22 Oct 2022

Scientists use fitness trackers and AI to detect depression with "80 percent accuracy"

Scientists harness the power of artificial intelligence (AI) for early detection of mental health disorders like depression and schizophrenia.

Unlike, for example, kidney disease, which is relatively easy to diagnose, there are no specific biomarkers for conditions such as anxiety or depression that can be detected with a simple test.

Patients with the same mental disorder can present with many different symptoms, which can make it difficult for doctors to diagnose them early and accurately.

Scientists at Nanyang Technological University in Singapore are developing an AI-driven diagnostic toolkit that could help solve the problem.

AI's ability to efficiently process large data sets helps them recognize the signs of various mental health conditions and determine if a patient's mental impairment is becoming more severe.

Dr Iva Bojic, a computer scientist and a key researcher on the project, told Euronews Next that mental disorders "can be visible in a very physical way" and wearable devices help them pick up those signals.

"We collected different variables, different signals from variables, something we call digital biomarkers," Bojic said.

Heart rate and sleep pattern tracking

Some of the biomarkers include heart rate, sleep patterns and energy expenditure, calories burned and number of steps; "Then we correlated those biomarkers with symptoms we saw, and after a while the model was able to learn," she said.

For example, one of the signals the scientists picked up on in their study is that the heart rate of people with depression usually accelerates during the night hours, especially between 2 a.m. and 4 a.m.

The biomarkers are then supplemented with a questionnaire to make a final assessment to determine which users in the sample are effectively struggling with depression.

Finally, users are divided into two groups, "zero for those who are not depressed and one, say, for those who are depressed. And then we develop machine learning models," Bojic explained.

The machine learning model is able to make predictions for new users based on their biomarkers, correlate the knowledge and labels learned from previously analyzed biomarkers, and determine a new outcome: zero or one – healthy or unhealthy .

But of course "nothing is bulletproof," said Bojic.

How the model predicts isn't really binary, she explains. The software gives a percentage from zero to 100, "then it's basically where we set the threshold. So are you saying depression starts at 50 percent, or are we saying it starts at about 80 percent?"

What is the error rate of the AI model?

The error rate depends on the level of detail in the data structure, how clean and granular the data is, and how many hours a day the user has been using the fitness tracker.

Bojic estimated the tool's accuracy to be around 80 percent. "Then sometimes, if you're really strict about the quality of the data, we can actually go up to 100 percent."

"But there can be many limitations," she added – and interestingly enough, the error often comes from the human side.

Bojic explained that the questionnaire often poses a problem because depending on how the evaluator asks the question, they can get a different answer.

AI screening tool 'not perfect'

It also happens that users are not sincere due to mental health stigma, and sometimes they are quite simply unaware of their condition.

But despite the challenges, "there is a significant correlation between the physical symptoms and the knowledge we extract. So there's definitely potential to be explored," she said.

"What we're doing is more of a screening tool for people … and then hopefully they can move into the care process where their condition can be properly managed."

"This tool is not perfect," she added. "So it's not about eliminating the need for professional psychiatric help, it's about how useful it will be to help people, to help professionals find people they wouldn't otherwise reach."

Not to mention that professionals help patients as early as possible. Studies show that early detection of diseases such as depression and schizophrenia is crucial to prevent the disease from escalating.

Bojic said one of the strengths of her team's study, which was published in JMIR mHealth and uHealth, was that it looked at the general population rather than focusing on people who already had a clinical diagnosis.

What would become of this data?

What to do next after identifying someone with a risk of developing the disease is still an important detail that researchers are working on.

"How could they actually approach a person from a clinical perspective? Is it a good way to say outright, you know, 'you're depressed'? How is that effective?" said Bojic.

"On the other hand, if the system goes wrong and someone who isn't depressed is told they are, how will that affect that person?"

Then there are thorny issues of ethics and privacy.

Should governments, agencies or hospitals have access to this information? And how could they use it to promote good mental health?

"There are many starting points, many considerations, ethical questions and privacy issues. All of that needs to be considered before actually using this information in different premises," said Bojic.

Once those concerns are addressed, she believes AI could show promise in the field of mental health.

"I really believe that we can help people with the knowledge and the algorithms that we have developed," she said.

"It's not just about chasing some numbers."

For now, the team is focused on detecting depression, but hopes to expand it to other conditions, such as dementia, loneliness and schizophrenia.