



## REVIEW ARTICLE

# Artificial Intelligence: The Future of Mental Health Treatment

Riya Subbaiah\*, Oskar Pineno

Department of Psychology, Hofstra University, USA

### Abstract

Through analyzing numerous studies in which computer-based programs evaluated the linguistic markers and clinical histories of patients with identified and/or unidentified mental health illnesses, it becomes clear that utilizing artificial intelligence in mental health treatment can maintain patient engagement, support healthcare professionals in their clinical work, and improve access to treatment for residents of underserved areas. Although there are risks to expanding this new technology, the significant benefit it's able to provide to both clinicians and patients invites more research and discussion amongst the scientific community.

**Keywords:** COVID-19; Artificial Intelligence; Mental Health; Substance Abuse; Practice Management

### Studies and Analysis

Currently one of the most rapidly growing fields in medicine, psychology and mental health illnesses impact a significant majority of our population. One in six adults in the U.S suffers from mental illness. Making strides in mental health treatment with the novel technological assets we have at our disposal is one of the largest goals for engineers and healthcare professionals everywhere. We have the unique opportunity right now in 2020 to assess what is and aren't working in current mental health treatment methods, and how we can incorporate our newest resource, artificial intelligence, into every clinician's room. AI can be used not to replace the invaluable clinician-patient relationship, but rather to give healthcare professionals another tool in their arsenal to help patients identify and cope with mental illness.

How can we use a binary-processing computer to treat patients with personal, complex psychological conditions? One study turned to the immense data-processing powers computers have to analyze thousands of Facebook posts from a wide range of people, some of whom already possessed known psychological disorders. After combing through the posts, the system identified linguistic patterns present across posts from the people with known depression, what Eichstaedt, the primary author of the study, referred to as "depression-associated language markers". In reporting his findings, he argues the case for incorporating AI programs like this into common practice by pointing out that "with surprisingly similar methods to those used in genomics, we can comb social media data to find these markers. Depression appears to be something quite detectable in this way; it changes people's use of social media in a way that something like skin disease or diabetes doesn't". A similarly astounding finding focused on the use of Super Learning, an AI program that after putting in a brief patient history,

generated "a successful course of treatment for a substance abuse disorder based on a variety of factors, including logistic regression, penalized regression, random forests, deep learning neural networks, and SL to predict successful substance use disorders (SUD) treatment" [1]. After analyzing the data Super Learning created for 100,000 patients, it was deemed one of the most superior programs in predicting reasonable, effective treatments for substance abuse patients. Programs like Super Learning can be used to identify high-risk patients through prognostic algorithms and increase support for patients to reduce overdose in substance abuse clinical scenarios. Similar AI systems could be extended to evaluating the effectiveness of various treatment models in all areas of mental health, as well as pave the way for innovative diagnostic strategies [2].

If AI can scan Facebook posts to identify markers of depressive thoughts across thousands of patients, it could be one of the most valuable, cutting-edge tools in adolescent mental-health treatment, especially in diagnosing suicidal patients. Suicide represents poorly controlled and/or unidentified mental health illness, and technological sentiment analysis can quickly identify linguistic markers in social media that are linked to suicidal thoughts. National prevention helplines, which receive thousands of calls a day, have already been set up with natural language processing technology and the rise in innovative AI systems can further support these crisis lines [3]. Results from this linguistic can also be brought directly into the clinician's office: if patients are willing, they can go over identified trends with their therapist or other mental health professional to

**Correspondence to:** Riya Subbaiah, Department of Psychology, Hofstra University, USA; E-Mail: riyasubbaiah17[AT]gmail[DOT]com

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start a conversation about prolonged feelings of depression or suicidal thoughts [4].

Operational intelligence solutions are not meant for replacement of mental health professionals, but can be used for practice management support and are a significant tool that could be incorporated into patient care.

#### **AI can be used to enhance clinical workflows and maintain patient engagement**

Operational AI can help support mental health professionals in their clinical workflows. Tree-based machine learning algorithms can analyze data and suggest treatment options after collecting important “features” while being put through decision-making algorithms. This same principle can be used to monitor patient progress with different responses to treatment options. Natural language processing enabled chat parts can utilize evidence-based cognitive-based therapy to re-create psychotherapy for at risk patients until a time where a mental health provider can see the patient physically. The first randomized controlled trial with Woebot, a Facebook-integrated computer program aimed to replicate conversations a patient might have with his or her therapist. The trial was able to show participants experienced significant reduction in depression and anxiety while also maintaining a high level of engagement almost daily.

#### **AI can improve access, risk stratification and outcomes**

Artificial intelligence chatbots and process automation tools can be utilized to provide 24/7 access through artificial intelligence solutions. This can be done by having patients interact with chatbots at times where clinical staff may be available in underserved areas. Process automation can answer questions and coordinate referrals.

The use of artificial intelligence can also be used to identify high-risk patients through prognostic algorithms and increase

resources/support for patients to reduce overdose in substance abuse clinical scenarios and identify patients at increased risk for suicide. Suicide risk factors can be monitored online through social media activity. Suicide help lines have been set up and can be supported with natural language processing. Researchers from the World Well-Being Project (WWBP) analyzed social media with an AI algorithm to pick out linguistic cues that might predict depression. Those suffering from depression can be screened via sentiment analysis to identify depression-associated markers.

Of course, there are obvious obstacles to the wide institution of artificial intelligence, such as financial barriers, equity concerns, and the innate level of trust it would require people to institute in these novel systems. However, the benefits of effective treatment management, social media analysis, and efficient diagnosis of high-risk patients would revolutionize the face of mental health for generations to come. As more innovative research is published and more mental health professionals collaborate with AI developers to create healthcare-changing technology, more people can be treated effectively than ever before- which, ultimately, is the shared ambition of clinicians, engineers, doctors, and scientists everywhere.

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