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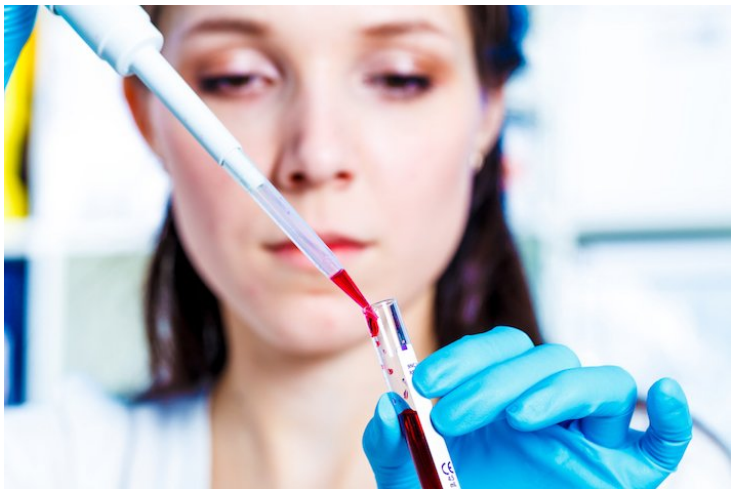
Singapore develops AI platform to assess blood vessel anomalies

March 24, 2021 | News

The AI-powered platform combines machine learning and a specially-designed microfluidic chip



An international team of scientists from Nanyang Technological University, Singapore (NTU Singapore), Brown University, and the Massachusetts Institute of Technology (MIT) has developed an artificial intelligence (AI) platform that could one day be used in a system to assess vascular diseases, which are characterised by the abnormal condition of blood vessels.

The AI-powered platform combines machine learning and a specially-designed microfluidic chip with analysis of 2D video images of blood flow and the application of physical laws, to infer how blood flows in 3D.

In tests, it accurately predicted blood flow characteristics such as speed, pressure, and shear stress, which is the stress exerted by the blood flow on the vessel wall.

The ability to determine these characteristics accurately could be a critical support for clinicians in detecting and tracking the progression of vascular diseases since the abnormalities that the platform could spot (such as an abrupt change in speed or shear stress of blood flow) may indicate the presence or progression of a vascular disease.

To validate the platform, the scientists tested it on simulated microaneurysms of the eye, using a microfluidic chip that is smaller than a thumbnail. Microaneurysms are bulges in the micro-scale blood vessels of a diabetic patient's eye, and are the earliest signs of diabetic retinopathy, the leading global cause of vision loss and blindless in diabetic working adults.

The team hopes to test their platform on clinical imaging data of microaneurysms in order to correlate the blood flow characteristics of microaneurysms to factors such as disease severity and potential risks.