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The Innovative Applications of Artificial Intelligence Conference

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What have you done for us lately? The question comes from an old joke about a Boston politician talking to voters in his district. "Will you vote for me? I gave your father a job at city hall, I found jobs for your wife, your sons, and your daughter. Last year I directed a million dollars worth of business to your company. And I got the city to repair your street." To which the voter replied, "I know all that, but what have you done for us lately?"

We in AI get the same kind of question. The Annual Conferences on the Innovative Applications of Artificial Intelligence (IAAI) were initiated 10 years ago to provide yearly updates to our answers. The tenth annual conference, IAAI-98, continued the IAAI tradition of case studies of deployed applications with measurable benefits whose value depends on the use of AI technology. The case studies provide a valuable guide to designing, building, managing, and deploying systems incorporating AI technologies. These applications provide clear evidence of the impact and value that AI technology has in today's world.

Researchers engaged in basic AI research also benefit from learning about challenges of real-world domains and the difficulties in applying AI techniques to real problems. The systems that are constructed and described, and that are demonstrated to work, provide experimental data for those inclined to study them. Authors of IAAI papers are encouraged to discuss the limitations of current techniques and analyze reasons for false starts. Although failures are more difficult to describe, especially within the page limits, these insights provide useful negative results that further inform the experimentalists about the limitations of various techniques.

In addition, as was done in 1997, IAAI-98 augmented these case studies with papers and invited talks that address emerging areas of AI technology or applications. Papers in the Emerging Applications and Technologies track describe efforts whose goal is the engineering of AI applications, with programs that are nearly ready for fielding. The emerging techniques papers inform AI researchers about the utility of specific AI techniques for applications domains and also inform applications developers about tools and techniques that will enable the next generation of new and more powerful applications. Although they do not meet all the same criteria as the deployed applications—namely, the systems are out of the hands of the developers, in use for a substantial time (more than a couple of months), and clearly of benefit to someone outside the research lab—the systems described in the emerging technologies papers are on a clear track to deployment.

The Innovative Applications of Artificial Intelligence Conference was held 28–30 July 1998 in Madison, Wisconsin. Bruce Buchanan was the program chair and Sam Uthrusamy was the program cochair.

This year's papers addressed applications in education, the military, networking, spacecraft, medicine, games, the stock market, and more. AI techniques include, among others, planning, natural language processing, diagnostic reasoning, and cognitive simulation. Five deployed applications and a panel were selected as a snapshot of IAAI-98 to present in this special issue. The other papers and talks were certainly interesting and important, but we were asked for a subset and selected the following, which are included in the present volume, in part for the reasons we note:

Richard H. Lathrop, Nicholas R. Steffen, Miriam P. Raphael, Sophia Deeds-Rubin, Michael J. Pazzani, Paul J. Cimoch, Darryl M. See, and Jeremiah G. Tilles, "Knowledge-Based Avoidance of Drug-Resistant HIV Mutants," an elegant application of modestly straightforward AI techniques to the highly visible and urgent problem of AIDS therapy

Randolph M. Jones, John E. Laird, and Paul E. Nielsen, "Automated Intelligent Pilots for Combat Flight Simulation," a demonstration from the psychological modeling side of AI using the SOAR architecture

Alexander Kott, Victor Saks, and Albert Mercer, "A New Technique Enables Dynamic Replanning and Rescheduling of Aeromedical Evacuation," a much-needed solution to a complex scheduling problem in an area where human lives are at stake, but the situation can't be held constant

J. Dale Kirkland, Ted E. Senator, James J. Hayden, Tom Dybala, Henry G. Goldberg, and Ping Shyr, "The NASD Regulation Advanced Detection System (ADS)," a powerful system that far exceeds human capabilities to detect patterns in millions of stock-trading transactions

Richard Helfman, Ed Baur, John Dumer, Tim Hanratty, and Holly Ingham, "Turbine Engine Diagnostics (TED): An Expert Diagnostic System for the M1 Abrams Turbine Engine," a carefully engineered troubleshooting system that reinforces the evidence that

"traditional" knowledge-based systems can save time and money by assisting human technicians

Dana Nau, panel chair, "Are AI Game-Playing Techniques Useful for Anything Other Than Games?" a summary of the provocative and fun panel discussion about the role of games as test beds for AI research

One measure of the growth of practical applications is the number of U.S. patents mentioning the term *artificial intelligence* and related terms (*knowledge based, fuzzy logic, expert system, genetic algorithm*). According to the primary examiner for AI in the U.S. Patent Office, Robert Downs,[1] a decade ago only about 100 patents mentioned AI specifically; last year, about 1700 mentioned *artificial intelligence*, with another 3900 or so mentioning related terms. About 2200 patents are specifically classified in the Patent Office's class for artificial intelligence, which means that the invention or technique is specifically directed to something new in knowledge-based systems, machine learning, fuzzy logic, or neural networks. Other patents using AI techniques might be classified in an area of application such as medicine.

These numbers confirm another important trend, which was noted by Reid Smith and others in the context of earlier IAAI conferences: AI technology is more likely to be embedded in some larger system than embodied in a stand-alone system. The difference between the 5600 patents mentioning AI and the 2200 specifically classified as AI is about 3400 patents in which AI contributes something in a larger context. This partly explains why the question "What have you done for us lately?" keeps surfacing. Successful applications of AI are part of, and buried in, larger systems that probably do not carry the label *AI inside*.

Another trend in patent applications being filed within the specific AI classification is that most in the last few years involve machine learning (mostly genetic algorithms and neural networks) and intelligent agents. Neural network inventions occupy the largest volume of patents related to artificial intelligence. We hope to see papers in future IAAI conferences on successful applications of these technologies.

As with the introduction of computers themselves, or electricity before that, serious AI research and development has been accompanied by hype and sideshows. The IAAI conferences are intended to focus on serious applications that make a demonstrable difference to someone outside AI, thereby defusing the question that doesn't want to die—whether the achievements of AI match the hype.

A recent editorial brings some common sense into the discussion of AI's achievements. The title was "Artificial What?" [F. D. Schwartz. 1998. "Postfix: Artificial What?" *American Heritage of Invention and Technology* 13(4)], and the main point was that the philosophers among us should stop arguing about whether intelligence is possible in a machine—because we have existence proofs that it is—and start discussing what we want AI to do for us. Well put. The papers from IAAI-98 in this volume are exemplars of the many solid demonstrations that AI delivers real value.

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Note

We are indebted to Robert Downs for performing the electronic searches over the Patent Office databases that gave us these numbers. For more information on specific patents, or information on the Patent Office in general, visit the office's web site at www.uspto.gov.