The mission of the Institute for Data, Systems, and Society (IDSS) is to advance education and research in state-of-the-art, analytical methods in information and decision systems; statistics and data science; and the social sciences, and to apply these methods to address complex societal challenges in a diverse set of areas such as energy systems, finance, healthcare, social networks, and urban science. Its mission also includes the creation of an MIT-wide focal point for advancing research and educational programs related to statistics and data science.

Technology advances in areas such as smart sensors, big data, communications, computing, and social networking are rapidly scaling the size and complexity of interconnected systems and networks and, at the same time, are generating massive data that can lead to new insights and understanding. Research at IDSS will aim to understand and analyze data from across these systems, which present unique and substantial challenges due to scale, complexity, and the difficulties of extracting clear, actionable insights.

Our ability to understand data and develop models across complex, interconnected systems is at the core of our ability to uncover new insights and solutions.

Spanning all five schools at MIT, IDSS embraces the collision and synthesis of ideas and methods from analytical disciplines including statistics, data science, information theory and inference, systems and control theory, optimization, economics, human and social behavior, and network science. These disciplines are relevant both for understanding complex systems and for presenting design principles and architectures that allow for the systems’ quantification and management. IDSS seeks to integrate these areas, fostering new collaborations, introducing new paradigms and abstractions, and utilizing the power of data to address societal challenges.

Undergraduate Study

Minor in Statistics and Data Science

The Minor in Statistics and Data Science (http://catalog.mit.edu/interdisciplinary/undergraduate-programs/minors/statistics-data-science) provides students with a working knowledge base in statistics, probability, and computation, along with an ability to perform data analysis. For a description of the minor, see Interdisciplinary Programs (http://catalog.mit.edu/interdisciplinary/undergraduate-programs).

Graduate Study

IDSS provides educational programs anchored in the following intellectual pillars: statistics, information and decision sciences, and human and institutional behavior.

IDSS’s academic programs embrace the collision and synthesis of ideas and methods from analytical disciplines, including statistics, stochastic modeling, information theory and inference, systems and control theory, optimization, economics, human and social behavior, and network science. Each of these fields in isolation is an insufficient basis for a deep understanding of complex interactions and systems. However, the intersections of these disciplines provide new tools and perspectives for understanding complex systems, addressing overarching challenges (including sustainability and systemic risk), and presenting design principles and architectures that enable those systems’ quantification, management, and regulation.

Inquiries about IDSS academic programs may be directed to the Academic Office (idss_academic_office@mit.edu).

Admission Requirements for Graduate Study

Application forms for all programs (http://web.mit.edu/admissions/graduate) are available online. Applicants whose first language is not English must offer evidence of written and oral proficiency in English by registering for the International English Language Testing System (IELTS) exam (http://www.ielts.org), academic format, and achieving a score of 7.5 or better. Information about the Graduate Record Examinations (GRE) (http://www.ets.org/gre) can be obtained through the website. Applicants should refer to the details of each program concerning specific requirements for admission.

Master of Science in Technology and Policy

The Technology and Policy Program (TPP) (http://tpp.mit.edu) educates students seeking leadership roles in the constructive development and use of technology—an area that is not well served by the traditional education of technical or social science specialists. TPP focuses on meeting the need for leaders who are engineers and scientists—people with not only strong technical foundations but also the skills and abilities to deal cogently and effectively with the economic, political, and administrative dimensions of the technological challenges of the 21st century.

The Master of Science in Technology and Policy is an engineering research degree with a focus on the increasingly central role of technology in the framing, formulation, and resolution of policy problems. Many students combine TPP’s curriculum with complementary subjects to obtain dual degrees in TPP and either a specialized branch of engineering or an applied social science, such as political science or urban studies and planning.

TPP’s coursework provides a solid grounding in technology and policy by combining advanced subjects in the student’s chosen
Student research in SES is characterized by the following traits: sciences, and in a particular application domain. Engineering and quantitative methods, as well as in the social coursework and research must include breadth and depth in rigorous, and original research leading to a doctoral thesis. Both program includes coursework that prepares them for advanced, from engineering and the social sciences. A student's doctoral concrete and societally significant problems by combining methods (The Doctor of Philosophy in Social and Engineering Systems (SES) Doctor of Philosophy in Social and Engineering Systems 617-258-7295, for additional information. Contact the TPP program office (tpp@mit.edu), Room E17-373, 617-258-7295, for additional information.

Doctor of Philosophy in Social and Engineering Systems

The Doctor of Philosophy in Social and Engineering Systems (SES) (http://idss.mit.edu/academics/SES_doc) is focused on addressing concrete and societally significant problems by combining methods from engineering and the social sciences. A student's doctoral program includes coursework that prepares them for advanced, rigorous, and original research leading to a doctoral thesis. Both coursework and research must include breadth and depth in engineering and quantitative methods, as well as in the social sciences, and in a particular application domain.

Student research in SES is characterized by the following traits:

- It is driven by problems of societal interest, in areas such as energy, finance, health care, social networks, urban science, as well as in policy-related topics.
- It is application domain driven.
- It involves quantitative methods. The program is focused on problems that can be addressed through mathematical modeling and data analysis.
- It relies on real-world data. Research is expected to analyze data from the application domain of interest, and draw upon the training provided in statistics, etc., through the program's coursework.
- It engages societal aspects of the problem. The research incorporates theories and tools from the social sciences.

The program's subject requirements follow. Waivers for some of the requirements are possible in special circumstances.

<table>
<thead>
<tr>
<th>Core</th>
<th>Select three of the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.6501</td>
<td>Fundamentals of Statistics</td>
</tr>
<tr>
<td>21A.809</td>
<td>Designing Empirical Research in the Social Sciences</td>
</tr>
<tr>
<td>14.121 &amp; 14.122</td>
<td>Microeconomic Theory I and Microeconomic Theory II</td>
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<tr>
<th>Information Systems and Decision Science</th>
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<tbody>
<tr>
<td>Five subjects in the areas of probabilistic modeling, statistics, optimization, or systems/control theory, including:</td>
</tr>
<tr>
<td>One subject from the list of Statistical Processing of Data Subjects below</td>
</tr>
<tr>
<td>One subject of substantial mathematical content 1</td>
</tr>
<tr>
<td>Two subjects belonging to a sequence that provides increasing depth on a particular topic 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social Science</th>
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<tbody>
<tr>
<td>Four subjects that create a coherent and rigorous program of study in the social sciences, providing necessary background for research, including:</td>
</tr>
<tr>
<td>Three subjects comprising a coherent collection that builds depth in a particular social science focus area 2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Problem Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two subjects in the application domain of the student's research 3,4</td>
</tr>
</tbody>
</table>

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1 Criteria defined by the graduate program committee.
2 Subjects used to satisfy the core can be counted toward this requirement. However, the remaining subjects should be at a more-advanced level.
3 One subject may be satisfied by an internship or independent study in which the student is evaluated on their performance of hands-on work in a particular domain.
4 One subject may also be counted toward the social science requirement.

**Statistical Processing of Data Subjects**

| 6.436[J] | Statistics for Engineers and Scientists |
| 6.438 | Algorithms for Inference |
| 6.867 | Machine Learning |

| 12 | 12 | 12 |
Research Centers

Research in IDSS addresses overarching challenges, including the modeling and prediction of system behavior and performance; systems design and architecture; and issues including social welfare, monetization, and regulation, as well as sustainability and resilience, cascades and contagion phenomena, and systemic risk.

IDSS will sustain this research agenda by fostering and prioritizing several types of strong connections, including:

- A community of experts, at MIT and elsewhere, with demonstrated success performing impactful, multidisciplinary research in these domains.
- A close connection between research and domain expertise, to enable a contextually-informed understanding of the challenges and opportunities in complex systems.
- Educational and research methodologies, not considered in isolation, but instead anchored in one or several of the cross-disciplinary fields of statistics, information and decision sciences, the science of interconnections, as well as the study of social and institutional behavior.

Laboratory for Information and Decision Systems

The Laboratory for Information and Decision Systems (LIDS) (http://lids.mit.edu) is an interdepartmental laboratory devoted to research and education in systems, networks, and control, staffed by faculty, research scientists, and graduate students from many departments and centers across MIT. The mission of LIDS is to develop and apply rigorous approaches and tools for system modeling, analysis, design, and optimization. It encompasses the development of novel analytical methodologies, as well as the adaptation and application of advanced methods to specific contexts and application domains. LIDS research addresses physical and man-made systems, their dynamics, and the associated information processing. Some of the lab’s core research areas are: statistical inference and machine learning; optimization; systems theory, control, and autonomy; and networks.

For further information, see the Research and Study (http://catalog.mit.edu/mit/research/laboratory-information-decision-systems) section.

Sociotechnical Systems Research Center

The Sociotechnical Systems Research Center (SSRC) (http://ssrc.mit.edu) is an interdisciplinary research center that focuses on the study of high-impact, complex, sociotechnical systems that shape our world.

SSRC brings together faculty, researchers, students, and staff from across MIT to study and seek solutions to complex societal challenges that span healthcare, energy, infrastructure networks, the environment, and international development.

For further information on SSRC and its programs, see the Research and Study (http://catalog.mit.edu/mit/research/sociotechnical-systems-research-center) section.

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