Evolving speech and AI as the window into mental health

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Credit: IBM

Mental health and neurological disorders are a growing epidemic. In the U.S., nearly one in every five people has a mental health condition.

Yet there is a growing shortage of mental health professionals to adequately treat this need. By 2025, it's estimated that demand for psychiatrists may outstrip supply by up to 15,600 psychiatrists. To help clinicians with limited resources support the growing number of patients who seek treatment, the research field of Computational Psychiatry applies data and metrics-driven approaches to psychiatry to study thought, emotion, and behavior.

In January 2017, IBM made the bold statement that within five years, health professionals could apply AI to better understand how words and

speech paint a clear window into our mental health. Almost two years later, we're already seeing promising early results. Since then, the work and research we've done has solidified our position: individualized data—from speech to word choice to written text and physiological indicators—coupled with AI could be the key to helping health professionals better understand our own minds.

Over the past year, teams from IBM Research have collaborated with clinicians to publish the following research in this space, all of which demonstrates the potential of AI and speech to help inform professionals and help them paint a more detailed picture of what's happening within our minds.

- We've made progress in building AI algorithms to help inform clinicians about users' mental state based on the structural complexity of their sentences, which can point to patterns of cognitive impairment.
- We have also proven that AI and machine learning can be used to help clinicians identify critical language patterns that determine, with 95 percent accuracy, speech samples which traditionally correspond to schizophrenic patients vs. those that correspond to individuals deemed more likely to experience psychosis by health professionals or healthy controls. Specifically, changes in discourse coherence (the way meaning is established between sentences) as well as discourse richness (the context added around words) can prominently indicate schizophrenia.
- We have developed a way to use machine learning to quickly automate the analysis of verbal speech and alert clinicians, with more than 83 percent accuracy, of the possibility of a psychotic episodes within cohorts that have been identified as more likely to experience psychosis, regardless of the diagnostic protocol. This could prove vital to helping professionals to predict psychosis before symptoms start to show, as subtle changes in

language could point to it even before its full onset.

We envision a future where these technologies can be put into the hands of [mental health professionals](#) and ultimately enable them to do their jobs more intelligently, with greater confidence, and with the ability to effectively treat a growing volume of patients with the right data at their fingertips.

While this is great progress, this is still just the tip of the iceberg. We're continuing to refine and build out these techniques further, and expand their use to help clinicians get an even broader view of what could be happening within an individual's brain when it comes to [mental health](#) and neurological disorders. Hopefully, health professionals will soon be able to frequently use [speech](#) to tap into the power of AI and make more informed diagnoses.

More information: 2015 Report: Substance Abuse and Mental Health Services Administration: [www.samhsa.gov/data/sites/defa … /NSDUH-FFR1-2015.pdf](#)

National Council for Behavioral Health: [www.thenationalcouncil.org/wp- … ational-Council-.pdf](#)

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