EDITORIAL

Artificial Intelligence as a Psychiatric Diagnostic Tool Instead of DSM

In the present era, a lack laboratory tests or neuroimaging methods for the diagnosis of psychiatric disorders remains a pressing issue. For this purpose, rapid developments in technology usher success in several branches of medicine and accelerate diagnostic processes. Recent advances in Artificial Intelligence (AI) have widened the distance between psychiatry and other medical branches in terms of diagnosis. Highly successful applications of AI have been reported in medical fields such as dermatology, radiology, and pathology, owing to a substantial amount of accumulated data and the ease of its inclusion in machine learning processes.[1,2]

Hence, the question arises: can we use AI for the diagnosis of psychiatric disorders? Conduction of psychiatric diagnosis is based on the data obtained during interviews with individuals with psychiatric disorders. These data are revealed by anamnesis, psychiatric history, and mental state examination. The diagnosis is performed by combining information on the symptoms and the findings obtained after conduction of the interview and by comparing them with the diagnostic criteria such as Diagnostic And Statistical Manual Of Mental Disorders (DSM) or International Statistical Classification of Diseases and Related Health Problems (ICD). Thus, AI exhibits potential applicability in psychiatric disorder diagnosis. AI can help reveal symptoms and signs associated with psychiatric disorders more successfully than experiments conducted by humans in certain areas. This observation may seem incompatible with our current findings. To understand an individual, it is imperative to establish a therapeutic relationship with them. As a matter of fact, thus far, machines have not demonstrated the establishment of such a relationship compared to that successuly established by humans. Furthermore, a question arises: can machines collect data on symptoms and signs of psychiatric disorders with the same efficiency as that exhibited by humans ? For a long time now, sensors and tools such as smartphones and watches have been used to collect data not only for our psychiatric evaluation but also for the acquisition of physiological and behavioral information. These data provide an important resource for AI applications and help establish a process known as digital phenotyping.

To decipher whether machines can collect data on symptoms and signs of psychiatric disorders with the same efficiency as that collected by humans, it would be useful to mention the sub-branches of AI. Machine learning is one of the most commonly known branches of AI. It can be defined as learning by experience, especially with the help of substantial amounts of data. Machine vision is defined as the field of perception, which involves the visualization of data in formats such as images or videos or by direct visualization in the real world. Examples such as the recognition of emotions or recognition of hand gestures can be used to describe machine learning. Natural language processing, in contrast, is defined as the branch of artificial intelligence involved in the understanding of natural language. For example, symptoms such as autonomic hyperactivity, anxiety, increased heart rate, respiratory rate, or facial flushing can be determined remotely without establishing contact using machine vision techniques and AI. Furthermore, hand and arm movements, the harmony or dissonance of these movements, and the frequency and speed of the movements can be determined and compared with the previous data obtained for the individual. The use of natural language processing can help provide valuable information about speech. Patterns that may be associated with psychiatric disorders can be identified by evaluating both the content of speech and physical processes related to speech. As a result, AI can be used to evaluate the basic data involving speech characteristics and images of those with psychiatric disorders. Using AI, a comparison between previous

records of patients and their current data can be deduced rapidly. For example, findings such as an increase or a decrease in the speech rate of the patient compared to the data obtained in the previous interview or an increase or decrease in emotions based on a certain direction in his gestures can be determined rapidly. Therefore, evaluation of patients with mood disorders using AI may be faster and more accurate than an evaluation performed by a psychiatrist. Furthermore, prediction of the occurrence of a manic or psychotic attack or a suicide attempt can only be determined by using AI.[3,4]

Along with mood disorder symptoms, a few other symptoms and findings as per DSM criteria can also be easily determined by using AI applications, for example, disorganized speech, disorganized behavior, and stereotypic behavior involved in psychotic disorders or autonomic hyperactivity observed in patients with anxiety disorders.

Currently, there are two main approaches of AI applications in psychiatric disorder diagnosis. The first approach relies on the collection of speech, image, or video data of several patients diagnosed with certain psychiatric disorders, with subsequent labeling of the patients with a diagnosis of the disorder and comparison with healthy individuals without that disorder.[5] In this approach, machine learning applications can help identify patterns that cannot be identified by doctors and can aid subsequent diagnosis using the data obtained as a result of learning. This approach is referred to as supervised learning. In other words, it is defined as machine learning enabled by disorder diagnosis information. In the unsupervised learning type, no labeling is performed using any patient diagnosis. Thus, the application of machine learning techniques will aid the clustering or grouping of those with psychiatric disorders with the help of the patterns noted. The most important advantage of this approach is that psychiatric disorders artificially grouped in the DSM system thus far can be grouped in a more rational manner.

The second diagnostic approach, as mentioned above, relies on the automation of the diagnostic work performed based on the traditional DSM criteria with AI applications. As all criteria in DSM cannot be evaluated by machines, they should be considered as supportive to the diagnosis initially. A marked limitation of this approach is that an important part of the DSM criteria is evaluated by question-answer, subjective assessment, or cognitive assessment, and this involves common sense. Nonetheless, AI applications can be performed using inputs such as laboratory findings, neuroimaging, or hospital records and can help enrich diagnostic processes by performing pattern analysis.[6]

Furthermore, AI-based applications, which are increasingly being used in the field of psychiatry, offer another important advantage in psychiatric diagnosis and patient follow-up. Examination or psychiatric evaluation need not be performed in a hospital or a doctor's office. The cameras, microphones, or other types of sensors that patients place in their homes or workplaces can be used to to evaluate their condition 24 hours a day, 7 days a week. This approach facilitates the follow-up of patients who have been diagnosed, who have been prescribed with medication, and who are under follow-up. Using this approach, day-to-day sleep problems, sleep times, speech and movement rates, behavioral patterns, anxiety periods, panic attacks, and mood changes can be monitored almost on a minute-by-minute basis and continuous comparison can be performed with the previous data. Additionally, the problems associated with the treatment and the hours of medication usage can be monitored. Using this approach, conditions such as the onset of a manic episode, worsening mood, or insomnia can be determined in advance. These systems can provide information to the patient, the psychiatrist, and the relatives of the patients via text messages or e-mails. This information is sent to the patient's psychiatrist and relatives, as limiting these applications only to those with psychiatric disorders is not correct. Detection of sudden or negative changes in the mental state will also be advantageous in emergency and critical situations.

As AI applications are gradually being boosted the field of psychiatry, further research is warranted to solve the ethical problems we may encounter in the future. One major problem is that the machines will gain the ability to diagnose independently of doctors and the diagnosis will be performed irrespective of the location or the timing. Another problem is associated with the authorization of the individual to access these data. Hence, a question arises: will data be accessible to government agencies, insurance companies, or employers?

As a result, AI-based applications have been initiated to aid psychiatric diagnosis. One must ask: are we ready for an objective diagnosis of psychiatric disorders by machines in the future? The aim is to develop fully automatic psychiatric diagnostic applications and research in this direction has already commenced.

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