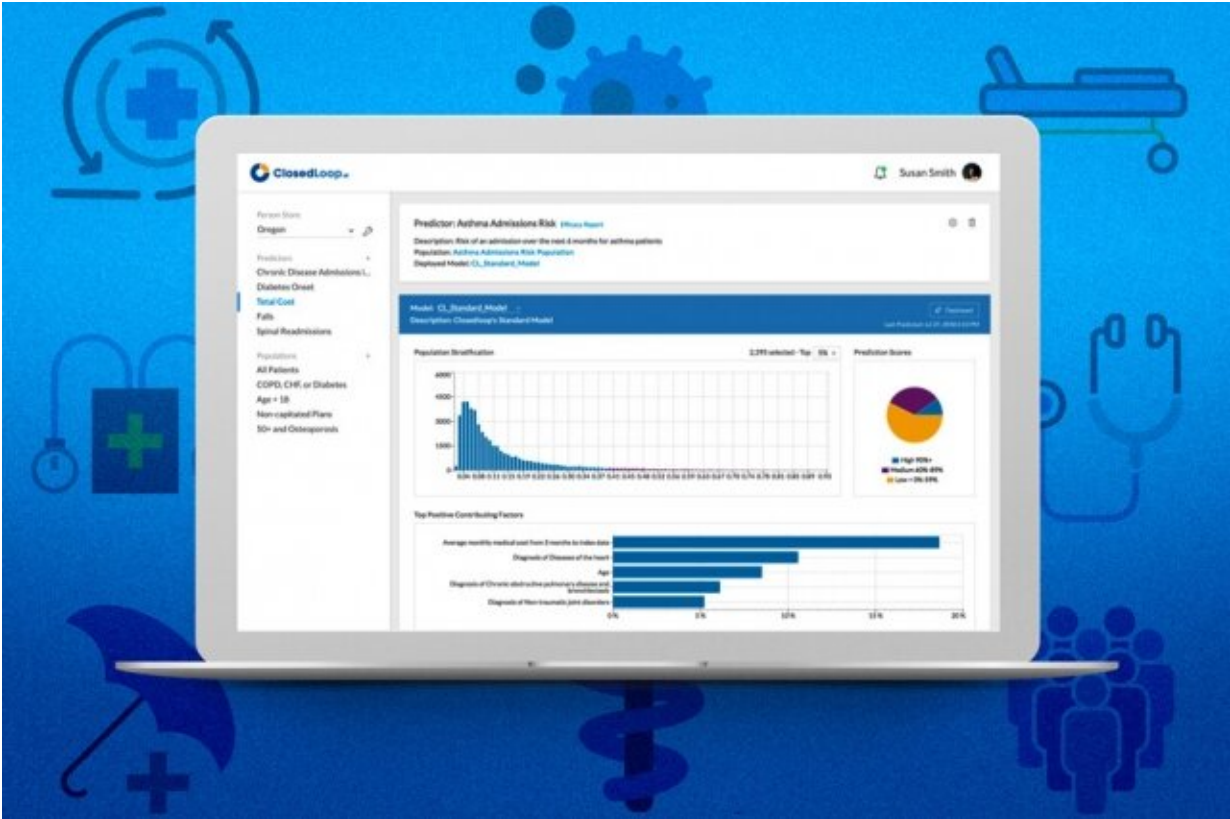


Bringing the predictive power of artificial intelligence to health care

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The startup ClosedLoop.ai, co-founded by an MIT alumnus, is using a platform of AI models to help hospitals make predictions based on their patient data. Credit: MIT News, with images courtesy of the researchers

An important aspect of treating patients with conditions like diabetes and heart disease is helping them stay healthy outside of the

hospital—before they to return to the doctor's office with further complications.

But reaching the most [vulnerable patients](#) at the right time often has more to do with probabilities than clinical assessments. Artificial intelligence (AI) has the potential to help clinicians tackle these types of problems, by analyzing large datasets to identify the patients that would benefit most from preventative measures. However, leveraging AI has often required [health care organizations](#) to hire their own data scientists or settle for one-size-fits-all solutions that aren't optimized for their patients.

Now the startup ClosedLoop.ai is helping [health care](#) organizations tap into the power of AI with a flexible analytics solution that lets hospitals quickly plug their data into machine learning models and get actionable results.

The platform is being used to help hospitals determine which patients are most likely to miss appointments, acquire infections like sepsis, benefit from periodic check ups, and more. Health insurers, in turn, are using ClosedLoop to make population-level predictions around things like patient readmissions and the onset or progression of chronic diseases.

"We built a health care data science platform that can take in whatever data an organization has, quickly build models that are specific to [their patients], and deploy those models," says ClosedLoop co-founder and Chief Technology Officer Dave DeCaprio '94. "Being able to take somebody's data the way it lives in their system and convert that into a model that can be readily used is still a problem that requires a lot of [health care] domain knowledge, and that's a lot of what we bring to the table."

In light of the COVID-19 pandemic, ClosedLoop has also created a model that helps organizations identify the most vulnerable people in their region and prepare for patient surges. The open source tool, called the C-19 Index, has been used to connect [high-risk patients](#) with local resources and helped health care systems create risk scores for tens of millions of people overall.

The index is just the latest way that ClosedLoop is accelerating the [health care industry](#)'s adoption of AI to improve patient health, a goal DeCaprio has worked toward for the better part of his career.

Designing a strategy

After working as a software engineer for several private companies through the internet boom of the early 2000s, DeCaprio was looking to make a career change when he came across a project focused on genome annotation at the Broad Institute of MIT and Harvard.

The project was DeCaprio's first professional exposure to the power of artificial intelligence. It blossomed into a six year stint at the Broad, after which he continued exploring the intersection of big data and health care.

"After a year in health care, I realized it was going to be really hard to do anything else," DeCaprio says. "I'm not going to be able to get excited about selling ads on the internet or anything like that. Once you start dealing with human health, that other stuff just feels insignificant."

In the course of his work, DeCaprio began noticing problems with the ways machine learning and other statistical techniques were making their way into health care, notably in the fact that predictive models were being applied without regard for hospitals' patient populations.

"Someone would say, 'I know how to predict diabetes' or 'I know how to predict readmissions,' and they'd sell a model," DeCaprio says. "I knew that wasn't going to work, because the reason readmissions happen in a low-income population of New York City is very different from the reason readmissions happen in a retirement community in Florida. The important thing wasn't to build one magic model but to build a system that can quickly take somebody's data and train a model that's specific for their problems."

With that approach in mind, DeCaprio joined forces with former co-worker and serial entrepreneur Andrew Eye, and started ClosedLoop in 2017. The startup's first project involved creating models that predicted patient health outcomes for the Medical Home Network (MHN), a not-for-profit hospital collaboration focused on improving care for Medicaid recipients in Chicago.

As the founders created their modeling platform, they had to address many of the most common obstacles that have slowed health care's adoption of AI solutions.

Often the first problems startups run into is making their algorithms work with each health care system's data. Hospitals vary in the type of data they collect on patients and the way they store that information in their system. Hospitals even store the same types of data in vastly different ways.

DeCaprio credits his team's knowledge of the health care space with helping them craft a solution that allows customers to upload raw data sets into ClosedLoop's platform and create things like patient risk scores with a few clicks.

Another limitation of AI in health care has been the difficulty of understanding how models get to results. With ClosedLoop's models,

users can see the biggest factors contributing to each prediction, giving them more confidence in each output.

Overall, to become ingrained in customer's operations, the founders knew their analytics platform needed to give simple, actionable insights. That has translated into a system that generates lists, risk scores, and rankings that care managers can use when deciding which interventions are most urgent for which patients.

"When someone walks into the hospital, it's already too late [to avoid costly treatments] in many cases," DeCaprio says. "Most of your best opportunities to lower the cost of care come by keeping them out of the hospital in the first place."

Customers like health insurers also use ClosedLoop's platform to predict broader trends in disease risk, emergency room over-utilization, and fraud.

Stepping up for COVID-19

In March, ClosedLoop began exploring ways its platform could help hospitals prepare for and respond to COVID-19. The efforts culminated in a company hackathon over the weekend of March 16. By Monday, ClosedLoop had an open source model on GitHub that assigned COVID-19 risk scores to Medicare patients. By that Friday, it had been used to make predictions on more than 2 million patients.

Today, the model works with all patients, not just those on Medicare, and it has been used to assess the vulnerability of communities around the country. Care organizations have used the [model](#) to project patient surges and help individuals at the highest risk understand what they can do to prevent infection.

"Some of it is just reaching out to people who are socially isolated to see if there's something they can do," DeCaprio says. "Someone who is 85 years old and shut in may not know there's a community based organization that will deliver them groceries."

For DeCaprio, bringing the predictive power of AI to health care has been a rewarding, if humbling, experience.

"The magnitude of the problems are so large that no matter what impact you have, you don't feel like you've moved the needle enough," he says. "At the same time, every time an organization says, 'This is the primary tool our care managers have been using to figure out who to reach out to,' it feels great."

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