Artificial Intelligence Faculty

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Roger Dannenberg
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Matt Mason
Tom Mitchell
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David Woodruff
Developing foundations and principled, practical algorithms for important modern learning paradigms. These include interactive learning, distributed learning, multi-task learning, and life-long learning. My research formalizes and explicitly addresses all constraints and important challenges of these new settings, including statistical efficiency, computational efficiency, noise tolerance, limited supervision or interaction, privacy, low communication, and incentives.

**Roger Dannenberg,** Professor (CS, Art & Music)

I am interested in creating computers that listen to music, understand music, and interact with human musicians. Music understanding includes the analysis of low-level features such as pitch and onset times, mid-level information such as chord recognition and tempo, and high-level structure such as repetition, themes, and emotion.

**Scott Fahlman,** Research Professor, Emeritus (LTI & CS)

My research group is working on knowledge representation and reasoning (the Scone knowledge-base system) and its applications, especially in the area of natural-language understanding. We are also working on common-sense planning, reasoning about actions and events, and modeling the mental states of multiple agents, all built on top of Scone.

**Zico Kolter,** Assistant Professor (CS)

My work focuses on machine learning and optimization, with a specific focus on applications in smart energy systems. From an algorithmic standpoint, I am interested in fast optimization algorithms for a number of problems and for general convex programs, large-scale probabilistic modeling, stochastic optimization, and reactive machine learning algorithms. On the application side, the focus is on energy disaggregation, probabilistic forecasting for energy systems, and model predictive control techniques for industrial control in the electrical grid.
Tai-Sing Lee, Professor (CS, CNBC & ML)
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Computer and biological vision, Neural computation

My research interests are: computational neuroscience, computational vision, neurophysiology of the primate visual systems, active and adaptive vision, hierarchical coding and inference, visual development, learning and adaptation, structure of neural codes.

Matt Mason, Professor (RI & CS)
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Robotic Manipulation

I am interested in robotic manipulation: all the different ways that robots (and animals) move things around. One favorite project is to use machine learning so that a robot can develop dexterity through practice, and another favorite project is to automate assembly of smart phones.

Tom Mitchell, Professor (ML & CS)
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Machine Learning

My research is primarily in machine learning. One primary focus is on never-ending learning, including our Never-Ending Language Learner (NELL) project, which is trying to learn to read the web (http://rtw.ml.cmu.edu). A second primary focus is studying language processing in the human brain, by applying machine learning analyses to brain image data (http://www.cs.cmu.edu/~fmri).

Ariel Procaccia, Associate Professor (CS & ML)
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Algorithmic game theory, Computational social choice

I mainly work on problems at the intersection of computer science and economics, combining ideas from multiagent systems, machine learning, optimization, and theoretical computer science, with areas of microeconomic theory such as social choice, fair division, game theory, and mechanism design. I am especially excited about deep theoretical problems that have direct real-world implications.
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*Machine learning, Game Theory*

My research spans the areas of machine learning, statistics, game theory, and information theory. I specifically focus on learning from people, addressing questions such as "How to make sense of noisy and/or subjective data given by people?" and "How to obtain better data through incentives and interfaces?"

Tuomas Sandholm, Professor (CS)
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*Mechanism Design, Game Theory, Auctions.*

I am interested in market design; optimization; game theory; mechanism design; electronic commerce; artificial intelligence; multiagent systems; auctions and exchanges; automated negotiation and contracting; equilibrium finding; algorithms for solving games; advertising markets; computational advertising; kidney exchange; prediction markets; market making; voting; coalition formation; safe exchange; normative models of bounded rationality; resource-bounded reasoning; multiagent learning; machine learning.

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*CS Education, Autonomous Robots, Computational Neuroscience*

I'm currently investigating two questions: how to teach computational thinking to young children using a curriculum based on autonomous robots, and how to teach high level robot programming to CS majors. My children's curriculum is based on a novel understanding of Microsoft's Kodu Game Lab. My undergraduate curriculum uses the new Cozmo robot by Anki.

David Woodruff, Associate Professor (CS)
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*Algorithms and Complexity, Machine Learning*

My current research interests are communication complexity, data stream algorithms and lower bounds, graph algorithms, machine learning, numerical linear algebra, sketching, and sparse recovery.