S'pore team invents AI tool that could speed up diagnosis of heart disease

Charlotte Chong

A new tool that could lead to faster diagnosis of heart disease has been invented by researchers in Singapore.

Powered by artificial intelligence (AI), it uses electrocardiograms (ECGs) and has an accuracy rate of 98.5 per cent. ECGs measure the electrical activity of the heart to detect abnormalities.

Almost one in three deaths in Singapore in 2019 was due to heart disease or stroke, figures from the Singapore Heart Foundation show.

The number of deaths caused by cardiovascular disease in Singapore has risen from 2017 to 2019.

Early detection can prevent complications such as kidney disease.

Invented by a team from the Nanyang Technological University (NTU), Ngee Ann Polytechnic and the National Heart Centre Singapore (NHCS), the new diagnostic tool uses an AI machine learning algorithm that enables computers to learn from past experiences.

The researchers trained the tool to recognise patterns in patients' ECGs by inputting examples of ECG signals that reflect cardiovascular diseases.

In a pilot study, the tool was used to analyse ECG signals from 92 healthy individuals and seven patients with coronary artery disease, 148 who had suffered a heart attack and 15 with congestive heart failure. The information was taken from four public databases.

The team found that the AI tool could identify ECG signals associated with healthy people and patients with the three different cardiovascular diseases with an accuracy of more than 98.5 per cent.

The study was published in the peer-reviewed scientific journal Computers In Biology And Medicine last month.

"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," said Associate Professor Tan Ru San, a senior consultant at the Department of Cardiology at NHCS, who co-authored the study.
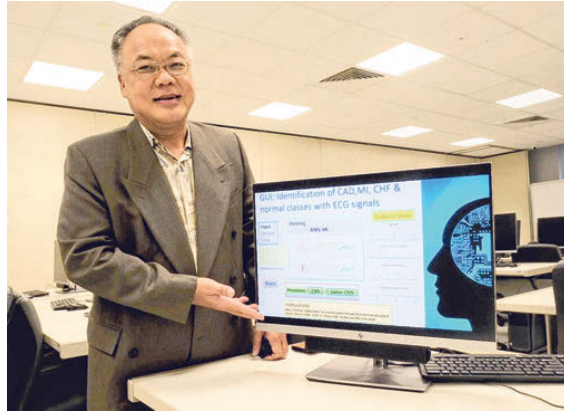
Associate Professor Eddie Ng Yin Kwee from NTU's School of Mechanical and Aerospace Engineering, who co-led the study, said the diagnostic tool could lead to advancements in merging AI with medical solutions.

The tool is still in the preliminary stages of research and will need to be validated with more data. The team plans to start further trials with a larger database from local hospitals within 18 to 24 months to validate its clinical use.

Prof Tan said: "This is very exciting, but we must also temper our enthusiasm with reality... this is only the beginning."

Dr Daniel Yeo, a cardiologist at Apex Heart Clinic in Gleneagles Hospital, welcomed the development.

"The number of cardiologists is small and they cannot read every single ECG done. This AI tool will therefore be useful in the general practice setting, such as a large and busy polyclinic," said Dr Yeo, who hopes the cost of using the tool would not be too high.

Dr Paul Ong, a cardiologist at Heart Specialist International in Mount Elizabeth Novena Specialist Centre, said the AI tool could help those who lack specialist knowledge quickly identify patients with cardiac emergencies in ambulances or emergency departments, though it is also important to not over-rely on AI and miss out on the patient's history and examination findings.

The research team hopes the tool can complement current techniques of diagnosing heart diseases. It could also be used with wearable devices, such as smart watches.

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Associate Professor Tan Ru San (above) from National Heart Centre Singapore co-authored the study. NTU's Associate Professor Eddie Ng Yin Kwee (left), who co-led the study, showing illustrations of how the diagnostic AI tool works. PHOTOS: NTU SINGAPORE