VALUE CHAIN INNOVATION: THE PROMISE OF AI

EXECUTIVE CONFERENCE
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STANFORD GRADUATE SCHOOL OF **BUSINESS** | Value Chain Innovation Initiative

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Event Highlights

On May 31, 2018, the Value Chain Innovation Initiative (VCII) at Stanford Graduate School of Business hosted an executive conference, "Value Chain Innovation: The Promise of AI." Over 120 individuals, including faculty, alumni, venture capital funders, and scholars, attended the all-day event exploring the potential of artificial intelligence, or the ability of computers to perform tasks normally requiring human judgement and decision making. The event welcomed a range of speakers from industry and academia to discuss current and prospective applications of artificial intelligence in value chains as well as limitations of the technology.

Speakers agreed that AI involving machine learning, and specifically technologies such as image recognition, natural language processing, deep learning, and neural networks, is already influencing business as well as society at large. These technologies are being applied to better sense customer demand, satisfy that demand through an efficient supply chain, and better integrate demand and supply. AI can deliver more precise and faster insights than other tools, and in the case of machines, it can enable automation that wasn't previously possible. In addition to exploring cutting-edge value chain applications, speakers also looked ahead, debating the future role of human workers and considering some of the ethical questions that AI raises.

The following summary highlights some of the main ideas discussed.

Hosts

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Thoma Professor of Operations and Information Technology
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Better Together

Intelligent people fiercely disagree on humans' relationship to AI and just how much influence it should have on human decision making. Opinions range from "AI is the solution for everything, to AI is horrible and will kill us and take over our lives," said Padmasree Warrior, CEO and CDO of NIO U.S., which is developing electric autonomous cars. Warrior believes the relationship will ultimately be "something in the middle." AI can make products useful and efficient, while society can guide the technology and address its unintended consequences, just as it has already done with cell phones.

To determine its relationship to AI, society needs to determine just how dependent it will be on AI and how much credence it'll give to a decision made by a computer algorithm. No matter how sophisticated an AI system, at times it's likely to require complementary human participation to ensure a desired outcome. At Stitch Fix, an online personal styling service using AI to select garments for customers based on their responses to a questionnaire about their fashion preferences and other data, the algorithm might rule out sending a sundress to the customer in Alaska in the dead of winter, said Daragh Sibley, director of data science at the company. Yet a human Stitch Fix stylist who happens to know that this particular customer is planning to travel to a wedding in Hawaii needs to override the algorithm and ship the sundress, said Sibley. Computers can look for patterns in data and perform computations, but "let humans apply their very specific human knowledge," he said.

With self-driving cars and other areas where safety is at stake, AI technology should recognize the power and importance of human judgment. In the future, self-driving cars in certain conditions could warn owners when it would be safer for the technology to take over, and if drivers don't, the cars could override the drivers and pull off the road and stop.

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Accuracy, Speed, and Innovation

Applications for AI have moved beyond recommending books and movies, as Amazon and Netflix currently do with remarkable accuracy. The Salesforce Einstein CRM platform uses AI to help salespeople sift through large amounts of information and identify which leads to pursue first. "In a business where humans are making decisions, we give them information to make better decisions faster in order to prioritize the workflow," said Jim Sinai, GSB '08, vice president of marketing for Einstein. IBM's Watson Supply Chain platform, too, helps customers predict and avoid disruptions in their supply chains by, for instance, analyzing weather patterns, incoming shipments of parts, and the correlated sales orders dependent upon those parts, added Jeanette Barlow, vice president of offering management and strategy for Watson Supply Chain.

In agriculture, startup Abundant Robotics is deploying a robot that navigates orchards and picks apples, using AI to "see" ripe fruit, which may be partially hidden behind branches and leaves. "If you look at the process for harvesting most fresh fruit and vegetables, it hasn't changed much since the Roman Empire," said Dan Steere, GSB '93, the company's co-founder and CEO, adding that the farming industry currently can't find enough workers.

Responsibility Required

Tools using AI can raise questions of authenticity and other matters of ethics. Adobe's software leverages its AI and machine learning technology, Adobe Sensei, which can alter fundamental qualities of photos and videos. For example, users can easily change perspectives and proportions on a selfie. "We believe we can use AI responsibly," said Tatiana Mejia, GSB '07, Adobe Sensei's head of AI product marketing and strategy, noting that AI systems can incorporate watermarking to show a photo's authenticity. "It's a responsibility for the companies that create these [technologies] to think about different ways they can be used," she said.

Other companies, too, are now figuring out the limits of what customers will tolerate. Even if, say, a store can use facial recognition software to identify customers as they approach, retailers believe shoppers don't want to be greeted by name as they walk in. "The consumer values privacy, and we as an analytics provider want to make sure we treat the consumer's privacy with the utmost care and consideration alongside our customers," said Jonathan Su, PhD '11, CEO and founder of startup Pilot AI, which is developing smart camera software.

Because AI is ultimately a tool, "humans still need to be involved in the decision to wield or not to wield those tools," added Carson Moore, senior software engineer at OhmConnect, which lets consumers reduce their home energy use and sell energy back to utilities. To support humans in smart use of AI tools, solutions like Adobe's are providing users with the reasoning behind optimal solutions so they understand the rationale behind decisions. Jim Sinai noted that this is more possible with machine learning heuristics, whereas deep learning is less transparent.

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Man Versus Machine

Society has for decades feared that robots and automation will eliminate the need for human workers, but that scenario is far from certain, speakers agreed. Completely automating some worksites, such as a brick-and-mortar store, would require such a huge re-design and financial investment that companies may be better off using automation for only select functions and retaining some humans to perform the rest.

Robots and other automation probably will generate new jobs, such as work in software and hardware maintenance. But some individuals, including high-end professionals such as dermatologists and pathologists, who visually look for signs of cell abnormalities, may eventually have to find another line of work. "In medicine, if you're a pattern-matching expert, you need to think about getting other skills," said Russ Altman, professor of bioengineering, genetics, medicine, and biomedical data science at Stanford.

Focus on the Future

As technology advances, the use of AI will become increasingly apparent to individuals and consumers. Russ Altman noted that future AI-based systems will be able to analyze information collected from sensors placed on individual patients, social media, medical records, and genomic data to help doctors design health policy and prevention strategies, diagnose illness, plan treatments, and determine prognoses.

Consumers might use self-driving cars not only for personal transportation but also as delivery vehicles for groceries or dry cleaning. And as AI improves, retailers' product recommendations may become even more tailored and personalized, said Bo Zhai, GSB '13, who heads emerging technology investments at U.S. Alibaba, the Chinese e-commerce and internet conglomerate. "This will show up more and more in your daily life," he said. If e-commerce firms can use AI to help them find more efficiencies in the back office and supply chain, ordering merchandise may become even easier for consumers and delivery times will decrease. "It all comes down to shortening the lead times at reduced cost," Zhai said.

Speakers agreed that before these promises can come to complete fruition, humans must solve one particularly pressing problem: In order for AI to work optimally, it needs a steady diet of "high quality" data to train itself and build its algorithms. "If you can't get that data, you're stuck," said Jonathan Su.

Organizations of all kinds are grappling with that problem. Altman noted that some data fed into AI systems are correct but biased. For example, medical staff sometimes don't enter complete health information into patients' electronic medical records, instead putting in only the information required by the insurer. The incomplete picture distorts the computer's attempts to learn about illness in a patient population lead it to make biased conclusions.

In Closing

It was clear from the day's discussions that AI has yielded business benefits in many phases of the value chain, including design, manufacturing, logistics and sales. Speakers agreed, however, that it was still early days for AI-enabled business value. As the technologies mature and evolve, managers will need to address challenges of bias, lack of transparency, and enabling successful human-machine collaboration. If risks are successfully and continually managed, companies may find myriad opportunities to incorporate AI as a valuable tool to strengthen their value chains.

> Before the promise of AI can come to fruition, humans must solve a pressing problem: In order for AI to work optimally, it needs a steady diet of data to train itself and build its algorithms to deliver more precise and faster insights than other tools.

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