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AI: It's Out There

Artificial intelligence may not be living up to sci-fi visions, but it has gone underground into many day-to-day systems.
Also: Jeff Hawkins & AI

August 22, 2005 Issue

Many people think of artificial intelligence (AI) as a high-flying 1980s tech concept that crashed and burned back in the early 1990s after a good deal of hype.

The fact is, AI technology has become pervasive in much of the software we use today. Take the word processor. Start to write a memo, and your word processor will try to decide which words you really mean to type, and which icons to hide because you rarely use them. Or do an online search, and notice the ads that the search engine displays based on the topics it decides must interest you.

"The big picture is that AI is almost everywhere, but we don't call it such," says Alex Linden, vice president in the Frankfurt, Germany, office of research firm Gartner.

Turn up your nose at AI and you'll be ignoring some of the latest technologies and business opportunities. AI experts point to exciting innovations in fields such as machine vision, data mining, and the semantic web, while old-school AI technologies like neural networking and expert systems still soldier on.

The idea behind the semantic web is to catalog information in web documents according to the higher meaning of the words—their ontology—rather than the mere presence of text. "I believe the semantic web is the Next Big Thing," says Jim Hendler, a computer science professor at the University of Maryland. To explain the concept of the semantic web, he cites the example of a Google search for the median age at which people start smoking in Baltimore. "I'm interested in the concept of age, not specific digits," he says.

With the semantic web, data is automatically tagged to enable a machine to interpret it. "Many people don't get it, and it still needs to be picked up by industry, but in the next five to 10 years it should be a flier," says Mr. Linden.

They think it's a flier at Cerebra, a privately held firm based in Carlsbad, California. Cerebra takes aim at corporate data inside an enterprise's firewall, explains Jeff Pollock, the company's vice president of technology. A grand vision of a new ontological web is not Cerebra's goal. Instead, the idea is to provide adaptive and agile data management capabilities that will stand up to complex demands. Implementations cost upwards of $100,000. "We get calls from venture capitalists to help evaluate startups, and there are quite a few exploiting semantic technology that are now in fundraising rounds and have had no trouble attracting interest," says Mr. Pollock. "The market is primed and ready to take this approach."

Employee-owned Cycorp in Austin, Texas, has been working toward a similar goal for two decades, compiling a database of common-sense information—called Cyc—in a special format that enables a computer to find meaning in what it reads. The effort has mostly been funded by large government database projects. Cyc is still not ready to read unassisted, according to Larry Lefkowitz, executive director of business solutions at Cycorp. His firm is just now readying off-the-shelf products that use Cyc.

Intelligent Search

Improved AI-based search technologies that fall short of a grand ontological vision are also drawing attention, including dtSearch's text search and retrieval products, which sell for a few hundred dollars. "Our products are often used in forensics, where you pull a computer out of a dumpster and try to figure

out what it was used for," says Elizabeth Thede, vice president of sales at Bethesda, Maryland-based dtSearch. "Venture capitalists approach us all the time…. They think we are a promising company and want to throw money at us, but that is not our business model." dtSearch doesn't need financing, she says.

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More upscale, with costs in the hundreds of thousands of dollars, are the intelligent search systems sold by InQuira of San Bruno, California. The systems are based on natural language processing, a branch of AI that enables the system to comprehend what a person is really asking, at least if the question is posed in standard English. "Pointing customers at documents does not approach the productivity of being able to understand a request and pull the right paragraph up to their screen," says Bob Macdonald, chief marketing officer at InQuira.



Another branch of search-related AI is content management, which involves organizing data that does not come in structured formats, explains Lubor Ptacek, director of marketing for the Documentum line of content management software at EMC in Hopkinton, Massachusetts. The AI involves understanding various document formats to give the documents a common architecture in a single repository.

At Mentor Graphics in Wilsonville, Oregon, customers can use an InQuira system over the web to query 17,000-page engineering software manuals. They get the answer they want almost 70 percent of the time, according to Tom Floodeen, the company's vice president of customer support. Mr. Floodeen cut his budget by $3 million, even as the number of users went up 16 percent. "Our investors are very excited, and we see a lot of interest from venture capitalists," says Mr. Macdonald. "They see us doing significant business with significant corporations, where we are powering their contact centers. But we never use the phrase AI."

Mining Value from Data

Another AI field is data mining, where the system tries to make sense of vast amounts of data. The career of one of its pioneers, Usama Fayyad, is an example of how an AI field sometimes develops. Mr. Fayyad was working at NASA analyzing silos of stellar survey data when a Microsoft researcher challenged him to examine the world of corporate data. "I saw that most companies were getting no value out of their data sets," he says. With investor backing, he set up a data-mining firm now known as Revenue Science.

"The next lesson I learned was that most firms did not understand how to think about data," he recalls. So he set up a consulting firm to help CEOs view their data as a strategic asset, rather than as a byproduct of the IT department. One client was Yahoo, which eventually bought the firm and made Mr. Fayyad its chief data officer. "And so we have the ultimate successful evolution of an AI technology migrating from academia to database servers until it ultimately gets recognized at the executive level," says Mr. Fayyad. But most corporate data repositories still resemble Egyptian pyramids, he adds. They're impressively big, but lack useful output. He notes that Yahoo amasses about 10 terabytes of data per day, which is 10 times the amount of text data stored by the U.S. Library of Congress.

Computer vision is the branch of AI that teaches machines to understand what they see through cameras and other viewing devices. "Traditionally, it is the branch of AI that has had the least progress," says Alan Lipton, chief technology officer at ObjectVideo, a Reston, Virginia-based firm that has received several rounds of VC funding. He recalls an academic researcher in the 1960s who assigned a summer

intern to "solve the vision problem."

"Almost 40 years later, we are still only scratching the surface," he says. Recent advances, however, have made computers superior to humans when it comes to fixed surveillance and watching for specific events, he claims. "People climbing fences, parking in the wrong place, driving the wrong way—it can detect all those things in real time, while not being bothered by trees blowing in the wind, waves on the water, and other environmental clutter," says Mr. Lipton. The software costs about $4,000 per camera, which is about one-fifth of the cost of wiring and mounting a good camera, he says.

Face recognition remains difficult, however. License plate recognition is possible but requires good lighting, and gait recognition is still in the embryonic stages. "It's not a crowded field, but our commercial success has caused interest to explode," says Mr. Lipton. "A lot of little firms are starting up, and a lot of big firms are devoting internal R&D to the problem."

Old-School AI

One of the flag-bearers of the original AI fad was "expert systems" software, which codified the decision-making behavior of an expert in a specific niche. The technology is now usually called "business rules," says Dustin Huntington, head of the privately held firm Exsys, based in Albuquerque, New Mexico.

When expert systems were developed in the early 1980s, according to Mr. Huntington, the initial technology was powerful. "A lot of venture money went into attempts to enhance it further," he says. "But in this case the initial discovery contained the vast majority of the power, and the money was sunk on projects that were not feasible."

Venture money eventually dried up. Worse yet, the Japanese government funded a massive but fruitless "fifth-generation" AI expert systems project. "Now expert systems are something you do not discuss in Japan, and we have sold virtually nothing there for the last ten years," says Mr. Huntington.

But those who apply expert systems to small, realistic problems typically succeed, he says. He points to an expert system that business managers can download from the U.S. Occupational Safety and Health Administration. They can ask the system questions to see if they are in compliance, while revealing nothing to a live bureaucrat.

Another old-school example is neural networking, which attempts to find patterns in masses of data. "The classic uses involve anything where fraud is an issue, such as authenticating credit card transactions," says Jack Copper, head of Neuralware in Pittsburgh, Pennsylvania. The privately held firm was originally founded as the first commercial neural networking firm in 1987, although it has since been acquired by Aspen Technology and then divested.

"There is a resurgence of interest, although it's fair to say it's not a groundswell," says Mr. Copper. "About once a month we get a call from a venture capitalist, typically on the East Coast, typically with a focus on either analytical software or bio-infomatics, asking if we are interested in expanding. We are, but we find they want companies with revenue of at least $10 million, which is more than we have."

Microsoft Brings in the Big Guns

Of course, with software, there's the rest of the world and then there's Microsoft. Eric Horvitz, senior research manager at Microsoft, says the Redmond-based software giant has about 600 researchers at multiple sites, of whom about a quarter are involved in AI. "With some of the best science going on today, the torch is being carried by AI researchers," he says. "AI is typically at the shockwave of innovation."

Mr. Horvitz speaks of working on systems that can predict traffic problems 30 minutes in advance and alert the user via cell phone. The phones in his office are answered by a system that decides whether to interrupt the recipient with a call, while checking his or her calendar to see if the recipient is in a meeting. It also checks where the meeting is, with whom, and where those people are on the organization chart in relation to the recipient.

Microsoft is also developing software that can gauge the urgency of an email message. Using technology called "augmented cognition," the company is working on a system that will decide when and how to present important information to a user, after gauging how busy the user is, while weighing the cost of interruption vs. the cost of delay. "You'll experience a quiet, beautiful support experience, instead of being hit every few minutes with alerts and email messages," says Mr. Horvitz.

Mr. Horvitz has also been involved with the Defense Advanced Research Projects Agency (DARPA)—the research arm of the U.S. Department of Defense—and the Office of Naval Research. "As in any area there has been a cycle of funding, and there has been outcry for funding lately," he says. "We have coordinated with DARPA, and so we spend our dollars in a complementary way."

With backing from heavy hitters like Microsoft and the Pentagon, AI won't crash and burn anytime soon.

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