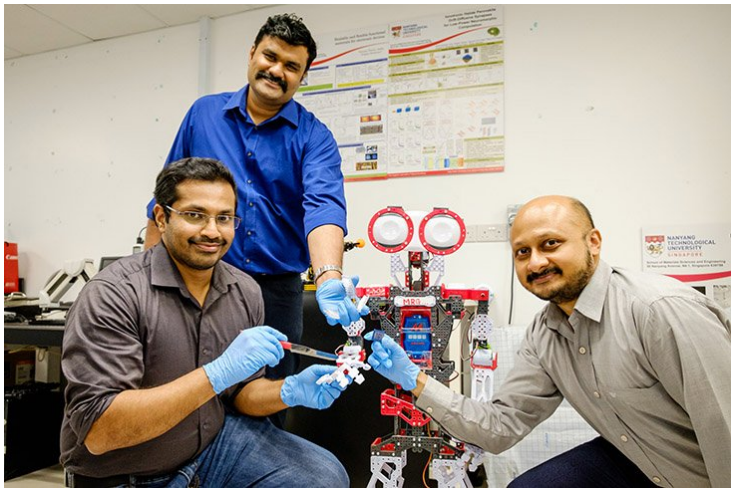
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Singapore develops mini-brains to help robots recognise pain and to self-repair

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The system has AI-enabled sensor nodes to process and respond to 'pain' arising from pressure exerted by a physical force



Using a brain-inspired approach, scientists from Nanyang Technological University, Singapore (NTU Singapore) have developed a way for robots to have the artificial intelligence (AI) to recognise pain and to self-repair when damaged.

The system has AI-enabled sensor nodes to process and respond to 'pain' arising from pressure exerted by a physical force. The system also allows the robot to detect and repair its own damage when minorly 'injured', without the need for human intervention.

To teach the robot how to recognise pain and learn damaging stimuli, the research team fashioned memtransistors, which are 'brain-like' electronic devices capable of memory and information processing, as artificial pain receptors and synapses.

Through lab experiments, the research team demonstrated how the robot was able to learn to respond to injury in real time. They also showed that the robot continued to respond to pressure even after damage, proving the robustness of the system.

Building on their previous body of work on neuromorphic electronics such as using light-activated devices to recognise objects, the NTU research team is now looking to collaborate with industry partners and government research labs to enhance their system for larger scale application.

Associate Professor Nripan Mathews, who is co-lead author and from the School of Materials Science & Engineering at NTU, said, "Conventional robots carry out tasks in a structured programmable manner, but ours can perceive their environment, learning and adapting behaviour accordingly. Most researchers focus on making more and more sensitive sensors, but do not focus on the challenges of how they can make decisions effectively. Such research is necessary for the next generation of robots to interact effectively with humans."