New robots with 'mini-brains' will feel pain and use AI to repair themselves

A research team from Nanyang Technological University, Singapore has developed artificial intelligence which it says allows the robot to detect and repair its own damage when "injured"

By **Joshua Smith** Digital News Reporter

11:07, 16 OCT 2020

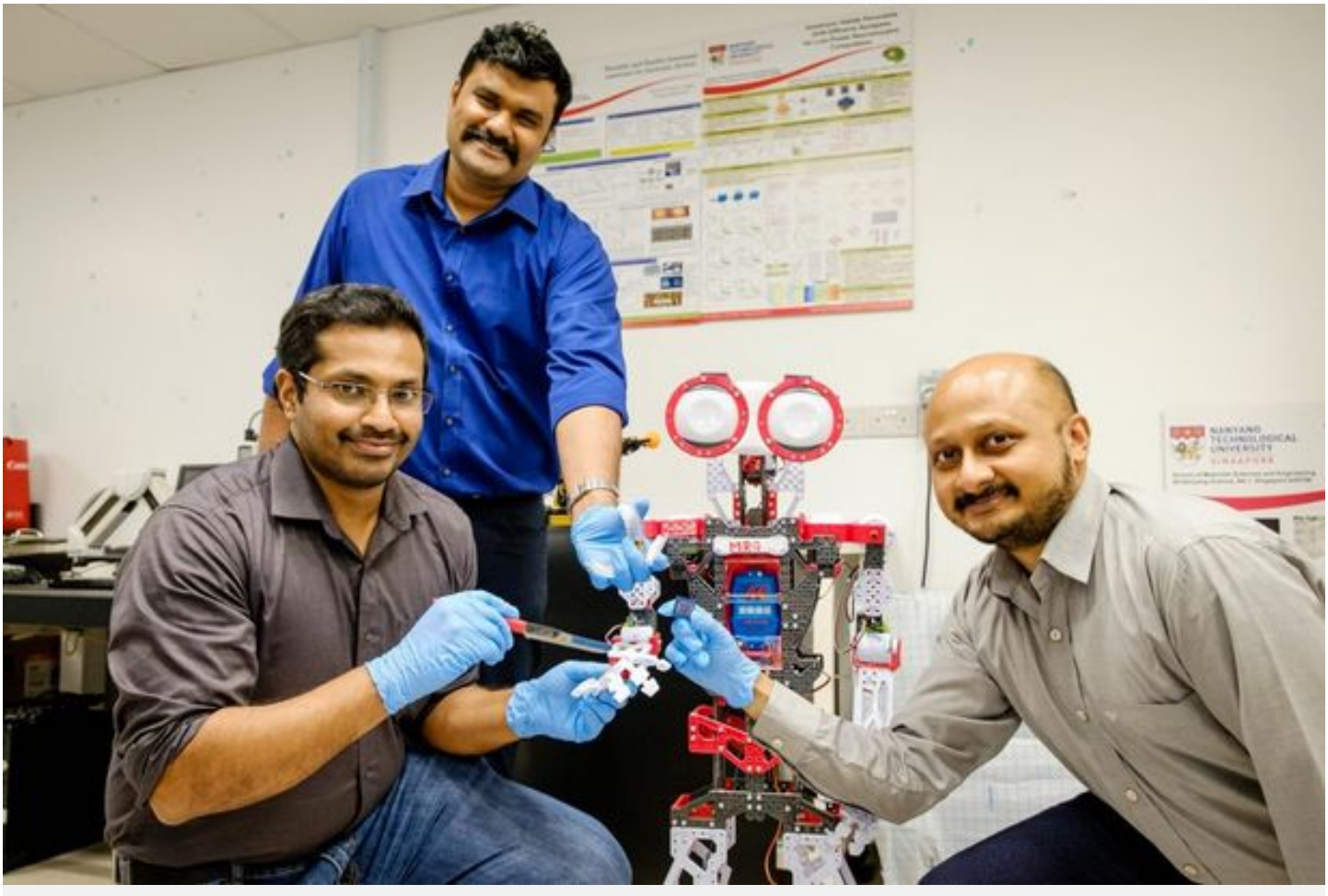
Scientists have developed robots which are able to recognise pain and repair themselves when damaged.

A research team from Nanyang Technological University, Singapore (NTU) has developed **artificial intelligence** (AI) which it says allows the robot to detect and repair its own damage when "injured", without the need for human intervention.

This is done through a system with AI-enabled sensor nodes which process and respond to "pain" arising from pressure exerted by a physical force.

The new NTU approach embeds AI into the network of sensor nodes, connected to multiple small, less-powerful, processing units, that act like "mini-brains" distributed on the robotic skin.

Combining the system with a type of self-healing ion gel material means that the robots, when damaged, can recover their mechanical functions.

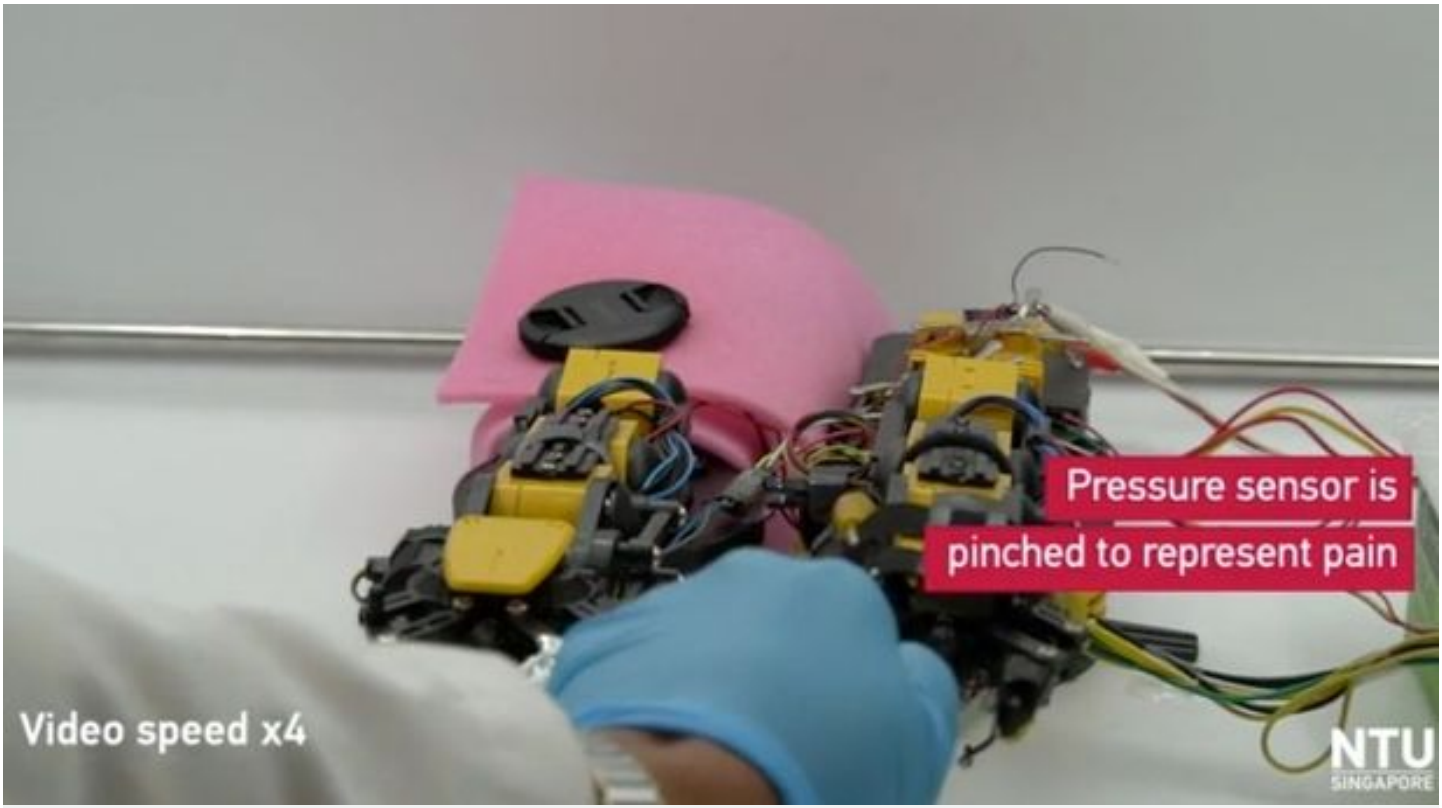


The breakthrough research by the NTU scientists was published in the peer-reviewed scientific journal Nature Communications in August.

The journal details how the robots were taught to recognise pain and learn damaging stimuli through memtransistors, which are "brain-like" **electronic devices** capable of memory and information processing, as artificial pain receptors and synapses.

Through their lab experiments, the research team demonstrated how the robot was able to learn to respond to injury in real time.

When "injured" with a cut from a sharp object, the **robot** quickly loses mechanical function.



The researcher team says their work will 'accelerate the adoption of a new generation of robots'

(Image: NTU Singapore)

But the molecules in the self-healing ion gel begin to interact, causing the robot to "stitch its "wound" back together and to restore its function.

Co-lead author of the study, Associate Professor Arindam Basu from the School of Electrical & Electronic Engineering, said: "For robots to work together with humans one day, one concern is how to ensure they will interact safely with us.

"For that reason, scientists around the world have been finding ways to bring a sense of awareness to robots, such as being able to 'feel' pain, to react to it, and to withstand harsh operating conditions.

"However, the complexity of putting together the multitude of sensors required and the resultant fragility of such a system is a major barrier for widespread adoption."

Associate professor Basu, who is a neuromorphic computing expert, added: "Our work has demonstrated the feasibility of a robotic system that is capable of processing information efficiently with minimal wiring and circuits.

"By reducing the number of electronic components required, our system should become affordable and scalable.

"This will help accelerate the adoption of a new generation of robots in the marketplace."