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China's push into artificial intelligence—how should the United States respond?

By Dieter Ernst

Scientists and engineers have been developing artificial intelligence (AI) applications for more than 60 years. These are computer programs that mimic human cognitive functions such as learning or problem solving, often by processing very large collections of data.

In recent years, big-data analytics and mathematics have generated sophisticated algorithms, high-performance computing has made it possible to analyze very large data sets, and computing systems have been developed that mimic biological neural networks. And today, real-world applications are finally taking off. Examples include global positioning software that gives directions to drivers, cell phones that recognize speech and facial expressions, smart and interactive robotics, and self-driving vehicles. The potential economic rewards are mindboggling.

Yet despite the long period of gestation, we are still decades away from "general AI," with machines performing the full range of cognitive tasks that humans can perform. AI functions remain domain-specific—algorithms designed to interpret medical images, for example, do not perform any other task.

Although the AI boom has enormous implications for economic growth and prosperity, the negative consequences can also be serious. Challenges include the erosion of privacy through misuse of personal data, increasing income inequality as technology-based jobs replace positions for low-skilled workers, and a concentration of corporate power that stems from unequal access to large data sets. Governments around the world are only now beginning to develop laws, regulations, and policies that will improve the balance between the huge gains and serious losses potentially associated with AI.

While China is now the world's second largest economy, it still lags far behind the United States and other advanced economies in the capacity for technical innovation. Chinese leaders believe that AI presents a unique opportunity to catch up, while many Americans believe that any increase in China's AI capacity poses a threat to leadership by the United States.

A closer look suggests that the danger of a Chinese threat is exaggerated. Chinese companies and the Chinese government have amassed huge data sets, but advanced algorithms have been developed in the United States that make AI less dependent on big data. In the critical area of advanced algorithms, China remains weak. China also lags behind in AI chip design and fabrication and in underlying research on computer architecture and design. As a result, the AI applications used by major Chinese companies still tend to be powered by foreign chips, mostly designed by US firms.

China's relatively weak position in AI analysis stems from a limited capacity to conduct the research necessary to improve data quality and expand AI applications. Less than a dozen Chinese universities have advanced AI programs, compared to many dozens in the United States, and finding sufficient numbers of qualified and experienced AI faculty remains a huge challenge.

In addition, China lags way behind the United States in the use of advanced information-technology-based manufacturing. Only about 60 percent of Chinese companies use industrial automation software, and only 25 percent of China's small and medium enterprises use the Internet. These deep and persistent gaps in knowledge and capability are critical, and it is unclear whether China's current policies are effectively addressing them.

At the corporate level, China's largest companies have made significant progress in commercial AI applications, but they generally lag behind American companies. With Facebook in crisis over concerns about data privacy, Tencent is becoming the world's most valuable social-network company, but this could be a short-term phenomenon. Alibaba has improved its market capitalization, but its profitability still lags well behind that of Amazon. And Baidu is seriously lagging in its quest to capture global markets as the "Google of China."

Very few other Chinese companies are even in the race. The United States, by contrast, has Facebook, Amazon, Netflix, and Google, plus another dozen or so large companies that are active in AI research and development, including IBM, Intel, Cisco, and Hewlett Packard.

Apart from advanced applications, improving data quality requires sophisticated approaches to data governance through technical standards, regulations, and policies, as well as data sharing and openness. China continues to rank low on all these metrics. In particular, data sharing is significantly constrained by China's "Great Firewall" that blocks access to selected foreign websites and slows down cross-border Internet traffic.

A major barrier to China's push into AI is a near-total lack of privacy protection, which persists despite the vague definitions contained in the 2017 Cybersecurity Law. Lax privacy protection has provided the Chinese government and leading companies some short-term advantages. Over time, however, the disregard for privacy presents a significant hurdle to Chinese companies seeking to expand into the global market. In the future, the lack of data privacy could also create damaging popular mistrust within China—think of the current backlash against Facebook.

Regulatory systems involve more than privacy protection, and these important systems are lagging behind the development of new technology, not just in China but around the world. In the United States, fatal accidents involving self-driving cars are one recent example of the risks that occur when new AI applications are introduced without an adequate regulatory framework.

It follows that China needs international cooperation, both as a source of core AI technology and as a model of best practice in data governance. In the United States, earlier complacency that the Chinese cannot innovate has given way to fear that they are "stealing our technology" and that trade and investment restrictions are needed to contain China's technological and geopolitical ambitions. Just now, the Trump administration is considering restrictions on Chinese students and researchers working in the United States based on concerns that they could be sharing American technology and trade secrets with China.

This response is myopic and self-destructive. It fails to recognize that it is too late to block China's rise in advanced technology. Even more importantly, cooperation with China is a must for the United States. Access to China's booming AI market is critical for the US information-technology industry, especially for semiconductor makers and their suppliers and also for global brand leaders and digital platform providers.

America's AI community also needs to interact with China's rapidly growing pool of AI talent. The 2017 annual meeting of the Association for the Advancement of Artificial Intelligence (AAAI), for example, featured a nearly equal number of papers by researchers based in China as in the United States. In fact, the Society, which is based in Palo Alto, California, postponed its 2017 meeting when the organizers discovered that the original date coincided with the Chinese New Year.

Today, as looming trade conflicts dominate economic relations between China and the United States, the atmosphere is not conducive for cooperation between the two countries' governments. Persistent tensions will most likely stifle official action to expand cooperative research and innovation or improve international governance.

Yet cooperation between AI sectors in China and the United States would yield substantial benefits, not only for both economies but worldwide. In the absence of constructive government leadership, it is up to global AI communities—in research institutions and companies—to establish alternative channels for international AI governance. Such broader forms of cooperation are urgently needed to address the three most important potential negative effects of AI development—job destruction and wage inequality, concentration of economic power, and the erosion of privacy.