

Machine learning proves its worth to business

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ABSTRACT (ENGLISH)

[Roundup: TensorFlow, Spark MLlib, Scikit-learn, MXNet, Microsoft Cognitive Toolkit, and Caffe machine learning and deep learning frameworks. | Get a digest of the day's top tech stories in the InfoWorld Daily newsletter.] "New chip technology in the form of central processing units, graphics processing units, or dedicated field-programmable gate arrays will be able to provide neural network processing at prices, sizes, and power consumption that fit smartphones," says Stuart Johnston, leader of the technology, media, and telecommunications practice at Deloitte. Building high-dimensional models Another company using machine learning, software provider Adobe Systems, has worked with supervised and unsupervised machine learning, as well as statistical models to help run its business for years, according to Anandan Padmanabhan, vice president of Adobe Research. With the transition of Adobe's business to a cloud-based subscription offering, there were two fundamental drivers that resulted in a need for large-scale machine learning within the company: online channels becoming the primary source for acquiring customers, and the need for driving product engagement and retention at scale across millions of customers. "Adobe captures this event-level longitudinal data across product usage, marketing, and customer support to build various types of predictive models," Padmanabhan says. "Examples of emerging smartphone technologies powered by machine learning include things like programs that determine users' moods and emotions through pressure sensors, programs that make health and life predictions using health data and programs that detect surrounding objects," Johnston says. Outside of smartphones, we will also see machine learning emerge in drones, tablets,...

FULL TEXT

Machine learning couldn't be hotter. A type of artificial intelligence that enables computers to learn to perform tasks and make predictions without explicit programming, machine learning has caught fire among the hip tech set, but remains a somewhat futuristic concept for most enterprises. But thanks to technological advances and emerging frameworks, machine learning may soon hit the mainstream.

Consulting firm Deloitte expects to see a big increase in the use and adoption of machine learning in the coming year. This is in large part because the technology is becoming much more pervasive. The firm's latest research shows that worldwide more than 300 million smartphones, or more than one-fifth of units sold in 2017, will have machine learning capabilities on board.

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"New chip technology in the form of central processing units, graphics processing units, or dedicated field-programmable gate arrays will be able to provide neural network processing at prices, sizes, and power consumption that fit smartphones," says Stuart Johnston, leader of the technology, media, and telecommunications practice at Deloitte.

"This hardware added to machine learning software will enable native programs designed to mimic aspects of the

human brain's structure and function, and will be applied to areas such as indoor navigation, image classification, augmented reality, speech recognition, and language translation," Johnston says. "What that means from a day-to-day user perspective is that complicated tasks will be easier, will be more personalized, faster, and have greater privacy."

Companies in various industries are already using or experimenting with machine learning technologies. Here is a look at how three companies are tapping machine learning to great business effect.

Pinning hopes on data-rich images

Social media site Pinterest began dabbling with machine learning in 2014, when it started investing heavily in computer vision technology and created a small team of engineers focused on reinventing the ways people find images.

Less than a year later the company launched "visual search," a new tool that does not require text queries to search for information. "For the first time, visual search gave people a way to get results even when they can't find the right words to describe what they're looking for," says Mohammad Shahangian, head of data science at Pinterest.

Visual search is powered by deep learning, a version of machine learning that taps into deeper neural networks, and allows Pinterest to automatically detect objects, colors, and patterns in any pin's image and recommend related objects. There are more than 200 million visual searches on Pinterest every month, in addition to 2 billion text searches, Shahangian says.

In the summer of 2016, visual search evolved as Pinterest introduced object detection, which finds all the objects in a pin's image in real time and provides related results.

"Today, visual search has become one of our most-used features, with hundreds of millions of visual searches every month, and billions of objects detected," Shahangian says. "Now, we're introducing three new products on top of our visual discovery infrastructure."

Pinterest has one of the largest collections of data-rich images on the internet. "We use machine learning to constantly rank and scale 75 billion dynamic objects, from buyable pins to video, and show the right pin to the right person at the best time," Shahangian says. "Our core focus is helping people discover compelling content, such as products to buy, recipes to make, and projects to try, and machine learning helps us provide a more personalized experience."

As Pinterest expands its international audience, it's vital that its service be personalized for people regardless of where they live, what language they speak, or what their interests are, Shahangian says. "Using machine-learned models, we've increased the number of localized pins for countries outside the U.S. by 250 percent over the past year," he says. "Now each of the more than 150 million people who visit Pinterest monthly see pins most relevant to their country and language."

In addition, machine learning predicts the relevance of a promoted pin on the site as well as its performance, helping improve the user experience with promoted ideas from businesses.

"We recently added deep learning to our recommendations candidate pipeline to make related pins even more

relevant,” Shahangian says. “Pinterest engineers have developed a scalable system that evolves with our product and people’s interests, so we can surface the most relevant recommendations. By applying this new deep learning model, early tests show an increase in engagement with related pins by 5 percent globally.”

Pinterest is constantly developing technologies with the latest in machine learning “to build a visual discovery engine, including making advancements in object detection and scaling an ever-growing corpus of data and the world’s data-rich set of images, to people around the world,” Shahangian says.

Building high-dimensional models

Another company using machine learning, software provider Adobe Systems, has worked with supervised and unsupervised machine learning, as well as statistical models to help run its business for years, according to Anandan Padmanabhan, vice president of Adobe Research.

With the transition of Adobe’s business to a cloud-based subscription offering, there were two fundamental drivers that resulted in a need for large-scale machine learning within the company: online channels becoming the primary source for acquiring customers, and the need for driving product engagement and retention at scale across millions of customers. In addition, the data captured on customer engagement with a particular product are far more detailed through machine learning.

“Adobe captures this event-level longitudinal data across product usage, marketing, and customer support to build various types of predictive models,” Padmanabhan says. These include paid conversion and retention models, customer retention models, automated feature extraction and segmentation, upsell and cross-sell models, and optimal allocation and segment-based forecasting models.

The tools the company has used for its machine learning efforts include Python Scikit-learn, Spark ML, SAS, and proprietary in-house methods.

Machine learning methods have helped the company build individual-level, high-dimensional models, Padmanabhan says. “Previously, Adobe leveraged statistical tools for building more aggregated models that would ignore individual-level heterogeneity altogether,” he says.

Among the key benefits of machine learning for Adobe is a greater understanding of the marginal impact of paid media, which has resulted in the improved allocation of media touchpoints across various selling channels; and the ability to understand individual customer propensities and lifecycle stages, which helps drive marketing campaigns.

The company has also seen improved customer engagement through a better understanding of how individual products are used and through responses to marketing campaigns, which has led to more customized products and customer support experiences. That, in turn, has helped with customer retention.

In addition, Adobe has seen improvements in enterprise sales and territory planning, which drive higher sales efficiencies; and the development of a consistent way of defining and analyzing key performance indicators across the business, which has allowed the company to evaluate all campaigns in a common framework.

Given the success so far, the company is looking for other options to take advantage of machine learning. “There is a strong push within Adobe to leverage machine learning in managing all aspects of the customer experience,”

Padmanabhan says.

Managing risk for customers

At LexisNexis Risk Solutions (LNRS), a provider of financial risk management services, machine learning helps customers protect against identity theft, money laundering, benefit scams, health care fraud, bad debt, and other risks.

LNRS began using machine learning several years ago to analyze and extract information from extremely large and heterogeneous data pools, to create graphs and make predictions about events, says Flavio Villanustre, vice president of technology architecture and product at LNRS.

The company uses mostly homegrown machine learning tools based on HPCC Systems, an open source, massive parallel-processing computing platform for big data processing and analytics.

The platform “gives us advantages when dealing with complex models and needing scalability to apply to very large and diverse data sets,” Villanustre says. On top of the HPCC platform, LNRS designed its own domain-specific abstractions in the form of domain-specific languages such as Scalable Automated Linking Technology, a sophisticated record linkage tool, and Knowledge Engineering Language, which combines graph analysis with machine learning capabilities.

Prior to machine learning, modeling through algorithms required people to understand the particular problem domain, extract facts from the existing data, and write large, “heuristics based” programs that used conditional rules to model different possible outcomes from the incoming data, Villanustre says. “These earlier systems required experts to sift through data to understand reality and describe it through conditional statements that a computer could understand,” he says. “This was very tedious, hard work, and better left to computers.”

Machine learning changed that by letting computers extract those facts and represent reality through statistical equations-based models instead, Villanustre says. “This saves countless hours of domain experts’ time and allows them to work with data sets that humans would struggle to deal with otherwise,” he says. “The resulting computer programs are more compact, easier to implement, and more efficient.”

LNRS uses machine learning to describe complete networks of organizations and individuals to identify fraud rings. It also uses the technology to assess and make predictions on credit and insurance risk, identify fraud in health-care-related transactions, and help capture criminals.

“Machine learning is at the core of everything that we do,” Villanustre says. And the company is looking into the latest iterations of the technology. Some of the recent developments around deep belief networks – generative graphical models composed of multiple layers of latent variables with connections between the layers – and deep learning are proving to be promising fields of applications, he says.

“It is always important for us to validate these new methodologies with the laws and regulations of the respective countries in which we work to ensure that they can be used in ways that maximize the benefit to individuals and society,” Villanustre says.

Machine learning in the mainstream

The adoption of machine learning is likely to be diverse and across a range of industries, including retail, automotive, financial services, and health care, says Johnston of Deloitte.

In some cases, it will help transform the way companies interact with customers, Johnston says. For example, in the retail industry, machine learning could completely reshape the retail customer experience. The improved ability to use facial recognition as a customer identification tool is being applied in new ways by companies such as Amazon at its Amazon Go stores or through its Alexa platform.

"Amazon Go removes the need for checkouts through the use of computer vision, sensor fusion, and deep or machine learning, and I expect many shopping centers and retailers to start exploring similar options this year," Johnston said.

The fact that common devices such as smartphones will be equipped with machine learning capabilities means the technology will no longer be limited to theoretical or highly selective applications.

"Examples of emerging smartphone technologies powered by machine learning include things like programs that determine users' moods and emotions through pressure sensors, programs that make health and life predictions using health data and programs that detect surrounding objects," Johnston says.

Outside of smartphones, we will also see machine learning emerge in drones, tablets, cars, virtual or augmented reality devices, medical tools, and a range of IoT devices, making it available to industries that use those products, Johnston says.

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