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Big Data Will See You Now: The Impact of Artificial Intelligence on Health Care

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If there was ever an industry in dire need of increased efficiency, cost containment and improved outcomes, health care tops the list. Despite consuming 18 percent of our nation's GDP—equal to \$3.4 trillion in annual expenditures—it is responsible for nearly 250,000 deaths due to medical errors, poor record keeping and a dismal lack of shared data among doctors about patients in their care.

From blockchain technology to surgical robots, medical experts worldwide agree that big data and artificial intelligence (AI) will play a key role in vastly improving health care quality and delivery. Aided by advances in sensor capabilities, computational power and algorithmic ingenuity, the pace of medical innovation is accelerating rapidly.

To be sure, AI and big data are not the next best thing, they are here and now. Digital medicine is currently tracking down and destroying mutant cancer cells faster than ever before. It is also commonly used in operating rooms by doctors tapping into pools of data accumulated from previous surgeries to receive guidance from computers systems that have analyzed learned procedures that can be scaled up in order to make appropriate recommendations before, during and after treatment. So instead of depending on one or two local practitioners determining the course of lifesaving treatments, patients now have access to a knowledge base of thousands of doctors worldwide.

AI—versus natural intelligence used by humans to power up their brains—is akin to a jigsaw puzzle that deploys algorithms to draw together seemingly unrelated dots of information to paint a clear picture of the underlying data. It has changed dramatically since the concept was first introduced at Dartmouth College in 1956. Today's man and machine AI is being aided by neural networks and deep machine learning methodologies powered by quantum computers and sophisticated algorithms that can crunch raw data into meaningful and actionable analyses.

A recent Wall Street Journal article titled "The Operating Room of the Future" is a case in point. Verb Surgical Inc., a recent startup formed by a partnership between Alphabet and Johnson & Johnson, is designing neural networks which enables robots to learn from one another by connecting each of them to the Internet to create machine-learning algorithms. Called "Surgery 4.0," it is the next logical step after traditional open procedures, minimally invasive surgery and the introduction of robotics. Using machine learning methodologies, computer programs study past procedures to identify best practices and potential errors. Verb's technology has rendered the da Vinci surgical robot ancient by today's standards despite the latter performing more than five million surgeries worldwide since 2000.

Another area ripe for AI is mental health. Researchers are developing new drugs and pharmaceutical combinations using machine learning to assess chemical reactions of anti-depressants among individual patients. They then tailor them to closely match an individual's unique biochemical makeup. The results thus far are promising. In addition to detecting when a patient is veering off into a bipolar episode even better than a psychiatrist could ever imagine, these drugs are mitigating some of the wrenching side effects associated with traditional serotonin re-uptake inhibitors. Taken one step further, Stanford University has created chatbots to combat this debilitating disease. Patients feeling an aura can tell their chatbot how they are feeling that day. Using predictive analytics, the bot can quickly suggest coping strategies drawn from numerous cognitive behavioral therapies. Again, the results are impressive, reducing depressive symptoms by 20 percent.

AI and big data can also predict patient falls resulting in head traumas, bone fractures and other injuries costing on average \$30,000 per incident. Businessweek recently featured California-based Qventus, a company that developed a program to help nurses overcome alarm fatigue and sensory overload from the constant beeping sounds and alerts found in hospital environments. In many cases, this results in medical staff missing critical and life-threatening alarms altogether. Qventus' software extracts and analyzes data to recognize patterns from call lights, bed alarms, electronic medical records, patients' prescriptions and age and other fall indicators. In turn, this has reduced injuries by 13.5 percent.

Today there is no such thing as TMI when it comes to data capture now that we have the tools to make sense of it all. We are far from Star Trek's tricorder ability to instantly detect what ails us, but we are moving in that direction. Even in its embryonic stage, AI outperforms dermatologists in spotting skin cancer, helps pharmacists predict more effective drug combinations, and spots nuances on x-rays far better than radiologists.

Quantum computers uncovering newfound data have provided medical professionals with keen insights into disease mapping and prevention, rendered speedier diagnoses and treatments for patients, accelerated scientific discovery aimed at curing the leading causes of death in our country, and have also played a major role in predictive analyses and detection.

Last month, Oakridge National Laboratory rolled out the world's most powerful supercomputer, Summit, capable of 122.3 petaflops (or 200 quadrillion) calculations per second. Comparatively speaking, the human brain clocks in at 10-100 petaflops per second. However, computers do not yet match the human brain in areas like reasoning, perceiving and intuition. AI will never replace humans or lead us to the dreaded robopocalypse of lore. Considered by many as an idiot savant, AI is well versed in single, closely supervised tasks but out of its element performing wider, more complex calculations. Equally important, big data and AI are only as good as the data fed to it by their mere mortals (you and me) whom program neural networks and plug and play algorithms that run the risk of being inherently biased or, worse yet, a victim of groupthink.

Yet, the opportunities that big data and AI present in vastly improving health care and the quality of life for ailing patients far outweigh the challenges. Together, man and machine are teaming up to exploit unprecedented amounts of medical information churned out by powerful computers and advances in integrated software technologies. According to Kevin Lasser, CEO of JEMS Telehealth, "we are at an inflection point now and will soon look back and realize that today was only the beginning of a major revolution in medicine."