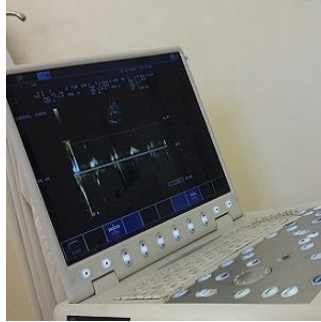# Can AI replace the human echocardiographer?

The increased prevalence of cardiovascular disease, as well as an ageing workforce, are all signs of an impending healthcare crisis in cardiology. Cardiologists consistently face a time crunch and have to rush through appointment after appointment and perform more and more procedures.

All these factors and an unavoidable need to multitask have resulted in a greater incidence of burnout, exhaustion and reporting errors. Artificial Intelligence (AI) offers a ray of hope and a possible solution for reducing physician workload. Artificial intelligence techniques could perform repetitive and tedious tasks involved in diagnosing and analysing patient data and imaging.

In order to evaluate this possibility, Zhang and colleagues applied an algorithm that has enjoyed significant success in image recognition tasks, a 96% accuracy for distinguishing between echocardiographic view classes and an 84% accuracy overall. The goal was to develop a machine learning algorithm that could automate several facets of echocardiography measurement and interpretation.

Deep learning has previously been explored for segmenting the left ventricle, but the work of Zhang et al. was more extensive with additional cardiac segments beyond the left ventricle. Their model also worked with a larger data sets and involved millions of images. Finally, their algorithm had the capability of automated quantification of cardiac structure and function.

The authors also assessed the ability to perform disease detection and were able to identify 3 cardiovascular diseases with impressive results. These include area under the receiver operating characteristic curve for hypertrophic cardiomyopathy, cardiac amyloidosis, and pulmonary arterial hypertension.

Transthoracic echocardiographic imaging is the most commonly performed non-invasive cardiac procedure. However, the quality of the image varies substantially depending on the operator and the patient. Errors in echocardiography quantification and interpretation are quite prevalent and are often associated with different interpretations of the echocardiography reports. Physician fatigue, impaired attention, memory, and executive function may also have a role to play in these errors.

Machine learning techniques as developed and studied by Zhang and colleagues could help in improving workflows and better data organisation. These techniques could also help reduce echocardiography measurement and cognitive errors. Also, AI techniques are a logical solution for limited training opportunities and lack of expert supervision. In simple words, AI technologies have the potential to improve clinical workflow and diagnostic efficacy in echocardiography.

However, the question is: do these deep learning techniques have the potential to supersede an echocardiographer? Not really. The fact is that complex decisions such as determining the appropriateness of a test or the ability to extract information in a clinical context are something that might be difficult to handle for the computational algorithm. Physicians have the necessary knowledge of cardiac physiology to integrate results with possible problems. But deep learning techniques cannot be programmed to extrapolate the knowledge of cardiac physiology. AI techniques may be able to filter, sort and organise data but they cannot integrate knowledge to identify problems or offer solutions.

Zhang and colleagues' work may be a step in the right direction, but it is still a long journey ahead. AI technologies can be used to free up time for physicians repetitive low-level and uneventful activities such as data preparation, measurements, and standardisation to focus more on high-quality tasks such as patient care, interpretation and decision making. AI cannot replace the echocardiographer, but it can definitely help them with their workload.

Source: Circulation
Image Credit: iStock

Published on : Wed, 16 Jan 2019