

Operations Research Center

The [Operations Research Center](#) (ORC), established in 1953 as a first-of-its-kind interdepartmental graduate degree program, completed its 58th year of operation in 2010–2011. ORC administers its own graduate programs and a varied research program of methodological and applied projects. It maintains a reading room with a small library as well as state-of-the-art computational workstations and a conference room equipped with distance-education equipment.

This report summarizes AY2011 activities and briefly reviews educational, research, and outreach programs.

Faculty, Students, and Staff

Professor Patrick Jaillet and Professor Dimitris Bertsimas continued to serve as codirectors of the Center.

During AY2011, ORC had 49 affiliated faculty and senior staff, with faculty drawn from the MIT Sloan School of Management and the departments of Electrical Engineering and Computer Science, Civil and Environmental Engineering, Economics, Mathematics, Aeronautics and Astronautics, Mechanical Engineering, Nuclear Science and Engineering, and Urban Studies and Planning.

ORC offers two interdepartmental graduate degree programs: a PhD and a master's degree. During the past year, these programs enrolled 52 students: 46 PhD candidates, and six SM candidates. ORC conferred five master's degrees and 10 PhDs. Several other PhD theses were in the final stages of completion in summer 2011.

Academic Programs

ORC's academic programs continue to be recognized as ranking among the very best nationally and internationally. Moreover, the programs are repeatedly cited as achieving an excellent balance between application and methodological domains.

Research Activities

Research activities spanned a wide spectrum of methodological topics and applications, ranging from small, unsponsored projects involving one faculty member supervising a student's thesis to larger sponsored programs involving several faculty, staff, and students.

Methodological research includes such topics as linear, nonlinear, and combinatorial optimization; solution methods for integer programming; interior point methods for linear and nonlinear programming; dynamic programming; cluster analysis; parallel and distributed computation and algorithms; network flow algorithms; network design; probabilistic combinatorial optimization; online optimization; deterministic and stochastic facility location; queuing theory, including queuing networks; risk analysis; stochastic processes; classical and Bayesian statistics; game theory; and decision analysis and statistical decision theory.

ORC faculty are also currently contributing to application domains as wide-ranging as manufacturing, communications, transportation, public services, logistics, marketing, financial services, health care, and nuclear engineering. Current projects are addressing such topics as air traffic control, epidemiology, AIDS testing, life-cycle modeling of municipal solid waste, safety, risk analysis and network design in air transportation, telecommunication network design, supply chain management, production scheduling, and transportation logistics, diseases and disasters.

Several organizations sponsored research projects at ORC during 2010–2011, including the National Science Foundation, Draper Laboratory (several projects and Draper fellowships), General Motors, Lincoln Laboratory, ISO New England, the Air Force Office of Scientific Research, Office of Naval Research, and the Singapore-MIT Alliance.

Outreach and Professional Service

During the AY2011, ORC held multiple faculty meetings and a faculty retreat in February 2011. Discussions at the retreat focused on four main topics:

- Introduction of doctoral program tracks to improve placement of our graduates in academic jobs
- Investigation of the current SM program to determine if any changes are warranted
- A proposed enhanced and larger SM program
- Collaboration with other MIT units

While most items will still require further investigation and discussion, ORC is planning to implement two of the proposed tracks/specializations (Operations Management and Networked Systems) in the upcoming year.

Ensuring Continued Ability to Support Graduate Students

ORC increased efforts to submit research proposals in order to obtain significantly sized collaborative research grants. One example is the “The Center for Management and Engineering of Healthcare Systems” with professors Dimitris Bertsimas and Retsef Levi being the principal investigators.

Seminar Series

The ORC Weekly Seminar Series was privileged to have many distinguished speakers from industry and academia this year. The operations research professionals who made presentations included Michael Braun (MIT); Benjamin Van Roy (Stanford University); Robert Smith (University of Michigan); Bert Zwart (VU University Amsterdam); Awi Federgruen (Columbia University); Andrew Lim (University of California, Berkeley); Foster Provost (New York University); Balaji Prabhakar (Stanford); Michael Kearns (University of Pennsylvania); Sebastian Pokutta (MIT); Jeannette Song (Duke University); David B. Shmoys (Cornell University); Ben Van Roy (Stanford); Eva Tardos (Cornell); Rakesh Vohra (Northwestern University); Carla E. Brodley (Tufts University); Peter Kolesar (Columbia); Hung-po Chao (ISO New England); Itai Ashlagi (MIT); Stefanos Zenios (Stanford); Kamal Jain (Microsoft Research Center); Retsef Levi (MIT); Jonathan Kelner (MIT); Paat Rusmevichientong (Cornell); George Shanthikumar (Berkeley).

ORC also offered, during January Independent Activities Period, a full-day session titled, “Crisis Mitigation and Response,” in which several talks focused on how people can design systems to deal with and respond to disease epidemics, natural disasters, and other crises that often overwhelm traditional logistics and transportation systems. The speakers included Arnold Barnett; Kathy King; Diana Michalek Pfeil; and Yossi Sheffi, all from MIT.

Future Plans

The ORC program is in a stable condition, and does not face any unusual challenges. We are however planning on implementing new PhD tracks/specializations, which have been under discussion for several years. Beginning in AY2012, PhD students will have the option of pursuing one of two tracks—in operations management or networked systems—in addition to the standard track in operations research. It is the belief of ORC and its affiliated faculty that this will help graduates to be more competitive in the current job market. The tracks are voluntary. Participation in the tracks will involve completion of related elective courses, teaching assistantship opportunities, and approval by a committee comprised of ORC-affiliated faculty members.

We also plan to continue exploring further synergies and collaborations with other units within MIT and the possibility of establishing an enhanced and larger SM program that would have higher impact in the operations research community at large.

Diversity

ORC has always attempted to provide an environment that is responsive to the varied professional and personal needs of the operations research community at MIT, and that builds diversity.

During AY2011, the staff of ORC was composed of one support staff member and one academic program administrator. Of these two staff, one is a woman. As for the student population, 12 of our current graduate students are women.

Over the past years, ORC has made efforts to attract women and underrepresented minorities to graduate programs by targeting information to math departments in liberal arts colleges and by sending information to historically black colleges.

Professional Activities

ORC Faculty

Arnold Barnett was selected for an Outstanding Teacher Award at the Sloan School of Management for his achievements in course 15.068 Statistical Consulting. (May 2011). His students selected him for this award. It was his twelfth such award.

Vivek Farias was awarded the National Science Foundation (NSF) Career Award (January 2011).

Dick Larson became a 2011 Massachusetts Academy of Sciences Fellow (April 2011). He also received the IBM Faculty Research Award (September 2010).

Andrew Lo was awarded the first ever Harry M. Markowitz Award (March 2011).

Amedeo Odoni was elected to the National Academy of Engineering (February 2011). He was also appointed to the eleven-member National Council for Research and Technology of Greece (September 2010), as well as given the Best Faculty Advisor Award for the Technology and Policy Program at MIT (May 2010).

James Orlin was awarded the William R. Bennett Prize (June 2011). This award is given annually to the best original paper published in the IEEE/ACM Transactions on Networking in the previous three calendar years. It was awarded for the paper “Oblivious Routing of Highly Variable Traffic in Service Overlays and IP Backbones” with Murali Kodialam, T. V. Lakshman, and Sudipta Sengupta.

Orlin was also awarded an honorable mention by the Transportation Science and Logistics Society of INFORMS Best Paper Prize Committee for his coauthored paper “The Locomotive Routing Problem” along with Balac Vaidyanathan and Ravi K. Ahuja (2010).

Carolina Osorio was awarded the Graduate Student Best Paper Award at the Transportation Research Forum for the paper “A Simulation-Based Optimization Framework for Urban Traffic Control” (March 2011).

Cynthia Rudin was awarded the NSF Career award (January 2011).

Andreas Schulz became an Honorary Hans Fischer Senior Fellow at the Institute for Advanced Study, Technische Universität München (May 2011).

Devavrat Shah was awarded The Erlang Prize (November 2010). The Erlang Prize is awarded every two years by the Applied Probability Society of INFORMS to honor a research scholar within nine years of receiving PhD who has contributed significantly to applied probability.

David Simchi-Levi has been elected by the Board of Governors of the Technion in Israel as an Academic Member of the Board of Governors. The Board of Governors of the Technion is similar to the Board of Trustees in American Universities.

Glen Urban became an INFORMS Fellow (November 2010). This year only 11 members received this honor. Fellows are recognized for outstanding lifetime achievement in operations research and the management sciences, having demonstrated exceptional accomplishments and made significant contributions to the advancement of their fields, in service to their profession and to INFORMS.

ORC Students

Chaitanya Bandi was awarded first prize in the Best Presentation Award, Financial Services Section at the INFORMS Annual Meeting 2010.

Virod Chiraphadhanakul was awarded third prize in the INFORMS Railway Applications Section Problem Solving Competition (November 2010).

Kimon Drakopoulos, an SM student at LIDS cosupervised by professors Asu Ozdaglar and John Tsitsiklis, was awarded the second place Ernst Guillemin Award for Best Electrical Engineering SM thesis for a thesis titled “Observational Learning with Finite Memory.”

Cristian Figueroa was awarded third prize in the INFORMS Railway Applications Section Problem Solving Competition (November 2010).

Srikanth Jagabathula, a PhD student at LIDS jointly supervised by Devavrat Shah and Vivek Farias, won first prize in the MSOM student paper competition during the 2010 INFORMS annual meeting for a paper titled “A New Approach to Modeling Choice” (November 2010).

Jinwoo Shin, a PhD student at LIDS supervised by Professor Devavrat Shah, was awarded the Sprowls Award for a thesis titled “Efficient Distributed Medium Access Algorithm.” The Sprowls Awards are given every year for the best PhD theses in Computer Science at MIT.

Kuang Xu, an SM student at LIDS supervised by Professor John Tsitsiklis, was awarded the first place Ernst Guillemin Award for Best Electrical Engineering SM thesis for a thesis titled “On the Power of Centralization in Distributed Processing.”

ORC Alumni

Jonathan P. Caulkins (Carnegie Mellon University) was awarded the INFORMS President’s Award (2010). The INFORMS President’s Award is made for contributions to the welfare of society.

Dan Iancu (Stanford University) was awarded third prize in the Best Presentation Award, Financial Services Section at the INFORMS Annual Meeting 2010. Iancu was also awarded the INFORMS Phillip McCord Morse Lectureship Award (2010).

Zhi-Quan (Tom) Luo (University of Minnesota) received the G. Farkas Prize of the INFORMS Optimization Society (2010).

Victor Martinez de Albeniz (IESE Business School) won first prize in the INFORMS Junior Faculty Forum Paper Competition (2010).

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