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New AI tool could speed up diagnosis of cardiovascular diseases

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A team of researchers and clinicians from Nanyang Technological University, Singapore (NTU), Ngee Ann Polytechnic, Singapore (NP), and the National Heart Centre Singapore (NHCS) have invented a tool which uses artificial intelligence (AI) to diagnose cardiovascular diseases.

Their innovation uses electrocardiograms (ECGs) to diagnose coronary artery disease, myocardial infarction and congestive heart failure to an accuracy of more than 98.5 per cent.

The scientists hope that the AI-enhanced tool could support the diagnosis of cardiovascular diseases in clinical settings, specifically while physicians carry out preliminary ECGs, ultimately leading to speedier courses of treatment.

The researchers hope the tool can be used to complement current diagnostic techniques

The researchers devised the tool by using an AI machine learning algorithm called Gabor-Convolutional Neural Network (Gabor-CNN), which mimics the structure and function of the human brain, enabling computers to learn from past experiences like a human. Using the algorithm, they trained their tool to recognise patterns in patients' ECGs by inputting examples of ECG signals that reflect cardiovascular diseases.

They then used the tool in a pilot study to analyse ECG signals from 92 healthy individuals, seven patients with coronary artery disease, 148 patients with myocardial infarction and 15 patients with congestive heart failure.

Local hospitals have agreed for the diagnostic tool to undergo further trials with their patients. The researchers hope it can be used to complement current techniques of diagnosing cardiovascular diseases such as magnetic resonance imaging (MRI) and coronary angiography.

Heart disease is the leading cause of death worldwide

The development of this tool is timely as the number of deaths caused by cardiovascular disease in Singapore has increased over the past three years. According to the Singapore Heart Foundation, nearly 1 in 3 (29.3%) of all deaths in Singapore in 2019 were due to heart diseases or stroke.

Clinical Associate Professor Tan Ru San, Senior Consultant at the Department of Cardiology, NHCS, who co-authored the study, said: "Heart disease is a leading cause of death worldwide, and affects not only the heart but other major parts of the body. Early detection prevents complications such as heart failure, stroke, kidney disease and artery disease.

"Our study on a preliminary small group of subjects has demonstrated promising results in terms of the accuracy of using routine ECGs to classify some common cardiovascular conditions. Although confirming the specific disease still requires additional testing, our diagnostic tool will allow physicians to triage patients more efficiently and to streamline the number and type of downstream confirmatory tests."