

Invited Talks and Panels

AAAI-04 Keynote Address:

Intelligent Systems and the Nation's Vision for Space Exploration

Daniel J. Clancy, NASA Ames Research Center

Over the past few months, NASA has been in the news numerous times both for the exciting discoveries of the pair of Mars Rovers as well as the country's "Vision for Space Exploration." This vision focuses on the joint human and robotic exploration of the solar system starting with a return to the moon and then the human exploration of Mars. In addition, the vision includes a continued array of exciting robotic missions to Mars as well as other destinations. There are numerous challenges that must be addressed to accomplish this vision. One critical area of technology is the broad area of information technology with a particular emphasis on intelligent systems. Future human exploration will require a new level of technology enabling NASA to deploy smarter, more adaptive

systems. These systems must be designed to complement their human partners. In this talk, Daniel Clancy will present a brief overview of the new vision and then will talk in depth about a range of technologies that have been developed and demonstrated by NASA over the past few years. In particular, he will focus on how advanced artificial intelligence technologies have been developed and demonstrated within a robust environment and then in some cases deployed on NASA missions. Technologies that will be discussed include: automated planning and scheduling, human-centered computing, remote collaboration tools, machine learning and multi-model interaction using EEG and EMG signals.

The Joint AAAI-04/IAAI-04 Robert S. Engelmore Memorial Lecture:

The Power of "Clear and Demonstrative Knowledge":

In Honor of a "True Son of Science"

Edward Feigenbaum, Stanford University

This talk, given to honor the memory and work of Robert S. Engelmore, revisits some of the themes that were central to his work by giving them a contemporary context. What is an up-to-date view of the "knowledge is power" hypothesis? What about

knowledge webs, new applications of knowledge-based systems, and particularly the blackboard-architectures that Engelmore helped to develop?

AAAI-04 Invited Talk:

AI And Biomedicine: Helping Scientists Reason about Genomes, Drugs, Diseases

Russ B. Altman, Stanford University Medical Center

Biology and medicine are now generating data at a pace far exceeding the ability of scientists completely to analyze it. Bioinformatics has responded with a number of powertools for reducing large data sets into manageable chunks. These tools are limited in two ways: they can't read the published literature (or textbooks)

and they don't have biological common sense, so they sometimes propose things that are already well-known or don't make sense (and thus can lose credibility). We are trying to ameliorate these problems with technology squarely within, or closely related to AI.

AAAI-04 Invited Talk:

“If not the Turing Test, then What?”

Paul Cohen, University of Massachusetts, Amherst, and USC Information Sciences Institute

Turing proposed his indistinguishability test more than half a century ago, and although it is never far from the thoughts of AI researchers, it has done us little good. While other sciences seem motivated by their grand challenges, AI does not strive to pass Turing's test. It is too remote a prospect, and the test itself provides no compass or route markers. It is mired in philosophical problems, it ignores physical and perceptual aspects of intelligence, and it has too many prerequisites. Yet Turing's test has virtues we should preserve in more effective grand challenges: it emphasizes common sense, universal scope, and understanding; success is judged by ordinary people; and the test provides ample rope to hang oneself. These are good criteria for grand challenge problems in general.

But there are other criteria that Turing's test does not satisfy. We need progressions of challenges, spaced at two-to-five year inter-

vals, which will get us to Turing's goal within twenty years, and parallel series of challenges in the perceptual/physical realm. We need “come as you are” challenges that do not require something else to be achieved before we can start work. These problems should drive the development of new technologies but discourage “self-inflicted” research. Ph.D. students should be able to trace very short paths from their dissertation topics to one or more of these problems, and should see clearly the progression from it to longer-term challenges. The grand challenge problems should be updated regularly to deal with unforeseen impediments.

Cohen will give several possible examples of progressions of grand challenge problems. It is time to put aside the Turing Test and replace it with challenges that work for us.

AAAI-04 Invited Talk:

Strength of Character: AI Personalities in Video Games

Ian Lane Davis, Mad Doc Software

Davis will examine the upcoming great frontier in AI, which is the construction of believable characters in video games. He will touch

on all the aspects of making believable characters from animations to behaviors to internal models of AI.

AAAI-04 Invited Talk:

Agents Meet the Semantic Web in the Aether

Tim Finin, University of Maryland, Baltimore County

The software agents paradigm has received considerable research but has not yet found broad application. The vision is still sound and will be re-invigorated by two new developments: semantic

web languages, which provide stronger knowledge sharing technology, and the emergence of pervasive computing environments, whose requirements match the strengths of multiagent systems.

AAAI-04 Invited Talk:

Applications of Artificial Intelligence to Web Search

Peter Norvig, Google

Web search engines have accumulated billions of pages of text. A corpus of this size provides an interesting opportunity for techniques in machine learning, natural language processing, and other

areas of artificial intelligence. This talk will examine how these techniques can be used in a large, practical web search engine.

AAAI-04 Invited Talk:

Human Dynamics

Alex (Sandy) Pentland, MIT Media Laboratory

Important and complex discussions are almost always face-to-face, with little or no technology intervention. The result is that current computer and communication tools are largely restricted to mechanizing back-office and support functions. Pentland believes that we can radically improve the functioning of the organizations through active analysis of face-to-face interactions. By using wearable ma-

chine perception to characterize, annotate, and influence face-to-face interactions we can augment peoples' memory, initiate productive interactions, improve group decision making, and better understand and manage the functioning of distributed workforce. Examples of each type of augmentation will be shown, and privacy concerns addressed.

AAAI-04 Invited Talk:

Intelligent Technology for Adaptive Aging

Martha E. Pollack, University of Michigan

The world's population is rapidly aging, and some are predicting a coming "crisis in caregiving." Intelligent technologies have the potential to help avoid this crisis, by providing people with ways to adapt to the physical and cognitive changes that can accompany

aging. This talk will survey the state-of-the-art in such technology, highlight the important role of AI techniques in its design, and describe open research challenges.

AAAI-04 Invited Talk:

Building a Life Science Company Around Statistical Machine Learning

Astro Teller, BodyMedia, Inc.

A tour through five years of challenges and discoveries building a wearable body monitoring business using statistical machine learning techniques. The talk will cover challenges gathering data,

building body state models, validating the models with the medical community, and place AI within the larger context of the company and the industry.

AAAI-04 Invited Talk:

Real Robots for the Real World

Sebastian Thrun, Stanford University

In 2002, nine coal mines were almost buried alive in Somerset, PA, when accidentally breaching a neighboring mine submersed in water, and thought to be several hundred yards away. According to a 1991 survey "tens of thousands, perhaps even hundreds of thousands, of abandoned mines exist today in the United States. Not even the U.S. Bureau of Mines knows the exact number, because federal recording of mining claims was not required until 1976." An improved understanding of the sizes, locations, and conditions of abandoned mines could substantially reduce the many risks to society that arise from subsidence, contamination, and other factors characteristic of many abandoned mines today.

This talk describes the Groundhog robot system, developed to acquire volumetric maps abandoned mines. Sebastian Thrun will discuss some of the challenges that arise when sending a robot into

mines, where it has to operate truly autonomously, outside the communication range of its creators. Specifically, Thrun will present some recent innovations on large-scale robotic mapping, exploration, and navigation in unknown and hazardous environments. These techniques leverage some of the most advanced work in large-scale graphical models, probabilistic inference, and decision making under uncertainty---topics that have been at the heart of AI research for more than a decade.

The Groundhog project was jointly conducted with Red Whittaker and Scott Thayer, who led the robot development, and the CMU Mobile robot design class. Some of the material presented was contributed by researchers from the Fraunhofer Institute in Germany.