

Computer game to assist clinicians in diagnosing mental health disorders

2 October 2019



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A team of researchers led by CSIRO's Data61, the data and digital specialist arm of Australia's national science agency, have developed a novel technique that could assist psychiatrists and other clinicians to diagnose and characterize complex mental health disorders, potentially enabling more effective treatments.

Announced today at D61+ LIVE in Sydney, the researchers revealed that using a simple computer game and [artificial intelligence](#) techniques, they were able to identify behavioral patterns in subjects with depression and [bipolar disorder](#), down to subtle individual differences in each group. The study included 101 participants: 34 with depression, 33 with bipolar disorder, and a control group of 34 subjects.

The computer game presents individuals with two choices, and tracks their behavior as they respond. The complex data collected from the game is analyzed through [artificial neural networks](#)—brain-inspired systems intended to replicate the way that humans learn—which are able to disentangle the nuanced behavioral differences between healthy

individuals, and those with depression or bipolar disorder.

Dr. Amir Dezfouli, lead author of the research, a neuroscientist and machine learning expert at CSIRO's Data61 said the research represented a possible step-change in the emerging field of computational psychiatry.

"Currently 69 percent of bipolar patients are initially misdiagnosed, and around one-third of these patients might remain misdiagnosed for 10 years or more," Dr. Dezfouli said.

"If we can understand how the brain works, we can develop more accurate processes for diagnosis and more effective treatments for people with mental [health disorders](#).

"Artificial intelligence and deep learning techniques allow us to analyze complex datasets and make accurate models of the brain processes involved in psychiatric disorders.

"Characterising mental health disorders in granular detail could allow clinicians to develop more personalized treatment plans based on an individual's unique diagnosis," Dr. Dezfouli said.

Clinicians around the world mainly rely on the Diagnostic and Statistical Manual (DSM) and the International Classification of Diseases (ICD), which provide a set of criteria for the diagnosis of mental health disorders.

"We hope that this technique will build on the DSM and provide an additional decision-making tool for clinicians," Dr. Dezfouli said.

"The strength of the computer game is that unlike traditional mental health assessments, the results can directly reflect the brain processes that are affected due to the disorders, as individuals are responding to stimuli rather than direct questions

about their mental state."

Dr. Richard Nock, machine learning group leader at CSIRO's Data61 said artificial intelligence is a powerful general purpose technology with the potential to help solve some of the greatest challenges relating to health, energy, aging, safety, security, climate and the environment.

"While artificial intelligence holds enormous potential it must be deployed with privacy, ethics and inclusiveness at its core," Dr. Nock said.

"We need to design systems that deliver benefits individually and collectively. The artificial neural network was specifically designed to produce interpretable results, and will augment the capabilities of clinicians and psychiatrists."

The researchers are looking to partner with hospitals and mental health research centers to conduct further research to validate the technique for real-world use, providing decision support for clinicians.

The [research paper](#), Disentangled behavioral representations, has been accepted at the 2019 Conference on Neural Information Processing Systems (NeurIPS), the world's largest machine learning conference taking place in Vancouver in December.

More information: Amir Dezfouli et al. Disentangled behavioral representations, *bioRxiv* (2019). [DOI: 10.1101/658252](https://doi.org/10.1101/658252)

Provided by CSIRO

APA citation: Computer game to assist clinicians in diagnosing mental health disorders (2019, October 2) retrieved 24 September 2022 from <https://medicalxpress.com/news/2019-10-game-clinicians-mental-health-disorders.html>

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