MIT’s Industrial Liaison Program (ILP) can bring the intellectual power of MIT to your organization by providing a direct connection to the knowledge, experience and resources at MIT in these areas – giving you the ideas to stay ahead. For more information about how the ILP can put the resources of MIT to work for you, call us at 1-617-253-2691, e-mail us at liaison@ilp.mit.edu, or visit http://ilp.mit.edu.

MIT and Consumer Products & Retail Industries
The Massachusetts Institute of Technology (MIT) is a leading center of research and education on topics important to consumer products and retail industries, including:

- Big data/analytics
- Consumer behavior
- Data security, privacy, trust
- Demographics
- Digital economy
- Innovation
- Manufacturing
- Marketing
- Product design & development
- Robotics / unmanned vehicles
- Sensors / sensing, digital interfaces, user experience
- Social networks, collective intelligence
- Supply chains/logistics
- Sustainability

Below are brief descriptions of a selection of MIT centers, departments, groups, and labs conducting research and education in these areas. This is not, however, a comprehensive summary of MIT research in the areas listed above, and some of these groups may fit within multiple topic areas.

BIG DATA / ANALYTICS

BigData @ CSAIL researchers are investigating how to transform big data into big insights. The initiative’s approach brings together world leaders in parallel architecture, massive-scale data processing, algorithms, machine learning, visualization, and interfaces to collectively identify and address the fundamental technology challenges faced with Big Data. The approach is focused on the themes of Computational Platforms; Scalable Algorithms; Machine Learning and Understanding; and Privacy and Security.

The Computer Science and Artificial Intelligence Laboratory (CSAIL) researchers have been key movers in developments like time-sharing, massively parallel computers, public key encryption, the mass commercialization of robots, and much of the technology underlying the ARPANet, Internet and the World Wide Web. CSAIL’s approximately 50 research groups are organized into three focus areas: artificial intelligence, systems, and theory. Research is conducted in almost all aspects of computer science, as well as exploring revolutionary new computational methods for advancing healthcare, manufacturing, energy and human productivity.

The Database Group (DBg) at MIT conducts research on all areas of database systems and information management. Projects range from the design of new user interfaces and query languages to low-level query execution issues, ranging from design of new systems for database analytics and main memory databases to query processing in next generation pervasive and ubiquitous environments, such as sensor networks, wide area information systems, personal databases, and the Web.

The Macro Connections group focuses on the development of analytical tools that can help improve our understanding of the world’s macro structures in all of their complexity. By developing methods to analyze and represent networks—such as the networks connecting countries to the products they export, or historical characters to their peers—Macro Connections research combines data, visualization techniques, statistical methods, and theoretical insights to help improve our understanding of the world.
The Mathematics Department at MIT is one of the top-ranked mathematics departments in the US—a world center in Pure and Applied Mathematics. The pure math group studies many aspects of algebra, analysis, geometry, mathematical logic and foundations, number theory, probability and statistics, and representation theory. The applied math group focuses on combinatorics, computational biology, computer science, scientific computing, numerical analysis, and areas of physical applied mathematics.

**CONSUMER BEHAVIOR**

The mission of the MIT 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 finance, energy systems, urbanization, social networks, and health. IDSS research is rooted in three core disciplines: statistics and data science, information and decision theory, and human and institutional behavior.

The MIT Sloan Neuroeconomics Lab’s multidisciplinary research studies problems at the intersection of economics, management, and cognitive neuroscience. The lab’s projects fall into these areas: behavioral economics and consumer behavior; neuroeconomics; and Bayesian truth serum. The group studies behavior that appears anomalous in light of the rational model, focusing especially on financial, medical and consumption choices. Methods include functional MRI, lab experiments, game theory, Bayesian modeling and machine learning.

**DATA SECURITY, PRIVACY, TRUST**

The Computer Systems Security Group researches and builds secure, practical, and flexible systems. The group’s work spans operating systems, computer architecture, distributed systems, programming languages, and web browsers.

The goal of CyberSecurity@CSAIL is to identify and develop technologies to address the most significant security issues confronting organizations in the next decade. CyberSecurity@CSAIL aims to provide an integrated and formal approach to the security of systems, combining design and analysis methods from cryptography, software and hardware.

The Cryptography and Information Security Group (CIS Group) seeks to develop techniques for securing tomorrow’s global information infrastructure by exploring theoretical foundations, near-term practical applications, and long-range speculative research. The group aims to understand the theoretical power of cryptography and the practical engineering of secure information systems, from appropriate definitions and proofs of security, through cryptographic algorithm and protocol design, to implementations of real applications with easy-to-use security features. Research examples include: Micropayments; digital signatures; electronic voting; private information retrieval.

The MIT Internet Trust Consortium uses its expertise and knowledgebase to develop new technological building blocks that underlie the emerging personal data ecosystem. These blocks can be combined to address issues like identity management & authentication, authorization & consent management, data security, data mining & privacy-preservation, and digital death & meaningful archiving.

**DEMOGRAPHICS**

The MIT AgeLab’s multidisciplinary research works with business, government, and NGOs to improve the quality of life of older people and those who care for them. The AgeLab applies consumer-centered systems thinking to understand the challenges and opportunities of longevity and emerging generational lifestyles to catalyze innovation across business markets. Work is focused on the impact of disruptive demographics on society, business strategy and innovation, and sits at the intersection of infrastructure, information, and institutions. For instance, what are the implications of disruptive demographics on how businesses engage the consumer, develop products and services, deliver value and see aging as a source of economic opportunity?

**DIGITAL ECONOMY**

The Center for Information Systems Research (CISR) conducts field-based research related to how companies design themselves and manage for success in the digital economy. CISR aims to develop concepts and frameworks that address the challenges of leading increasingly dynamic, global, and information-intensive organizations. The relevance of CISR’s research is ensured by the active participation of corporate sponsors from a range of industries. Research results are shared with CISR Patron/Sponsor community through working papers, research briefings, an annual conference, and sponsor forums.

The Department of Economics faculty is equally committed to graduate and undergraduate education and is at the forefront of both theoretical and applied economics. Its faculty has made pioneering contributions from theory to macroeconomics, to finance, to industrial organization, to international trade. Student dissertation topics span a wide range of issues in microeconomics and macroeconomics, and include economic theory, data analysis, and econometric methodology.

The Initiative on the Digital Economy (IDE) researchers examine how people and businesses work, interact, and will ultimately prosper in a time of rapid digital transformation. The ini-
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tiative helps organizations understand how the digital transformation is affecting society and everyday life. IDE conducts research in four key areas: Productivity, employment, and inequality; big data and information privacy; new digital business models; social analytics and digital experimentation.

INNOVATION

The Industrial Performance Center (IPC) studies innovation, productivity and competitiveness. The IPC specializes in bringing together teams of researchers in engineering, science, management and the social sciences to carry out innovative, applied research on industrial growth and transformation, national and regional economic growth and competitiveness, and innovation performance. Its research is organized around the broad themes of energy; globalization; innovation; and production.

The MIT Innovation Initiative (MITii) is committed to strengthening MIT’s innovation and entrepreneurship landscape by: Serving as a connector across the wide range of student groups, programs, and campus centers; supporting MIT’s most successful innovation and entrepreneurship programs to reach more students and external partners; raising the profile of MIT’s entire landscape through convening events, publications, and programmatic efforts that include representation from across all five schools; and filling in gaps in the landscape through the creation of new educational programs, research efforts, and physical infrastructure.

The MIT Innovation Initiative Lab for Innovation Science and Policy was established to help develop the area of ‘innovation science’ — an emerging field that can be thought of as applying the scientific method to the practice of innovation. Using a diversity of methods, the lab empirically investigates how innovation occurs, and pioneers more systematic assessments of possible interventions (such as policies, programs or incentives) to achieve desired innovation outcomes (such as the creation of innovation-driven enterprises, job creation, economic and social impact, vibrant innovation economy). Areas of focus: metrics, policies, programs, boundaries, scale-up.

The MIT Startup Exchange (STEX) is a web community for the MIT innovation ecosystem, particularly MIT ILP’s members, MIT-connected startups and all MIT employees or alumni who have active startup engagements.

MANUFACTURING

The Computational Fabrication Group at the MIT Computer Science and Artificial Intelligence Laboratory investigates problems in digital manufacturing and computer graphics. Areas of research include computational materials and digital fabrication, virtual humans and robotics, computational photography and displays.

The Interactive Robotics Group is developing innovative methods for enabling fluid human-robot collaboration. The group’s vision is to harness relative strengths of humans and robots to accomplish what neither can do alone. The focus is on developing robots that work in teams with people in high-intensity and safety-critical applications, including industrial manufacturing, disaster response, and space exploration.

The Mechatrosynthesis Group aims to create new materials, machines, and design principles for advanced manufacturing. Much of our work seeks to discover and exploit micro- and nanoscale phenomena toward new and improved energy storage materials, electronic devices, composite structures, engineered surfaces, medical diagnostics, and consumer products. The group’s work is multidisciplinary, yet generally at a nexus of manufacturing, materials, and mechanical design.

The Self-Assembly Lab’s cross-disciplinary research invents self-assembly and programmable material technologies aimed at reimagining construction, manufacturing, product assembly and performance. The group has demonstrated that this phenomenon is scale-independent and can be utilized for self-constructing and manufacturing systems at nearly every scale. They have also identified the key ingredients for self-assembly as a simple set of responsive building blocks, energy, and interactions that can be designed within nearly every material and machining process available.

National Network for Manufacturing Innovation (NNMI) Institutes at MIT: Designed to foster innovation and accelerate advanced manufacturing in the US, new public-private consortiums are working to create a sustainable manufacturing. The newest (2016) of these MIIs is the Advanced Functional Fibers of America (AFFOA) Institute, which includes a new vision for a distributed foundry for functional fabric production and for training the workforce of the future. MIT leads and coordinates the education and workforce training program of AIM Photonics, called the AIM Photonics Academy, developing online/hands-on tools for photon device manufacturing integrated with industry partners. And in NextFlex, MIT is proposing “education factories” that integrate manufacturing training for flexible hybrid electronics with development of training skills and kits that inspire today’s young “makers” to make more.

MARKETING

Members of the MIT Sloan School of Management Marketing group have pioneered research methods, marketing models, and decision-support systems that have enhanced new product development, identified customer desires, predicted customer behavior, and have led to enhanced understanding of...
marketing strategy. The concept of marketing science, established and popularized at MIT Sloan, remains a critical component of marketing strategy in corporations across the globe.

**PRODUCT DESIGN AND DEVELOPMENT**

The *Ideation Laboratory at MIT* aims to deepen the theoretical foundations of early stage design process across product design, engineering design, system design, and beyond in order to develop transformational strategies for creating compelling new products and systems that address challenges of global competitiveness, sustainability, and emerging markets.

The *Integrated Design & Management (IDM)* is an MS degree in engineering and management track with a curriculum that combines the inspired, intuitive methods taught in the world’s best design schools, with the systematic, analytical methods of the world’s best engineering and business schools. IDM’s student and faculty backgrounds are composed of equal parts engineering, business, and design. Its core curriculum is taught in the Integrated Design Lab, where interdisciplinary teams have dedicated team space to practice the human-centered design process, complete with state-of-the-art tools from 3D printers to robotic arms.

The *Department of Mechanical Engineering (MechE)* conducts research in a range of areas, such as mechanics, product design, manufacturing, energy, nanoelectronics, ocean engineering, controls, instrumentation, robotics, and bioengineering, that are diverse and allow for rich collaboration both within the department and with other engineering and science disciplines at MIT and beyond. These broad areas of focus and the department’s commitment to multidisciplinary research results in an exciting variety of innovative projects.

**ROBOTICS, UNMANNED VEHICLES**

The *Aerospace Robotics and Embedded Systems (ARES) Group*’s mission is the development of theoretical foundations and practical algorithms for real-time control of large-scale systems of vehicles and mobile robots. Application examples range from UAVs and autonomous cars, to air traffic control, and urban mobility. The group uses advanced algorithmic approaches to control high-dimensional, fast, and uncertain dynamical systems subject to stringent safety requirements in a rapidly changing environment.

The *Robust Robotics Group* aims to build unmanned vehicles that can fly without GPS through unmapped indoor environments, robots that can drive through unmapped cities, and to build social robots that can quickly learn what people want without being annoying or intrusive. The group specifically focuses on problems of planning and control in domains with uncertain models, using optimization, statistical estimation and machine learning to learn good plans and policies from experience.

**SENSORS/SENSING, DIGITAL INTERFACES, USER EXPERIENCE**

The *Auto-ID Labs* are an independent network of currently seven academic research labs (including MIT) that research and develop new technologies for revolutionizing global commerce and providing previously un-realizable consumer benefits. The Labs research is divided into the following: business processes and applications (fundamentally new business processes and industries); software and network (future architecture of the Internet of Things); and hardware (next-class tags which include memory, battery, sensors and actuators).

The *Fluid Interfaces* group radically rethinks human-computer interaction with the aim of designing novel form factors that leverage the full range of user sensory capabilities and control modalities while exploring the following themes: Interfaces that perceive the user, her current context and actions and offer relevant services and information; interfaces that offer a more natural interaction experience, allowing use of the functionality without diverting attention or disrupting user actions; wearable interfaces that augment the human senses and capabilities; interfaces designed for more specific or limited applications making innovative use of their physical shape, size and materials.

The *Responsive Environments* group explores how sensor networks augment and mediate human experience, interaction and perception, while developing new sensing modalities and enabling technologies that create new forms of interactive experience and expression. The group’s work encompasses the development and application of various types of sensor networks, energy harvesting and power management, and the technical foundation of ubiquitous computing, and has been highlighted in diverse application areas, such as automotive systems, smart highways, RFID, wearable computing, and interactive media.

The *Tangible Media* group’s focus is on the design of seamless interfaces between humans, digital information, and the physical environment. The Tangible Media group is designing a variety of “tangible interfaces” by giving physical form to digital information, seamlessly coupling the dual worlds of bits and atoms. The goal is to change the “painted bits” of GUIs to “tangible bits,” taking advantage of the richness of multimodal human senses and skills developed through our lifetime of interaction with the physical world.
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SOCIAL NETWORKS, COLLECTIVE INTELLIGENCE

The MIT Center for Collective Intelligence (CCI) conducts research on how people and computers can be connected so that—collectively—they act more intelligently than any person, group, or computer has ever done before. CCI brings together faculty from across MIT to conduct research. Projects range from Combining Human and Machine Intelligence for Making Predictions, to the Climate CoLab, to the Deliberatorium, to Nonlinear Negotiation.

The Human Dynamics Group is exploring how social networks can influence our lives in business, health, governance, and technology adoption and diffusion. The Human Dynamics group uses Reality Mining to ask how to use this data to better organize companies, public health, and governance, by better understanding how social networks influence people when they make decisions, transmit information, adopt new technologies, or change behaviors.

The MIT Mobile Experience Lab seeks to reinvent and creatively design connections between people, information and places. Using cutting-edge information and mobile technology, the lab seeks to improve people’s lives through the careful design of meaningful experiences. The multidisciplinary team designs new technologies, carefully considering their impact on societies, spaces and communities. Project area examples: Banking; product design; fashion; responsive environments.

SUPPLY CHAINS / LOGISTICS

The Center for Transportation & Logistics (CTL) is widely recognized as an international leader in supply chain management education and research. Along with basic contributions to the understanding of transportation system planning, operations and management, its efforts include significant contributions to logistics modeling and supply chain management for shippers; to technology and policy analysis; and to management, planning and operations for trucking, railroad, air and ocean carriers.

The MIT Forum for Supply Chain Innovation (the Forum) is composed of academics and industry members whose support allows Forum researchers to provide customer-focused solutions to design and manage the new supply chain. The rigorous approach used guides businesses through the latest innovations in supply chain management, technology, and implementation techniques. Members have the flexibility and opportunity to participate in both industry-wide research into the supply chain as well as initiating their own specific research project.

Operations Research Center (ORC) research has led to significant contributions in such areas as health care, education, transportation, manufacturing, and finance. Whether helping a health care company predict future costs and improve medical outcomes or affecting systemic change in how a city assigns students to its public schools, ORC research streamlines business operations and shapes meaningful policies. Research topic examples include health care analytics; machine learning and its interface with optimization; online algorithms; personalized medicine; pricing and revenue management; social networks; supply chain management.

SUSTAINABILITY

The Center for Clean Water and Clean Energy at MIT and KFUPM focuses on research in desalination, low carbon energy, related areas of design and manufacturing as well as curriculum development in mechanical engineering. Projects are in the areas of clean energy, clean water, and design.

The Environmentally Benign Manufacturing research group is focused on examining the environmental effects associated with manufacturing and products. Research areas include: the thermodynamic, economic, and life cycle assessment of manufacturing processes and systems, products and recycling systems. Additional work looks at the environmental effects from the consumption side of the issue.

The MIT Joint Program on the Science & Policy of Global Change’s integrated team of natural and social scientists studies the interactions between human and Earth systems to provide a sound foundation of scientific knowledge that will aid decision-makers in confronting the challenges of future food, energy, water, climate and air pollution, among others.

The mission of the Massachusetts Institute of Technology is to advance knowledge and educate students and others in science, technology, and additional areas of scholarship. MIT is committed to generating, disseminating and preserving knowledge and to working to bring this knowledge to bear on the world’s great challenges. As part of its mission, MIT maintains relationships with industrial organizations that enable the exchange of ideas in the context of real-world problems and demonstrate how principles studied at MIT are applied to generate practical benefits for industry and society. MIT’s Industrial Liaison Program helps develop these relationships by facilitating industry’s access to MIT and its vast resources.