MIT Institute for Data, Systems, and Society

FOUNDED 2015

Introduction

IDSS Impact: Launch to Now

When we launched IDSS in 2015, it was with the understanding that complex societal challenges, ranging from climate change to misinformation to the persistence of racism, had been fundamentally changed by advances in data collection and computation. To understand sociotechnical systems like power grids, transportation networks, and social media, you have to understand how physical and engineered systems interact with social and institutional behavior. What MIT needed was a department-spanning 'entity' to promote foundational development in the new transdiscipline of statistics and data science.

The data explosion also presented a chance to take a crack at something that had eluded MIT for some time: making a home for statistics. The Statistics and Data Science Center was created within IDSS, where it benefits from IDSS's interdisciplinary ethos and cross-campus reach.

Emerging at this crossroads between physical and engineering systems, information science, sociotechnical challenges, and 21st century statistics, IDSS launched its signature doctoral program, the PhD in Social and Engineering Systems. IDSS also became home to the nearly 50-year-old Technology and Policy Program, a transformative master's program that prepares students to effect real change.

IDSS research collaborations have since brought computer scientists and statisticians together with economists, political scientists, and computational social scientists. New ideas and new connections continue to materialize from these interactions across domains. A notable collaboration is the Initiative on Combatting Systemic Racism, which has brought together MIT faculty, students, post-docs, staff, and interns to address this urgent challenge in our society.

To reach the world beyond MIT, we launched IDSSx, our online offerings in data science education. With the MicroMasters in Statistics and Data Science as the flagship of IDSSx, faculty also created multiple programs to help learners at different experience levels become fluent in the foundations and applications of machine learning and AI tools.

I have always believed that no matter what program or center we aim to build, the most important thing to create is a community. It's community that breathes life into an institution, and that ultimately decides which efforts take off.

When I reflect on how IDSS has grown since its launch, I am deeply grateful to the many people whose hard work contributed to nurturing our community. I look forward to seeing how the connections we are forging can bring new approaches, new methods, and new insights to bear on the toughest challenges we face.

Munther Dahleh, Director
Institute for Data, Systems, and Society
William A. Coolidge Professor, Electrical
Engineering and Computer Science
April 2023

Social and Engineering Systems PhD

Addressing societal challenges with data

Fotini Christia, Political Science; SES Program Chair

The Social and Engineering Systems (SES) doctoral program is a unique interdisciplinary graduate research program. Focusing on societally significant problems in physical and engineered systems, SES students apply the analytical tools of statistics and data science, including machine learning and complex modeling. At the same time, they engage the human and institutional dimensions of challenges using the social sciences.

Examples of current focus areas include **systemic racism**, **climate change**, **public health**, and **misinformation**.

Launched with IDSS in 2015, the SES program now has 16 alumni with positions in academia and industry, including:

8
YEARS

55
STUDENTS

16
GRADUATES

Alumni in Industry
- Citadel
- Facebook
- Google
- Microsoft Research

Alumni Faculty
- Boston University
- Cornell
- Purdue
- City University, Hong Kong

Alumni Postdocs
- UC Berkeley
- Carnegie Mellon
- Stanford

Hammaad Adam's research showed that AI models can identify a patient's race from redacted clinical notes.

SES student Manon Revel aims to improve governance in AI systems, corporations, and democracies.

SES alum Minghao Qiu seeks energy policy changes that can lower both carbon emissions and air pollution.

Hammer Fellows

Thanks to a generous gift, each year IDSS selects postdoctoral fellows and SES PhD students to join the Michael Hammer Society of Fellows. Hammer Fellows carry on the legacy of Michael Hammer, a visionary engineer, business leader, author, and MIT professor.

Doctoral Student Hammer Fellows
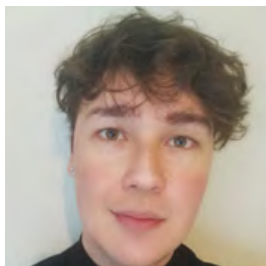
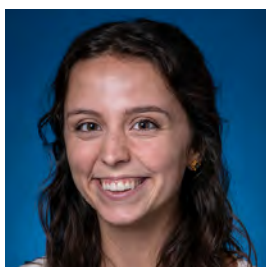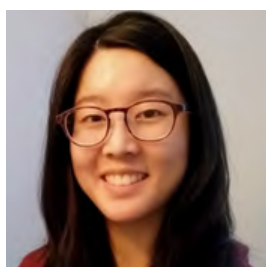|				
Umutcan Ay	Hongyu Chen	Carlo Duffy	Jessy Han	Chris Hays
Cate Heine	Shannon Hwang	Shomik Jain	Rachel Kha	Thomas Lee
Haiwen Li	Sirui Li	Vanessa Lin	Elijah Pivo	Manon Revel
Arnab Sarker	Erin Walk	Manxi Wu	Xinyi Wu	Leon Yao
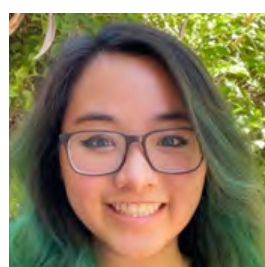
Postdoctoral Hammer Fellows
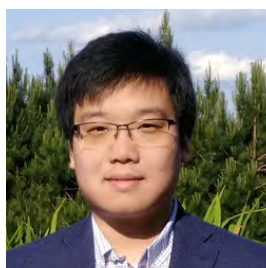
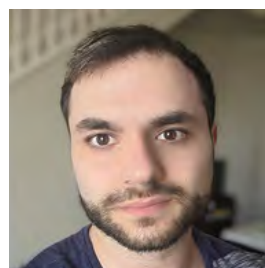|			
Kiran Garimella	Weizi Li	Janelle Schlossberger	Zach Schutzman

Technology and Policy Program

Advancing technologically– informed policymaking

The Technology and Policy Program, founded in 1975, prepares students to address societal challenges through research and education at the intersection of technology and policy. TPP students work with research teams across the Institute to advance MIT's mission to serve the nation and the world in the 21st century.

TPP alumni can be found in government, academia, and industry, forming a network of technology policy practitioners that enrich our Program while enhancing its efforts to mobilize science and engineering to inform intelligent, responsible strategies and policies.

Among TPP's alumni you will find:

- Agency and ministry officials in countries around the world
- Congressional staffers and elected office holders
- Researchers at laboratories and research universities
- NASA and ESA professionals, including a NASA astronaut

- Corporate policymaking and regulatory compliance staff
- Officials at international and non–governmental organizations
- Industry, technology, and management consultants,
- Leaders of startups and other technology companies

Noelle Selin, EAPS; TPP Director
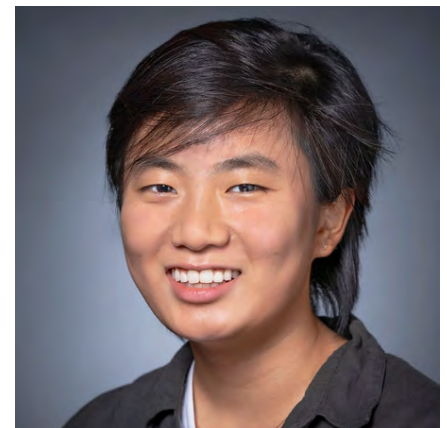
48
YEARS

1,449
ALUMNI

68
CURRENT STUDENTS

TPP alum Olamide Oladeji cofounded Pastel to provide offline–enabled software tools for small businesses.

Biogen Fellow Will Atkinson studied how policy can both reduce air pollution and mitigate climate change.

Jisoo Hong combined linguistic anthropology with machine learning to study scientific controversy.

Statistics and Data Science Center

Advancing the education and research of statistics at MIT

The Statistics and Data Science Center (SDSC) within IDSS is MIT's focal point for research and education related to statistics and data science. The SDSC provides a gateway to the cutting-edge research in statistics and data science performed at MIT, which includes computational tools and methods like machine learning. complex modeling, and AI decision systems. In addition to an interdisciplinary PhD, the SDSC oversees an undergraduate minor in statistics and data science.

Ankur Moitra, Math; SDSC Director

23
IDPS GRADS

32
IDPS STUDENTS

105
STATS MINORS

INTERDISCIPLINARY PHD IN STATISTICS

Augmenting doctoral research with 21st century statistics

The Interdisciplinary PhD in Statistics (IDPS) is designed for students enrolled in a participating MIT doctoral program who wish to develop their understanding of statistics, using concepts of computation and data analysis as well as elements of classical statistics and probability within their chosen field of study.

IDPS and SES alum Jinglong Zhao designed experiments to measure the efficacy of the algorithms that drive online marketplaces.

Jonathan Weed, a LIDS alum with a PhD in Math and Statistics, researches optimal transport and data with geometric structure at NYU.

Sophie (Liyang) Sun, now a postdoc at Berkeley, received her PhD in Economics and Statistics.

IDSSx: Online Education in Data Science

The IDSS commitment to advancing education in data science has been the driving force behind the creation of several online programs. From the graduate-level MicroMasters to the new No Code AI course, these programs provide opportunities for learners at different entry points to level up their ability to bring data-driven value to work and research — whether they are looking to break into the field, are seeking career development opportunities, or simply want to provide more valuable insights to an organization.

Devavrat Shah, MicroMasters Faculty Director

No Code AI and Machine Learning: Building Data Science Solutions

New "no-code" platforms are designed to allow users create solutions previously requiring programming. Using intuitive, interactive user-interfaces allowing, learners will quickly classify information, perform data analysis, and create accurate data predictions with models.

🕐 12 Weeks, 6-8 hours per week

📖 Experience level: Learners with limited to no coding experience

🎓 Certificate of Completion from MIT Professional Education

🌐 idss.mit.edu/idssx/NoCodeAI

Data Science and Machine Learning: Making Data-Driven Decisions

This course is for data scientists, data analysts, and professionals who wish to turn large volumes of data into actionable insights through practical, hand-on training.

🕐 12 Weeks, 6-8 hours per week

📖 Experience Level: Some academic/ professional training in applied mathematics/ statistics.

🎓 Certificate of Completion from MIT IDSS

🌐 idss.mit.edu/idssx/DSML

Applied Data Science Program

This course is for professionals who are interested in a career in Data Science and Machine Learning. Learners will be able to upgrade their data analytics skills by learning the theory and practical application of supervised and unsupervised learning, time-series analysis, neural networks, recommendation engines, regression, and computer vision, to name a few.

🕐 12 Weeks, 10-15 hours per week including live virtual sessions

📖 Experience level: Basic knowledge of Computer Programming and Statistics

🎓 Certificate of Completion from MIT Professional Education

🌐 idss.mit.edu/idssx/AppliedDataScience

MicroMasters® program in Statistics and Data Science

This program is based on MIT graduate-level classes, and will prepare technically advanced learners with rigorous training in the methods and tools used in data science, and hands-on training in data analysis and machine learning. Comprised of four online courses and a virtually proctored exam, the MicroMasters® program in Statistics and Data Science provides the MicroMasters credential and academic credits to pathway school programs.

🕐 18-24 Months, 10-14 hours per week

📖 Experience level: College-level calculus and comfort with mathematical reasoning and Python programming are highly recommended.

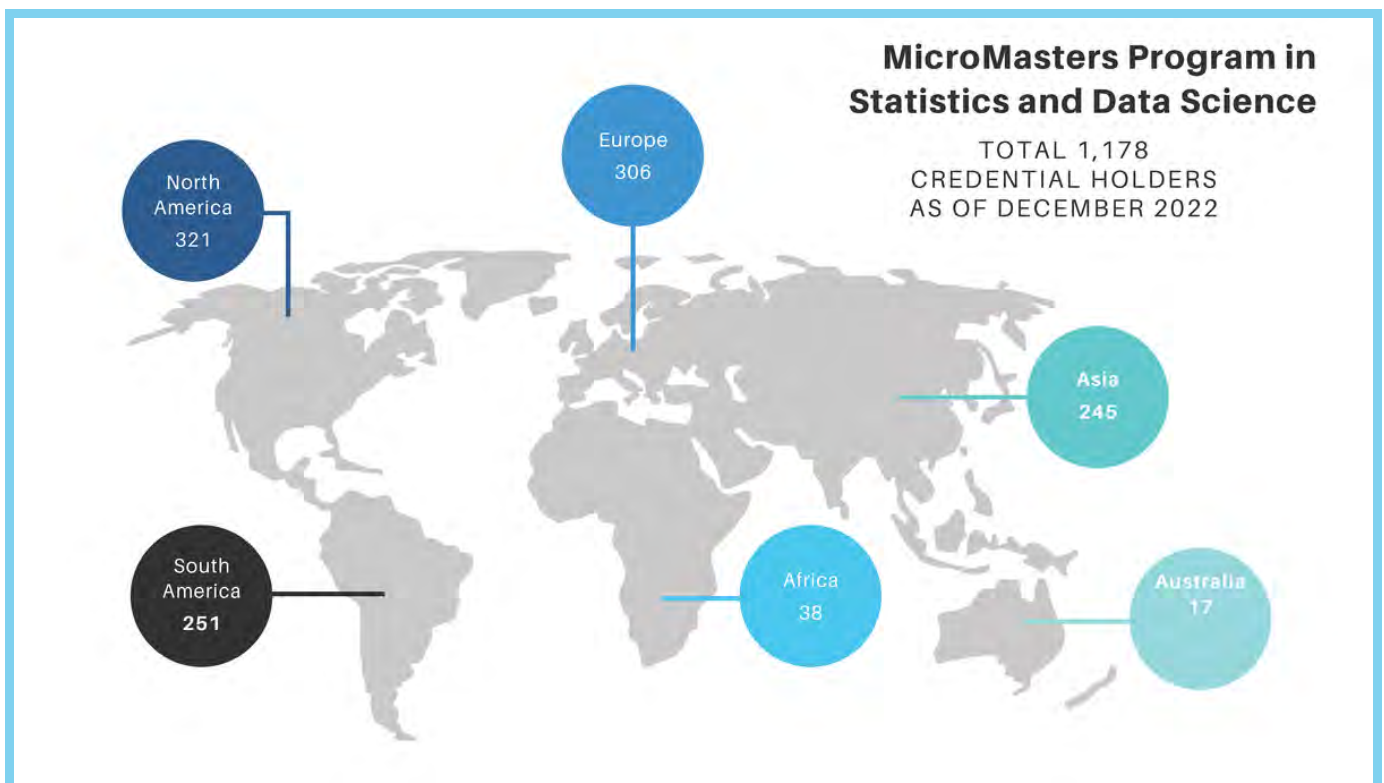🎓 MicroMasters Credential from MITx, academic credits to universities around the world. Learn more.

🌐 idss.mit.edu/idssx/MicroMastersSDS

MicroMasters in Statistics and Data Science

Teaching the skills needed to solve complex challenges with data

Since its launch, the MicroMasters Program in Statistics and Data Science has had tens of thousands of interested learners online. Last year, the program passed 1,000 credential holders worldwide. Credential holders are people from different circumstances, fields, and career trajectories in every country in the world.

MicroMasters Program in Statistics and Data Science

TOTAL 1,178 CREDENTIAL HOLDERS AS OF DECEMBER 2022

North America 321
Europe 306
Asia 245
South America 251
Africa 38
Australia 17

1,178

CREDENTIAL HOLDERS WORLDWIDE

Ukrainian mathematician Tetiana Herasymova's capstone experience was disrupted by war. She is one of over a thousand learners around the world to complete the MM SDS program. Each have their own unique journey.

Research Collaborations

Research at IDSS addresses some of the most pressing information and systems challenges facing the world, and integrates systems thinking, state-of-the art quantitative analysis, and an understanding of human and institutional behavior into its methodologies.

In addition to the many projects and efforts of faculty, research staff, and students, IDSS organizes research groups to explore particular subjects.

ISOLAT: IDSS COVID-19 COLLABORATION

In March 2020, as Covid-19 cases were surging worldwide, IDSS organized a volunteer, interdisciplinary team to provide analysis of data associated with the coronavirus pandemic in order to inform policy makers. The 'IDSS Covid-19 Collaboration,' dubbed 'Isolat,' brought together faculty, postdocs, and students from across IDSS, MIT, and around the globe.
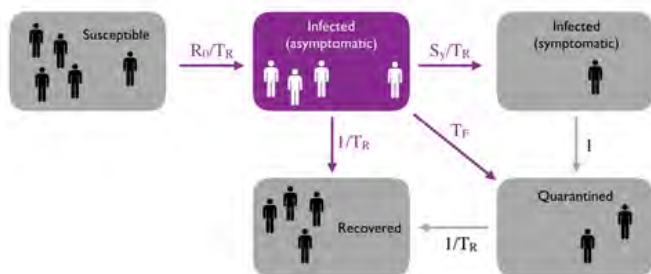
Over the course of five months, Isolat met daily to discuss findings from various interconnected research projects. Isolat established a 'data lake' that allowed researchers access to many relevant, up-to-date datasets. Isolat brought insight to bear on many aspects of the pandemic, particularly the challenges of Covid testing strategy.

Isolat research findings made a local, national, and global impact. As MIT navigated the process of bringing students back to campus, Isolat research informed MIT re-opening policy with systems thinking and data analysis. Isolat research has been shared with other colleges and with governments both local and global.

Peko Hosoi shows off the Covid-19 Testing Impact Calculator at whentotest.org

IDSS researchers led by MechE and IDSS professor Anette 'Peko' Hosoi co-developed the Covid-19 Testing Impact Calculator, an online tool to help organizations like schools, businesses, and factories make rational decisions and implement successful strategies for Covid-19 testing.

Research Collaborations

INITIATIVE ON COMBATTING SYSTEMIC RACISM

Computational tools for comprehensive change

The IDSS Initiative on Combatting Systemic Racism (ICSR) coordinates cross-disciplinary research on racially discriminatory processes in American institutions and policy domains. Building on social science literature on systemic racism, ICSR research develops computational tools to help effect structural and normative change towards racial equity.

RESEARCH HIGHLIGHTS

HEALTHCARE: AI BIAS

Researchers evaluated the impact that biased AI recommendations have on emergency decisions, and made recommendations on reframing advice to reduce harm caused by biased models.

HOUSING: BEYOND FAIRNESS

Using causal inference to identify historical bias, researchers explored redesigns of mortgage lending algorithms to address the harms caused by decades of discriminatory housing policies.

POLICING: IMPACT OF PREDICTION

Predictive policing systems lead to 'hotspot' policing, a disproportionate policing of small areas. Researchers examine the impact on communities and how algorithms can impact police practices.

SOCIAL MEDIA: RADICALIZATION

Researchers take a new approach, mapping content and users in a multi-dimensional space, to measure the influence YouTube algorithms have on political thought and extremism.
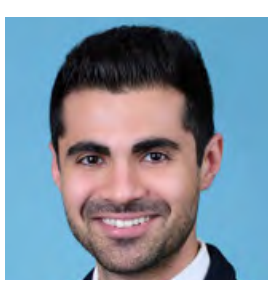
The IDSS Community

With efforts like research collaborations, lecture series, conferences, hackathons, online programs, and strategic partnerships, IDSS enriches its vibrant community of faculty, students, researchers, partners, and learners — and adds unique value to MIT.

Hiring and promoting talented faculty

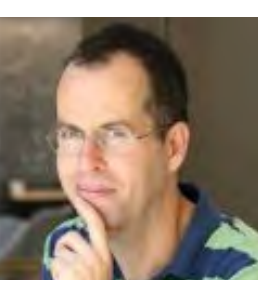Alberto Abadie, Economics; IDSS Assoc Director

Navid Azizan, MechE

Guy Bresler, EECS

Ali Jadbabaie, CEE Dept Head; former IDSS Assoc Director

Elchanan Mossel, Math

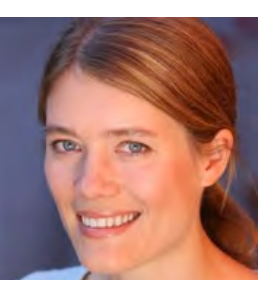Alexander 'Sasha' Rakhlin, Brain & Cog

Philippe Rigollet, Math

Noelle Selin, EAPS; TPP Director

Suvrit Sra, EECS

Jessika Trancik, IDSS

Caroline Uhler, EECS; Co-Director, Schmidt Center, Broad

Sherrie Wang, MechE

Cathy Wu, CEE

Thomas Siebel Professorship

A professor in EECS and IDSS, Tommi Jaakkola is the inaugural holder of the Thomas Siebel Professorship. The professorship was established through the generous contribution of veteran software entrepreneur Thomas Siebel, chair and CEO of C3IoT.

Tommi Jaakkola, Thomas Siebel Professor in EECS and IDSS

45
CORE FACULTY

49
FACULTY AFFILIATES

15
MIT DEPARTMENTS
(from every school)

The IDSS Community

Convening cross-disciplinary thinkers and problem solvers

Each year, IDSS co-hosts the **Women in Data Science** Cambridge conference, showcasing work by women who are leaders in the field.

SDSCon, the Statistics and Data Science conference, is MIT's annual celebration of all things statistics.

The **Policy Hackathon** is a student-run competition that explores solutions to challenges sponsored by non-profits, industry, and government.

IDSS organizes the **Research to Policy Engagement Initiative**, the **Stochastics and Statistics seminar series**, **Distinguished Seminars**, and symposia exploring different topics.

Building a global community of learners and practitioners

The IDSS podcast Data Nation features conversations with faculty across MIT.

IDSS partners with BREIT in support of their efforts in Peru to advance data science skills.

Learners from IDSS partner UTEC Uruguay visited MIT to meet IDSS students and faculty.

Connecting, celebrating, and having fun

Hammer Fellows meet the family of the late Michael Hammer, whose generous gift supports them while they are at IDSS.

TPP students and Tim the Beaver pose for a photo at the TPP Thesis signing celebration.

Student social events range from casual snack chats to organized outings and even an intramural hockey team.

The IDSS Winter Celebration is an annual fest of crafts, games, and sweet treats.

Special Thanks

IDSS owes much of its success to founding industry partners, education organizations and generous donors that share our mission of proliferating statistics and data science skills, groups collaborating on the development of computational solutions to overarching challenges, and other sponsors of IDSS events and initiatives.
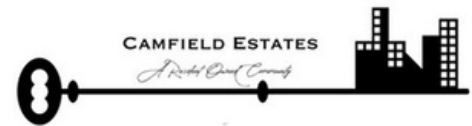
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