

IJCAI-03 Conference Highlights

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This summer's AI conference in Acapulco offered attendees a wide variety of program choices as well as ample time to catch up with friends and colleagues. For many, scheduling time was probably the biggest challenge because the conference included numerous invited speakers, 189 technical paper presentations, 93 posters, a Mobile Robot Competition, 19 Innovative Applications of AI (IAAI) award-winning paper presentations, a Trading Agents Competition, a special track on AI and the web, and the vendor exhibit.

Where Is AI Having an Impact?

Frequently, many of us in the AI community get asked, "Where is AI being used these days?" There were several high-impact applications discussed at IJCAI that provided excellent new information to answer such queries, including Google News and a NASDAQ surveillance tool that detects insider trading and fraud.

Google News, which is used several million times a day, employs several AI techniques to automatically generate and refresh the news from 4,500 news sources.

The NASDAQ surveillance tool that detects insider trading and fraud is AI-based data mining software that digs through 8,500 to 18,000 news wire stories and approximately 1,000 quarterly and annual SEC filings

from corporations, and evaluates price-volume models for 25,000 securities each day, identifying and linking items of interest that might warrant further investigation. The system has raised red-flag warnings on a number of cases (including some very high profile, instantly recognizable cases) to the Securities and Exchange Commission and Justice Department for further investigation and/or prosecution. (For more information about this application, please visit AAAI's new e-Press Room.)¹

Other recent high-impact applications include the 2003 winners of AAAI's IAAI award, including the Educational Testing Service, the National Association of Securities Dealers, the Tokyo University of Science, Information Media Center, and the Norwegian State Railways.

Educational Testing Service, a leading supplier of fair and valid assessment instruments, received an award for a commercially deployed, web-based system that provides automated scoring and evaluation of student essays. It provides specific feedback for students to improve their writing skills. The application is intended to relieve the load on teachers faced with reading and providing detailed feedback on perhaps 30 essays or more every time a topic is assigned.

The Tokyo University of Science, Information Media Center (Japan) presented a sales support system for door-to-door sales that uses a cellular

phone with a camera, e-mail software, and a web browser to customize and automate product recommendations to the individual prospective customer.

Norwegian State Railways now has an automated scheduling system that schedules and manages the work of 1,800 personnel, 1,000 engine drives, and 800 ticket inspectors allocated to 39 bases across Norway.

For more information about these award-winning examples of fully deployed innovative applications of AI, as well as emerging applications that are still under development, see the backgrounds in the electronic AAAI Press room.² This site also includes summaries of winning applications for the previous two years.

AI at Google

Google is an AI application used several million times a day. Google Senior Research Scientist Mehran Sahami was an invited speaker at IJCAI-03. He spoke of the role of AI today and in the future at the popular web search engine company. Sahami is also a lecturer at Stanford University in the Computer Science Department, where he received his Ph.D. His research interests include machine learning, data mining, intelligent agents and information retrieval on the web.

Sahami portrayed some of the issues Google faces in the web information-retrieval business, such as data collection, short user queries, and response speed and reliability.

Data collection in an environment of varying page quality and trustworthiness, misspellings, bad formatting, spam, and misinformation is a serious issue for Google. Adversarial interests, for example, try to fool the rankings, thereby compromising the trustworthiness of the documents. The freewheeling nature of the web, with no editorial filters or mediation to ensure well-authored documents, adds to the chaos. In some cases, misinformation gets served up by sites that "cloak," serving the Google search engine one page and the users another or replacing words in otherwise legitimate text.



IJCAI-03 was held in Acapulco, Mexico, August 9–15, 2003.

Another issue Google faces are user queries that are short, have limited if any specificity, and can have many different misspellings. For example, Google has documented over 800 different spellings of pop-singer Britney Spear's name.

Yet another serious issue is speed and reliability of response with millions of users in an environment whose use is rapidly escalating. Sahami reported that the number of web users increased from 140 million in 1999 to 320 million in 2002. In the same time period, the number of web pages swelled from 500 million to 3 to 8 billion, and the number of searches quintupled from 100 to 500 million. (Source: Warburg Dillon Read LLC).

Users Want Fast Response Time

Google, one of the most popular search engines, manages colossal amounts of data and computing resources, indexing 4 billion docu-

ments, 3 billion URLs, 390 million images, 35 million file types, 700 million individual messages, and 30 terabytes of data in more than 35 languages. It services 200 million queries a day—or 1,000 each second. Google services this work load with more than 20,000 machines acting as servers and 1,000 terabytes of disk storage.

"AI applications are using the infrastructure to get people useful information in interesting ways," according to Sahami. For example, "Google News is automatically generated from 4,500 news sources each 15 minutes, using several AI techniques (such as clustering, automatic image extraction, and autonomous categorization by topic areas)" says Sahami. "There is no human intervention." Google News is an example of where AI is making a huge difference. It's used several million times a day."

Sahami also gave a glimpse of AI-

based research in progress at Google that has yet to be deployed, such as voice-driven search-and-query result clustering to help users navigate. "We want to combine information retrieval, large systems, and AI to work together toward the next generation of search engines," concluded Sahami.

Paul Allen Funding AI Research

What do Paul Allen (cofounder of Microsoft with Bill Gates) and AI have in common? Allen's investment company, Vulcan Ventures, has been funding research for a project called Halo. "Mr. Allen has a personal passion for AI," according to Halo project manager Noah Friedland.

Halo is a staged research effort inching toward a "digital Aristotle," named after the Greek philosopher said to have known the answer to

any question about science. As envisioned, Halo will be capable of producing user- and domain-appropriate answers and justifications to novel (previously unseen) questions in an ever-growing number of domains.

This past August, Friedland and members of the three contract groups involved in the first phase of Halo participated in a lively panel presentation and discussion about the project at IAAI-03. In phase 1, a six-month effort, Vulcan funded three competing teams to use their distinctive knowledge representation and reasoning and query technologies to first encode 71 pages of advanced placement inorganic chemistry into laws and rules the computer could understand. Then, each team developed a query language and formulated 100 free-form questions. Phase 2 of the project is now under way in this multi-stage project being managed in a Defense Advanced Research Project Agency "request-for-proposal" like fashion.

The three competing teams for Phase 1 included (1) Cycorp Inc. (Austin, Texas); (2) Ontoprise GmbH (Karlsruhe, Germany); and (3) a team composed of SRI International (Menlo Park, Calif.), the University of Texas at Austin, and Boeing Phantom Works (Seattle, WA).³

AI and Molecular Biology: A Growing Success Story

AI's role in assisting research molecular biologists in using an exploding number of data sources was the topic of Lawrence Hunter's talk during IAAI-03 this year. Hunter, director of the Center for Computational Pharmacology at the University of Colorado Health Sciences Center, is the first recipient of the newly established AAAI Robert S. Englemore Memorial Lecture award. This annual keynote lecture was established by AAAI in honor of Robert Englemore's extraordinary service to AAAI, *AI Magazine*, and the applied AI community.

In his talk, Hunter surveyed how successful AI has been in molecular biology. "Tens of thousands of molecular scientists use AI tools all the time," he asserted. "Lots of people are



The NIST Urban Search and Rescue Course at IJCAI-03.

using the technology, although they may not think of it as AI."

"There are huge sources of information about life," he says. "Molecular biologists have access to dozens of general and hundreds of specialized databases with little if any standardization.... There's an exponential explosion of data. We're drinking from the fire hose. More than 12,000 articles are published each week."

Hunter cited an AI-based data mining tool developed by the Georgia Institute of Technology, GOMINER (gene ontology miner) as an example of a literature-based information-extraction and presentation system that performs meta analysis making connections between genes.⁴

AAAI Mobile Robot Competition

The thirteenth annual Mobile Robot Competition again pushed researchers to new heights with their robots. Every year, the tasks become more difficult and the capabilities of competing robots more sophisticated and innovative. There were three competitive events this year: rescue, host, and challenge.

Robot Rescue

First introduced to the competition three years ago, the Robot Rescue event gives entrants an opportunity to work in search and rescue operations—a domain that proved of critical importance shortly after the tragedy of September 11, 2001, when teams that competed at that year's event swiftly transported their robots to the ruins of the World Trade Center and offered assistance to the search efforts.⁵

In 2003, robots entered a fallen structure, found human victims, and directed human rescuers to the victim. The event was developed in close coordination with experienced rescue professionals and used the highly challenging test course from the U.S. National Institute of Standards and Technology Standard.

The 2003 winners were first-place INEEL and second-place Swarthmore College, with a technical award for inspired interface going to the University of New Orleans.

Robot Host

Although the Robot Host event has been a part of the competition for a number of years, in 2003 the tasks



The Robot Awards Ceremony at IJCAI-03.

Photo courtesy Jon Glick.

did not involve serving food to conference attendees, but, rather, navigating the exhibition area, interacting with guests, and offering information as a guide to the exhibits. The focus was on navigation in typical human environments, human-robot interaction, and robustness in situations the robot encounters. The University of Rochester won the event, with the State University of New York at Stony Brook coming in second.

Robot Challenge

In 2003, the competing robots were challenged to attend the International Joint Conference on Artificial Intelligence, interact with the other attendees, and give a (brief) technical talk on itself in the robot meeting area. Subtasks included starting at the front door of the conference center, navigating to the registration desk, registering and getting a room number and time for the talk, interacting with other conference attendees, getting to the conference room on time, and making a two-minute presentation about itself and answering questions. Two teams successfully completed their runs in this arduous competi-

tion: Washington University in St. Louis, and the GRACE Team (Carnegie Mellon University, Naval Research Laboratory, Metrica Labs, Northwestern University, Swarthmore College.)

"In the Robot Challenge," notes Bruce Maxwell, cochair of the event, "It is notable that two teams successfully completed the challenge this year. Washington's run was very smooth although it was tuned somewhat to the event, but GRACE's run had a lot of hardware issues. The focus of the GRACE team this year was integration, which they largely accomplished. Additional highlights were sign reading by GRACE, who differentiated between a sign saying HUMANS and a sign saying LARGE ROBOTS and her ability to answer questions posed by the audience—after being typed in."

Ben Wegbreit Award

The Ben Wegbreit Award for Integration of AI Technologies was awarded to Washington University in St. Louis, Missouri. The Wegbreit Award, established by Stanford University AI scientist and successful entrepreneur Ben Wegbreit, is awarded to the most outstanding robot of the entire program.

Reflections on the Robot Event

In reflecting on the Robot Competition in Acapulco, Maxwell stated, "I felt like a lot of the most important stuff in the competition this year went on somewhat behind the scenes. GRACE's run, for example, didn't look much different than last year except for some subtle details. However, those subtle details involved a lot of work and made GRACE a much more robust robot than she was last year. Likewise, Swarthmore's work on urban search and rescue was largely in the interface presented to the user rather than any upgrade or change in the robot's capabilities. Although this made the robot/human team much more efficient, it did not change much in the way of the robot's visible behavior.

"I'm looking forward to having more participation in 2004 because the conference will be back in the U.S. Travel and robot shipping to Acapulco were prohibitively expensive, so participation this year was not as high as last. We are all looking forward to San Jose," he concluded.

2004 AI Conferences Scheduled

The 2004 AAAI-sponsored AAAI-04 and IAAI-04 conferences will be held jointly July 25–29, 2004, in San Jose, California.⁶

Notes

1. www.aaai.org/Pressroom/Releases/releases.html.
2. www.aaai.org/PressroomBackgrounders/backgrounders.html.
3. Information about the project and the results of the phase 1 bake-off can be found at www.projecthalo.com.
4. <http://discover.nci.nih.gov/gominer/>.
5. See the September 10, 2002 archived news release, "In the Aftermath of September 11: What Roboticists Learned from the Search and Rescue Efforts" at www.aaai.org/Pressroom/pressroom/html.
6. Visit www.aaai.org/Conferences/National/2004/aaai04.html for more information.