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RESEARCH ARTICLE

ARTIFICIAL INTELLIGENCE IN PRE-CHAT GPT ERA FOR MENTAL HEALTH

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ABSTRACT

Artificial intelligence (AI) is being employed more and more frequently in medicine for applications relating to physical health, but its adoption in the field of mental health has lagged. The topic of mental health holds a lot of potential for AI technology. AI has enormous potential to transform how we identify and understand mental illnesses. However, we only have a limited understanding of how these social, psychological, and biological systems interact. The pathophysiology of mental illness is extremely diverse, and the discovery of biomarkers may enable more accurate and useful classifications of various diseases. AI makes it possible to diagnose mental diseases early or prodromally, in this review, we highlight an overview of chatbot systems for mental health. Such systems use artificial intelligence to analyse natural language, simulate human conversation, and generate relevant recommendations based on a particular user's utterance and mental state. However, there are other restrictions and moral dilemmas that need to be taken into account, such as the effect on the patient-therapist relationship, the danger of over-reliance, and the limited capabilities and emotional intelligence of chatbots that might restrict their usefulness. Though the use of artificial intelligence in medicine has increased over the past few years, the issue of how it will affect mental illness is still complex and open for debate. This review discusses the application of artificial intelligence (AI) to the diagnosis, prognosis, and treatment of psychiatric illnesses.

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INTRODUCTION

A chatbot is a system that interacts with users using natural language through a variety of ways that include written, spoken, facial and/or body expressions. Other terms used for a chatbot include: machine conversation system, virtual agent, dialogue system, conversational user interface (CUI), and chatterbot. The purpose of a chatbot system is to simulate a human conversation. Chatbots are usually text-driven, with images and unified widgets, which make it easy to start interacting with a bot. There are two types of chatbots: unintelligent (rule-based) chatbots, which generate their dialogue based on some predefined rules or decision trees, and intelligent chatbots, which use Artificial Intelligence (AI) to understand the context and intent of a user utterance and respond to it.¹

Artificial intelligence (AI) is being used in medicine more and more often for applications that have to do with physical health, but its uptake in the area of mental health has been slower. AI technology has a lot of potential for the study of mental health. AI has the power to fundamentally alter how humans recognise and comprehend mental diseases. Artificial intelligence and mathematical modelling techniques are being progressively introduced in mental health research to try and solve this matter. These methods can be helpful for the field of mental health because they are aware of how crucial it is to gather specific information in order to characterise the various psychiatric disease.² The prevalence of mental diseases is rising in India year after year, while at the same time, there are fewer mental healthcare specialists available. Artificial intelligence (AI) and other intelligent technologies are crucial in bridging the delivery gap in mental health care.

Artificial intelligence in field of mental health has enormous potential to personalise treatment selection, monitoring recurrence prediction, diagnosis and prevention of mental health illness before they become clinically symptomatic as well as treat them. Future decision between low resources digital interventions and higher levels of traditional care may be guided by machine learning models. The ability to prioritise meeting patients who are unlikely to benefit from digital intervention may also assist doctors to save time.³ Depression, schizophrenia, and Alzheimer's disease were among the most prevalent mental health issues discussed. Support vector machines, decision trees, neural networks, latent Dirichlet allocation, and clustering were among the ML methods used. The use of ML in the field of mental health has shown a variety of advantages in the areas of clinical management, research, and diagnosis, treatment, and support. The three main categories of ML algorithms are supervised, unsupervised, and semi-supervised learning. For instance, in supervised learning, data with predetermined labels are used to train a model that can anticipate the label for future data, such as when identifying emails as spam based on emails that have already been assigned a label. Unsupervised learning, in contrast, uses mathematical methods to group data in order to reveal new insights, such as mapping the subjects of conversation in online forums. Techniques for semi-supervised learning create models using a combination of labelled and unlabelled input.⁴

Artificial intelligence (AI) is becoming more popular with patients in the field of mental and behavioural health treatment. The use of AI to assist in the management of depression has a number of potential advantages. Major advantages of applications and programmes developed with artificial intelligence include the capacity to access practical and affordable mental health services as well as enhanced access to coordinated care. Most of the readily available mental health platforms and apps offer users tools they may access via a smartphone, tablet, or laptop from any location. Additionally, they are always accessible. The technology has some restrictions, but these apps can be utilised day or night, on weekends, holidays, or at any other time that fits your schedule.⁵ There have been many recent developments in artificial modelling and techniques for automatic emotion analysis for problems related to depression. They show that depression analysis is a challenge that the science of computer vision can handle. It is anticipated that machine-based automatic early identification and recognition of depression will improve the standard of clinical care and significantly lessen its possible negative effects in daily life.⁶

The University of Pittsburgh study found that both the voice and the face had a moderate level of contemporaneous validity with depression. Manual FACS had an accuracy of 88% and AAM had an accuracy of 79% for diagnosing depression. Vocal prosody accuracy was 79%. Additionally, it raises fresh concerns about automated facial image analysis and machine learning, which have intriguing ramifications for clinical theory and practise. It also raises the possibility of automatically detecting depression.² Additionally, it discovered that clinical samples of people with depression may be accurately diagnosed and retrieved from using automatic facial image analysis and audio signal processing of speech prosody. Four analogue cameras that were physically synced together and two microphones were used to record the interviews. The participant's face and shoulders were captured

by two cameras that were angled roughly 15 degrees to the participant's left and right. A third camera captured the participant's entire body in its footage. The interviewer's shoulders and face were captured by a fourth camera at a 15-degree angle to the right. The Hamilton Rating Scale for Depression (HRS-D), criteria measure for evaluating the severity of depression, was used during interviews. The study discovered that 57 people (20 men and 37 women) revealed information through their facial and voice expression.² Another study in the same vein revealed that a proposed artificial intelligence system for monitoring depression. It can infer from vocal and visual expressions the Beck Depression Inventory II (BDI-II) scales.⁷

The researcher also analysed both manual and automatic facial expressions during semi-structured clinical interviews of clinically depressed patients. They came to the conclusion that those who experienced more severe symptoms tended to display greater feelings of scorn and smile less. It also studied the relationship between three mental diseases' gaze, head posture, and smile characteristics (i.e., depression, post-traumatic stress disorder, and anxiety). They found that, in terms of automatically recognised behaviours, there was a clear distinction between the most and least upset participants.⁹ The study also demonstrated that vocal source qualities can be employed as biomarkers of depression severity and that voice quality conveys information about a person's mental state.¹⁰

Another study, conducted at the psychiatry department at the University of Toronto in Canada, revealed that AI is a practical way to create outcomes predictors while providing objective and comparable accuracy metrics—a rare opportunity, especially in mental health research. Through processing the enormous volumes of multi-domain, semi-structured medical data that are already available, the methodology has also regularly provided considerable insight into disease models. In addition to improving disease models, the potential for AI in psychiatry also pertains to therapy discovery and personalization.¹¹

The chatbot is one such technology used in mental healthcare delivery. It's interesting to note that chat bots were initially primarily employed to give mental health services like psychotherapy, but that they have now been adopted by other businesses. According to evaluations, chat bots are frequently used to treat stress, anxiety, and depression as well as to impart psycho education. Its limitations include the inability to think critically and empathetically like a human, as well as the grave concern over the confidentiality of the data. At the same time, these chatbots will play a significant role in our lives in the years to come.¹²

One researcher introduced the personality behaviours and perceived anxiety scale of undergraduate students were mapped using machine learning techniques (MLT). A correlation between the terminology and the development of computer science and machine learning applications has been made. The results suggest that procedures involving little to no human interaction, as well as in data collecting and labelling, may be used to identify sadness (or anxiety). It also demonstrates a technique for predicting emotions and mental states that uses machine learning algorithms to assess a range of mental time series psychological data.¹³

One study with an Indian focus discovered that there aren't many models for the detection of depression among those working in the IT industry. In order to identify any indicators that may indicate the prevalence of any stage of depression throughout the COVID-19 era, researchers examined the mental health of IT sector employees in India by comparing five different predictive models using machine learning techniques. It also noted the typical causes of depression in workers in the IT industry. Due to neglect and the use of basic tools like the Impact of Event Scale-Revised, depression among employees in the IT sector goes misdiagnosed (IES-R). In order to predict depression in workers in the IT sector, they employed supervised machine learning classifiers. The study of algorithms used in computers that learn from experience is known as machine learning. Using labelled data for training, supervised learning generates predictions for the unlabelled data based on the training dataset. We chose a supervised machine learning strategy for the problem of depression identification because it efficiently learns a link between the goal variable and the input information. A quantitative analysis of the relationships between depression and various coexisting factors was also conducted, and the researchers came to the conclusion that "male employees are more likely to experience anger or frustration while female employees are more likely to experience depression accompanied by indecision."¹⁴

It has also been discovered that computer vision, using video analysis of a person's behaviour, is 96% accurate at detecting ADHD and ASD. Such instruments may help diagnose patients and track their development in both inpatient and outpatient settings. The quality of care could be significantly raised if AI is successfully incorporated into the healthcare industry. New methods for diagnosis, observation, and therapy in psychiatry may enhance patient outcomes and restructure the workload of clinicians.¹⁵ AIME (Artificial Intelligence Mental Evaluation) uses artificial intelligence, specifically deep learning, with a brief human-computer interactive review to predict whether or not a participant is sad. This technology can be a useful tool for mental health professionals to recognise depression signs, allowing for a quicker preventative response. This is due to its simplicity of usage. Through the use of highly objective methodologies to harness observable affect-related actions, ML-based techniques exhibit enormous promise for mental diagnosis.¹⁶

CONCLUSION

In the area of mental health care, artificial intelligence technology has both great potential and formidable obstacles. The degree to which artificial intelligence is successfully incorporated into healthcare could have a substantial effect on the standard of care. While also redistributing the workload of practitioners, new technology for psychological diagnosis, monitoring, and therapy may improve patient results. The application of artificial intelligence to the definition, analysis, and treatment of mental diseases. Massive mental illnesses have been caused by the fictional COVID-19 pandemic and the following lockdown, which have been exacerbated by a lack of mental health resources. As a result, AI could help mental health professionals redefine mental illnesses in a way that is more objective than the DSM-5, as well as diagnose and treat mental health disorders using chatbots for cognitive behavioural therapy delivered online, intelligent virtual

worlds, artificial companions, augmented reality applications, therapeutic computer games, and electronic medical records. For those who find it difficult to reveal their mental health difficulties to a healthcare practitioner owing to stigmatisation, chatbots are also appropriate for offering mental health treatment. Chatbots can make it easier for people to access mental health support everywhere, which may increase the accessibility and quality of mental healthcare while also lowering costs in India, a country with a shortage of mental health specialists.

FUTURE DIRECTION

The use of AI-based chatbots for providing mental healthcare has a number of advantages, some of which have been partially shown by research that are now available. To develop trustworthy mental health chatbots and include them into care procedures, a number of outstanding research issues must be solved in the future. Researchers ought to focus more on the advantages that chatbot use can offer to those who deliver mental healthcare. Here, it will undoubtedly be important to develop new care models that incorporate chatbots in a way that ensures the system reflects the healthcare professional's suggestions and that the chatbot is aware of the treatment objectives indicated in the therapy session.

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