Spotting Parkinson's disease through AI

July 14 2022

Credit: Pixabay/CC0 Public Domain

Tracking wearable sensors, filming the patients performing routine exercises, or examining their handwriting—which is better for Parkinson's detection? Researchers at Skoltech performed a comparative study of these three patient-driven monitoring approaches based on machine learning to find out what technique is most reliable for doctors

and comfortable and less time-consuming for patients. The study was published in *IEEE Transactions on Instrumentation and Measurement.*

Artificial intelligence is being leveraged to solve a variety of health care challenges, but its greatest promise remains its potential to detect and diagnose diseases better than humans can. Doctors currently diagnose Parkinson's disease by making an assessment of a patient's motor symptoms, medical history and physical and mental well-being, but symptoms can be hard to distinguish from other neurological conditions. With no way of completely curing the condition, earlier diagnosis of Parkinson's disease can have profound impacts on treatment options and a patient's quality of life. Scientists are making inroads into picking up the telltale signs of the disease's onset.

A team of Skoltech researchers, led by Assistant Professor Andrey Somov and Associate Professor Dmitry Dylov, designed the machine learning algorithms to detect and objectively measure symptoms of Parkinson's through sensors—an accelerometer and a gyroscope, video, and handwriting analytics. The study could one day assist people anywhere in getting a diagnosis and their reaction to medical treatment—as long as they have a wearable device like fitness tracker, a webcam, a computer, and an internet connection.

"We have collected data from 120 people—35 without Parkinson's and 85 with Parkinson's—with a mean age of 58½ while they were working on a series of motor tasks in front of three cameras, wearing sensors. The tasks, which generally take about 15 minutes to complete, included folding a towel, filling a glass with water, tapping the index finger to the thumb, and reading a complex sentence aloud, writing it down and tracing a spiral. The exercises were designed under the supervision of neurologists and came from several different sources, including scales that are used for monitoring Parkinson's disease and previous research done in this area. Each exercise has a target symptom that it can reveal,"

Skoltech Ph.D. student Ekaterina Kovalenko says.

"Not all people with Parkinson's show each and every symptom of the disease, and we tried to figure out if identification could rely on a single diagnostic modality: a sensor, cameras, or handwriting. Even though sensor data analysis showed the best results, it's inconvenient for the patients at a later stage of PD. But the patients diagnosed at early stages report that wearable sensors are reasonably comfortable to wear, meaning that in the near future wearable technologies could collect and assess the data continuously to track the disease development and patients' response to medical treatment," says Aleksei Shcherbak, a Skoltech Ph.D. student.

In terms of convenience for the patients, the "handwriting" approach is the best as it does not take much time to accomplish the spiral drawing and taking its photograph. Video analysis is also convenient for patients, and is the most promising, since detection can occur in real time with no restrictions while the patient is performing exercises.

"We keep in mind that apart from differential diagnosis, doctors need objective tools to assess motor fluctuation in patients with PD. These evaluated tools can provide a more personalized approach to therapy and help doctors make decisions on medical treatment and, if needed, neurosurgical interventions," says article co-author Dr. Ekaterina Bril.

More information: Aleksandr Talitckii et al, Comparative Study of Wearable Sensors, Video, and Handwriting to Detect Parkinson's Disease, *IEEE Transactions on Instrumentation and Measurement* (2022). DOI: 10.1109/TIM.2022.3176898

Provided by Skolkovo Institute of Science and Technology