MASSACHUSETTS INSTITUTE OF TECHNOLOGY
ARTIFICIAL INTELLIGENCE LABORATORY

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AI Lab Faculty
1996–1997

Edited by
AI Lab Faculty Members (1998-present)
Raquel A. Romano (1997)
Mark C. Torrance (1995)

Abstract: This document is meant to introduce new graduate students in the MIT AI Lab to the faculty members of the laboratory and their research interests. The report consists of pictures of the faculty members, information on how to reach them, their responses to a few survey questions, and a few paragraphs about their research, including excerpts from the AI Lab section of the MIT President's Report, as edited by Patrick Winston.

This document is meant to introduce new graduate students in the MIT AI Lab to the faculty members of the laboratory and their research interests. The report consists of pictures of the faculty members, information on how to reach them, their responses to a few survey questions, and a few paragraphs about their research, including excerpts from the AI Lab section of the MIT President's Report, as edited by Patrick Winston.

Below you will find a copy of the survey each professor was asked to complete. Careful reading of the questions may help you better interpret their responses.

Most current students and faculty agree that it is a good idea to visit many professors and students before you settle on an advisor and group. Many older students say they wish they had spent more time getting a broad sense of the variety of work done in the lab before they committed to their current advisors.

Some people in the lab feel that the *User's Guide to Tech Square* gives the mistaken impression that you need to be well-prepared before you talk to a faculty member about his/her research. The faculty expect new students to come around to talk to them during the first few months of the year. Such a meeting does not constitute a commitment on either part to form a working relationship, so you are encouraged to meet as many of the faculty as you can during your first few weeks and months here. You'll find, for example, that many of the faculty surveyed here explicitly encourage students to approach them with little or no preparation. Consider this document a gentle introduction to the faculty, and don't be shy!

The survey

The following message was sent by email to all the faculty members affiliated with the AI Lab and the Clinical Decision Making Group on the 4th floor, and to members of the research staff who work with graduate students.

Questions with continuous numerical answers have been converted to a uniform scale for purposes of the presentation that follows. The lowest numbered choice in the survey was converted to a bar of no length, the highest numbered choice to a full-length bar.

1. Many students enter the AI Lab not yet even knowing what general area within AI they want to study. How willing would you be to talk to such students while they are in this stage?

   0.0 not interested

   2.5 indifferent

   5.0 very interested

2. What level of preparation do you feel is *necessary* on the part of a student before you would want to meet with that student? (Provide your own description if none below apply.)

   0 No preparation

   1 Has read blurb about my work in LCS or AI progress report

   2 Has skimmed some of my recent papers

   3 Has carefully read papers and has specific questions

   4 Has already talked to some of my students

   5 Already has an idea for a thesis proposal

3. Do you have group meetings? If so, would you suggest a new student come to the meetings to get a flavor of your group before meeting with you? (Yes/No)

4. How interested are you in taking new students at this time?

   0.0 not interested

   2.5 indifferent

   5.0 very interested

5. How important is it that new students who want to work with you have their own funding this term?

   0.0 not important

   2.5 somewhat important

   5.0 necessary

6. Please recommend one or two of your graduate students who would be good for interested new students to ask about your/their work.

7. Describe your current research interests in 2-3 short paragraphs. If you would like, we will instead use an excerpt of either our choosing or yours from Patrick Winston's President's Report (`http://www.ai.mit.edu/people/phw/96blurb.html`) that describe your research interests. If your work does not appear in the President's Report, please send an appropriate 2-3 paragraph description.

Any other comments you have about integration of new students into your group or new student orientation in general would be warmly received.

Thank you very much for your time,

Christian Shelton and Raquel Romano

Hal Abelson

Office: NE43-410
Phone: x3-5856
Email: hal@ai
URL: http://www.swiss.ai.mit.edu/~hal/hal.html

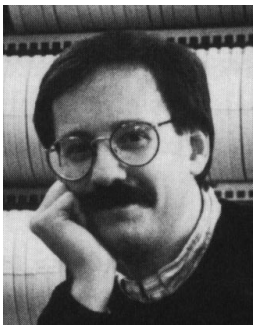
Survey answers not available.

Professor Abelson has recently returned from on leave where he served as Chief Scientist of Hewlett-Packard's Internet Technology Group.

Professor Abelson has developed a new subject called Ethics and Law on the Electronic Frontier. He runs the Project on Mathematics and Computation (Project MaC) with Professor Gerald Sussman. Project Mac builds a wide spectrum of intelligent computational tools to help scientists and engineers understand mathematical models of physical processes.

See also information under Gerald Sussman.

Bob Berwick



Office: NE43-765
Phone: x3-8918
Email: berwick@ai
URL:
http://www.ai.mit.edu/projects/cbcl/web-pis/berwick/homepage.html

Willingness to talk to students before they are sure of their area ..	0 [5] 5
Amount of preparation required ...	Read blurb about his work in AI President's report
Has group meetings	Yes
Should you attend them	Best to meet with him first
Seeking new students	0 [4] 5
Must have your own funding	0 [2.5] 5
Current students to talk to	Gina Levow, Charles Yang

Professor Berwick and his group have concentrated on the problem of learning a lexicon. In particular, they have come up with a general framework for language acquisition in which linguistic parameters like words are built by perturbing a composition of existing parameters and related it to ”traditional” coding schemes like Lempel-Ziv. that do not include the cost of parameters. Because the compressed text is stored in terms of linguistic units like words, it can be searched, indexed, and parsed without decompression. In addition, Professor Berwick and Dr. Partha Niyogi have been formalizing linguists' intuitions about language change by advancing a dynamical systems model for language change derived from a model for language acquisition.

Professor Berwick is also interested in computational biology, especially computational evolutionary biology, modeling via genetic algorithms, and adaptive systems.

Rodney A. Brooks

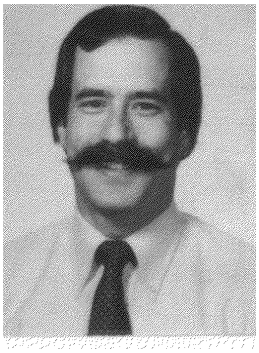
Office: NE43-822
Phone: x3-5223
Email: brooks@ai
URL: http://www.ai.mit.edu/people/brooks

Willingness to talk to students before they are sure of their area ..	0 [4] 5
Amount of preparation required ...	No preparation necessary
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	0 [0] 5
Must have your own funding	0 [0] 5 N/A
Current students to talk to	Cynthia Ferrell, Matt Marjanovic, Brian Scassellati

Rod Brooks is the Director of the Artificial Intelligence Lab.

Professor Brooks directs the Cog project, a humanoid robot composed of sensors and actuators which tries to approximate the sensory and motor dynamics of a human body. Among Cog's parts are a ”brain” which is a scalable MIMD computer consisting of up to 239 processor nodes, a torso, two six degree of freedom series elastic actuator arms, and a camera system with four degrees of freedom consisting of two active ”eyes.” The robot also has a system that learns how to move Cog's arm in reaching motions based on visual feedback and a system that coordinates visual saccades with head motion so that Cog can look around the room and maintain a steady view of the world. Cog is a single hardware platform which seeks to bring together each of the many subfields of artificial intelligence into one unified, coherent, functional whole.

Professor Brooks' group is also building the pet robot, a project to investigate models of emotions in artificial creatures. Emotions can be modeled at various levels—purely as imitations of emotional states in animals, as controlling systems for artificial creatures with both internal behavior regulation mechanisms as well as external expressions, or just as internal behavior regulation mechanisms where the external expressions are large side effects. The group is building artificial creatures to experiment with these approaches, to study human reactions to such systems, and to find ways to have robots with which people can have empathetic interactions (in both directions).



Randy Davis

Office: NE43-801A
Phone: x3-5879
Email: davis@ai
URL: None

Willingness to talk to students before they are sure of their area	4 (0–5)
Amount of preparation required	No preparation necessary
Has group meetings	No
Should you attend them	N/A
Seeking new students	5 (0–5)
Must have your own funding	1 (0–5)
Current students to talk to	Will Neveitt, Kimberle Koile

Professor Davis leads projects in both Intelligent Design Tools and Knowledge Navigation.

Current design practices and tools are focused on the end product - the final design for the artifact - and are almost completely out of touch with the design process and some of its most important features, notably the design rationale. Professor Davis' group is building a new design environment, one that will quite literally look over the designer's shoulder, watching as the designer sketches, gestures, and explains the design concept. The environment must understand the drawing and understand the technical vocabulary that the designer is using. It will use that knowledge to understand the sketch, assist in exploring variant designs, and assist in eliciting design rationales from the designer.

The hypothesis of Professor Davis' knowledge navigation group is that very large collections of information can be made more accessible by engaging the native intuitions humans use to mentally organize very large physical spaces. His group is developing principles for the design and architecting of information spaces, so that they can be as intuitively easy to navigate as a well designed city, a well laid out library, or a well designed museum exhibit. By architecting information around the mental models people use, rather than around surface features like keywords, they aim to magnify the value of information by overcoming the limitations of information overload.

See also information under Howard Shrobe.

Jon Doyle

Office: NE43-419
Phone: x3-3512
Email: doyle@medg.lcs.mit.edu
URL: http://www.medg.lcs.mit.edu/doyle

Willingness to talk to students before they are sure of their area ..	0 4 5
Amount of preparation required ...	No preparation necessary
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	0 4 5
Must have your own funding	0 4 5
Current students to talk to	Latanya Sweeney

Jon Doyle is a member of the Clinical Decision Making Group (MEDG) of LCS (see also group information under Peter Szolovits).

His primary research interests concern understanding AI, psychological, and economic ideas from a mathematical point of view, with special focus on understanding structure and physical basis of notions of limited rationality, both as an aid to understanding and constructing AI systems, and as an intellectual foundation for realistic theories of economics. This mathematical work has involved several interrelated efforts, including equilibrium treatments of reflective and nonmonotonic reasoning, economic theories of distributed and "society of mind" agents, variational and least-change treatments of reason maintenance and belief revision, semantics for generic preferences, qualitative decision theory, and theories of deliberative decision making, planning, and representational methods.

His primary system-building interests concern construction of rational and distributed agents in medical and other areas. This work includes the Guardian Angel project, which aims to construct artificial agents serving as a personal, lifelong, active medical assistant monitoring an individual's health status, protecting the individual against healthcare errors, and explaining ongoing and contemplated medical and lifestyle interventions; the MAITA (Monitoring, Analysis, and Interpretation Tool Arsenal) project, which aims to facilitate the construction and modification of knowledge-based monitoring systems through development of an extensive library of monitoring procedures (of differing levels of specificity) and tools for editing and initiating distributed monitoring processes based on library entries; and the AI/LCS information survivability effort (in collaboration with Randy Davis and Howard Shrobe), which aims to detect, prevent, and mitigate attacks on or breakdowns in the modern information infrastructure.

He also has side interests in the structure and implication of electronic publishing, knowledge-based support for electronic publishing and digital libraries, and the history and biography of AI ideas and people.

See also information under Pete Szolovits.

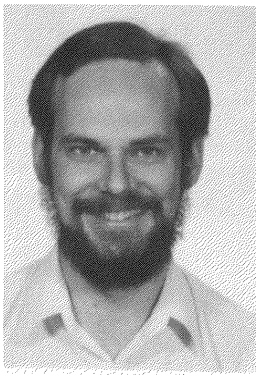
Olivier Faugeras

Office: NE43-713
Phone: x3-8826
Email: faugeras@ai
URL:
http://www.inria.fr/robotvis/personnel/faugeras/faugeras-eng.html

Willingness to talk to students before they are sure of their area	0 [2.5] 5 when he is around
Amount of preparation required	Skim some recent papers
Has group meetings	No, having group meetings does not make sense in his position
Should you attend them	Yes
Seeking new students	0 [4] 5
Must have your own funding	0 [5] 5
Current students to talk to	

Professor Faugeras is an Adjunct Professor of EECS and a member of the AI Lab in addition to being research director of the ROBOTVIS Group at INRIA in Sophia Antipolis, France. Professor Faugeras' current work includes the following: geometric approaches to computer vision, application of algebraic invariants to computer vision, application of differential invariants and partial differential equations to computer vision and shape analysis, motion analysis, and stereo.

Eric Grimson

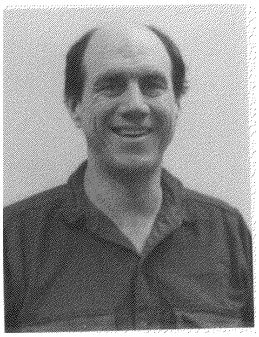


Office: NE43-725
Phone: x3-5346
Email: welg@ai
URL: http://www.ai.mit.edu/people/welg/welg.html

Willingness to talk to students before they are sure of their area	0 [4] 5
Amount of preparation required	Skim some recent papers
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	0 [1.5] 5
Must have your own funding	0 [2] 5
Current students to talk to	Tina Kapur, Mike Leventon, Raquel Romano

Professor Grimson's current research foci include the following:

- Medical image analysis. Together with the Surgical Planning Laboratory of Brigham and Women's Hospital, Professor Grimson's group is developing image guided surgery systems, and clinical analysis tools based on computer vision techniques. Research topics include segmentation of medical imagery into tissue types, 3D reconstructions of anatomy, registration of anatomical reconstructions to live imagery, real time tracking of surgical instruments, and integrated systems for surgical guidance.
- Video surveillance and monitoring. Professor Grimson's group is developing methods to support real time tracking of objects in cluttered, unstructured scenes. Particular focus is given to problems of activity detection and classification. Related topics include camera calibration, site modeling from collections of cameras, incorporating learning techniques with visual observations.
- Image database and video indexing. Professor Grimson's group is developing methods to search large databases of images and video streams. A key motivation is to support methods that can classify imagery on the basis of content, as well as to support intelligent searching based on content similarity.



Carl Hewitt

Office: NE43-789
Phone: x3-5873
Email: `hewitt@ai`
URL: `http://www.ai.mit.edu/people/hewitt`

Survey answers not available.

Professor Hewitt's group is developing foundations to address how participation is described and processed using telecomputer services. They call their approach Participatory Semantics. They take participation as distributed, open (multi-agent) activity, and they take semantics of participation broadly: it includes influences on all subsequent participation.

Participatory infrastructures are developing through the synergy between the availability infrastructures, which provide us with the telecomputing means to participate from ever more times and places, and the interaction infrastructures which help us manage our negotiating, communicating, coordinating, cooperating, collaborating, and competing. The Participatory Semantics project develops issues, practices, principles, methods, technologies, and presentations for understanding, communicating, and negotiating the impact of participation on future participation. In particular, they address semantics of participation of humans and telecomputing systems mediated by participatory infrastructures.

Berthold K. P. Horn

Office: NE43-715A
Phone: x3-5863
Email: bkph@ai
URL: http://www.ai.mit.edu/people/bkph/bkph.html

Willingness to talk to students before they are sure of their area	0 4 5
Amount of preparation required	Skim some recent papers
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	0 2 5
Must have your own funding	0 3 5
Current students to talk to	Gideon Stein, Nicole Love

Professor Horn and his students work on problems in motion vision. Because recovery of information about the world from a single cue such as motion parallax, binocular stereo disparity, or shading in images tends to be unreliable, Professor Horn works on the integration of information from multiple cues at a low level, building systems that interlace iterations of different schemes for recovering shape.

Professor Horn's group is completing a new special-purpose early-vision analog VLSI chip. This chip determines an image's focus of expansion—that point in the image towards which the camera appears to be moving without the need to detect image features. The result can be used to compute time to impact at 1000 frames per second with sub-pixel resolution. As part of an effort in the "Intelligent Highway" arena, the focus-of-expansion chip may be adapted to become a component in a time-to-impact warning system to warn drivers of rapidly approaching objects.

Professor Horn is also exploring diaphanography, the science of recovering the spatial distribution of absorbing material in a highly scattering medium from optical measurements on the surface of a volume. Potential medical applications include mammography and the imaging of testicular cancers, thyroid tumors, and of brain tumors in infants.

David R. Karger

Office: NE43-321
Phone: x8-6167
Email: karger@lcs.mit.edu
URL: http://theory.lcs.mit.edu/ karger/

Willingness to talk to students before they are sure of their area ..	0 [5] 5
Amount of preparation required ...	No preparation
Has group meetings	Yes
Should you attend them	No
Seeking new students	0 [5] 5
	I am eagerly seeking new students for an Information Retrieval and User Interface pr
Must have your own funding	0 [0] 5
Current students to talk to	

I am interested in information retrieval: extracting the information you want from a large collection, such as the web or a library. This work involves elements of human computer interaction, machine learning, and databases, and I am interested in all of these areas. My current focus is on *personalization* of information retrieval systems: how can a system be built that will adapt over time to the idiosyncratic behavior of individual users? To study this question I am running the Haystack project, which is attempting to build such a personalizing system.

Boris Katz

Office: NE43-824
Phone: x3-6032
Email: boris@ai
URL: http://www.ai.mit.edu/people/boris/boris.html

Willingness to talk to students before they are sure of their area ..	0 [2.5] 5
Amount of preparation required ...	No preparation necessary
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	0 [2.5] 5
Must have your own funding	0 [0] 5
Current students to talk to	Deniz Yuret

Boris Katz is developing the START Natural Language System that answers questions that are posed to it in natural language. START parses incoming questions, matches the queries created from the parse trees against its knowledge base and presents the appropriate information segments to the user. In this way, START provides untrained users with speedy access to knowledge that in many cases would take an expert some time to find. START was first connected to the World Wide Web in December, 1993, and in its several forms has to date answered hundreds of thousands of questions from users all around the world.

A key technique called ”natural language annotation” helps START connect information seekers to information sources. This technique employs natural language sentences and phrases – annotations – as descriptions of content that are associated with information segments at various granularities. An information segment is retrieved when its annotation matches an input question. This method allows START to handle all variety of media, including text, diagrams, images, video and audio clips, data sets, Web pages, and others.

The natural language processing component of START consists of two modules that share the same grammar. The understanding module analyzes English text and produces a knowledge base that encodes information found in the text. Given an appropriate segment of the knowledge base, the generating module produces English sentences. Used in conjunction with the technique of natural language annotation, these modules put the power of sentence-level natural language processing to use in the service of multi-media information access.

Tom Knight

Office: NE43-735
Phone: x3-7807
Email: `tk@ai`
URL: `http://www.ai.mit.edu/people/tk/tk.html`

Willingness to talk to students before they are sure of their area ..	0 5
Amount of preparation required ...	No preparation necessary
Has group meetings	No response
Should you attend them	No response
Seeking new students	0 2 5
Must have your own funding	0 2 5
Current students to talk to	Michael Frank, Carlin Vieri, Jeremy Brown

Tom Knight is interested in advancing the state of the art in computing technology, all the way from intelligent systems, down to integrated circuit technology and biology: “A Top to Bottom Understanding of Intelligence,” as Patrick Winston would say. He is especially interested in smart students who don’t know what they are interested in yet.

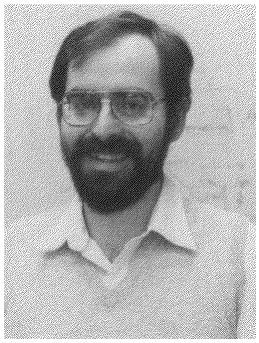
Bill Long

Office: NE43-420A
Phone: x3-3508
Email: wjl@medg.lcs.mit.edu
URL: http://www.medg.lcs.mit.edu/people/wjl

Survey answers not available.

Bill Long is a member of the Clinical Decision Making Group (MEDG) of LCS. He is responsible for the Heart Disease Program (HDP), a program to assist physicians with the diagnosis of cardiovascular disease. The system uses a diagnostic mechanism that combines probabilistic reasoning in a Bayesian network with the constraints imposed by the severities of the states and the temporal relations of causality. For predicting the effects of therapy the the system uses equations for the hemodynamic relationships and a signal flow technique to calculate the likely quantitative steady-state change for all parameters given changes in therapies (or other parameter changes).

See also information under Pete Szolovits.



Tomás Lozano-Pérez

Office: NE43-836A
Phone: x3-7889
Email: tlp@ai
URL: http://www.ai.mit.edu/people/tlp

Willingness to talk to students
before they are sure of their area .. 0 [4] 5
Amount of preparation required ... No preparation necessary
Has group meetings ..... No
Should you attend them ..... A one-on-one meeting is better
Seeking new students ..... 0 [4] 5
Interested in students, but currently does not have funding for them
Must have your own funding ..... 0 [4] 5
Right now, important to have funding
Current students to talk to ..... Ed Wang, Oded Maron, J.P. Mellor, Lisa Tucker-Kellog

Professor Lozano-Pérez's principal interest at the moment is computational chemistry and biology. His main focus right now is in obtaining information about the 3D structure of molecules from different sources: NMR, X-ray and binding data. This involves a range of technical problems, ranging from geometry, through search to machine learning. He also has interest in applications of machine vision, principally in medical applications and 3D reconstruction.

Tom Marill

Office: NE43-824
Phone: x3-2662
Email: `marill@ai`
URL:
`http://www.ai.mit.edu/people/marill/marill.html`

Dr. Marill would be happy to meet with new students to talk with them about his work.

Tom Marill works on the three-dimensional interpretation of line-drawings. This work involves excursions into computer-vision, geometry, coding theory, minimum description-length theory, minimization techniques, and related topics.

Leonard McMillan

Office: NE43-213
Phone: x3-6652
Email: `mcmillan@graphics.lcs.mit.edu`
URL: `http://graphics.lcs.mit.edu/~mcmillan`

Willingness to talk to students before they are sure of their area ..	0 ▮▮▮ 3 5
Amount of preparation required ...	No preparation necessary
Has group meetings	Yes, intends to have group meetings
Should you attend them	Yes, good idea to attend before setting up a one-on-one meeting
Seeking new students	0 ▮▮▮▮ 4 5
Must have your own funding	0 ▮▮▮ 3 5 Has some money but is looking for a good fit
Current students to talk to	New faculty member, so no students yet

The primary focus of Professor McMillan's work has been the fusion of imaging, multimedia, and computer graphics methods. He has recently been exploring new approaches to computer graphics in which the underlying scene model is composed of a set of reference images rather than a collection of geometric primitives. The goal of this work is to synthesize novel new views of an environment from these images as easily as scenes are rendered by computer-graphics methods today. This work combines elements of computer vision and computer graphics.

He is also interested in a wide range of topics concerning the extraction of information from digital video streams. This includes the extraction of semantic information as well as geometric content, and touches upon many topics in the area of video compression and analysis. He is currently beginning a project called computational video. The goal of this project is to embed synchronized computational methods into live video streams to provide new interaction capabilities beyond what is possible within the classical broadcast paradigm. Many new applications are enabled by the simple notion of encapsulating video bits along with the processing required to render them visible.

Marvin Minsky

Office: E15-483
Phone: x3-5864
Email: `minsky@ai`
URL: `http://www.ai.mit.edu/people/minsky`

Professor Minsky is a professor at both the the AI Lab and the Media Lab.

Professor Minsky has made many contributions to AI, cognitive psychology, mathematics, computational linguistics, robotics, and optics. In recent years he has worked chiefly on imparting to machines the human capacity for commonsense reasoning. His conception of human intellectual structure and function is presented in The Society of Mind, which is also the title of the course he teaches.

Tomaso Poggio

Office: NE43-787
Phone: x3-5230
Email: `poggio@ai`
URL: `http://www.ai.mit.edu/people/poggio`

Willingness to talk to students before they are sure of their area ..	0 [3] 5
Amount of preparation required ...	Skim recent papers and possibly talk to some of his students
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	0 [4] 5
Must have your own funding	0 [1] 5
Current students to talk to	Max Riesenhuber, Edgar Osuna

Professor Poggio is co-director of the Center for Biological and Computational Learning (CBCL) and is a professor at the Department of Brain and Cognitive Sciences.

The work of Professor Poggio's group is in machine and biological learning, especially supervised learning. The main directions of research are theory (sample complexity, capacity control, Support Vector Machines, sparse representations), applications (computer vision, especially on trainable object detection systems, computer graphics and time series analysis and prediction) and biological models (especially models of the IT cortex for object recognition).

Professor Poggio's group is also developing an artificial financial market in which agents learn trade futures and are subject to market selection and evolution. The goal is to ask questions about bounded rationality in economics, interaction and coevolution of "simple" learning agents and models of cognitive processes.

Gill Pratt

Office: NE43-820
Phone: x3-2037
Email: gill@ai
URL: http://www.ai.mit.edu/people/gill

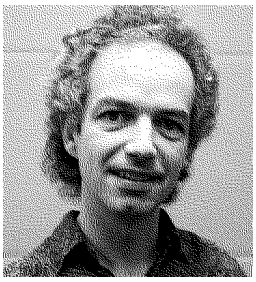
Willingness to talk to students before they are sure of their area ..	0 (0–5)
Amount of preparation required ...	Talk to some of his students first
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	3 (0–5)
Must have your own funding	4 (0–5)
Current students to talk to	Jerry Pratt

Professor Pratt directs the Leg Laboratory where students are developing autonomous biped walking robots based on two new ideas: series-elastic actuators and virtual model control.

Professor Pratt's group has been working on robotic systems that are specialized for interaction with natural environments. Unlike traditional industrial robots, these robots are far less concerned with positional accuracy and maximal slew rate. Instead, they must have smooth and stable force-controlled interactions with unknown environments, including tolerance to unexpected shock. Such requirements have led Professor Pratt and his students to develop the concept of series-elastic actuators, which differ from conventional actuators in their purposeful placement of mechanical elasticity between the transmission and the load.

Robots that interact with natural environments also need control systems that differ from those used in industrial robots, and developing such control systems is a second thrust of Professor Pratt's group. Path planning and accuracy are unimportant, as the environment is dynamic and unpredictable. Rather, what is needed is an appropriate behavioral abstraction to reduce control bandwidth and increase smoothness. This "late motor" processing converts discrete behaviors into smooth interactions and expands the bandwidth of information used to modulate motor action. Professor Pratt's research in this area is presently focused on Virtual Model Control, where simulations of physical systems are used as the processing mechanism for control. Recent efforts have shown this method to be superior to conventional inverse kinematics for describing the control of robot posture.

Kenneth Salisbury



Office: NE43-837
Phone: x3-5834
Email: jks@ai
URL: http://www.ai.mit.edu/people/jks/jks.html

Dr. Salisbury is taking a leave of absence for the 1997-98 year to do research at Stanford University.

Ken Salisbury performs basic and applied research on the development of high performance electromechanical systems. He focuses on the design and utilization of sensor guided hand/arm systems, and on force reflecting haptic interfaces for interaction with virtual and remote environments.

Dr. Salisbury's Vision and Touch Guided Manipulation group studies manipulator and end effector design, dextrous manipulation, adaptive nonlinear control, and vision guided manipulation, employing techniques from various fields including mechanical design, stability theory, machine learning, approximation theory, and computer vision.

Dr. Salisbury's haptics group researches touch perception and feedback including the development of devices to effect haptic stimulation and software to render the sensations of touch.

Howard E. Shrobe

Office: NE43-839
Phone: x3-7877
Email: hes@ai
URL: http://www.ai.mit.edu/people/hes/hes.html

Survey answers not available.

Dr. Shrobe is the Assistant Director of the Artificial Intelligence Lab.

Howard Shrobe has recently returned from serving as Assistant Director of the Information Technology Office at (D)ARPA for 2 years. He is affiliated with the Intelligent Information Infrastructure Project.

See also information under Randy Davis.

Lynn Andrea Stein

Office: NE43-811
Phone: x3-2663
Email: las@ai
URL: http://www.ai.mit.edu/people/las

Willingness to talk to students before they are sure of their area . .	0 [4] 5
	Between 3 and 5: should have some interest in her work
Amount of preparation required . . .	Have overlapping interests and skim recent papers or speak with people about her work
Has group meetings	Yes for some projects, no for others. Four independent projects with separate group meetings
Should you attend them	Worth meeting with her first before attending a meeting
Seeking new students	0 [5] 5 for at least two projects
Must have your own funding	0 [0] 5
Current students to talk to	Michael Coen, Eytan Adar, Craig Henderson, Robert Ringrose

Professor Stein has four separate projects of potential interest to new grad students: Hal/Intelligent Room, Haystack, Rethinking CS 101, and Cognitive Robotics.

Hal is an offshoot of the AI Lab's Intelligent Room and is designed to be a highly interactive computational environment. The AI Lab has built a prototype Intelligent Room which has cameras for eyes, microphones for ears, and uses a variety of computer vision, speech and gesture recognition systems to allow people to interact naturally with it. Led primarily by Michael Coen, the group is now building a newer, more cognitive version of the room that supports the kind of human-computer interaction which up until now has only been science fiction. They are actively seeking new graduate students.

In addition, Professor Stein works with Professor Karger of LCS on the Haystack project. This project is aimed at the individual customization of information retrieval systems. The group is interested in creating a community of interacting personal information repositories which archive user-specific meta-information. Such a system will allow users to organize their own personal collections of information, learn from its users and evolve, and allow users to search for information that might be located in others' collections. This project is actively seeking new graduate students in areas ranging from systems to computational learning to computer security.

Professor Stein also directs the project on Rethinking CS 101, a project to develop a curriculum for a first course in computer science based around the idea of computation as interaction. *Computation-as-interaction* treats inputs as things that are monitored and outputs as actions that are taken over the lifetime of an ongoing process. By beginning with a decomposition in terms of interacting computational processes, the project aims to teach our students a model of the world much closer to the one that underlies the thinking of most computer professionals. It is possible that this project will take on new graduate students, either in pedagogic or architectural areas.

Finally, Professor Stein is interested in cognitive robotics, a project to build and analyze intelligent agents whose physical capabilities constrain their internal and communicative representations. Previous projects involve human-robot communication and collaboration, robots that learn to communicate, and active vision systems. Current work involves cognitive architectures and the scaling of behavior-based and reactive architectures. It is possible that this project will take on new graduate students.

Gerald Sussman

Office: NE43-408
Phone: x3-5874
Email: gjs@ai
URL: http://www.swiss.ai.mit.edu/~gjs/gjs.html

Survey answers not available.

Professor Sussman's research has centered on understanding the problem-solving strategies used by scientists and engineers, with the goals of automating parts of the process and formalizing it to provide more effective methods of science and engineering education. He has also worked in computer languages, in computer architecture and in VLSI design. More recently Sussman has become interested in the acquisition of linguistic knowledge.

The research of the Project for Mathematics and Computation (Project MaC), under the direction of Professors Abelson and Sussman, is working to demonstrate breakthrough applications that exploit new computer representations and reasoning mechanisms that they have developed. These mechanisms enable intelligent systems to autonomously design, monitor, and understand complex physical systems through appropriate mixtures of numerical computing, symbolic computing, and knowledge-based methods. They call this mixed approach intelligent simulation.

Systems incorporating intelligent simulation can automatically prepare numerical experiments from high-level domain descriptions. They automatically select and configure appropriate numerical methods. They actively monitor numerical and physical experiments. They automatically analyze the results of such experiments, using domain knowledge to interpret the numerical results, and they report these results to their human users in high-level qualitative terms. In favorable cases intelligent simulation programs can automatically configure special-purpose hardware for efficient execution of computationally demanding numerical experiments.

Recently, the group has also demonstrated that intelligent simulation can help in creating dynamically stabilized structures. Such structures will be sensitive and active, incorporating networks of high-performance controllers. They have constructed and demonstrated a prototype column that is actively stabilized by piezo-electric actuators. The have also demonstrated a truss bridge that uses actively stabilized members to support greater loads than would be possible without active control.

See also information under Hal Abelson.

Pete Szolovits

Office: NE43-416
Phone: x3-3476
Email: psz@medg.lcs.mit.edu
URL:
http://www.medg.lcs.mit.edu/people/psz/psz.html

Willingness to talk to students before they are sure of their area ..	4 (0–5)
Amount of preparation required ...	Skim some recent papers
Has group meetings	Yes
Should you attend them	All are welcome
Seeking new students	2.5 (0–5)
Must have your own funding	1.5 (0–5)
Current students to talk to	Eric Jordan, Chris Tsien

Professor Szolovits is the director of the Clinical Decision Making Group (also called MEDG). The overall goal of the Clinical Decision Making Group is to create sophisticated and useful computer programs to assist doctors and nurses to provide better health care. This goal requires the development and application of new methods of artificial intelligence for use in medical systems for diagnosis and therapeutic management.

Since the mid-1970's, Professor Szolovits' group has developed various conceptual models and computer programs for diagnosis of kidney diseases, diagnosis and therapy of heart disorders, design of cancer therapy protocols, etc. They have also developed numerous technical approaches to allowing programs to explain their knowledge, strategies and conclusions, and to teach based on that same knowledge. Their group led the medical AI community in moving away from simplistic pattern-matching approaches to diagnostic reasoning, toward the use of much richer models that incorporate reasoning about the physiological mechanisms of disease, quantitative considerations, relative likelihoods, models of temporal evolution of disease, and methods of combining simple "it is what it looks like" with deeper model-based reasoning.

In addition to basic medical reasoning and its applications, they are developing efficient means to evaluate probabilistic models and applying them in clinical genetic counseling and molecular genetics. Professor Szolovits is also pursuing a more theoretical study demonstrating the equivalence of the known exact methods for Bayesian calculation.

Seth Teller

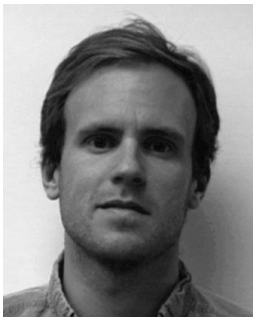
Office: NE43-208
Phone: x8-7885
Email: seth@graphics.lcs.mit.edu
URL: http://graphics.lcs.mit.edu/~seth

Willingness to talk to students before they are sure of their area ..	0 (0–5)
Amount of preparation required ...	Read blurb about his work and talk to some of his students first
Has group meetings	No
Should you attend them	Talk to his students instead
Seeking new students	5 (0–5)
Must have your own funding	0 (0–5)
Current students to talk to	Justin Legakis, Satyan Coorg, J.P. Mellor

Professor Teller is co-head of the MIT Computer Graphics Group. He and his students work on four main projects: digitizing whole cities (also called the ”city scanning” project) with pose-instrumented (6-DOF) digital cameras, managing and rendering extremely complex geometric datasets, generating real-time ray-traced imagery on general-purpose (i.e., non-graphics) hardware, and techniques for remote, interactive, collaborative undergraduate education.

His research interests include global illumination algorithms; visibility computations; constrained spatial subdivisions; visual simulation; interactive algorithm visualization, verification and animation; self-checking geometric algorithms; real-time ray-traced imagery; and machine vision, including fully automated acquisition of geometric models and other forms of data.

Paul Viola



Office: NE43-733
Phone: x3-8828
Email: viola@ai
URL: http://www.ai.mit.edu/people/viola

Willingness to talk to students before they are sure of their area ..	4 (0–5)
Amount of preparation required ...	Skim some recent papers and talk to some of his students first
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	3.5 (0–5)
Must have your own funding	2 (0–5)
Current students to talk to	Greg Galperin, Erik Miller, Jeremy De Bonet, Kinh Tieu

Professor Viola leads the Learning and Vision Group, which focuses on issues and applications in machine learning. The primary focus of the group is to apply learning methods to problems in vision; however, because they employ principled techniques from statistics and information theory, their work is applicable to a wide variety of domains, including information retrieval, event prediction, feature discovery, coincidence detection, function learning and optimization as well as vision-related problems such as image alignment, object recognition and object tracking.

Patrick Winston

Office: NE43-816
Phone: x3-6754
Email: `phw@ai`
URL: `http://www.ai.mit.edu/people/phw`

Willingness to talk to students before they are sure of their area ..	0 ▬▬▬▬▬▬▬▬▬▬ 5 5
Amount of preparation required ...	Best to follow guidance in his home page
Has group meetings	Yes
Should you attend them	Yes
Seeking new students	0 ▬▬ 1 5
	Selectively interested, which is different from indifferent
Must have your own funding	0 ▬▬▬▬▬▬ 2.5 5
Current students to talk to	Will Neveitt

Professor Winston believes it is time to take a different view of the vision, language, and motor faculties. Rather that thinking of those faculties as I/O channels, he prefers to think of those faculties instead as the place where intelligence actually resides. Further details are explained in the discussion of optimism on his home page, which he recommends that interested students read.