

The 2004 National Conference on AI: Post-Conference Wrap-Up

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AAAI's Nineteenth National Conference on Artificial Intelligence (AAAI-04) filled the top floor of the San Jose Convention Center from July 25–29, 2004. The week's program was full of recent advances in many different AI research areas, as well as emerging applications for AI. Within the various topics discussed at the conference, a number of strategic domains emerged where AI is being harnessed, including counterterrorism, space exploration, robotics, the Web, health care, scientific research, education, and manufacturing.

Counter-Terrorism / Crisis Management / Defense—For decades, the Department of Defense has been a major funding source for AI research. Since the tragedies of September 11, there has been a new urgency to develop and field AI-based systems to aid the intelligence, defense, and emergency response communities. While much of this work remains cloaked in secrecy, this year's IAAI conference includes nine papers on this and related topics.

Space Exploration—The AAAI-04 conference keynote speaker, Daniel J. Clancy, discussed the United State's vision for space exploration. This vision focused on the joint human-robotic exploration of the solar system, beginning with a return to the moon, then human exploration of Mars. Two emerging Innovative Applications of AI papers from NASA Ames also focused on this and related topics.

Robotics—Robotics is seen by some

as the capstone of AI research and applications, bringing together diverse avenues of AI research such as vision, planning, sensor fusion, natural language, and face recognition. This year's conference included the Mobile Robot Competition and Exhibition, and an invited talk by Sebastian Thrun, who discussed "Real Robots for the Real World."

The World Wide Web—AI technology is an integral component of current and future trends in intelligent computing. There were nine different talks and papers on various aspects of this trend at AAAI-04, such as the invited talk by Peter Norvig, Google Director of Search Quality, who spoke about AI trends in Web search engines; and the presentation by Alex (Sandy) Pentland, Director of Human Dynamics Research at the MIT Media Lab, who discussed trends in wearable machine perception to characterize, annotate, and influence face-to-face interactions.

Health Care / Elderly Care—The world's population is rapidly aging, leading some experts to predict a coming crisis in caregiving. Some believe that 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. In her talk "Intelligent Technology for Adaptive Aging," Martha Pollack of the University of Michigan described the state-of-the-art in such technology, and the role of AI. Two related Innovative Applications of AI

papers were also presented that dealt with this subject.

Scientific Research—Much scientific research is so data rich that traditional information management, extraction, and analysis tools are ineffective. The latest AI techniques to assist with biomedical research, cross-disciplinary and large-scale experimentation and analysis were presented in invited talks, IAAI papers, and a panel discussion.

Education—Intelligent computer-assisted instruction (ICAI) continues to be a frontier of computer science. Several IAAI papers were presented on this topic.

Manufacturing / Business—For more than two decades, manufacturing has been a very fruitful domain for AI applications. This year, several of the earliest major corporate investors in AI technology received awards for strategic, high-impact AI-based applications, including General Motors, Ford Motor Company, and General Electric.

For detailed information about these domains at the conference, see "Synopsis of AI Trends Emerging at 2004 AI Conference" at www.aaai.org/Pressroom/Backgrounders/backgrounders.html.

Technical Program

The 120 accepted technical papers for the conference covered a broad array of research topics. A full list of papers in the proceedings can be found at www.aaai.org/Conferences/National/2004/aaai04.html. The proceedings from the conference are available in book form from MIT Press (<http://mitpress.mit.edu>). A CD of the conference papers is available from AAAI.

Robot Program

Always a favorite at the conference, the Mobile Robot Competition and Exhibition this year brought together fifteen teams from universities, colleges, and research laboratories to compete and demonstrate state-of-the-art research in robotics and AI. This year there were three events: (1)

IAAI Emerging Applications

Honeywell Laboratories. "An Application View of COORDINATORS: Coordination Managers for First Responders." This paper describes coordination manager agents that provide decision support to first response teams by reasoning about who should be doing what, when, with what resource, and so forth.

Honeywell Laboratories. "The Independent LifeStyle Assistant: AI Lessons Learned." Experimental automated monitoring and caregiving research system that integrates emerging home automation devices, augments them with reasoning to create an intelligent, coherent, useful assistant to support independent living for the elderly. Field tested in 2003 to test the monitoring of medication and mobility.

Lehigh University. "CaBMA: Case-Based Project Management Assistant." CaBMA adds a knowledge layer on top of a commercial project management tool (MS Project), enabling case reuse.

NASA Ames. "A Comparison of Techniques for Scheduling Earth Observing Satellites." This study compared thirteen alternate scheduling algorithms for coordination of the approximately 60 scientific and commercial Earth observing satellites.

NASA Ames. "SOFIA's Choice: An AI Approach to Scheduling Airborne Astronomy Observations." SOFIA (Stratospheric Observatory for Infrared Astronomy) is NASA's next generation airborne astronomical observatory, a modified 747-SP with a 2.5 meter telescope, scheduled to commence operations early in 2005.

Northwestern University. "VModel: A Visual Qualitative Modeling Environment for Middle-School." VModel helps middle-school students learn by enabling them to create qualitative models. The system has been used successfully to help students in several studies in Chicago public school classrooms.

Simon Fraser University. "The U.S. National Football League Scheduling Problem." Simon Fraser has developed a prototype system for the NFL to produce schedules satisfying a number of preferences and constraints.

Soar Technology, Inc. "Agent-based Simulation of Geo-Political Conflict." Soar has created a framework that builds executable models to conduct regional analysis. It allows intelligence analysts to hypothesize about relationships between countries, and to explore events and decisions leading up to conflict.

Soar Technology Inc., University of Michigan. "Synthetic Adversaries for Urban Combat Training." This paper describes requirements for synthetic adversaries to be used in urban combat training, and MOUTBots, a prototype application.

SRI International, Palo Alto Research Center. "Identifying Terrorist Activity with AI Plan Recognition Technology." This paper describes a technology that automatically identifies hostile intent. The prototype is designed to support hu-

man intelligence analysts in processing national security alert sets.

University of Alberta. "Machine Learning for Adaptive Image Interpretation." This tool interprets aerial images. It is being considered for identification of forest fire burn boundaries, validation of commercial thinning practices, and brain tumor detection in magnetic resonance imaging scans.

University di Chieti-Pescara, University of College Cork. "Detecting and Eliminating the Cascade Vulnerability Program from Multilevel Security Networks Using Soft Constraints." This paper describes a promising new approach to help ensure multilevel security across a network configuration.

University of Michigan. "AI Characters and Directors for Interactive Computer Games." This paper describes the role of advanced AI in interactive, story-based computer games with complex characters.

University of Southern California, ISI. "Artemis: Integrated Scientific Data on the Grid." Artemis is a scientific data analysis system that integrates petabyte-sized distributed data repositories across organizational boundaries.

University of Southern California, ISI. "The KOJAK Group Finder: Connecting the Dots Via Integrated Knowledge-Based and Statistical Reasoning." KOJAK is a discovery system that finds hidden groups and group members in a large evidence database. It is intended as an aid to law enforcement and intelligence agencies.

University of Southern California, ICT. "An Explainable Artificial Intelligence System for Small-unit Tactical Behavior." This paper describes the AI architecture and associated explanation capability used by a US Army computer training system.

University of Southern California, ICT. "Branching Storylines in Virtual Reality Environments for Leadership Development." This simulation-based leadership training system uses branching story lines realized within a virtual reality environment.

University of Texas at Austin. "Towards Autonomic Computing: Adaptive Job Routing and Scheduling." This new network simulator studies the application of machine learning methods from a system-wide perspective for job routing and scheduling.

Utah State University. "A Robotic Wayfinding System for the Visually Impaired." Utah State is developing an indoor assisted navigation system with a mobile robotic base and sensors both on the robot and mounted in the indoor environment.

Zhejiang University, University of Hong Kong, and Hong Kong Baptist University. "Automatic Generation of Artistic Chinese Calligraphy." This paper describes a novel intelligent system that generates new Chinese calligraphic artwork in a variety of styles, automatically and in real time.

the Robot Challenge wherein the competing robots registered, volunteered, and gave talks at the conference; (2) the Rescue Robot Competition, which challenged robots to find human victims in a simulated fallen structure and direct human rescuers to the victims, and (3) the Open Interaction Task, which involved human-robot interaction in an unstructured environment. In addition, the Robot Exhibition provided a venue to showcase current robotics and embodied-AI research. Collocated with AAAI-04 was the 2004 Botball Competition where large numbers of middle school, high school, and college students with an robotics gathered.

Invited Talks

The conference's invited speakers offered a wide array of thought-provoking and informative talks, such as: "Intelligent Systems and the Nation's Vision for Space Exploration" by Dan Clancy, NASA-Ames (Acting) Director for Information Sciences and Technology Directorate; "Applications of Artificial Intelligence to Web Search" by Peter Norvig, Google Director of Search Quality; "Human Dynamics" by Alex (Sandy) Pentland, Director of Human Dynamics Research at the MIT Media Lab; "Intelligent Technology for Adaptive Aging" by Martha E. Pollack, Professor of Electrical Engineering and Computer Science, University of Michigan; and "The Power of Clear and Demonstrative Knowledge: In Honor of a True Son of Science," honoring the memory and work of Bob Englemore by colleague and friend Edward Feigenbaum, Stanford University Kumagai Professor of Computer Science and Co-Scientific Director of the Knowledge Systems Laboratory.

Innovative Applications

The Innovative Applications of Artificial Intelligence Conference (IAAI-04) continued a sixteen year highly regarded tradition of presenting new and emerging applications of AI technology. This year twenty-four papers were accepted for the conference, including four fully deployed applica-

tions and twenty emerging applications. This year's papers cover a vast array of topics, such as AI being applied to counterterrorism, health impairment assistance, urban combat training, and automatic generation of Chinese calligraphy. (For a list of the IAAI award winners, see page 92.)

The program committee is already laying plans for AAAI-05, to be held from July 9–13, 2005, in Pittsburgh, Pennsylvania. We hope to see you there!

Journalist **Sara Hedberg** is AAAI's press liaison. She can be reached at hedberg@aaai.org.

Deployed Applications Award Winners

Ford Motor Company

"Ergonomics Analysis for Vehicle Assembly Using Artificial Intelligence" analyzes potential ergonomic concerns to reduce workplace injuries and their associated costs and lost productivity. The system has also become a global repository for standardized engineering process and data for assembling all Ford vehicles, including parts, tools, and standard labor time. This application saves Ford over \$17 million in avoided injuries. It has also stopped over 1,100 process sheets with potential ergonomics problems from reaching assembly plants, and reduced the workload of ergonomics engineers.

General Electric Plastics

"Tenth Anniversary of the Plastics Color Formulation Tool." Since 1994 this case-based reasoning tool has been employed by GE Plastics, which manufactures many of the world's polymers, and has manufacturing and sales sites on five continents. The system determines the colorants and amounts to be added to plastics to match a given color—a problem that is much more complex than it sounds with multiple variables. It has saved GE millions of dollars in productivity and material costs and saves 22,500 hours of work per year of developing test chips for customers (a free service to customers). Colorant cost savings are conservatively estimated at \$2.4 million annually since 1996.

General Motors R&D Center

"The General Motors Variation-Reduction Adviser: Deployment Issues for an AI Application." This case-based reasoning knowledge system is used in a dozen GM Assembly Centers to support quality improvement for various assembly line processes. The system is being deployed in all GM assembly centers where it is in daily use.

National University of Singapore

"Making Better Recommendations with Online Profiling Agents." This application uses complex, adaptive autonomous agents with prior domain knowledge (such as real estate) to assist users in identifying requirements—especially unstated ones—quickly and unobtrusively.



Journal of Artificial Intelligence Research (JAIR)

The *Journal of Artificial Intelligence Research (JAIR)* (ISSN 1076-9757) covers all areas of artificial intelligence (AI), publishing refereed research articles, survey articles, and technical notes. Established in 1993 as one of the first electronic scientific journals, JAIR is indexed by INSPEC, Science Citation Index, and MathSciNet. The hard-copy version of JAIR is published twice a year, exclusively by AAAI Press. The editor-in-chief of *JAIR* is Martha E. Pollack.

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