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Emotion-focused AI spots early signs of psychosis in youths from short speech samples

Story by Science X staff • 11h • 4 min read



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Nanyang Technological University, Singapore (NTU Singapore) and the Institute of Mental Health (IMH) have developed an artificial intelligence (AI) framework capable of identifying youths at high risk of psychosis from short samples of casual, spontaneous speech.

https://www.msn.com/en-us/news/other/emotion-focused-ai-spots-early-signs-of-psychosis-in-youths-from-short-speech-samples/ar-AA2e9cMw

Psychosis is a severe mental health condition that typically emerges between adolescence and early adulthood, in which a person may experience hallucinations, delusions and disordered thinking.

This is the first reported study in Singapore to focus specifically on early psychosis risk among youths using large language models (LLMs), a form of artificial intelligence trained to analyze and generate human language.

The team of researchers believes the technology could eventually support primary care providers and community workers in identifying vulnerable youths before clinical symptoms escalate.

Early identification of individuals at ultra-high risk (UHR) of psychosis is challenging because youths in everyday life rarely articulate mental health struggles directly. Ultra-high risk of psychosis refers to a clinical state in which an individual shows early warning signs or risk factors that significantly increase the likelihood of developing psychosis.

For example, a depressed person may not explicitly state that they feel depressed. This is known as "non-disclosing speech," meaning language that does not contain any explicit mention of the mental health condition experienced by the speaker.

Therefore, evaluating whether AI can detect potential risk purely from casual, spontaneous conversation addresses a key hurdle in early intervention.

Transforming casual conversation into clinical insight

Published in the journal *npj Mental Health Research*, the joint NTU–IMH study evaluated transcribed text samples from 429 participants ages 14 to 29 enrolled in Singapore's Longitudinal Youth-at-Risk Study (LYRIKS), a Singapore study initiated in 2008 to comprehensively assess the social, clinical and biological risk factors associated with youths at ultra-high risk of developing psychosis.

Each participant provided a 45-second non-self-disclosing speech sample in response to a neutral prompt, such as making a case for why they should win an award for being the "most interesting person."

The researchers found that standard LLMs struggled when prompted directly to predict clinical risk from raw transcripts, achieving performance no better than a random guess and missing most at-risk individuals.

The researchers believe standard models struggled due to a lack of suitable training datasets, as well as the nature of spontaneous everyday speech, which rarely contains structured clinical information or explicit symptom descriptions.

To overcome this limitation, the team developed LEMon-AID (Latent Emotion Proxy for Mental Health Detection with AI-integrated Decision-making), which uses LLMs to extract subtle emotional profiles such as joy, trust, fear and sadness from the text, then combines these emotional signals with traditional machine learning predictions.

The study demonstrated that LEMon-AID performs significantly better than conventional approaches. It boosted overall predictive accuracy from 55% under conventional direct LLM prompting to 67%, while increasing detection sensitivity so that up to 93% of at-risk youths can be identified.

Human-AI collaboration and transparent reasoning

Wilson Goh, co-lead investigator of the study and assistant professor of biomedical informatics at LKCMedicine and the NTU Centre of AI in Medicine, said, "Standard AI models struggle to pick up early mental health risks from everyday conversation because people rarely talk about their symptoms openly.

"Instead of asking AI to give a direct diagnosis, LEMon-AID uses language models to read underlying emotional cues. This system connects emotional patterns with mental health risks while keeping patient data private and providing clear, understandable explanations."

Unlike traditional machine learning models, which may operate as "black boxes," LEMon-AID generates natural-language explanations alongside its risk assessments. This allows clinicians to understand the reasoning behind each prediction, making AI a safer and more transparent tool for doctors to use when evaluating patients.

Dr. Jimmy Lee, group chief research and innovation officer at NHG Health, senior consultant at IMH and an associate professor at NTU's LKCMedicine, who led the LYRIKS study, said, "Early detection is one of our most powerful tools in preventing long-term disability and restoring the health and futures of young people with mental illness.

"This research brings us a meaningful step closer to that goal—a future where frontline community workers and health care providers are better equipped to identify at-risk youths early, supported by AI tools that help surface those who might otherwise be missed. The aim is to reach young people sooner and encourage them to seek the care they need before their condition worsens."

Matheus Calvin Lokadjaja, first author of the study and research assistant at LKCMedicine, said, "When we directly asked standard AI models to identify at-risk individuals from casual conversation transcripts, they missed almost everyone. By shifting the AI's focus to mapping emotional signals such as joy, sadness or trust across a conversation, we found a way to uncover meaningful patterns that were previously hidden in everyday speech."

Next steps toward clinical validation

The newly developed LEMon-AID framework is being explored for various clinical deployments in future work. The researchers will use multimodal approaches, incorporating different data types and modalities—such as acoustic cues, vocal pitch, speech rhythm and facial expressions—to improve system reliability while also helping us understand what patterns discovered across speech, behaviors and acoustics reveal about mental health progression.

Further extensive research and real-world validation will be needed before practical implementation can occur.

More information: Matheus Calvin Lokadjaja et al., Emotion-informed associative learning in large language models for mental health detection from speech, *npj Mental Health Research* (2026). DOI: 10.1038/s44184-026-00236-z

Provided by Nanyang Technological University

This story was originally published on Medical Xpr