson Professor in Electrical Engineering in EECS, starting July 2019.

Daniel Huttenlocher was appointed as Henry Ellis Warren (1894) Professor in EECS, starting July 2019.

David J. Perreault was appointed as Joseph F. and Nancy P. Keithley Professor in Electrical Engineering in EECS, starting July 2019.

Ronitt Rubinfeld was appointed as Edwin Sibley Webster Professor of Electrical Engineering in EECS, starting July 2019.

Antonio Torralba was appointed as Thomas and Gerd Perkins Professor of Electrical Engineering in EECS, starting July 2019.

Awards and Honors

Faculty Awards and Honors

EECS faculty received a number of awards and honors over the past year.

Hal Abelson was awarded an honorary doctorate in education by the Education University of Hong Kong.

Mohammad Alizadeh won VMware's Systems Research Award.

Saman Amarasinghe was named a fellow of the Association for Computing Machinery.

Dimitri Antoniadis was inducted into the American Academy of Arts and Sciences.

Hari Balakrishnan was named a fellow of the Institute of Electrical and Electronics Engineers (IEEE) and won the IEEE Koji Kobayashi Computers and Communications Award.

Sangeeta Bhatia was elected to the National Academy of Medicine.

Guy Bresler received an NSF CAREER Award.

Michael Carbin was named a Sloan Research Fellow and won an MIT Frank E. Perkins Award for Excellence in Graduate Advising.

Vincent W.S. Chan was named president of the IEEE Communication Society.

Anantha Chandrakasan was inducted into the American Academy of Arts and Sciences.

Adam Chlipala was named a distinguished member of the Association for Computing Machinery (ACM).

Jesus del Alamo received the University Researcher Award from the Semiconductor Industry Association. Also, he won the 2020 IPRM (Indium Phosphide and Related Materials) Award.

Joel Emer was elected to the National Academy of Engineering.

William Freeman was named a fellow of the Association for the Advancement of Artificial Intelligence. Also, he received the Distinguished Researcher Award from the IEEE Computer Society's Technical Committee on Pattern Analysis and the Machine Intelligence 2020 Breakthrough Prize in Fundamental Physics from the Breakthrough Prize Foundation.

Robert Gallager was named a Japan Prize Laureate for "pioneering contributions to information and coding theory."

Ruonan Han was selected as a distinguished lecturer by the IEEE Microwave Theory and Techniques Society.

Song Han received an NSF CAREER Award.

Leslie Kolodziejski won an MIT Frank E. Perkins Award for Excellence in Graduate Advising.

Charles Leiserson was presented the Test of Time Award at the IEEE Symposium on Foundations of Computer Science.

Jae S. Lim was named a Ho-Am Foundation Laureate.

Tomás Lozano-Pérez received the 2021 IEEE Robotics and Automation Award.

Nancy Lynch was awarded a doctor honoris causa (honorary doctorate) by Sorbonne University. Also, she was the keynote speaker at the International Conference on Distributed Computer Systems and presented a distinguished lecture at the Arizona State University Ira A. Fulton Schools of Engineering.

Muriel Médard was awarded an honorary doctorate by Technische Universität München (Technological University of Munich) and was elected to the National Academy of Engineering.

Stefanie Mueller was named a Sloan Research Fellow and a Microsoft Research Faculty Fellow. In addition, she won the Best Paper Award and the Best Talk Award at the 2019 ACM Symposium on User Interface Software and Technology.

Pablo Parrilo received the 2020 Best Paper Prize from the Activity Group on Optimization of the Society for Industrial and Applied Mathematics.

Yury Polyanskiy won the IEEE Information Theory Society's 2020 James L. Massey Award.

Ronitt Rubinfeld was elected to the American Academy of Arts and Sciences.

Arvind Satyanarayan received an NSF CAREER Award.

Jeffrey H. Shapiro won the IEEE Signal Processing Society Best Paper Award.

Justin Solomon was presented the Junior Bose Award.

Collin Stultz was named a fellow of the American Institute for Medical and Biological Engineering.

Vivienne Sze received the ACM-W (ACM Council on Women in Computing) Rising Star Award.

Jacob White was named a 2020 Margaret MacVicar Faculty Fellow.

Departmental Awards

In June, the department presented nearly 60 awards in a virtual version of EECS Celebrates.

Seth J. Teller Award for Excellence, Inclusion, and Diversity

Named for the late EECS professor, this award honors members of the MIT community who embody excellence, inclusion, and diversity through work, research, or educational innovation. The 2020 winners were Professor Leslie Kolodziejski and EECS PhD students Candace Ross and José Cambronero Sanchez. All were honored for their activities to improve diversity and inclusion in the department.

Kolodziejski is the co-chair of the EECS Committee on Diversity, Equity and Inclusion and also focuses on graduate student diversity as the EECS graduate officer. Ross and Cambronero Sanchez were recognized for their many volunteer activities for the EECS Graduate Office, especially their leadership in the graduate student visit days events. For the past three years they have planned, organized, publicized, and led the discussions for the Student Diversity Panel portion of the visit days. As a result of their efforts, attendance at this event has grown each year. Visiting admitted students often describe how informative and helpful they find the authentic panel discussion and report choosing MIT because of our openness about diversity.

Faculty Awards

Louis D. Smullin ('39) Award for Excellence in Teaching: Daniel Sanchez Martin

Jerome H. Saltzer Award for Excellence in Teaching: Peter Hagelstein

Burgess (1952) and Elizabeth Jamieson Prizes for Excellence in Teaching: Patrick Jaillet, Pablo Parrilo

Ruth and Joel Spira Awards for Excellence in Teaching: Tamara Broderick, Julian Shun

EECS Outstanding Educator Award: Kimberle Koile

Kolokotrones Education Award: Arvind Satyanarayan

IEEE/ACM Best Advisor Award: Silvina Hanono Wachman

HKN Best Instructor Award: Jason S. Ku

Special Recognition

Department Head Special Recognition Awards: Yong Rong (Irene) Huang (EECS administrative official), Chris Terman (EECS senior lecturer emeritus)

Richard J. Caloggero Award: Luca Daniel

Student Service and Teaching Awards

Undergraduate Teaching Assistant Awards: Srijon Mukherjee, Tony Wang

Frederick C. Hennie III Teaching Awards: Evan Denmark, Mesert Kebed, Jennifer Madiedo, Valerie Richmond, Zhongxia Yan

Harold Hazen Teaching Award: Dylan Mathis McKay

Carlton E. Tucker Teaching Award: Srini Raghuraman

Student Awards

Jeremy Gerstle UROP Award: Steven Liu (Diverse Image Generation via Self-Conditioned GANs; Antonio Torralba, supervisor)

Morais (1986) and Rosenblum (1986) UROP Award: Brandon Motes (Automated Optical Measurements to Predict Performance of Optoelectronic Devices; Vladimir Bulović, supervisor)

Anna Pogosyants UROP Award: Zoë Marschner (Hexahedral Mesh Repair via Sum-of-Squares Relaxation; Justin Solomon, supervisor)

Licklider UROP Award: Carlos Castillo Lozada (Sprayable User Interfaces: Prototyping Large-Scale Interactive Surfaces with Sensors and Displays; Stefanie Mueller, supervisor)

Robert M. Fano UROP Award: Dhruv Rohatgi Truncated Linear Regression in High Dimensions and Near-Optimal Bounds for Online Caching with Machine Learned Advice; Costis Daskalakis and Piotr Indyk, supervisors)

2019–2020 SuperUROP Awards: Fatima Gunter-Rahman (Using Single-Cell Transcriptomics to Understand Cognitive Resilience in Alzheimer's Disease; Li-Huei Tsai, supervisor), Lior Hirschfeld (Uncertainty Quantification Using Neural Networks for Molecular Property Prediction; Regina Barzilay, supervisor), Yaateh Richardson (Learned Bloom Filters; Tim Kraska, supervisor)

George C. Newton Undergraduate Laboratory Prize (6.111): Ishaan Govindarajan and Eric Pence (The DiGuitar)

Northern Telecom/BNR Project Awards (Best 6.111 Project): Jeremy McCulloch, Adam Potter, and Sreya Vangara (Futuristic Pepper's Ghost Approximation), Kendall Garner and Claire Traweek (digitEyez)

David A. Chanen Writing Awards (for Writing in 6.033): Eric Hong, Magdalena Price, and Alok Puranik (ZoomNet: Updating NASA's ExtraNet)

David Adler Electrical Engineering MEng Thesis Awards: Theia Henderson (first place; "A Continuous Approach to Information-Theoretic Exploration with Range Sensors"; Vivienne Sze and Sertac Karaman, supervisors), Chandler Squires (second place; "Causal Structure Discovery from Incomplete Data"; Caroline Uhler, supervisor)

Charles and Jennifer Johnson Computer Science MEng Thesis Awards: Ryan Senanayake (first place; "A Unified Iteration Space Transformation Framework for Sparse and Dense Tensor Algebra"; Saman Amarasinghe, supervisor), Severyn Kozak (second place; "Chasing Zero Variability in Software Performance"; Charles Leiserson and Tao B. Schardl, supervisors)

Charles and Jennifer Johnson Artificial Intelligence and Decision-Making MEng Thesis Awards: David Mayo (first place; "Understanding Object Recognition Performance at Scale in Machines and Humans"; Boris Katz, supervisor), Nilai Sarda (second place; "On Anomaly Detection in Particle Accelerators"; Justin Solomon, supervisor)

J. Francis Reintjes Excellence in 6-A Industrial Practice Awards: Matthew Hutchinson ("Applying High Performance Computing to Early Fusion Video Action Recognition"; Charles Leiserson, supervisor), Lokhin Cheng ("Digital Control for Adaptive Efficiency in Switching Regulators"; David Perreault, supervisor)

George M. Sprowls PhD Thesis Awards in Computer Science: Joshua Alman ("Linear Algebraic Techniques in Algorithms and Complexity"; Ryan Williams and Virginia Williams, supervisors), Young Hyun (Albert) Kwon ("Riffle—An Efficient Communication System With Strong Anonymity"; Srini Devadas, supervisor), Amy Xian Zhang ("Systems for Collective Human Curation of Online Discussion"; David Karger, supervisor)

Ernst A. Guillemin SM Thesis Award in Electrical Engineering: Alireza Fallah ("Robust Accelerated Gradient Methods for Machine Learning"; Asu Ozdaglar, supervisor)

Ernst A. Guillemin SM Thesis Award in Artificial Intelligence and Decision Making: Jingzhao Zhang ("Dynamical Systems View of Acceleration in First-Order Optimization"; Suvrit Sra, supervisor)

Department Leadership

EECS department leadership from July 1 to December 31, 2019, included Asuman Ozdaglar, department head; Saman P. Amarasinghe and Joel Voldman, associate department heads; Elfar Adalsteinsson and Dennis M. Freeman, co-education officers; Katrina L. LaCurts, undergraduate officer; Leslie A. Kolodziejski, graduate officer; Karl K. Berggren, undergraduate laboratory officer; and Yong Rong (Irene) Huang, administrative officer.

After reorganization, EECS department leadership (effective January 1, 2020) included Asuman Ozdaglar, department head; Joel Voldman, Arvind, and Antonio Torralba, faculty heads; Elfar Adalsteinsson, Dennis M. Freeman, Robert Miller, and Leslie Kaelbling, co–education officers; Katrina L. LaCurts, undergraduate officer; Leslie A. Kolodziejski, graduate officer; Karl K. Berggren, undergraduate laboratory officer; and Yong Rong (Irene) Huang, administrative officer.

Asuman Ozdaglar
Department Head
Professor of Electrical Engineering