

Operational Artificial Intelligence: The Future of Neurological and Psychological Disorder Treatment

Riya Subbaiah* and Oskar Pineno PhD

Hofstra University, Department of Psychology, 1000 Hempstead Turnpike, Hempstead, NY, USA.

*Correspondence:

Riya Subbaiah, Hofstra University, Department of Psychology, 1000 Hempstead Turnpike, Hempstead, NY, USA.

Received: 24 September 2020; Accepted: 15 October 2020

Citation: Subbaiah R, Pineno O. Operational Artificial Intelligence: The Future of Neurological and Psychological Disorder Treatment. *Neurol Res Surg.* 2020; 3(1): 1-2.

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 and neurological disorders, it becomes clear that utilizing artificial intelligence in these treatments can maintain patient engagement, support healthcare professionals in their clinical work, and improve access to treatment for residents of underserved areas. Although there are challenges to expanding this new technology, the significant benefits it's able to provide to both clinicians and patients invites more research and discussion amongst the scientific community.

Keywords

COVID-19, Neurological Disorders, Artificial Intelligence, Deep Learning Neural Networks, Artificial Intelligence, Mental Health, Practice Management.

Studies and Analysis

Currently one of the most rapidly growing fields in medicine, psychological and neurological disorders impact a significant majority of our population. One in six adults in the U.S suffers from a neurological disease or mental illness [1]. Making strides in treatment plans for these illnesses with the novel technological assets we have at our disposal is one of the largest goals for engineers and healthcare professionals everywhere, including the renowned team at IBM research, who state one of their essential questions as “How can we help the doctors and patients who are impacted by neurological diseases?” [1]. We have the unique opportunity right now in 2020 to assess what is and isn't working in current 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 psychological or neurological 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. Psychological illness 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” [2]. These deep learning neural networks are also “probabilistic... classifiers for diagnosis of neurological disorders,” since one of the earliest signs of cognitive decline is a regression or change in linguistic patterns [3].

The effective and efficient identification of such shifts in behaviour would lead to a quicker diagnosis and earlier intervention, yielding more optimistic outcomes. Operational intelligence solutions are not meant for replacement of healthcare 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 analyse 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 technology can utilize sample segments of dialogue to identify the abnormal, disjointed speech which presents as an early sign of Alzheimer’s in some patients, and re-create psychotherapy for at risk patients until a time where a mental health provider can see the patient physically.

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, for example. Additionally, indicators such as 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 and alternative psychological illnesses can be screened via sentiment analysis to identify markers of abnormal behaviour [4-6].

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 neurology and mental health for generations to come. As more innovative research is published and more healthcare professionals collaborate with AI developers to create healthcare-changing technology, more people can be treated effectively than ever before. This ultimately, is the shared ambition of clinicians, engineers, doctors, and scientists everywhere.

Acknowledgement

I would like to thank Dr. Oskar Pineno for his expertise and assistance throughout all aspects of this research.

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