Step by Step, AI Is Accelerating the Search for a Cancer Cure

AI already is delivering breakthroughs in cancer diagnosis, but even optimists believe a cure is a decade away.

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For about a million years, the human race has been on a curve of innovation, an upward arc that has progressed from controlling fire, to inventing the mechanical movable-type printing press, to creating artificial intelligence (AI) systems that can defeat mankind's most accomplished game players. Today, AI systems are bending the human innovation curve ever further skyward, accelerating the pace of progress and putting major breakthroughs within reach — such as ending terrorism or curing cancer.

Indeed, some researchers believe that an AI-assisted cancer cure is less than a decade away. However, even with the accelerant of AI, the journey toward a cancer-free world will be iterative, built on small steps — just as past innovations led to today's cutting-edge technologies.

AI already is delivering breakthroughs in cancer diagnosis, but the technology will undergo multiple iterations, solving a plethora of smaller problems before taking on the ultimate challenge. This process will present copious opportunities for AI technology providers to contribute to the monumental challenge.

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But to participate in this effort, technology providers need to understand the sequence of innovations that have led us to where we are today and to where we will eventually arrive in the future. Let’s look at a timeline of select AI innovations that potentially ends with the conquest of cancer:

- 1952 – Marvin Minsky unveils the Stochastic Neural Analog Reinforcement Calculator (SNARC), the first connectionist neural network learning machine – and possibly the first self-learning machine.
- 1975 – Backpropagation algorithm is developed that solves challenges with computational machines, allowing the training of multilayer neural networks and leading to the widespread usage of neural networks in the 1980s.
- Circa 2000 – The first use of the expression “deep learning” to describe a type of machine learning that creation of networks capable of learning from unstructured data in an unsupervised fashion.
- 2011-2012 – Convolutional neural network AlexNet achieves unprecedented levels of accuracy in visual recognition, paving the way for deep learning to enter the mainstream.
- January 2017 – Researchers at Stanford University develop deep-learning technology that can visually identify cancerous skin moles and lesions with the same level of accuracy as a human dermatologist.
- February 2017 – Microsoft establishes Healthcare NExT, an initiative designed to apply AI and machine-learning technologies to health issues, including cancer treatment.
- March 2017 – Google’s GoogleNet deep-learning technology detects cancerous tumors with higher accuracy than human clinicians.
- October 2017 – Intel announces first silicon for its

Nervana Neural Network Processor (NNP) chip, which can accelerate deep learning tasks, including diagnosing cancer.

- Circa 2021 to circa 2026 – Microsoft is projected to release an AI-powered computer that operates inside the human body to detect and reprogram cancerous cells, rendering them harmless.

As this timeline shows, the pace of innovation in deep-learning and AI-based cancer research is accelerating. However, progress at this stage still involves relatively small steps leading up to the ultimate goal in the future.

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This situation reflects the status quo in AI innovation, which involves using single-task-specific cognitive engines to perform mundane and repetitive tasks that are challenging for people, such as examining large numbers of images of tissue samples to detect signs of cancerous lesions.

These technologies are collectively called artificial narrow intelligence (ANI). Today's most successful AI technologies are leveraging these engines for a wide range of specific purposes, from the object-recognition technology that powers Amazon's DeepLens video camera to the face-recognition algorithms that control the Face ID authentication on Apple's iPhone X.

These solutions are called "one-time" (1x) AI transformations. They represent pragmatic tools that satisfy immediate needs while promoting strategic objectives.

Such 1x transformations are playing a critical role the development of AI. Businesses that successfully integrate 1x AI innovations into their operations are expected to expand their workforce by 10 percent and revenues by 38 percent during the next five years, according to a report from Accenture.

These types of innovations will lead to the next generation of AI: two-fold (2x) transformations. Such 2x transformations take things a step further by using ANI to look at the bigger picture. For example, they can combine large amounts of data from a variety of sources, processing it and analyzing it to make it useful for specific tasks.

At the next level are 10x transformations, where AI technologies become powerful enough to solve major challenges. The 10x transformations will be enabled by the future development of two technologies: artificial general intelligence (AGI) and artificial superintelligence (ASI).

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AGI is defined as a machine that can perform any intellectual task as well as a human does. Artificial superintelligence goes beyond AGI by delivering machines with intellectual capabilities that are superior to humans'.

The road to cancer's cure will progress from today's ANI-enabled 1x transformations, through 2x solutions, to the AGI- and ASI-driven technologies of the future. In order to participate in this process, providers and users of medical AI technology will have to participate in the iterative process of AI innovation, taking small steps toward the ultimate goal.

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