



Artificial Intelligence in Mental Health

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Abstract : *Over the period of years, technology has done wonders around us [1]. From creating chatbots to creating first human-like robot. Artificial Intelligence (AI) has been reaching new heights in every sector of life. When Covid-19 came into our lives as a pandemic, every part of medical industry had been ushered into a new era of care delivery. Due to lockdowns being imposed, healthcare sector had to quickly find new ways of safely providing quality care to patients. In the mental health field, this has become particularly prevalent. The rise of digital mental healthcare has also brought up the use of a technology: Artificial Intelligence. With the on-set of Covid-19 and all the stress that came with it, organizations have turned to artificial Intelligence to potentially broaden access to and availability of mental health services.*

Keywords – *Artificial Intelligence, Artificial Intelligence in Mental health, Covid-19, Depression Digital Mental Health, Disorders Medical View, Mental Health, Research View, Wellbeing*

I. INTRODUCTION

In 1940's with the invention of the programmable digital computer [2], came the thought of a Programmic Intelligence that is similar to that of Human Thinking, this mere thought came by the classical philosophers who described the process of human thinking similar to the manipulation of Symbol. The device and the idea of Programmic Intelligence inspired many scientists to begin seriously discussing the possibility of building an electronic brain, this idea gave the birth to Artificial Intelligence. In the start of 21st century, machine learning was a huge success in various field of academia and industry due to new methods and powerful hardware's and new softwires to due to this, investments and efforts increased in the field of AI.

The definition of mental health refers to the behavioural, emotional, and cognitive well-being of a person. It may refer to a person's state of mind, thoughts, feelings, and behaviour. Sometimes the term "mental health" is also used in terms of the absence of mental disorders. The environment that surrounds us also affects our mental health and decision-making. Mental Health can be disrupted by various factors, such as interpersonal connections, the current situation of a person, the mindset of the person, physical factors, and many more. Mental health is important as it preserves a person's ability to enjoy life and have a positive attitude towards life. Conditions like stress, depression, insomnia, anxiety sometimes serve as signs of bad mental health.

As technology evolves, the stress in our work-life and personal life increases. We tend to overlook our mental health, in order to pursue our professional/personal goals. When the pandemic was announced and lockdown was implemented, people were confined to their homes and work and personal life became imbalanced. Mental health took a big hit. Depression, insomnia and such diseases took a spike in the graph. Due to the lack of human touch, Artificial Intelligence saw a spike in the field of mental health.

II. DEFINING ARTIFICIAL INTELLIGENCE AND MENTAL HEALTH

2.1 DEFINITION OF ARTIFICIAL INTELLIGENCE

The definition of AI is the ability of a computer or a robot controlled by a computer to do tasks that are usually done by humans as they require human intelligence and discernment. Artificial Intelligence usually requires deep knowledge about machine learning and speciality in hardware and software, languages like Python, java, R are popular when it comes to AI as not any particular language is synonymous with AI[5]. With AI, systems mainly work by ingesting large amount of training data or collection of data, analyse the data for patterns to make the predictions for future states.

2.2 IMPORTANCE OF ARTIFICIAL INTELLIGENCE

The importance of AI is differed in various fields as per the requirements. AI gives enterprises insights into their operations that they might have overlooked previously, and hence sometimes, AI can perform tasks better than humans, especially when it comes to repetitive or detailed oriented tasks like analysing data or documents to ensure the relevancy in the fields as they complete their jobs quickly and with few to none errors[5].

This has helped fuel an explosion in efficiency and opened the door to entirely new business opportunities for some larger enterprises. Prior to the current wave of AI, it would have been hard to imagine using computer software to connect riders to taxis, or helping a person out of depression or anxiety, but today Uber has become one of the largest companies in the world by doing just that, and apps like Woebot Health uses its smart algorithm to understand the user's needs and converse with them.

2.3 MEANING AND DEFINATION OF MENTAL HEALTH

"A State of wellbeing in which an individual realizes his/her own abilities and state of mind, so can cope up with the stress occurring in the daily life", is the common definition of Mental health. The deep definition of mental health can be quotes as "Health is a state of complete physical, mental and social well-being and not merely the absence of diseases or infirmity ", by this definition we can say that mental health is more than just the absence of mental disorders or disabilities. Mental Health is rudimentary to our collective ability as humans to emote, feel, think, and interact with each other, earn a living and live a good life. Mental Health of an individual can be affected by various different factors as per their current circumstances and choices. It helps us to determine how we can handle our stress, relate to others, and make healthy choices.

Mental Health is the primary key to every stage of life, that is from childhood to adulthood. People often confuse Mental Health with Mental illness. A person can have poor mental health but not be have with mental illness, the same way a person can have mental illness but can experience periods of social, menta and physical well-being.

2.4 DETERMINANTS OF MENTAL HEALTH

The level of mental health of a person can be determined by various factors such as biological strain, psychological elements or multiple social factors. For instance, violence or socio-economic pressures are the risks to poor mental health. Sexual violence is one of the most common and the clearest evidence of poor mental health.

Excessive work load, unhealthy lifestyle, rapid social changes, gender discrimination, physical disabilities are some of the reasons as for poor mental health. There are particular psychological and personality factors that make people vulnerable to mental health problems.

III. METHODOLOGY

Over the past decades, AI techniques have been seen in the fields of medicine and health in general. Medical Applications of AI usually include diagnosis, therapy, classifications and robotics and many more. Usually, AI uses fuzzy logic or neural networks to work around, but when it comes to mental health AI has taken a different approach. Some of the systems that are used in AI are:[4]

3.1 Expert Systems in Medicine

The ability to capture expert knowledge, facts and reasoning techniques to help care providers in routine work. To solve a proposed problem by the rules used by ES, the system is used to gather the knowledge from the rules. These processes can be done through direct input by an expert or database knowledge made up of past case studies and their results.

3.2 ANN

Human Brain is the collection of 10 billion interconnected neurons. The complex connections of our human brain inspired the birth of ANN or known as Artificial Neural Network. The idea was to receive several inputs and generate only one output. Just like our brains makes any decisions, in ANN each connection or the network has an assigned weight as per importance of the output. ANN Learns by training with inputs known to it, compares the actual output with its known output and adjusts weight as per errors in previous knowledge.

3.3 Deep learning

Deep Learning is the subset or we can say the child of Machine Learning, which is based on the concept of behaviour of neurons in the human brain. In order to carry out the process of classification, it tends to contemplate an evolution of ANN by utilizing a hierarchical level of ANN.

Deep learning algorithms are immensely cogent in learning processes and it ultimately provides a high degree of intelligence to systems based on them. Some other methodologies are altered into Artificial Intelligence after deciding on its theory, like usage of Cognitive Behavioural Therapy (CBT), Interpersonal Psychotherapy (IPT), and Dialectical Behavioural Therapy (DBT) are some of the approaches that experts use while giving therapeutic support to clients.

To provide more insights into the user problem and self-learning programs, such theories which are mixed with artificial Intelligence are used. These blends help the users to feel more connected to AI, at the same time the program self learns the needs of the user and improves automatically.

3.4 DT

DT refers to Decision Tree when we talk about Artificial Intelligence. It is a graphical representation of a dataset that describes data in a tree-structure, representing a very intuitive way of understanding the rules. Nodes, branches and leaves is what Decision Tree comprises of. In Decision Tree, leaves represent an outcome and a node represent a decision. The DT always starts from the root node and grows down by splitting the data at each level into new nodes.

Accumulating a knowledge from specific dataset through a learning algorithm are often created by DT. After, the DT structure has been defined, the knowledge can also be represented as sets of if-then rules to improve human readability [4].

IV. WORKING OF AI IN MENTAL HEALTH

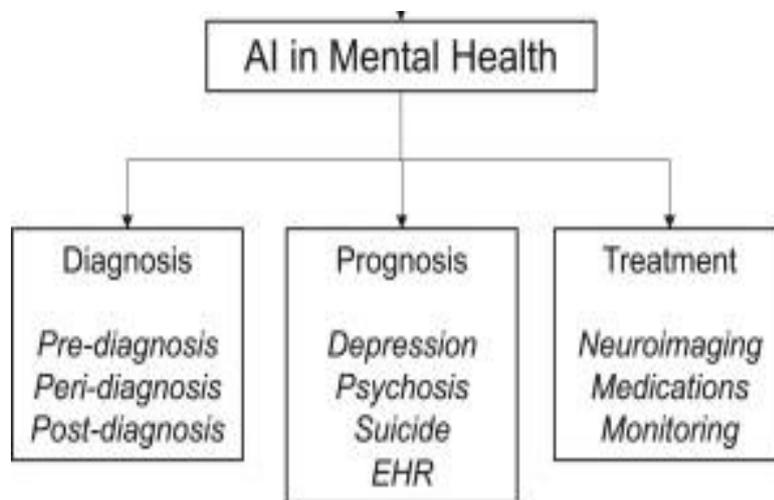


FIG: 1 Structure of Literature Review

The Growing research in AI and mental health inpatient flow issues, studies adequately combine the two fields. Different criteria were taken into consideration and then the research was done. The main themes or the categories are: The literature review revealed a wide range of applications with three main themes: diagnosis, prognosis and treatment [9].

4.1.1 Diagnosis

Diagnosis of mental health disease still lacks objective measures, often relying on subjective self-reported questionnaires leading to commonplace misdiagnosis and underdiagnosis. Problems with diagnosis lead to poor outcomes and resource inefficiencies.

4.1.2 Prognosis

Predictive models are crucial in evidence-based medicine, as they guide healthcare professionals' decisions on investigations and treatments.

4.1.3 Treatment

Pharmaceutical and psychotherapeutic treatments are only effective for 30–50% of mental health patients and currently there is no objective gold standard for a combination of psychotherapy and pharmacological treatments.

Each Person has a different case, and solutions are always different, but the AI follows the terms: Diagnosis – Prognosis – Treatment.

Sometimes it becomes difficult to detect poor mental health in the early stages, which is of crucial importance to the prompt and successful treatment of the patient. With the new technologies it has become easier to detect cancer with the help of AI, so the thought raised that what if AI could show signals similar to that of warning signs about your mental health, and notice the relevant symptoms and act as an early detection mechanism [9].

There is at-least one psychiatrist for every 100,000 people to be treated. It is clear that access to treatment is a luxury that many people around the globe do not have or cannot afford on top of improving access to mental health treatments, AI can play a big role within personalized treatments.

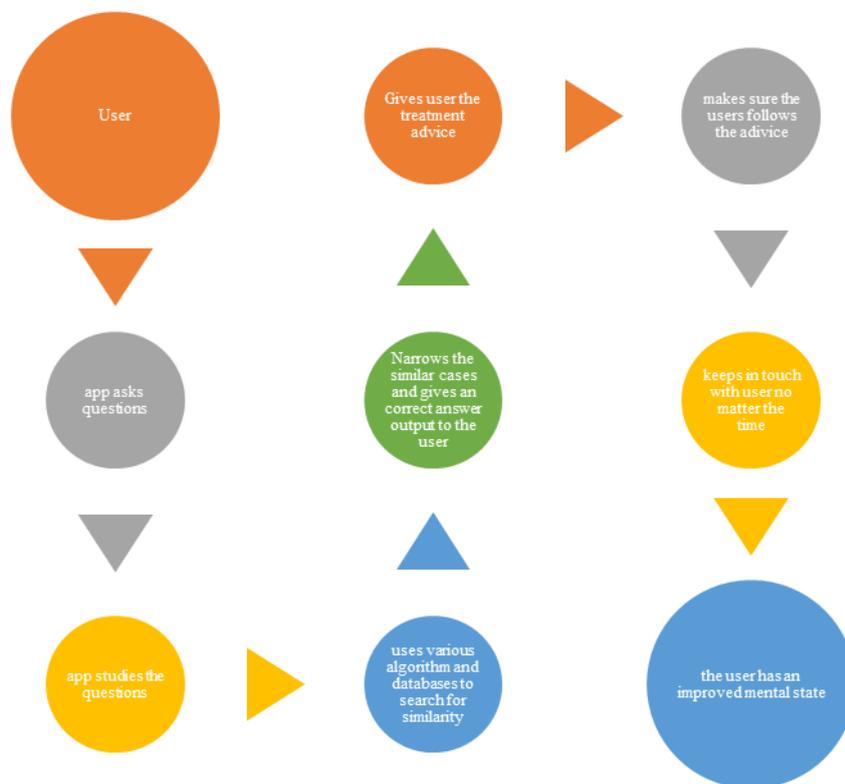


FIG: 2 Working of AI in a Mental Health app

Since AI is very effective when it comes to diagnosis of poor mental health, many companies have come up with AI based apps, that help the user to improve their mental health. Woebot App is an example when it comes to Implementing Artificial Intelligence in Mental Health, it is a chat application that not only provides medical assistance to improve one’s mental health but also interact with their members whose mental health is not stable. It gives people immediate access to tools they can use anyplace, anytime, at a moment’s notice [6]. Their automated, relational platform engages people with the right intervention at the right time, and provides invaluable support that people can depend on.

The Diagram [7] shows a very simple chart of the working of AI in mobile application. Some of our dark moments escape our mind boxes when we are most vulnerable, they may escape when in a meeting, or lying-in bed at the middle of the night. Since counselors cannot be there 24x7, apps that uses AI for their diagnosis and treatment for psychological treatments come in handy they work in the simplest way while having a vast data network connected through various algorithms and databases, where in the code of the system runs in. Once the question is asked by the system to the user, and upon the answer of the user, the system searches for similar cases across its network and comes up with the appropriate outcome for the user, side by side implementing self-learn. The system keeps learning from the various responses given by the users and understands their response and then gives feedback. The system also makes sure that the user follows the treatment and gives regular feedback, till it has not achieved its goal - Improved Mental Health

V. CONCLUSION

AI holds each unbelievable guarantee and plenty of next-level complexities, together with an associate array of moral pitfalls [15]. AI is more and more vicinity of digital medication and can contribute to psychological state analysis and apply. various community of specialists unconditional in psychological state analysis and care, together with scientists, clinicians, regulators, and patients should communicate and collaborate to understand the complete potential of AI.

AI is huge and continuous improvement within the psychological state sector will do wonders for the users. because of recent states of lockdowns, folks have turned to AI for psychological state comforts and designation. The essential part

is combining human intelligence with AI to confirm construct validity, appreciate unobserved factors not accounted for in information, assess the impact of information biases, and proactively determine and mitigate potential AI mistakes. the long run of AI in mental attention is promising.

The literature review of AI in psychological state discovered that AI may be used for rising diagnostic accuracy, personalization of treatment, and predicting clinical [15]. Outcomes to confirm timely delivery of interventions; the most objective typically being the advance of the standard of patient care.

The literature review on victimization AI patient flow explored predicting evitable readmissions, rising care potency, optimizing resource allocation, reducing the length of keep, and corroboratory existing algorithms for additional generalized functions. In each area, studies vary in their accuracy and generalizability. There's a necessity for additional analysis which will focus specifically on patient flow in psychological state units. though this review targeted solutions within the hospital setting, it's vital to focus on that the long run of attention can embody high integration between services, so any community interventions can have a big indirect impact on the patient's flow.

These potential AI implementations will affect patients' expertise either completely or negatively. additional studies ought to check up on the patient perspective on the mixing of AI in attention as patient expertise could be a key thought in attention, particularly during a patient-centered approach. Addressing patient issues is crucial to the wider-scale implementation of AI to take care of patient autonomy around their sensitive information, notably within the field of medical specialty.

The use of AI in psychiatric attention remains for the most part undiscovered. vital aspects like the patient's expertise, clinical significance, and moral issues need additional studies and analysis.

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