



**Massachusetts Institute of Technology**

**Department of Electrical Engineering  
and Computer Science**

***Research Interests of Faculty and Staff  
Who Supervise Graduate Theses  
2013-2014***

**Area I: Electrical Engineering: Information Systems, Circuits,  
Applied Physics and Devices, and Biomedical Science  
and Engineering**

**Area II: Computer Science: AI, Systems and Theory**

The list below is intended to help students who are seeking a thesis topic and an appropriate thesis supervisor. Most theses will be supervised by a member of the Electrical Engineering and Computer Science faculty who are listed below. Faculty and research staff in other departments may also supervise graduate theses.

Each doctoral thesis committee must include at least two Electrical Engineering and Computer Science faculty members. Special approval of the Committee on Graduate Students is required for doctoral thesis supervision by a non-faculty member except for those individuals noted in the non-faculty listing. Requests for such approval should be made to the appropriate Area Chair before beginning thesis research. This approval is also needed for the supervision of the Master of Science thesis.

**Faculty Member**  
**Area(s)**

**Special Interest for Research**

**Aaronson, S.**  
II

Computational complexity, quantum computing.

**Abelson, H.**  
II

Artificial intelligence, scientific computation, educational computing, societal and legal frameworks for information technology.

**Adalsteinsson, E.**  
I

Medical imaging with magnetic resonance and methods for optimal acquisition, reconstruction, and processing of imaging data acquired in vivo.

**Agarwal, A.**  
II, I

Computer architecture and software systems, multicore architecture, multicore operating systems, self-aware computing, VLSI processors, compilations and runtime technologies for parallel computing.

**Akinwande, A. I.**  
I

Display devices, vacuum microelectronic devices, and wide bandgap semiconductor devices.

**Amarasinghe, S. P.**  
II

Program analysis and optimization, computer architecture.

**Antoniadis, D. A.**  
I

Nanoscale solid-state electronic devices. Application of new materials systems and new structures to transistors for deeply scaled electronics. (On Leave Fall and Spring Terms)

**Arvind**  
II

Architecture synthesis and verification, digital design, term rewriting systems and lambda calculus. Parallel architectures and programming languages.

**Baggeroer, A. B.**  
I

Sonar, array processing for sonar, radar and seismic systems, acoustic telemetry, oceanography using acoustics.

**Balakrishnan, H.**  
II

Networked computer systems: wireless and mobile computing, network architecture and protocols, data management, cloud computing. (On Leave Spring Term)

**Baldo, M. A.**  
I

Molecular electronics, integration of biological materials and conventional electronics, novel nano-organic transistors; charge transport and injection in organic materials, energy transfer, high density phenomena, and exciton spin selection.

**Barzilay, R.**  
II

Natural language processing.

**Berggren, K. K.**  
I

Nanofabrication methods. Superconductive nanowire single-photon detectors. Quantum information science.

**Berners-Lee, T.**  
II

The Semantic Web: using the WWW infrastructure to create a global, decentralized, web-like mesh of machine-processable knowledge.

**Bers, A.**  
I

Plasma phenomena relevant to energy generation by controlled thermonuclear fusion. Plasma dynamics in the ionosphere-magnetosphere. Laser-plasma interactions. Nonlinear waves and chaotic dynamics. Electrodynamics of dispersive media. (Emeritus)

<b>Bertsekas, D. P.</b> I	Analytical and computational methods of deterministic and stochastic optimization, large scale systems, data networks.
<b>Berwick, R. C.</b> II	Natural language processing: computer models of language acquisition and parsing. Computational biology and evolutionary theory including evolution of language. Artificial intelligence: formal models of learning, including inductive inference and computational complexity analysis of language. Cognitive science: word learning, semantics of natural languages. (On Leave Fall and Spring Terms)
<b>Bhatia, S.</b> I	Applications of micro- and nano-technology in regenerative medicine, cell-based bioMEMS, bio-nanotechnology.
<b>Boning, D. S.</b> I	Semiconductor manufacturing. Metrology and modeling of IC and MEMS process, device and circuit variation. Computer tools and systems for statistical design for manufacturability, and environmentally benign manufacturing.
<b>Braida, L. D.</b> I	Development of aids for the deaf based on signal processing and automatic speech recognition. Computational models of hearing impairment and speech intelligibility.
<b>Bulovic, V.</b> I	Physical properties of organic and hybrid organic/inorganic thin films, structures, and devices as applied to the development of optoelectronic, electronic, and photonic organic devices of nano-scale thickness, including visible LEDs, lasers, solar cells, photodetectors, transistors, and flexible and transparent optoelectronics.
<b>Chan, V.</b> I	Optical, wireless and space communications and networks. Architecture, technology, system designs, and testbed implementations. New communication and network technologies, architectures and applications.
<b>Chandrakasan, A. P.</b> I	Design of digital integrated circuits and systems. Energy efficient implementation of signal processing, communication and medical electronics. Circuit design with emerging technologies.
<b>Chlipala, A.</b> II	Computer theorem-proving. Formal verification. Programming language design and implementation. Functional programming and type systems.
<b>Chuang, I.</b> I	Quantum information science, quantum physics, computation and physics.
<b>Dahleh, M. A.</b> I, II	The interface of robust control, estimation, information theory, and computation with application to control with communication constraints, and distributed mobile agents. Model reduction of stochastic systems, hybrid control. The interface between system theory and neurobiology. The analysis of complex networks with applications to social networks, transportation networks, and the power grid.
<b>Daniel, L.</b> I	Development of integral equation solvers for very large systems; stochastic field solvers for large number of uncertainties; automatic generation of parametrized stable compact models for linear and nonlinear dynamical systems. Simulation, modeling and optimization for mixed-signal/RF/mm-wave circuits, power electronics, MEMs, nanotechnologies, materials, MRI, and human cardiovascular system.

<b>Daskalakis, C.</b> II	Theory of computation. The interdisciplinary fields of algorithmic game theory, computational biology, social networks and applied probability.
<b>Davis, R.</b> II	Artificial intelligence, intelligent multimodal interfaces and natural interaction; intellectual property issues in software.
<b>del Alamo, J. A.</b> I	Field-effect transistors using III-V compound semiconductors for beyond Si CMOS logic applications. Reliability of III-V and GaN field-effect transistors. High electron mobility transistors for terahertz applications.
<b>Demaine, E.</b> II	Algorithms and data structures. Discrete and computational geometry, particularly folding. Graph algorithms and graph minors. Combinatorial games, puzzles, and magic. Art.
<b>Dennis, J. B.</b> II	Parallel computer system design to support functional languages and advanced environments for modular programming. Study of architecture, performance and reliability issues. (Emeritus)
<b>Devadas, S.</b> II, I	Computer-aided design. Computer security. Computer architecture.
<b>Dresselhaus, M. S.</b> I	Electronic materials engineering. Electronic, lattice, structural properties of semimetals, semiconductors, metals, carbon nanotubes, graphene, graphene edges, low dimensional thermoelectric materials, bismuth nanowires. (Emeritus)
<b>Durand, F.</b> II, I	Computer graphics; computational photography; structural analysis of masonry, content creation for online education. Lighting simulation, Fourier analysis, light fields. Computational optics, blur removal, revealing the invisible, video magnification. Systems for computational imaging, compilers. Video lecture authoring and editing.
<b>Emer, J. S.</b> II	Processor performance modeling infrastructures, especially FPGA-accelerated simulation, reconfigurable logic computing, parallel and multi-threaded processor architecture, cache and memory hierarchy design, processor reliability analysis.
<b>Englund, D.</b> I, II	Scalable implementations of emerging quantum technologies for secure communications, massively parallel computation and precision measurements. Semiconductor quantum optics, combining techniques from device physics, atomic physics, and modern nanofabrication. Current focus areas: silicon photonic integrated circuits for unconditionally secure communications and quantum simulation; quantum-enhanced sensors for real-time imaging of neural activity; spin-based memories in diamond for computing and quantum repeaters; spin-based solid-state atomic clocks; graphene photonics – modulators, detectors, hyperspectral imagers.
<b>Fonstad, Jr., C. G.</b> I	Compound semiconductor heterostructures, devices and physics. Optoelectronic devices, monolithic optoelectronic integration technologies and applications, and optoelectronic VLSI. Microscale thermophotovoltaics. Molecular beam epitaxy.
<b>Freeman, D. M.</b> I	Theoretical and experimental studies of auditory physiology. Development of 3D imagers to measure motions of biological and man-made microsystems. Measurement of sound-induced motions of inner ear structures and motions of microelectromechanical systems (MEMS).

<b>Freeman, W. T.</b> II, I	Machine learning applied to computer vision and computer graphics. Computational photography. Bayesian models of visual perception.
<b>Fujimoto, J. G.</b> I	Biomedical optical imaging. Imaging technology research and development. Advanced laser and photonics technologies. Medical imaging devices. Structural and functional imaging in ophthalmology, endoscopy, pathology, surgery. Cancer diagnostics. Advanced microscopy and imaging techniques for surgical guidance.
<b>Gallager, R. G.</b> I, II	Wireless communication, information theory, all optical networks, data networks. (Emeritus)
<b>Gifford, D. K.</b> II	Computational and systems biology, computational genomics. Computational genetics. Entrepreneurship. Machine learning.
<b>Goldwasser, S.</b> II	Cryptography, pseudo randomness, property testing, computational number theory, multi-party computations.
<b>Golland, P.</b> II, I	Developing novel techniques for image analysis and understanding. Statistical modeling, shape representation. Medical and biological imaging applications. (On Leave Fall Term)
<b>Gray, M. L.</b> I	Molecular imaging of cartilage. Cartilage degeneration and repair. Electrical, mechanical and chemical mediators of connective tissue growth and development. Ion partitioning and transport in biological tissues.
<b>Grimson, W. E.</b> II	Computer vision, medical image analysis, medical image processing, image guided surgery, activity recognition.
<b>Grodzinsky, A. J.</b> I	Osteoarthritis and joint injury: cartilage degradation, diagnostics, therapeutics, transport and drug discovery; tissue engineering for cartilage repair using self-assembling peptide scaffolds and encapsulating bone marrow stem cells; molecular electromechanics: AFM-based properties of matrix proteins and proteoglycans; mechanobiology: mechanical regulation of gene expression and cellular biosynthesis; cell and tissue nanomechanics.
<b>Guttag, J. V.</b> II, I	Application of machine learning and data mining techniques to large data sets, especially medical data sets. Application of computer vision to medicine. Sports analytics. (On Leave Fall and Spring Terms).
<b>Hagelstein, P.</b> I	Theoretical studies of anomalies in metal deuterides, excitation transfer, and anomalous energy exchange between disparate quantum systems, and thermal to electric conversion.
<b>Han, J.</b> I	Micro-nanofluidic systems, application of micro-nanofabrication to biological problems. Biological MEMS, biomolecular analysis. Nanofluidics, biosensing, proteomic sample preparation. Desalination. Electrochemical neuroengineering.
<b>Heldt, T.</b> I	Signal processing, modeling, estimation and identification of physiological systems; computational physiology; computational medicine; clinical inference.

<b>Horn, B. K. P.</b> II	Computational imaging, machine vision. Representation of objects and space. X-ray phase imaging. Traffic flow instability suppression.
<b>Hoyt, J. L.</b> I	Novel processes, materials and device concepts for electronic and photonic technology. Device physics and processing of silicon-based and III-V heterostructures. Epitaxial growth of SiGe/Si by chemical vapor deposition.
<b>Hu, Q.</b> I	Terahertz and infrared quantum cascade lasers and electronics, T-rays imaging, and their applications.
<b>Indyk, P.</b> II	Computational geometry, especially in high-dimensional spaces; databases and information retrieval; learning theory; design and analysis of algorithms; streaming and sketching algorithms.
<b>Jaakkola, T. S.</b> II	Statistical inference and machine learning. Applications to computational biology and information retrieval. Artificial intelligence.
<b>Jackson, D. N.</b> II	Software design and specification; design methods, tools and analysis; dependability; safety-critical systems; reverse engineering; static analysis, model checking, programming languages.
<b>Jaillet P.</b> I, II	Online optimization; real-time and dynamic optimization; networks; probabilistic combinatorial optimization problems; financial engineering.
<b>Kaashoek, M. F.</b> II	Computer systems: operating systems, networking, programming languages, compilers, and computer architecture for distributed systems, mobile systems and parallel systems.
<b>Kaelbling, L. P.</b> II	Planning and learning with applications to robotics, with special interest in: decision-theoretic planning, integrating geometry and probability, integrating logic and probability, and learning relational models.
<b>Kaertner, F.</b> I	Advanced ultrafast light sources from THz to X-ray wavelengths: femtosecond to attosecond precision timing distribution and sampling systems, femtosecond laser frequency combs, high-energy pulsed and high-average-power cryogenic lasers, multi-octave-wide high-energy lightwave synthesizers to be used in attosecond science and novel electron and X-ray sources. (Adjunct)
<b>Karger, D.</b> II	Group and personal information management, human computer interaction, computer supported collaboration, online education, algorithms – especially in application to other areas of computer science, randomized algorithms, graph theory.
<b>Kassakian, J. G.</b> I	Power electronics. Power supplies, dc/dc converters, inverters, power semiconductor devices. Automotive electronics and electrical systems. High energy storage double-layer capacitors.
<b>Katabi, D.</b> II, I	Computer networks and data communication. Congestion control, network measurements, scalability and robustness of communications systems. Differentiated services, internet pricing, routing, content distribution, self-configurable and wireless networks and network security.

<b>Kellis, M.</b> II	Computational biology, machine learning and algorithms in genomics. (i) Genome interpretation, comparative genomics, evolutionary signatures. (ii) Gene regulation: regulatory motifs, biological networks, dimensionality reduction, epigenomics. (iii) evolution: phylogenomics, population genomics, human variation. (iv) disease: genome-wide association studies (GWAS), single-nucleotide polymorphisms (SNPs), personal genomes, molecular underpinnings of common disease.
<b>Kirtley, Jr., J. L.</b> I	Electromechanics, electric machinery, electric power systems engineering, distributed and alternative energy systems.
<b>Kolodziejski, L. A.</b> I	Compound semiconductor materials, novel heterostructures, devices and device physics, heteroepitaxial growth processes and advanced fabrication technology, optoelectronic and photonic devices.
<b>Kong, J.</b> I	Chemical syntheses/device integration of low dimensional materials, Raman spectroscopy characterization.
<b>Lampson, B. W.</b> II	Computer science. Hardware design and machine architecture through distributed systems and programming languages to user interfaces and office automation.
<b>Lang, J. H.</b> I	Analysis, design and control of electromechanical and energy conversion systems. Emphasis on: traditional rotating- and linear-machine drives, micro/nano sensors and actuators, and flexible systems.
<b>Lee, H. S.</b> I	Research in analog integrated circuits in CMOS and BiCMOS technologies. Implementation of early vision algorithms in CCD and resistive fuse circuits.
<b>Leeb, S. B.</b> I	Design, analysis, construction, control, and monitoring of servomechanical actuators and mechatronic systems. Application of exotic materials including gel polymers to actuator construction.
<b>Leiserson, C. E.</b> II	Algorithms, caching, computer architecture, concurrency, multicore systems, multithreading, parallel computing, parallel programming, performance engineering, theory.
<b>Lim, J. S.</b> I	Advanced television systems. Video processing. Audio processing. Speech processing. Theories of digital signal processing.
<b>Liskov, B. H.</b> II	Programming methodology, programming languages, distributed systems, object-oriented databases.
<b>Lo, A. W.</b> II	Financial economics; risk management; econometrics; machine learning and financial big data; evolutionary models of behavior; artificial intelligence; secure multi-party computation with applications in financial regulation; natural language processing; healthcare finance.
<b>Lozano-Perez, T.</b> II	Artificial intelligence; robotics and computer vision.
<b>Lu, T. K.</b> I, II	Construction of synthetic organisms and fundamental gene circuits using engineering principles and quantitative designs; development of new clinical therapeutics for cancers and protein-misfolding disorders; using synthetic biology to produce renewable energy; study of the human microbiome.

<b>Lynch, N. A.</b> II	Theory of distributed and real-time computing: mathematical models, specification, algorithm and system design, performance and fault-tolerance analysis. Distributed data management, communication, synchronization. Languages and tools for abstract distributed programming. Hybrid (continuous/discrete) systems. Mobile wireless networks. Biologically-inspired distributed algorithms.
<b>Madden, S.</b> II	Databases and computer systems; query processing, distributed systems, management of streaming data, adaptive data processing, sensor networking.
<b>Magnanti, T.</b> I, II	Network design and optimization. Large-scale optimization. Optimization in telecommunications, manufacturing, logistics, and transportation.
<b>Mark, R. G.</b> I	Multiparameter physiologic signal processing; intelligent patient monitoring systems; multiparameter physiologic signal database design from ICU patients; ECG arrhythmia and ischemia analysis; cardiovascular physiology and modeling; database mining and machine learning.
<b>Matusik, W.</b> II	Computer graphics, applications in computational materials and novel displays.
<b>Medard, M.</b> I	Wireless systems' capacity and fading channels. Optical networks, network robustness and reliability. Network coding.
<b>Megretski, A.</b> I, II	Theory and algorithms of analysis and design of hybrid systems, nonlinear and robust control, non-convex and convex optimization, formalization of knowledge in education, functional analysis and operator theory.
<b>Meyer, A. R.</b> II	Educational technology and assessment.
<b>Micali, S.</b> II	Cryptography, secure protocols, pseudo-random generation, proof systems, zero knowledge, mechanical design.
<b>Miller, R.</b> II	Human-computer interaction, crowd computing, social computing, programming systems, user interface customization, software engineering.
<b>Minsky, M. L.</b> II	Artificial intelligence. Robotics and machine vision. Representation of knowledge and structure of personality. Common sense reasoning, theories of emotion and consciousness. (Emeritus)
<b>Mitter, S. K.</b> I, II	The interaction between information and control. Structure function and organization of complex systems.
<b>Morris, R. T.</b> II	The design of an easy-to-control data networking infrastructure designed to bring about a new level of flexibility to network configuration. The Resilient Overlay Networks Project. Grid routing protocols. (On Leave Fall and Spring Terms)
<b>Moses, J.</b> II	Organization of large complex systems, artificial intelligence.
<b>Moshkovitz, D.</b> II	Theoretical computer science, probabilistically checkable proofs derandomization, coding theory.



<b>Oppenheim, A. V.</b> I	Signal processing theory, applications and algorithms.
<b>Orlando, T. P.</b> I	Quantum computing with superconducting devices. Superconducting devices.
<b>Ozdoglar, A.</b> I, II	Nonlinear optimization and convex analysis; parallel and distributed algorithms; game theory; network economics, pricing, and resource allocation games; network optimization and control.
<b>Palacios, T.</b> I	Design, processing and characterization of novel electronic devices in wide bandgap semiconductors and graphene; polarization and bandgap engineering; transistors for sub-mm wave power and digital applications; new concepts for power conversion and generation; interaction of biological systems with semiconductor materials and devices.
<b>Parrilo, P.</b> I, II	Control and identification of uncertain complex systems, robustness analysis and synthesis, and the development and application of computational tools based on convex optimization and algorithmic algebra to practically relevant problems in engineering, economics and physics.
<b>Peh, L-S</b> II, I	On-chip networks, many-core chip architecture, mobile, distributed computing. (On Leave Fall and Spring Terms)
<b>Penfield, Jr., P. L.</b> I, II	Information and entropy. (Emeritus)
<b>Perreault, D. J.</b> I	Electronic circuit design, power electronics and energy conversion, control. Applications to industrial, commercial, scientific, transportation, and biomedical systems.
<b>Polyanskiy, Y.</b> I, II	Non-asymptotic characterization of the performance limits of communication systems, optimal feedback strategies and optimal codes. Searching for practical implementations of channel codes that attain theoretical promise with low latency and small delay.
<b>Ram, R. J.</b> I	Novel semiconductor lasers for advanced fiber optic communications. Study of fundamental interactions between electronic materials and light.
<b>Reif, L. R.</b> I	Integrated circuit fabrication technology. New process technologies for VLSI. Multilevel interconnect technologies. Three-dimensional integration. Environmentally-benign semiconductor manufacturing.
<b>Rinard, M. C.</b> II	Program analysis, compilers, distributed computing, software engineering. (On Leave Spring Term).
<b>Rivest, R. L.</b> II	Cryptography. Computer/network security. Algorithms. Voting technology.

<b>Roberge, J. K.</b> I	Electronic circuit design, including space circuitry; design for integrated circuits; analog to digital conversion techniques, and other analog-digital circuits. Feedback systems.
<b>Rubinfeld, R.</b> II	Sublinear time algorithms, randomized algorithms, computational complexity theory, property testing.
<b>Rus, D.</b> II, I	Robotics, mobile computing and information access.
<b>Sanchez, D.</b> II	Computer architecture. In particular, striving to improve the performance, efficiency and scalability of future parallel and heterogeneous systems, and to enable programmers to leverage their full capabilities easily. Current projects focus on scalable and efficient memory hierarchies, architectures with quality-of-service guarantees, scalable dynamic fine-grained runtimes and schedulers, and hardware support for scheduling.
<b>Sarpeshkar, R.</b> I, II	Analog circuits and biological systems; synthetic biology; analog and bio-inspired supercomputers; glucose powered neural prosthetics; ultra energy efficient, ultra low power, and energy harvesting systems; implantable medical devices.
<b>Schindall, J.</b> I	Automotive applications of electronics: energy storage using nanotube-enhanced ultracapacitors, reliability enhancement of complex system architectures, industry-related research and product development, novel time-domain processing methods, satellite communication architectures.
<b>Schmidt, M. A.</b> I	Microelectromechanical systems (MEMS). Design of micromechanical sensors and actuators. Microfabrication technology.
<b>Shah, D.</b> I, II	Network algorithms. Scaling laws for networks. Stochastic networks. Message passing algorithms. Statistical inference. (On Leave Spring Term).
<b>Shapiro, J. H.</b> I	Quantum communication and measurement. Optical communication through the atmosphere.
<b>Shavit, N.</b> II	Techniques for designing, implementing, and reasoning about multiprocessors, and in particular the design of concurrent data structures for multi-core machines. Introduction and first implementation of software transactional memory.
<b>Sodini, C. G.</b> I	Design of technology-intensive microsystems, emphasizing integrated circuit and system design, for medical electronic devices. These devices include wearable and minimally invasive monitoring and imaging.
<b>Solar-Lezama, A.</b> II	Programming systems with a focus on software synthesis. Programming tools for parallel and high performance computing.
<b>Stonebraker, M.</b> II	Database systems, query processing, data warehouses, federated databases, data visualization. (Adjunct)
<b>Stultz, C.</b> I, II	Conformational changes in macromolecules and the effect of structural transitions on human diseases. Gain insights into the role of molecular structure by utilizing techniques drawn from computational chemistry, signal processing, and basic biochemistry. (On Leave Fall Term).

<b>Sudan, M.</b> II	Theoretical computer science, theory of communication, complexity theory, coding theory, algebraic methods in computer science. (Adjunct)
<b>Sussman, G. J.</b> II, I	Artificial intelligence: learning, problem solving and programming. Computational performance models for intelligent behavior, especially modeling the behavior of engineers. Numerical models of physical systems.
<b>Sze, V.</b> I, II	Joint design of algorithms, architectures, VLSI and systems for energy efficient implementations. Applications include video coding/processing, computer vision, machine learning, health monitoring and distributed sensing.
<b>Szolovits, P.</b> II	Application of artificial intelligence techniques to medical decision making. Effective representation of knowledge. Personal health information systems, medical confidentiality.
<b>Tedrake, R. L.</b> II, I	Robotics, nonlinear control, and machine learning. Legged robots, flapping-wing flight, motion planning, optimal control and reinforcement learning, convex optimization, flow control, biological motor control, and computational neuroscience. Emphasis on solving difficult robotics problems with nonlinear dynamics and combining rigorous feedback control approaches with combinatorial motion planning algorithms. (On Leave Fall Term)
<b>Teller, S.</b> II	Autonomous and semi-autonomous robotics for mobility and mobile manipulation; human-robot interaction; sensing, perception, state estimation and inference; assistive technology for people with sensory and motor disabilities.
<b>Tidor, B.</b> II, I	Modeling of protein-protein interactions, focusing on electrostatic effects and structure-based drug design. Systems-level biology including biological network modeling and information theory applied to data analysis.
<b>Torralba, A.</b> II	Computer vision, machine learning and human perception; development of computer vision systems and solving real world recognition tasks; modeling human perceptual and cognitive capabilities; object recognition, classification of whole scenes; visual recognition and classification of places and objects.
<b>Tsitsiklis, J. N.</b> I, II	Analysis, optimization, control and algorithms for deterministic and stochastic systems. Resource allocation and decision making in networks. (On Leave Fall and Spring Terms).
<b>Vaikuntanathan, V.</b> II	Cryptography, communication complexity, distributed algorithms, computational number theory.
<b>Vergheese, G. C.</b> I	Signal processing, estimation, identification, modeling, structured reduction and control for systems arising in biomedicine and other applications; computational physiology, bedside informatics and clinical inference.
<b>Voldman, J.</b> I	Biological applications of microtechnology, especially to cell biology; bioMEMS; electrostatics at the microscale.
<b>Ward, S. A.</b> II	Computer architecture and operating systems.

<b>Warde, C.</b> I	Devices and systems for optical information processing; optoelectronic integrated circuit neuro-processors; optical neural network algorithms and architectures; integrated spectropolarimetric imaging sensors; spatial light modulators; microdisplays. (On Leave Spring Term).
<b>Watts, M.</b> I	Electromagnetics and microphotonics.
<b>Weiss, R.</b> II, I	Synthetic biology. Construction and analysis of synthetic gene networks. Use of computer engineering principles of abstraction, composition, and interface specifications to program cells with sensors and actuators precisely controlled by analog and digital logic circuitry. Emphasis on establishing the engineering foundation for synthetic biology and the pursuit of novel applications enabled by the technology (e.g. programmed tissue engineering, diabetes, engineered neuronal circuits).
<b>White, J. K.</b> I, II	Numerical simulation and optimization techniques with application to problems in integrated circuit interconnect and packaging, micromachined devices (MEMS and bioMEMS), photonic devices, drug design, and systems biology.
<b>Willsky, A. S.</b> I, II	Estimation, inference, machine learning, and statistical signal and image processing. Multiresolution methods, image reconstruction, large-scale data assimilation and multisensor fusion, computer vision, and graphical models for inference on complex phenomena. Application from a wide variety of fields, including low-level computer vision and segmentation, medical image processing, remote sensing, object recognition and sensor networks.
<b>Winston, P. H.</b> II	Artificial intelligence and computational theories of human intelligence, with special emphasis on the roles of language, vision and story understanding.
<b>Wornell, G. W.</b> I, II	Information-theoretic, coding, and algorithmic aspects of inference, learning, communication, compression, storage, security, control, sensing, imaging, and computation. Contemporary and novel applications including wireless networks, multimedia systems and databases, neuroscience and bioengineering, quantum communication, millimeter-wave systems, and digitally-enhanced analog and mixed-signal devices, circuits and microsystems. (On Leave Fall and Spring Terms).
<b>Wyatt, Jr., J. L.</b> I	Implantable retinal prosthesis. Neural coding. Random process models. Dynamics of nonlinear circuits and systems.
<b>Yanik, F.</b> I	Technologies for regenerative neurobiology. Neural regeneration and complex wiring of neuronal networks probed and manipulated using various technologies including microfluidics, femtosecond laser microsurgery, and 3D multi-photon imaging. Development of novel drug and genetic screening and discovery platforms. Animal and cell culture models employed ranging from <i>C. elegans</i> to embryonic-stem-cell derived neurons. (On Leave Fall Term).
<b>Zaharia, M.</b> II	Computer systems, networks, large-scale data management, parallel programming models, cloud computing. (Starting Fall Term 2014)

<b>Zahn, M.</b> I	Electromagnetic, electromechanical, and electro-optic interactions with gaseous, liquid, and solid media, especially under high electric field conditions. Theory, measurements, and applications of high voltage conduction and breakdown phenomena. Capacitive and inductive sensors for measuring dielectric, conduction, and magnetic properties of materials. Design and fabrication of magnetic field based MEMS devices using magnetic particles and liquids especially for oil spill cleanup in the oceans using oleophilic magnetic nanoparticles. (On Leave Fall Term)
<b>Zeldovich, N.</b> II	Building practical secure systems. Operating systems, hardware design, networking, and distributing systems. Programming languages and tools, security analysis and verification.
<b>Zheng, L.</b> I, II	Wireless communications, physical layer designs, wireless networks; space-time processing, digital communications, multi-user detection algorithms, information theory, stochastic signal processing, optical communications.
<b>Zue, V.</b> II, I	Development of human language technologies to enable easy access of structured and unstructured information from the web, especially dialogue modeling and content processing, for applications such as education and healthcare.

### Non-Faculty Supervisors

The following members of the research staff and departmental affiliates have been approved by the Committee on Graduate Students as both **PhD** and **Master's** thesis supervisors.

<b>Clark, D. D.</b> II	Computer networks: Internet engineering; hardware and protocols for high speed large scale network communications. Real-time services over networks. Policy and economic issues; pricing. Computer/communication security.
<b>Fisher, J. W.</b> II	Information theory, nonparametric statistics and machine learning. Pattern recognition, distributed inference and learning in sensor networks, computer vision, multi-modal data fusion and functional imaging.
<b>Glass, J. R.</b> II, I	Speech recognition and understanding; unsupervised speech pattern discovery; language acquisition, acoustic scene analysis.
<b>O'Reilly, U-M</b> II, I	Big data analysis, cloud-scale machine learning for knowledge mining, optimization, prediction and adaptive systems; genetic programming (evolutionary algorithms); applications in knowledge mining for clinical medicine and massive open online course (MOOCs) education.
<b>Rosenholtz, R.</b> II	Computational modeling of human vision. Application of understanding of human vision to design of user interfaces and information visualizations.

<b>Rudolph, L.</b> II	Pervasive computer, cell phone programming, optical communication, parallel computing/sensors/actuators, complex systems.
<b>Seneff, S.</b> II	Biomedical data mining; spoken dialogue systems; computer games for language learning.
<b>Shrobe, H.</b> II	Computer security, artificial intelligence, software understanding, computer architecture.
<b>Sollins, K. R.</b> II	Network architecture, information networks, naming, privacy, security network management.
<b>Temkin, R.</b> I	Vacuum electron devices, coherent radiation generation, free electron lasers, gyrotron research, quasi-optical antennas, relativistic beam physics, accelerator physics, plasma physics.
<b>Terman, C.</b> II	Digital systems, design tools, educational technology.
<b>Velasquez-Garcia, L. F.</b> I	Micro- and nano-enabled multiplexed scaled-down systems that exploit high electric field phenomena for space, energy, healthcare, manufacturing and analytical applications.
<b>Wong, F. N. C.</b> I	Nonlinear and quantum optics, quantum communication, quantum imaging.

Some research staff members and other non-faculty associated with the department have been given departmental approval to supervise Master's of Engineering (MEng) theses.