The Impact of AI on the Digital Future of

Healthcare and Life Sciences

Co-created by

Emerj Artificial Intelligence and **SambaNova Systems**

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Introduction

A generational shift has come to healthcare and pharma. Today's practitioners are flooded with increasing amounts of data in their day-to-day practice. Navigating this flood of data takes significant time and effort. This often means less time for delivering the human element of care and addressing the real-life needs of their patients.

With AI innovations that push the limits of today's technologies, providers and researchers are increasingly able to focus on the crucial human element of healthcare. In areas such as telehealth, drug discovery, and disease diagnosis, we're already seeing multiple use cases for AI applications, including:

Exponential advances in computer vision technology that will allow practitioners to rely on AI to help identify conditions like diabetic retinopathy, multiple sclerosis, or dementia.

In drug discovery, AI has the capability to accelerate time to insight with greater efficiency and accuracy than current methods. Increasingly intelligent deep learning recommendation models (DLRM) can help predict the viability of targets in the drug discovery pipeline.

For telehealth, innovations in recommendation models and conversational AI will allow AI to go beyond matching patients with practitioners and consider other variables, such as personal preferences for doctors, insurance coverage, location, and scheduling availability.

According to McKinsey, 44% of high-performing healthcare and drug companies will increase their investments in AI during the COVID-19 crisis—a trend sure to continue as AI use cases continue to demonstrate value across these sectors.

In this paper, we'll meet with Bill Fox, Healthcare and Life Sciences Lead at SambaNova Systems, to explore the opportunities and technological advancements that AI can bring to a few key areas.

AI-Driven Drug Discovery of the Future

The drug discovery process moves too slowly, requiring an average of ten years and nearly $3 billion to complete, from idea to prescription. And many pitfalls await nascent drug ideas, including shifting priorities. In the end, two of every three targets do not survive to become drugs.

How can we leverage AI to navigate the drug discovery process more quickly and make better decisions about which targets will survive to become drugs? According to Bill Fox:

> *"There's a tremendous amount of data and knowledge locked inside an organization. It's siloed, and in people's heads, notebooks, or in databases they created. It's in different formats. Some are structured. Some aren't. It's difficult to pull it all together."*

Imagine AI at work in this process, finding critical connections among disparate data and enabling pharmaceutical companies to drive new insights.

Incorporating AI into the drug discovery process, big pharmaceutical companies are developing knowledge graphs to organize and link this scattered data. The knowledge graphs organize the data the same way a scientist would, drawing connections between proteins, molecules, and pathways.

Best-in-class natural language models, such as BERT and GPT-3, can be used to accelerate finding patterns in the data that suggest likely targets. The targets can then be investigated by the researcher, with potentially higher success rates.

Recommendation models, such as DLRM, can also be utilized to more accurately predict likely drug targets, accelerating this crucial, time-intensive process.

Both NLP and recommendation models are rapidly growing in sophistication. They can deliver results that are increasingly precise and actionable as they grow in their abilities to include more attributes and utilize new advances in hardware to scale.

Reimagining Drug Discovery

If you can turn a two-year process into two months or three weeks," asks Fox, "how much faster could you develop meaningful targets using AI before you go from in silico to in vivo?"

When combined with the expert knowledge of scientific researchers bringing decades of experience, AI technologies based on knowledge graphs, natural language, and deep learning recommendation models could dramatically accelerate drug discovery. Further, the efficiencies won by these AI solutions could significantly increase ROI for the enormous amount of time and money dedicated to the drug design process.

As AI adoption accelerates in the pharma sector, life sciences leaders working towards competitive innovation will need expertise to navigate the challenges of bringing these AI technologies into production workflows.

Telehealth Comes of Age

Telehealth has held a place on the roadmaps of most healthcare organizations for years. Once thought years away, the COVID-19 pandemic moved telehealth from the three- to five-year roadmap to the next-week roadmap almost overnight.

This accelerated adoption of telehealth has led to a challenge: As the industry currently operates with Version 1 of telehealth and virtual care, how can healthcare organizations develop and deliver more effective, advanced, and engaging virtual service processes that enhance the patient journey?

Doctor matching

Provides the ability to include more variables to strengthen doctor-patient alignment

Symptom checking

Increases the accuracy of virtual diagnosis

Virtual assistants

Utilize conversational AI for better “next best” actions

Remote patient monitoring and alerts

Drives smarter IoT and alerts for better patient outcomes

The healthcare industry is currently facing real challenges in integrating new technologies into existing processes. But healthcare professionals will increasingly call upon telehealth and virtual solutions to help address client scheduling and insurance challenges, assist with initial diagnoses of symptoms, and make it easier for patients to navigate the continuum of care.

These advances in the use of telehealth technology will enable better patient engagement that strengthens connections between healthcare consumers and providers.

> *"We're at the dawn of something new in healthcare, driven by advances in AI adoption and the realities of the pandemic," says Bill Fox. "These advances are effective and help a lot of people. But, the AI and machine learning technologies that support these changes need to further evolve to effectively support the next versions of telehealth's evolution."*

AI Applications in Telehealth

In the near future, AI technologies will accelerate the adoption of new approaches to healthcare. Example use cases include:

NLP technologies listen as patients describe their symptoms and concerns, and then deliver the relevant responses and ask the right questions.

Recommender models evaluate symptoms and determine a likely list of causes and diagnoses. These model-driven recommendations can then be used by clinicians to expedite the patient journey and make their first visit—virtual or in-person—more focused and meaningful.

With computer vision, patients could take a picture of their health concerns and send it, securely, for evaluation and potential diagnosis. This information can then be delivered to a provider before the first “visit,” which may also be virtual.

With these innovations, AI would expand the time and reach of practitioners in a world where they’re increasingly scarce. Patients could rely on technology to gather the information practitioners need to detect concerns (the human eye may miss) and diagnose diseases.

Computer Vision in Detection and Diagnosis

The world's population is aging. UN data indicates that 16% of people alive in 2050 will be older than 65, up from 9% today. And by the end of the 2020s, the world will face a shortage of some 15 million healthcare workers needed to care for this growing elderly population. Developing countries will be impacted even more severely by these trends. Fortunately, increasing AI adoption can help bridge the gap.

For example, consider diabetic retinopathy. This disease currently ranks as the most common diabetic eye disease in the US and is a leading cause of blindness in adults the world over. In countries with less robust healthcare systems that have a shortage of ophthalmologists, people will go without the critical screenings that could save their eyesight. In these circumstances, AI technologies, such as computer vision can be employed to identify and diagnose diabetic retinopathy in patients—enabling medical facilities to stretch the valuable time of healthcare providers to offer increased access to care to more people.

AI Empowers Patients and Providers

High-resolution computer vision can directly impact patient outcomes. Beyond identifying and diagnosing conditions, such as diabetic retinopathy, the increased accuracy enabled by training and inferring on true-resolution images can extend to tracking the progression of other diseases, including cancer.

The key to more accurate screening and diagnostics across healthcare and pharma applications is the ability to use true-resolution images, for both training and inference, without “tiling” and down-sampling — workaround techniques necessitated by conventional AI systems that may sacrifice accuracy.

> *“If healthcare and life sciences organizations can utilize all of their data, to train and infer on images that haven’t been down-sampled,” says Fox, “it may tell us something we didn’t think of or show us something we couldn’t see before.”*

We are already seeing the benefits of high-resolution computer vision in healthcare and the use cases will continue to grow. Imagine the advances that AI could soon make possible in diagnosing other ailments, such as multiple sclerosis, dementia, and even less common diseases.

“There are some rare conditions that a doctor may only see a few, or a few dozen, times in their career,” says Fox. “But, if doctors around the world can share their expertise in these rare diseases, bringing together a larger corpus of knowledge that can be analyzed, AI can be employed to assist them in finding the right treatments more quickly.”

By bringing AI to the detection of diseases, the industry can combine the collective power of human medical expertise with the unique efficiencies and capabilities promised by machine learning. With the next generation of AI, we’re moving away from telling the data what to find and heading toward AI telling us something we didn’t know or expect.

New Technologies Accelerate AI Initiatives Across the Industry

As AI technology advances, so too will its demands.

“Machine learning models are 10xing in size every year,” observes Bill Fox. “Healthcare will inevitably struggle to keep up because they’re in the business of healing people—not building AI.”

SambaNova Systems delivers machine-learning and AI solutions that will bring healthcare closer to patients. With its Dataflow-as-a-Service™ solution, SambaNova offers healthcare and life sciences organizations comprehensive services, models, and a platform that provide the fastest, easiest, and guaranteed path to AI.

Dataflow-as-a-Service™ enables organizations in all industries to access powerful AI innovation through a simple subscription model that delivers expert AI solutions at a fraction of the time and expense it takes to develop complex in-house infrastructure and machine learning expertise.

Learn how healthcare and life sciences organizations can leverage advanced AI solutions to achieve innovative breakthroughs that redefine healthcare—and the world. Visit us on the web at SambaNova.ai.

Bill Fox J.D., M.A.

Healthcare and Life Sciences Lead, SambaNova Systems

Bill leads healthcare and life sciences business development at SambaNova Systems. He has over 20 years of experience in healthcare technology and is an internationally recognized thought leader on digital transformation in healthcare and life sciences. He is the former SVP of AI at Change Healthcare. Prior to that, he led the global healthcare and life sciences vertical at MarkLogic. Before MarkLogic, he held senior positions at Booz Allen, LexisNexis, and Maximus.

About SambaNova Systems

SambaNova Systems is an AI innovation company that empowers organizations to deploy best-in-class solutions for computer vision, natural language processing, recommendation systems, and AI for science with confidence. SambaNova's flagship offering, Dataflow-as-a-Service™, helps organizations rapidly deploy AI in days, unlocking new revenue and boosting operational efficiency.

SambaNova's DataScale® is an integrated software and hardware system using Reconfigurable Dataflow Architecture™ (RDA), along with open standards and user interfaces. Headquartered in Palo Alto, California, SambaNova Systems was founded in 2017 by industry luminaries, hardware, and software design experts from Sun/Oracle and Stanford University. Investors include SoftBank Vision Fund 2, funds and accounts managed by BlackRock, Intel Capital, GV, Walden International, Temasek, GIC, Redline Capital, Atlantic Bridge Ventures, Celesta, and several others.

Contact us at: info@sambanova.ai

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Emerj Artificial Intelligence Research is a market research and advisory company focused exclusively on the business impact of AI.

Companies that thrive in AI disruption run on more than just ideas. They leverage data and research on the AI applications delivering return in their industry today and the AI capabilities that unlock true competitive advantage into the future - and that's the focus of Emerj's research services.

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