University of Lethbridge

NEWS RELEASE

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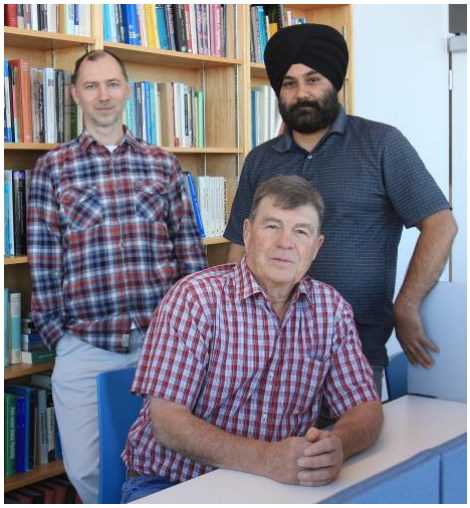
Artificial intelligence can help diagnose and monitor patients with neurological disorders

Deep learning can analyse complex behaviour

For someone with a neurological disorder that impairs their movement, such as stroke or Parkinson's disease, getting to the doctor's office for a checkup can be difficult. What if patients could just take a video clip of their movements with a smartphone app that interprets the video and sends the results to their doctor?



Drs. Hardeep Ryait, Ian Whishaw and Artur Luczak, together with their colleagues from the Canadian Centre for Behavioural Neuroscience at the University of Lethbridge, propose just that in their paper, *Data-driven analyses of motor impairments in animal models of neurological disorders*, published today in the prestigious journal, PLOS Biology.

First, they asked people with special training to score the quality of reaches for food made by rats that had suffered a stroke that impaired their movements. They then provided this information to a state-of-the-art deep neural network, a type of machine learning that simulates the brain's neural network, so that it could learn to score the rats' reaching movements with human-expert accuracy.

"When the network was subsequently given video from a new group of rats reaching for food, it scored their impairments with human accuracy," says Ryait, a post-doctoral fellow in Luczak's lab at that time.

The same program proved able to score other tests given to rats and mice, including tests of their ability to walk across a narrow beam and pull a string to obtain a food reward.

"Intelligent neural networks are being implemented to drive cars, interpret video surveillance and monitor and regulate traffic," says Luczak. "This revolution in the use of neural networks has encouraged behavioural neuroscientists to use networks to evaluate movement disorders."

The study shows the potential for neurological disorders to also be assessed automatically and behaviour quantified as part of a checkup or to assess the effects of a drug treatment.

“The delay in the assessments of neurological diseases is often a major roadblock in patient treatment,” says Whishaw. “This research indicates the network can provide a reliable score for neurological assessment and this breakthrough can assist in designing behavioural indexes to diagnose and monitor neurological disorders.”

Interestingly, the results also revealed the network can use a wider range of information than that included by trained humans in a behavioural scoring system. The network was able to identify features of a behaviour that are the most indicative of motor impairments, which, in turn, can improve monitoring of rehabilitation. This method would help standardize diagnosis and monitoring of neurological disorders and could be used by patients at home to monitor daily symptoms.

The application could be used with any disorder that affects movement and would significantly reduce the costs of doing clinical trials for new drugs for disorders like Parkinson’s disease. Beyond the health field, the application could be used in sports to help players perfect their golf swing or score a basket.

“Now, we are looking for funding to create a smartphone app,” says Luczak. “Here we have showed that it works in principle in a big computer cluster. It requires more work to adapt it to a smartphone but it is completely doable and we are interested in pursuing it.”

This news release can be found online at deep learning.

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