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Artificial Intelligence and the Reconfiguration of Healthcare

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Using an open-source Google machine learning library called TensorFlow, a Japanese auto engineer developed a tool for sorting cucumbers to save his parents hours of tedious manual effort each day on their small farm.[1]

Using an intelligent cloud capability to recognize voice patterns and link them to services, Amazon's Echo allows users to request a car, order dinner, play music, shop online, and perform dozens of other tasks without using a smartphone, opening an app, or tapping a keyboard.[2]

Using machine learning techniques with names like Markov Chain Monte Carlo and Bayesian switchpoint detection, Netflix translates users' viewing habits—including starting and stopping a program—into predictions of which movies they would like to watch, saving viewers time and saving Netflix $1 billion each year by reducing subscriber loss and making more efficient use of its entertainment inventory.[3]

Artificial intelligence (AI)—including machine learning and deep learning—is the process by which computers discern new patterns from vast amounts of data. AI does this not by applying existing algorithms, but by learning in a way that mimics the thought processes of a human—with far greater volume capacity. AI promises to be a key tool for functions as diverse as self-driving cars, Google searches, and fraud detection.

In any field it touches, AI has the potential to disrupt traditional competitive dynamics by introducing previously unknown levels of insight, convenience, efficiency, and personalization. That potential is especially high in healthcare.

Among all industries developing AI, the most active is healthcare. Between 2012 and August of 2016, there have been nearly 190 equity investment deals in healthcare-related AI start-up companies for a total of $1.5 billion, along with billions more invested to acquire the data and other capabilities for AI.[4]

How AI Is Permeating Healthcare

When IBM began its efforts to monetize the Jeopardy-winning AI engine Watson, its first move was into healthcare. In AI, data is the coin of the realm, and within 10 months, IBM Watson Health spent $4 billion to acquire four companies that had data from 300 million patients, along with the capability to store medical images and analytics engines for clinical, operational, and financial decision support.[5] IBM's plan is for Watson to translate this vast amount of unstructured data into what IBM calls "a goldmine of insights" that it will "scale globally" to achieve "better outcomes at lower costs."[6]

A particular area of focus is radiology. IBM has been working to leverage AI's ability to interpret images—for example, seeing abnormalities in CT scans—and combine that with existing medical knowledge to suggest diagnoses and treatment.[7] Some studies suggest AI is more accurate than humans in this type of interpretation,[8] leading to debate about the future role of radiologists.[9] Saurabh Jha, a radiologist and researcher at the University of Pennsylvania, says, "That AI will do the job radiologists do today is a mathematical certainty."[10]

Cancer is another focus for IBM Watson Health. The company is working with Memorial Sloan Kettering Cancer Center and MD Anderson Cancer Center on developing treatment plans by combining patient medical information with extensive medical literature. Watson also is being used to suggest cancer treatment based on an individual's genomic sequencing.[11]

Consumer wellness, another area of great potential for AI in healthcare, has not escaped IBM's notice. IBM Watson has partnered with Welltok, a platform for consumer engagement, on CaféWell—an application that learns about a user's health behaviors over time and offers wellness suggestions. The app also has voice recognition functionality that understands and answers complex questions about topics ranging from health insurance to managing a chronic condition.[12]

AI and the Erosion of the Expertise Model

IBM is positioning Watson Health as an assistant to clinicians, hospitals, payers, and employers, making it easier for these traditional stakeholders to improve health and reduce costs. However, something far deeper is happening—both through IBM specifically and AI in healthcare generally.

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The most fundamental aspect of healthcare's business model is expertise. Access to the healthcare system flows through a physician gatekeeper. Healthcare knowledge, decisions, and treatments come from physicians. Healthcare is delivered, for the most part, at hospitals and clinics. AI's attack is trained directly at this expertise model.

First, AI has the potential to commoditize aspects of clinical care that traditionally have been the sole domain of physicians. Diagnostics is the first area, but others could follow. The implications are far reaching. Clinical sophistication has long been a major competitive differentiator for leading healthcare organizations. That could change as AI takes root in healthcare. The result could not only change the competitive landscape, but also the revenue and expense structure, as AI's advanced analysis reduces the volume of testing and treatment, and reduces the reliance on experts for tasks that AI makes more routine.

Second, AI has the potential to shift the center of influence in healthcare from leading provider organizations to companies that provide the new knowledge infrastructure. Much like Uber is using infrastructure to become the center of transportation and Amazon is using infrastructure to be the ecosystem for, well, everything, technology giants like IBM and Google could become the new nexus of healthcare. They will have the data and AI capabilities that could become the new engine for healthcare.

Third, AI can bring healthcare directly to consumers, bypassing traditional sources of expertise. Today, IBM is marketing Watson Health to physicians, hospitals, payers, and employers. However, as the CaféWell example suggests, IBM is cognizant of the consumer market. It makes more sense for IBM to target 300 million consumers rather than 800,000 physicians. In the future, consumers may well go first to companies like IBM for initial health insights before they approach their traditional providers.

Fourth, AI is inclusive. Google's machine learning library is open source. Any company, large or small, can connect its service to the Alexa brain that powers the Amazon Echo. Netflix shares its AI innovations on a public tech blog. As of 2016, there are more than 90 AI startups focused on healthcare.[13] This inclusiveness suggests it is highly unlikely that the center of the universe for healthcare AI will be the traditional legacy provider functioning under the expertise model.

Envisioning the Future

As healthcare executives cope with a changing payment model, downward pressure on revenue, and the need to control costs, AI may seem like a point in the far distance. It is true that AI is still in an exploratory stage and that its full benefits may not be felt for several years. However, AI is powerful evidence of a fundamental change in healthcare that executives need to recognize—a change in which consumer relationships, competitive dynamics, and the way services are provided all will change. As AI takes hold, hospitals may play a very different role than they do today. Executives need to think deeply about trends such as AI, develop a vision about the future healthcare system, and identify the steps their organizations need to take today to secure a relevant place in the health system of tomorrow.

Your comments are welcome. I can be reached at kkaufman@kaufmanhall.com.

Ken Kaufman's book *Fast and Furious: Observations on Healthcare's Transformation* is available at kaufmanhall.com/fastandfurious

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