

Center for Computational Engineering

Computational engineering plays an increasingly important role in economic competitiveness, national security, environmental stewardship, and public safety. Indeed, computational engineering is central to all engineering endeavors, from the development of appropriate mathematical models to the prediction of mechanical, electrical, chemical, and biological phenomena and the design of complex natural and engineered systems. Computational engineering has now reached the stage at which further progress—if it is to reach full potential as a pervasive enabling technology—requires the development of new interdisciplinary education and research models.

In fall 2008, the [Center for Computational Engineering \(CCE\)](#) was formed in the School of Engineering to support computational engineering research and education at MIT. Seventy-seven faculty members and researchers representing 13 academic programs from across the School of Engineering, the School of Science, and the MIT Sloan School of Management are currently affiliated with CCE. Researchers at the center focus on computational approaches to engineering problems—the formulation and implementation of new approaches that are more efficient and capable and the informed application of existing approaches to important engineering and scientific questions. The emphasis is on the development of the next generation of innovators and innovations in computational engineering.

Graduate Education

CCE offers two educational programs, the interdisciplinary Program in Computation for Design and Optimization (CDO), a master's degree program, and the Program in Computational Science and Engineering (CSE), a doctoral program. Nicolas Hadjiconstantinou, professor of Mechanical Engineering, and Youssef Marzouk, associate professor of Aeronautics and Astronautics, serve as co-directors of the graduate programs.

Master of Science Program in Computation for Design and Optimization

Enrollment in the CDO program at the start of academic year 2018 was 13 students, eight of whom were first-year students. Four CDO students were on the September 2017 degree list and two graduated in June 2018, increasing the number of CDO alumni to 167 as of June 2018.

CDO conducted its 14th admissions cycle this past winter and spring. Serving on the admissions committee were Nicolas Hadjiconstantinou (chair; Mechanical Engineering), Luca Carlone (Aeronautics and Astronautics), Benoit Forget (Nuclear Science and Engineering), Carolina Osorio (Civil and Environmental Engineering [CEE]) and Justin Solomon (Electrical Engineering and Computer Science). There were 112 applications submitted in January 2018, a 15% increase from the previous application period. Nine applicants were offered admission; seven of those accepted and plan to begin work on their SM degrees in September 2018. These seven will be joined by one incoming CSE student who must complete a master's degree before formally joining the CSE doctoral program.

Doctoral Program in Computational Science and Engineering

The CSE doctoral program began accepting applications in September 2013. Enrollment at the start of AY2018 was 41 students. Seven were first-year students; four doctoral students in affiliated home departments joined the CSE program over the course of the academic year. One CSE student graduated in September 2017, two graduated in February 2018, and five graduated in June 2018, bringing the number of CSE alumni to 22.

CSE conducted its fifth admission cycle this past winter and spring, receiving 107 applications. Nicolas Hadjiconstantinou (Mechanical Engineering) served as the CCE reviewer, reading all applications and passing the most qualified applicants along to the indicated home department for review. Of the 107 applicants, 13 were offered admission; nine students accepted and plan to begin their degree work in September 2018.

Honors and Recognitions

Pablo Fernandez del Campo, whose home department is the Department of Aeronautics and Astronautics (AeroAstro), was a finalist in the 29th Robert J. Melosh Medal Competition. The competition is run by Duke University's Department of Civil and Environmental Engineering; the medal presented annually to the best student paper on finite element analysis. Fernandez del Campo was also awarded second place in the student paper competition at the seventh annual American Institute of Aeronautics and Astronautics Computational Fluid Dynamics Conference.

Zheng Wang (AeroAstro) was awarded the Best Poster prize for Optimization-Based Samplers during the annual MIT CCE Student Symposium Poster Session.

Abdullah Almaatouq (CEE) led a group of students from the Media Lab's Human Dynamics team to win first place in three categories in the [Fragile Families Challenge](#), which was featured in *MIT News*.

In addition, Almaatouq:

- Received the competitive Prince Mohammed bin Salman bin Abdulaziz Foundation Fellowship, which provides a monthly stipend, travel, accommodation, health insurance, and tuition coverage;
- Was awarded \$8,000 by the Russell Sage Foundation in support of running online experiments on Amazon's Mechanical Turk; and
- Received the Saudi Arabian Cultural Mission scholarship achievement reward of \$1,800 for graduate-level academic excellence.

Mathieu Dahan (CEE) received the Robert B. Guenassia Award from the MIT Office of Graduate Education.

Justin Montgomery (CEE) won the student research competition at the 18th annual conference of the International Association for Mathematical Geoscience in Perth, Australia. Montgomery was also featured in the *Journal of Petroleum Technology*, on the front page of *Bloomberg News*, and was interviewed on *Bloomberg's Daybreak* program.

Samuel Raymond (CEE) attended the 2017 SPHERIC Beijing International Workshop in Beijing, China, where he received the Excellent Student Paper Award for his work, "A Comparative Study of SPH and MPM in Modeling Mixed-mode Failure in Rocks."

Mojtaba Forghani Oozroody was selected as the inaugural winner of the MIT CCE MathWorks Prize for outstanding doctoral research, CSE, 2018.

Ravikishore Kommajosyula (Mechanical Engineering) attended the 10th International Conference on Boiling and Condensation Heat Transfer in Nagasaki, Japan, where he received a Best Poster award for his work, A Cavity-Size-Independent Model for Bubble Departure Frequency Based on Thermal Boundary Layer Energy Limit.

Anthony T. Patera, Co-director
Ford Professor of Engineering
Professor of Mechanical Engineering

Karen Willcox, Co-director
Professor of Aeronautics and Astronautics