

Smartphone data helps predict schizophrenia relapses

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Passive data from smartphones—including movement, ambient sound and sleep patterns—can help predict episodes of schizophrenic relapse, according to new Cornell Tech research.

Two papers from the lab of Tanzeem Choudhury, professor of integrated health and technology at Cornell Tech, examined how smartphone data can predict patients' own self-assessments of their condition, as well as changes in their [behavior patterns](#) in the 30 days leading to a [relapse](#).

Early prediction of schizophrenic relapses—potentially dangerous episodes which may involve hallucinations, fears of harm, depression or withdrawal—could prevent hospitalizations, in addition to providing clinicians and patients with valuable information that could improve and personalize their care.

"The goal of this work was to predict digital indicators that are early warning signs of relapse, but these symptoms or changes can be very, very different from one individual to another," said Dan Adler, doctoral student at Cornell Tech and first author of "Predicting Early Warning Signs of Psychotic Relapse From Passive Sensing Data: An Approach Using Encoder-Decoder Neural Networks," which published in the *Journal of Medical Internet Research mHealth and uHealth*.

"We tried to create an approach where we could tell a clinician: Not only is this participant experiencing unusual [behavior](#), these are the specific things that are different in this particular patient," Adler said. "If we can

predict when someone's symptoms are going to change before relapse, we can get them early treatment and possibly prevent an inpatient visit."

The researchers collected smartphone data from 60 participants over one year, 18 of whom experienced relapse during that time. They used encoder-decoder [neural networks](#)—a kind of machine learning that is good at learning complex features amid highly irregular data—to detect behavior patterns such as sleep, number of missed calls, and the duration and frequency of conversations.

The method found a median 108% increase in behavior anomalies in the 30 days leading up to relapses, compared with behavior during days of relative health.

The paper used data collected in collaboration with the University of Washington, Dartmouth College and Northwell Health System. Based on the same data set, another paper—"Using Behavioral Rhythms and Multi-Task Learning to Predict Fine-Grained Symptoms of Schizophrenia," which published in *Scientific Reports* - used machine learning to better understand and predict symptoms from changes in behavioral rhythms passively detected by smart devices.

"We wanted to provide some actionable steps or clinically interpretable features so we can either tell the patient to take some actions or tell the clinician to suggest some early interventions," said Cornell Tech doctoral student Vincent Tseng, the *Scientific Reports* paper's co-first author.

More information: Daniel A Adler et al, Predicting Early Warning Signs of Psychotic Relapse From Passive Sensing Data: An Approach Using Encoder-Decoder Neural Networks, *JMIR mHealth and uHealth* (2020). [DOI: 10.2196/19962](https://doi.org/10.2196/19962)

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