



## Artificial intelligence: Practical advice for health care



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**Artificial intelligence (AI), machine learning and deep learning are terms that appear in business conversations with growing regularity. We asked Optum experts to weigh in on these trending topics and their impact on the business of health care.**

As the parent field of computer sciences, AI is comprised of many subfields. Think of it as the outermost layer of a Russian nesting doll. The first subfield — or nested doll — is machine learning, where we “train” systems with data rather than explicit programming. Within machine learning is deep learning, inspired by the way the human brain works. Deep learning uses many artificial neurons to ultimately improve the way a task is accomplished.

Differences between AI, machine learning and deep learning are helpful to understand, as the terms are often used in the same context. These terms are often conflated in popular media, but they all have very different historic development trajectories.

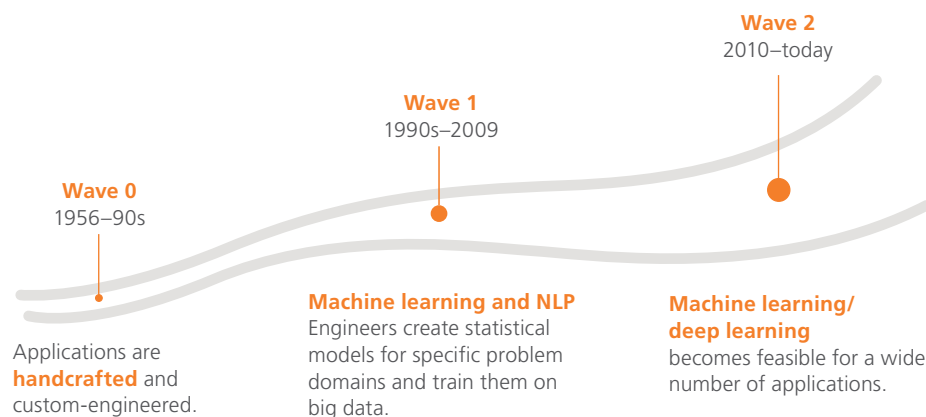
- Artificial intelligence dates back to 1956, when a number of prominent scientists gathered at Dartmouth College to formalize aspects of learning and intelligence. During that time, there was a strong view that one needs to precisely describe all aspects of learning and intelligence in order to make computers simulate learning and intelligence. Today, AI includes areas of research in knowledge representation, automatic reasoning, decision-making, planning, natural language processing, social intelligence and general intelligence.
- Machine learning is the study of algorithms that “learn” patterns from data in order to perform a usually very narrow task. This is in contrast to coding concrete instructions to perform the same task. Machine learning, being an inherently data-driven enterprise, includes statistical techniques, mathematical optimization and data mining.
- Deep learning, which is based on the theory of neural networks, has its origins in the 1940s, when research papers were published on computational models inspired by biological processes of the brain. Major breakthroughs in the application of deep learning stem from the confluence of three trends: the explosion of big data, fueled by digitization and the internet; the proliferation of computing and graphics processing units (GPUs); and novel scientific approaches to neural networks.



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### Building modern-day capabilities

Just like any other technology, the evolution and adoption of AI has come in waves. Many health care organizations have surpassed both Wave 0, when applications were handcrafted and custom engineered, and Wave 1, when narrow applications of machine learning and NLP have automated mostly administrative tasks. The focus for most organizations is on Wave 2. We must be careful not to conflate the analytics of Wave 1 with the need to build intelligent and cognitive systems of Wave 2. Although Wave 1 technology capabilities continue to transform health care, the industry needs to focus on the practical value of emerging AI solutions.



## AI in health care: Relevancy and important first steps

Many factors make the use of AI particularly attractive in health care. Potential applications are numerous, and include:

- **Transforming health care administration and operations.** Use cases include claim process redesign, fraud and waste identification, and network optimization and steerage.
- **Empowering consumers.** Potential applications include person-level engagement and recommendations, and enablement of lower-level or home-based care through remote monitoring technology.
- **Enabling health care delivery.** AI can facilitate patient-level recommendations based on identification and stratification models, and can contribute to total cost of care reductions through integrated medical, pharmacy and behavioral interventions.

With so much potential, it's no surprise that 85% of health care executives have implemented or are planning to implement an AI strategy in their organizations.<sup>1</sup> So, where do we start?

Patients with high-cost chronic and complex conditions account for the vast majority of health care spend. Approximately 60% of our population has at least one chronic condition, and they account for 90% of the nation's annual health care expenditures.<sup>2</sup> In 2019, those costs amounted to \$3.2 trillion.<sup>3</sup> We estimate that a significant portion of this spend is avoidable through improved, highly coordinated population and/or condition-specific health management that enables clinicians with the best clinical decision support and empowers patients with the best tools to manage a fragmented health care system.

Many operational processes within health care are based on years of data and human expertise. Extending our data fabric to include both historic data and human expertise appropriately, AI can assist clinicians with review and analysis, streamlining tasks and freeing clinicians to devote more time to patient care. Better diagnostic aids and tools will be made possible because of AI.

No matter where the start line seems most obvious, an unwavering reality is that AI requires lots of data. The better the data strategy, the greater impact AI makes in an organization's processes, products and services. For example, the data fabric will have to include data that is usually not found in databases, such as regulatory frameworks and medical expertise, in order to ground AI solutions and build capabilities to seamlessly integrate the human factor to health care delivery.

### Q Which health care applications are you most comfortable having AI support?

#### Top responses

Percent of respondents from survey of 500 health care executives

**Operational: Automating prior authorizations**

51%

**Clinical: Providing individuals with relevant health actions using personalized communications**

47%

**Operational: Managing electronic health records (EHRs)**

45%

**Financial: Detecting fraud, waste and abuse in reimbursement**

43%

## Dispelling the myth: Algorithms replacing humans

Health care is well-suited to using AI as an augmentation tool to aid people. For example, combing through pathology slides and extracting results or reviewing thousands of pages of academic journals are tasks humans are not naturally suited to do. By taking on repetitive tasks, AI allows health care services to scale — adding more people and making services available to a wider community. Automation through AI is essential for improving the delivery of quality care because it frees up the actual practitioners to do what they do best: care for patients. The question is not whether AI will change health care — it is already disrupting and changing health care. But the AI of today and the foreseeable future — what we call narrow AI — is trained to solve one particular problem at a time. We're a long way from the general AI that's often depicted in science fiction.

The question we must address is how we can use AI in ways that help humans and systems work better and faster, making the health care system work for everyone and making people healthier. Two studies support our view that AI is best suited for a complementary role that enables humans to achieve better performance:

- A recent MIT study evaluated whether a doctor's intuition could be replaced by AI; the study concluded that it could not.<sup>4</sup> In part, that's because we do not know the digital analogues of creativity, fairness, justice and intuition.
- "The Future of AI" report<sup>5</sup> cited a clinical study that showed when AI and pathologists individually judged whether a lymph node contained cancer cells, there were error rates of 7.5% versus 3.5%, respectively. But when AI was used to augment the pathologist's decision process, the error rate went down to just 0.5%.

## Summary

Health care is a very large and attractive field for anyone who wants to use AI to drive improvements and disruptive change in the industry. As the practical applications of AI continue to develop at a rapid pace, we see more opportunities for technology to improve access to care and help people live healthier lives. Both business and emerging technology experts need to establish a collaborative environment to challenge the status quo in order to drive novel opportunities, like more compelling consumer experiences and the elimination of waste and friction. In order for health care organizations to reach these goals, it's important to commit to the following:

- Teaching business and technology managers and leaders about health care use cases and value, as well as hype versus reality, when it comes to AI. This task cannot be underestimated, as it is essential for business units to understand the potential and opportunity presented with AI.
- Continuing to build up capabilities and infrastructure.
- Infusing AI into administrative platforms and consumer outreach efforts platform.
- Establishing benchmarks and performance measures.

While AI is not a panacea, an AI future presents exciting opportunities for all stakeholders. Optum innovations in AI, including NLP, machine learning and deep learning, provide tangible solutions to improve health care delivery and operations.



Optum leaders are working across health care and with tech innovators to approach health care with practical AI applications that augment human skill and solve real health care problems.

## Our approach to research and innovation in AI

Our team of over 25,000 health care experts seek to solve the most complex problems in health care — through research, development and application of emerging technologies — to improve the lives of the people we serve. We incubate emerging technologies and explore ways to apply them practically by working with clinicians, researchers and business professionals. Technology areas include AI, the internet of things (IoT), deep learning, genomics, NLP, blockchain and graph databases.

From a technology perspective, our team of multidisciplinary experts is comprised of the first Optum Technology Fellow, distinguished engineers, principal engineers, AI software engineers, researchers, high-performance computer engineers, business operations and technical product management. Team members hold more than 1,400 combined patents, have conducted over 200 global speaking engagements, and have published more than 375 articles and papers on emerging and advanced technologies.

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OptumIQ is the unique combination of curated data, leading analytics and applied expertise infused in Optum products and services. The strength of OptumIQ comes from our unique experience across the health system, working with providers, health plans, employers, government agencies and life sciences organizations.

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