A Review on Development of Technology in The Mental Healthcare Industry

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Abstract- *Mental health is a significant general wellbeing concern worldwide and ought to be an unmistakable piece of the medical services industry. The world's progress has been impaired due to an increase in the number of mental health patients and sluggish growth. Recently, AI procedures have drawn in a great deal of consideration in various enterprises, including emotional wellness. Artificial Intelligence has the potential to greatly aid in the detection of symptoms of depression, anxiety, and other mental diseases. AI is also capable of delivering psychological counseling to patients in addition to diagnosing symptoms. Image recognition and deep learning are key applications of Artificial Intelligence. In this paper, we examine various frameworks for mental health, focusing on virtual guidance, accuracy therapy, and symptomatic models. The research digs into the constraints and the calculations of these frameworks.*

Keywords- Mental Health, AI, Deep Learning, Computer Vision, framework, data analysis

I. INTRODUCTION

Mental wellness is a huge public health issue all over the world, and it should be a big element of the medical service sector. Regardless, the rate of progress in this field looks to be somewhat slow. Many businesses giving a lot of attention to this topic is a huge step toward improving society's mental health. The figure 1.1 shows the growth in mental health patients in comparison with other illnesses.

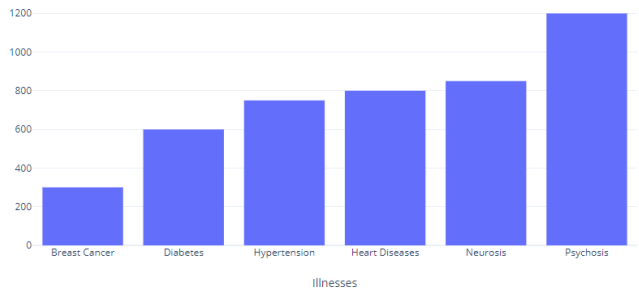

Figure 1.1: comparison of the number of mental health patients and patients with other illnesses

As evidenced by the relevance of mental health in the Sustainable Development Goals, there has been a growing recognition of the role mental health plays in achieving global development goals in recent years. People with serious mental illnesses die considerably sooner than they should, up to two decades earlier – as a result of curable physical ailments.

Mental illnesses are frequently subjected to severe human rights breaches, racism, and stigma. Despite the fact that many mental health illnesses can be adequately treated at a reasonable cost, the gap between those who need care and those who have access to it remains significant. The percentage of people who receive effective treatment is still very low. The figure 1.2 shows the number of people getting proper treatment with respect to the number of untreated patients.

It's not always easy to spot the difference between normal behaviors and what indicators of mental illness.There is no simple method that can determine whether someone has a mental illness or whether their actions and ideas are typical of their personality. Although each condition has its own range of symptoms, the following are some out of many prevalent indicators of mental illness.

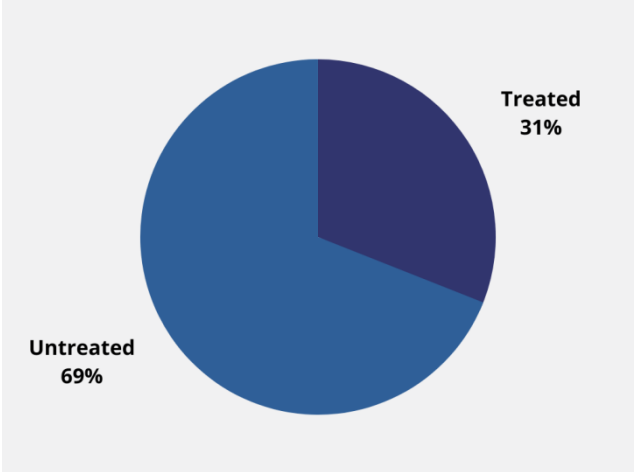

Fig 1.2 comparison of treated mental health patients and untreated mental health patients

1. Extreme mood fluctuations, euphoric feelings
2. Understanding or relating to others is difficult.
3. Sleeping patterns that have changed or a feeling of exhaustion and low energy
4. Avoiding social situations and people
5. Irritability or anger that lasts for a long time or is very intense

II. USE OF AI IN MENTAL HEALTH

Artificial intelligence (AI) technology and approaches are valuable in many areas of psychiatric and medical care, including decision support, therapies, diagnosis, self-care, health administration, research, etc. Artificial intelligence (AI)-based solutions have the potential to raise therapists' current capabilities, allowing them to cope with complicated challenges and ever-expanding data streams that push human capacities to their limits.Technological advances, particularly those involving natural language processing, have the capability to make a big difference in public health and monitoring.

Some of the Artificial Intelligence Applications are listed below:

2.1 Computer Vision

Computer vision is a part of artificial intelligence (AI) that allows computers and devices to extract useful information from photos, recordings, and other visual data and act or suggest decisions based on that data. Advancements in the field of image processing have resulted in the creation of effective systems capable of recognising emotions from facial photographs in a much more coherent way.

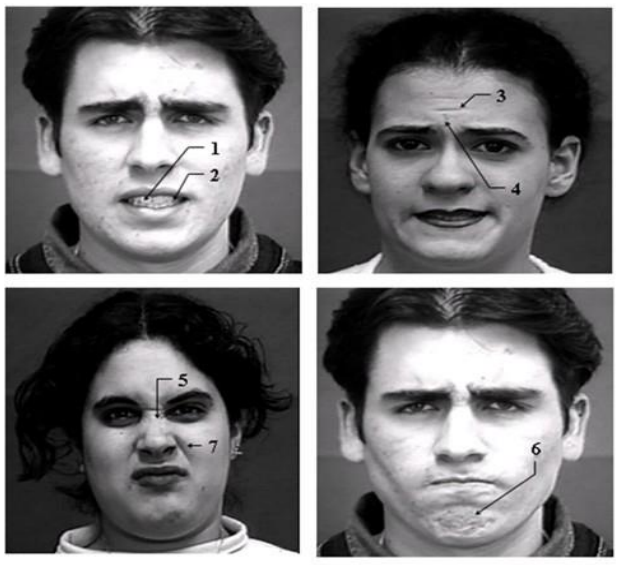

Fig. 2.1Facial Expressions[12]

2.2 Chat System

Individualized counselling can be provided via the conversational service to users on a one-on-one basis. It is critical to end the isolation of people suffering from mental illnesses such as sadness and fatigue. Isolation can be efficiently resolved through one-on-one discussion. Chatbots are useful when a user requires immediate assistance.Critique, Inherency, Thesis, and Plan are all ways that a Chatbot system can aid the industry.

III. LITERATURE REVIEW

3.1A Mental Health Chatbot for Regulating Emotions (SERMO) -

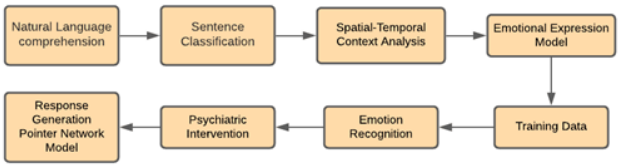

Fig 3.1 System Procedure

This study explored SERMO, a mobile app with an integrated Chatbot that uses cognitive behavior therapy (CBT) methods to help mentally ill people regulate their emotions and deal with their thoughts and feelings. Cognitive behavioral therapy (CBT) is a psychotherapy treatment that teaches people how to recognize and alter harmful or distressing thoughts that affect their behavior and emotions.

Types of Cognitive Behavioral Therapy

1) Cognitive therapy
2) Dialectical behavior therapy
3) Multimodal Therapy
4) Rational emotive behavior therapy

As the thought pattern is now comprehended, the app focuses on a variety of ways to assist people in overcoming these ideas, such as journaling, role acting, relaxation techniques, and mental distractions. The following are some common factors in all of these strategies:

1) Identifying Negative Thoughts
2) Practicing New Skills
3) Goal-Setting
4) Problem-solving
5) Self-Monitoring

This app also has additional features such as an emotion diary. The user is prompted to rate his mood on a scale of 1 to 5 on a slider. They are either offered ideas to strengthen their abilities or the Chatbot asks for the mood trigger based on this reading.

3.2 A Chatbot for Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation

This system is a dialogue service for psychiatric therapy that uses high-level natural language understanding (NLU) and multi-modal emotion identification to understand counseling material. Out of the many modes of communication, like image, video, text, audio, etc. this chat service focuses on building a rapport with the user through text format.

Understanding the user's inputs lays the groundwork for delivering a suitable response. Depending on their linguistic aptitude and vocabulary level, each user will have different conversation expressions. It then employs a thorough sentence analysis strategy. The utterance purpose of the sentence entered by the user is assessed, as well as the domain analysis. Unstructured expressions are converted into structured data concerning spatial-temporal information throughout the analysis. The information is useful in providing a response that is appropriate for the Chatbot's spatial-temporal context. Simultaneous building of training data works in this process. An analysis conclusion is made and an appropriate response is generated using a pointer network model. Figure 3.1 shows the procedure of the system.

The limitation to this observable service is the poor precision accuracy. The mode of textual communication requires deep emotional recognition capabilities. For a sensitive subject like mental health, a more accurate method is more optimal.

3.3The ChatBot Feels You – A Counseling Service Using Emotional Response Generation

In this paper, a novel Chatbot application that provides mental health care counseling services based on emotion recognition methods is introduced in a chat assistant platform that consists of user sensitive emotion and context extraction. This paper focuses on chat assistants which can recognize and monitor human emotion and understand natural language conversation, the most crucial technologies in the conversational psychiatric counseling service.

This paper focuses on chat assistants which can recognize and monitor human emotion and understand natural language conversation, the most crucial technologies in the conversational psychiatric counseling service. The work-related included:

Sr. No.	Authors	Title	Findings	Publication
1	Kerstin Denecke, SayanVaahees an, AaganyaAruln athan	A Mental Health Chatbot for Regulating Emotions(SERMO)-Concepts and Usability Test	Implements methods from cognitive behaviour therapy (CBT) and oscova interpreter is used for emotion detection from text	IEEE Transactions on Emerging Topics in Computing **IEEE - 2020**
2	Kyo-Joong Oh, Dongkun Lee, Byungsoo ko, Ho-Jin Choi	A Chatbot for Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation	Establishment of textual chat system for psychiatric counseling	18th IEEE International Conference on Mobile Data Management(MDM) **IEEE – 2017**
3	Charith Silva	Data Science in Public Mental Health	Projection and deeper understanding of disease classification, specifically in mental health.	**IEEE - 2019**
4	N.S.Parames waran and D.Venkatara man	A computer vision based image processing system for depression detection among students for counselling	Identification of Depression using Students facial expressions	2019 April

A.Emotion Recognition:

There are several types of recognition about a user's emotion: text, image and video and audio proposed an emotion recognition approach for mobile social network services. The paper demonstrated those models on the SFEW2.0 competition dataset that was released for the EmotiW2015 challenge.

The root of the limitation is, until now, user emotions are influenced by only one-time recognition from external factors.

B.Chat Assistant for Mental Healthcare:

The Chatbot needs to have the capacity to analyze natural language dialogue. It introduces a smart mobile healthcare assistant. They improve patient-doctor interactions.

3.4A computer vision based image processing system for depression detection among students for counselling

The identification of depression at the college level is desirable in this research such that it can be controlled by providing better counseling from the outset. The facial expressions of a student suffering from depression would reveal his or her troubled mental state. A study has been completed on an automated system that gathers and analyses student facial photos in order to diagnose depression effectively.

This computerized system will be programmed to recognize positive and negative facial expressions. A video of the student is captured, from which the student's face is retrieved, in order to forecast depression. The face traits are then extracted using Gabor filters. The SVM classifier is used to classify these facial traits. The amount of negative feelings present throughout the entire film is used to determine the level of depression. Notification of the student's disturbed mental state is sent to the class adviser, department counselor, or university counselor, depending on the extent of depression. The current research suggests a system that will be trained with happy, neutral, disdain, and disgust facial features.
The only limitation to this system is that it has a reliability of 64.38 per cent. To improve the system accuracy, other inputs like academic results, social material, peer opinions, and hostel activities can be examined in the development of a hybrid system for depression identification, which the current system does not take into account.

3.5 Predicting Depression Using Texts from Contact Subsets

Due to the sheer importance of social interactions and intimate relationships on mental health, the concept of forecasting depression scores based on received communication was born.

The method employed in this paper is to create a subset of the most influential contacts, construct a rich diversity of attributes from messages, and use a machine-learning algorithm to predict a binary depression score.

A. Contact Subset Creation

The system examines text messages from each of the user's contacts, only the top contacts with whom the user is comfortable were chosen.

B. Text & Emotion Feature Engineering

Extraction of features includes the following steps

- **Polarity:** Having scores ranging from -1 to 1, communications are classed as positive or negative. Finally, the average polarity is determined.
- **Subjectivity:** Text Blob used to extract Subjectivity.
- **Part of Speech Tags**: POS tags can capture linguistic style.
- **Volume:** For each participant P, the number of contacts, text messages, and an average number of POS tags per text is calculated.

C. Machine Learning Methodology

The cutoff for an interim diagnosis of depression and therapy suggestion is a PHQ-9 score of 10. Since the research is concerned with extracting characteristics from a subset of contacts, the average feature score was dramatically increased by 13.2 per cent.

IV. CONCLUSION

This research examines the benefits and drawbacks of artificial intelligence (AI) as a tool for detecting and intervening in mental health concerns. Chatbots are a convenient approach to give mental health treatments using devices. Chatbots use various techniques like multi-modal emotion recognition, intonations, etc. to reach a better accuracy level.

Computer vision on the other hand helps to recognise emotions beyond text conversations. Using facial expressions, an intelligent responding technique such as psychiatric specific instance reasoning and surveillance, and ethics judgement helps train and execute models. Although every system has its limitations, the advancement of technology will help minimize these disadvantages in the near future.

REFERENCES

[1] Kyo-Joong,Dongkun Lee, Byungsoo Ko, Ho-Jin Choi.“A Chatbot for Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation”DOI 10.1109/MDM.2017.64IEEE 18th International Conference on Mobile Data Management
[2] Kerstin Denecke, SayanVaaheesan, AaganyaArulnathan.“Mental Health Chatbot for Regulating Emotions (SERMO) - Concept and Usability Test”DOI: 10.1109/TETC.2020.2974478 Date of Publication: 17 February 2020
[3] Charith Silva, MahsaSaraee, Mo Saraee. ”Data Science in Public Mental Health: A New Analytic Framework”DOI**:** 10.1109/ISCC47284.2019.8969723
[4] Mandar Deshpande ,Vignesh Rao. “Depression Detection using Emotion Artificial Intelligence.”
[5] Aishwarya Paul, JossyGeorge.”Mental Health Data Analysis Using Cloud.”DOI**:**10.1109/ICECCE49384.2020.9179289
[6] StamatisKarnousko.”Artificial Intelligence in Digital Media: The Era of Deepfakes.”DOI**:** 10.1109/TTS.2020.3001312 IEEE Transactions on Technology and Society
[7] “ Investing in Mental Health: World Health Organisation Department of Mental Health and Substance

Dependence, Noncommunicable Diseases and Mental Health, World Health Organization, Geneva"

[8] MLTlachac,ErmalToto,ElkeRundensteiner."You're Making Me Depressed: Leveraging Texts from Contact Subsets to Predict Depression." DOI: 10.1109/BHI.2019.88344812019IEEE EMBS International Conference on Biomedical & Health Informatics (BHI)

[9] https://www.nami.org/About-Mental-Illness/Warning-Signs-and-Symptoms. YouTube.

[10] Saket S Kulkarni, Narender P Reddy & SI Hariharan "Facial expression (mood) recognition from facial images using committee neural networks."BioMedical Engineering OnLine volume 8, Article number: 16 (2009) Published: 05 August 2009

[11] Mr.LokeshM.Giripunje,Mr. Prasad Khajone, Mr. Yogesh Sudrik, Mr. Akash Range," Review Paper on Automatic Vehicle Number Plate Detection and Recognition Using Image Processing", "International Journal of Advance Engineering and Research Development, pp.673-677.

[12] "The ChatBot Feels You – A Counseling Service Using Emotional Response Generation."DOI: 10.1109/BIGCOMP.2017.7881752