Microsoft

CASE STUDY

HOW MICROSOFT USES MACHINE LEARNING TO HANDLE WORKLOADS THAT HUMANS CANNOT

For better or for worse, depending on your view about technology's impact on employment, artificial intelligence has long been seen as a technology to help companies do more things with fewer people. That is a key part of making companies 'lighter,' as we refer to it in this issue of *TCS Perspectives*—to run and grow a business without having a geometric increase in payroll.

However, Joseph Sirosh, a Microsoft Corp. corporate vice president of information management and machine learning, believes AI—and more specifically, machine learning—will be essential to helping companies conduct business processes in which there simply are not enough people to do them in the first place. Many of those processes handle enormous and continuous volumes of digital data.

A great example of this is the way big companies defend their computer systems against attacks—hackers trying to penetrate their networks, malware that intrudes their email systems and web browsers, and more. "Every one of those things today are most efficiently detected in real-time and automatically, using machine learning algorithms," he explains. "It is absolutely true that today's machine learning algorithms are what is keeping Microsoft's cyber infrastructure data secure. There are not a lot of human beings [at Microsoft]

poking around trying to find out if there is something bad going on. It just would not scale."

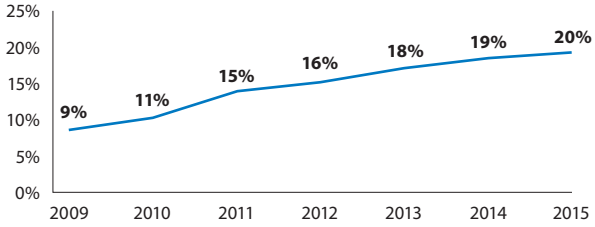
Without automated machine learning models to detect cyber-attacks, Microsoft and other big companies would have a hard time fending them off rapidly before damage is done, he notes. "Without these kind of automated systems, it would be very, very hard for these things to be detected fast enough to stop them," he says. "When people launch a virus in some part of the world that is starting to spread over networks and infect PCs, when you look at the data coming from these machines, you can understand what is going on—*if* there is a machine learning algorithm going on behind the scenes alerting you to the dramatic changes that are happening."

Guarding its computer networks is by no means the only place Microsoft has been applying its large and growing expertise in machine learning technology. Sirosh and others have been hired at Microsoft for several years to inject more machine learning models into the products and services that Microsoft sells. Products such as the Bing search engine and Microsoft's entry into the digital assistant market (Cortana) are imbued with the machine learning's ability to help a computer system become 'smarter' on its own, without the need for human programmers.

Take Bing, a search engine that in 2009 was a distant third in the marketplace to Google and Yahoo, according to market tracker ComScore. Back then, Microsoft had brought in a data scientist (Qi Lu, now a Microsoft EVP) who recommended the firm's search engineers to build machine learning algorithms that would automatically and continuously refine Bing's ability to summon relevant content. And he also suggested Microsoft build a data storage platform that stored all its search data, a critical piece for machine learning.

The Bing engineers followed his advice, and great things happened. By producing ever more relevant search results for Bing users, between 2009 and 2015 Bing's share of the search market more than doubled to 20%. What is more, Microsoft's search business has grown to more than $1 billion a quarter in revenue and has become profitable.

Microsoft doubles search share



Source: ComScore 2009–2015 Search Report U.S.

"The quality of the ranking results that are produced by the Bing search engine depends entirely on the machine learning models behind it," Sirosh explains. "The machine learning models examine the search queries and what people click on. They then build a very powerful model that is then deployed in a few programmable data for extremely fast querying."

The result is that every search result you get from typing words into Bing is found and ranked by a machine-learning model. "They're producing huge amounts of quality improvements for our search customers," says Sirosh. "That is one example where machine learning is totally built in the fabric of the product and has become one of its biggest differentiators."

This is one of numerous ways that Microsoft has embedded machine learning into its technology products and services. It has a strategy that is central to Microsoft CEO Satya Nadella's initiative to continue to grow the 41-year-old company far beyond the personal computer. As a *Bloomberg Businessweek* article put it earlier this year, Nadella "has been sprinkling machine learning like fairy dust on everything his company touches."[48] Sirosh and many others at Microsoft are there to make that happen.

[48] Dina Bass, "Inside Microsoft, Where Lie Detection Is a Killer App," Bloomberg Businessweek, Feb. 22, 2016. Accessed June 24, 2016. http://www.bloomberg.com/news/articles/2016-02-22/inside-the-new-microsoft-where-lie-detection-is-a-killer-app