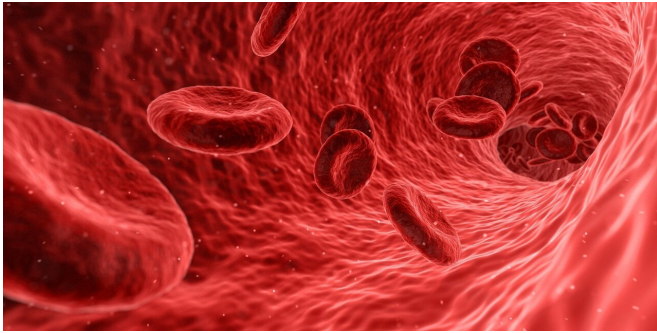# Research shows potential of artificial intelligence to screen for cardiovascular disease

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Credit: CC0 Public Domain

A rapidly growing body of evidence suggests the microscopic bacteria that live in our digestive tracts have a profound effect on our cardiovascular health.

With the assistance of artificial intelligence, University of Toledo scientists have shown it might be possible to use those microorganisms to diagnose heart and vascular diseases without the need for a battery of specialized tests.

The innovative discovery was recently featured at a premier American Heart Association scientific conference and published in the journal *Hypertension*.

"The association between one's gut microbiota and conditions like hypertension and heart failure is overwhelmingly clear, even if we don't yet know all of the mechanisms. Using artificial intelligence, we developed a machine learning model that could simply use stool bacterial signatures to screen for cardiovascular disease," said Dr. Bina Joe, Distinguished University Professor and chair of the UToledo Department of Physiology and

Pharmacology, who directed the study.

Researchers in Joe's lab used computer algorithms to analyze the bacterial makeup present in stool samples from nearly 1,000 individuals. Roughly half of those people had been diagnosed with some form of cardiovascular disease, while the other half reported no cardiovascular disease.

The analysis found higher levels of certain bacteria were present in each group, essentially providing a microbial signature that differentiated those with cardiovascular disease from those who were healthy. In all, researchers identified nearly 40 bacterial taxa that appeared to correlate with cardiovascular health.

Researchers were able to apply those gut microbiota signatures to a machine learning model that can screen individuals for cardiovascular disease based on bacteria in their stool samples.

"Even after so much development in technology, cardiovascular disease remains the leading cause of death worldwide. There are various diagnostic methods for identifying cardiovascular disease but for the overall evaluation of cardiovascular health, we are still lagging behind," said Sachin Aryal, a bioinformatics student in UToledo's College of Medicine and Life Sciences and the paper's first author. "Our study demonstrates the promising potential of further developing gut microbiota-based approaches for diagnosing cardiovascular disease."

Patients who the machine learning model identifies as having a high probability of cardiovascular disease could be referred to their doctor for additional testing and therapeutic intervention, saving time and reducing costs.

"I am thrilled that my first major publication is

gaining so much attention and could one day serve as the basis for a new way to diagnose cardiovascular disease." Aryal said. "This study is a good example of how our department is embracing machine learning and similar artificial intelligence projects."

The initial 1,000 patient samples researchers used looked only at cardiovascular disease in general, not specific conditions such as hypertension or heart failure. By adding more nuanced data that includes individual conditions or demographic information, the artificial intelligence is likely to produce even more accurate results—including a specific diagnosis.

"The machine is quite similar to a doctor. If a doctor sees more patients they can gain more experience and expertise and further improve their future diagnosis," said Dr. Xi Cheng, a postdoctoral to faculty fellow in the Department of Physiology and Pharmacology and the paper's lead author. "This is the future of our research—combining artificial intelligence and machine learning with traditional biomedical research."

Provided by University of Toledo

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