AI researchers harness data to drive health care innovation

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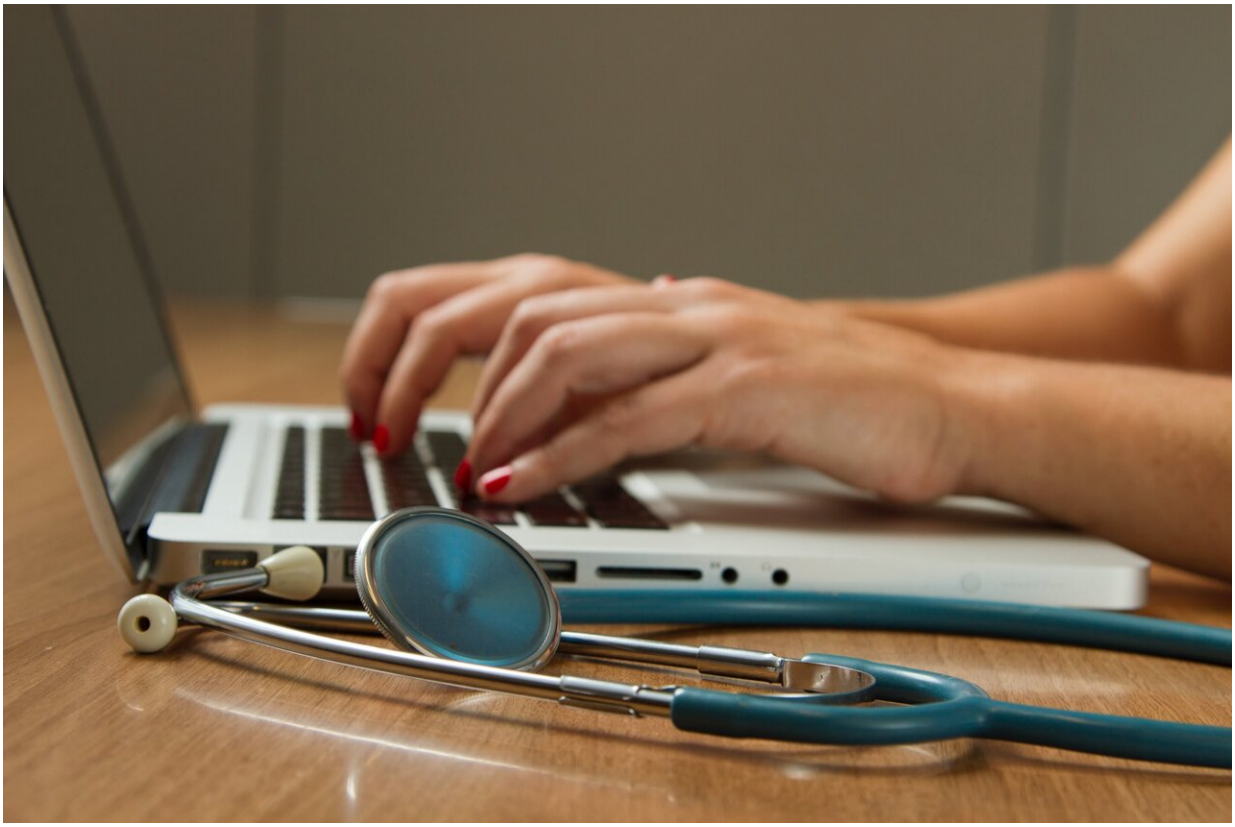

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As an expert in developing artificial intelligence tools to improve health care, Ross Mitchell has always viewed the research process a little differently.

For a long time, he explains, the standard approach involved starting with a hypothesis, conducting experiments to collect data and then determining whether the data confirmed or denied that hypothesis.

Instead, Mitchell was approaching issues from a data-first perspective—much like the way the physicians he worked with approached the problems they saw.

"It's what happens every day in hospitals around the world. When somebody comes in with symptoms, you don't know what it is, so you do tests and imaging to look for things. You literally start by looking at the data and then form a hypothesis," says Mitchell, a professor in the Department of Medicine, adjunct professor in the Department of Computing Science and one of two University of Alberta researchers recently named Canada CIFAR AI Chairs.

Harnessing health data to benefit patients

One area Mitchell has focused on involves something called unstructured data. As he explains, about 80% of health-care data is stored in a format that isn't searchable, such as images. The current standard requires trained professionals to go through this data manually, a time-consuming process that creates lags in care delivery.

A past project of his involved creating a system that would process tumor pathology reports to identify which patients may be a good fit to enroll in a clinical trial.

"It did a really good job of extracting the tumor site and the type of tumor it was, and we could store that in a database immediately and the next day it's searchable," says Mitchell, who is also the inaugural Alberta Health Services Chair in AI in Health as well as senior program director of AI adoption with AHS.

"That now opens up all kinds of clinical trials to patients immediately instead of this slow, laborious, expensive process of having to read through these documents manually," he explains.

Storing sensitive data safely and securely

In addition to finding efficient ways to analyze large amounts of data for researchers to make strides in health care and AI, we also need to find ways to safely and securely store all that sensitive data—an area Bei Jiang explores in her work.

"One significant challenge in health data analysis is dealing with data complexity and heterogeneity—for example, electronic health records and neuroimaging data," says Jiang, an associate professor in the Department of Mathematical and Statistical Sciences.

"My research has been focusing on developing efficient computational tools that can effectively handle these complex data types."

Along with creating tools that can store and analyze this type of data, researchers also need to establish systems to share it. However, while sharing data is an important step in advancing medical research and improving patient outcomes, Jiang emphasizes that "it must be done in a way that respects patient privacy."

"I have been developing novel privacy tools that enable secure data sharing while protecting sensitive patient information."

Jiang, who has a particular interest in fairness and debiasing algorithms and AI models, notes that this is especially important in health care because bias "can impact treatment decisions and lead to disparities in health-care outcomes."

Bringing her perspective as a statistician to the work she does, Jiang also lauds the way programs like CIFAR encourage collaboration among researchers.

"There are strengths that we can provide as statisticians, and computer science has its strengths in terms of developing more complex algorithms. We need to work together because each of us can contribute a lot to AI research."

A unique Alberta advantage

The way Alberta's single provider health-care system is set up offers researchers like Mitchell and Jiang a wealth of data to use as they create innovative systems and models.

"You have information on over four million people for 20 years in a single data warehouse. That means you have data sets that nobody else in the world can even come close to in terms of both the size and the diversity," says Mitchell.

It also makes it easier to build models that can be adapted to have a wider impact, he notes.

"The models we develop are going to be highly portable. If we develop a model in Alberta, it'll be applicable in many other provinces and locations and probably around the world too."

From Mitchell's perspective, one of the most important steps that needs to be taken over the next two to five years involves granting broader access to data for medical research and building AI models.

"We have the data, we have the AI talent, we have the great medical school and fabulous university that attracts students from around the

world. That combination is incredibly rare," he says.

"I think the future is very bright. It's a fantastic time to be getting into AI and health, and things are moving incredibly fast."

Provided by University of Alberta