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A Review Paper on Various Depression Analysing Algorithms

Harsh Bachawat[1], Vaibhav Ganjoo[2], Sanket Udapi[3], Vinita Bhandiwad[4]

Studying BE IT, Studying BE, INFT, Studying BE, INFT, Asst. Prof. VIT

Abstract—*Depression is a highly prevalent disease worldwide, which have placed undue burden on individuals, families, and society. Studies suggest that effective treatments for clinical depression can be aided by the detection of the problems at its early stages. Depression as we know is a less talked about topic and very few people view it as even a real disease. Making the people really suffering from it even reluctant to come out. This report describes the various AI and machine learning algorithms that can be used to detect depression in early stages in an individual. These algorithms are based upon the various features extracted from individuals such as audio, video, text, facial features, social media history, etc.*

***Keywords*—Depression Detection, DAIC-WOZ, RNN, Natural Language Processing, NLTK, Machine Learning Algorithms.**

1. Introduction

The depression analysis done by the chatbot is like a subset of the whole sentiment analysis which can be done by natural language processing as well as other methods.

In this project we have used natural language processing to determine the abstract keywords in the teletype conversations done by the chat bot with the user which are generally linked with depression universally. And then we use several AI tools and algorithms to generate a report on the effect current depression levels.

This report can be used by a psychologist or even a therapist to help the patient with proper treatment and prescribe therapy.

Effective anti-depressive therapy means more than improvements in, or even cessation of, clinical symptomatic presentations. To optimize your patients' chances of achieving true and lasting remission, the full constellation of emotional, physical and cognitive symptoms should be assessed and addressed at diagnosis, throughout treatment and beyond. Steps should be taken to prevent relapse whenever possible, and treatment perseverance should be encouraged throughout the course of therapy. Residual symptoms have been shown to present, on average, for 44% of the time during periods of remission in patients previously diagnosed with depression.

The presence of residual symptoms show that the individual can relapse into depression any time. This can affect ones work and personal life. As we all know depression is very real and a serious threat to today's generation. The idea behind the whole project being that people don't open up to general public or even to their therapist from the fear for having their secrets spilled out. Hence the idea being that they could talk freely to a technology.

The app here helps to keep a track of an individual's mental health along the prolonged period of time if the user is regularly using the app. It helps to determine the effective improvements in the user's depression levels using various questionnaire daily and subsequent reporting of improvements

2. Literature Survey

Dr Bot. So-called chatbot counselling is another AI tool producing results. Chatbots are computer programs that simulate human conversation, either through text or a voice-enabled AI interface. In mental health, these bots are being pressed into service by employers and health insurers to root out individuals who might be struggling with substance abuse, depression, or anxiety and provide access to convenient and cost-effective care.

Woebot, for example, is a chatbot developed by clinical psychologists at Stanford University in 2017. It treats depression and anxiety using a digital version of the 40-year-old technique of cognitive behavioural therapy – a highly structured talk psychotherapy that seeks to alter a patient's negative thought patterns in a limited number of sessions.

Woebot has a sense of humour, and I can see people who are having a bad day sticking with the attractive platform. Woebot also has skills — in no time, Woebot had identified my mood (with emoji support), identified three thoughts underlying my mood, and helped me see that these thoughts were "distortions," which we replaced with more helpful thoughts(The journal of health,2019).

Ellie — an avatar rendered in 3-D on a television screen — functions by using different algorithms that determine her questions, motions, and gestures. The program observes 66 points on the patient's face and notes the patient's rate of speech and the length of pauses before answering questions. Ellie's actions, motions, and speech mimic those of a real therapist — but not entirely, which is an advantage with patients who are fearful of therapy.

The bot has been launched as recent figures show that NHS patients seeking help with their mental health are waiting more than eight weeks to see a doctor after their first appointment.

The chatbot therapist was developed by medical device company Flow, which in June launched a brain stimulation headset treatment for depression, the first and only medically approved at-home treatment of its kind in the UK and EU.(Depression Scale Recognition from Audio, Visual and Text Analysis,arxiv,2019).

Little research has been done on the impact of chatbots on mental health, although there has been some discussion of their potential for overcoming certain barriers in mental health, such as waiting lists and geographical problems that hinder attendance at face-to-face counselling appointments. SimCoach is an intelligent virtual human agent that aims to initiate user engagement, increase awareness of symptoms and treatments for users who may be reluctant to talk to a traditional counsellor. Another solution available utilises a web camera and a set of questions to assess a user's level of self-esteem and anxiety. The overall aim is improving a user's wellbeing, reducing anxiety and anger by helping them to cope with stressful situations. Chatbots have been used within the area of student counselling. Kavakli, Li and Rudra (2012) explored the idea of using a chatbot to help students overcome exam stress, as during exam time university counselling services can reach their peak capacity. In their study on students, Bhakta, Savin-Baden, and Tombs (2014) found that they perceived disclosing sensitive information to a chatbot as "safe"

3. Problem Statement

Depression in these recent years has become a serious problem more and more teenagers and as well as adults are being diagnosed with it. The depression is usually caused by the stress and expectations in their day to day life and to the fear of not achieving what they want in life be it a big or a small thing. The problem with people with depression is that these people don't easily open up due to how the general perception about depression is portrayed in the society. People are not able to open up to even therapists and on top of that not everyone can afford them.

Hence there was a need for a feasible alternative which would be able to provide a more personalised experience.

4. Proposed System

The proposed system is a chatbot that regularly asks some questions to the user, the answers of which are used to predict his/her depression level. These questions can be both choice based or text based and are randomly selected from the database containing about 100 questions.

The chatbot here uses natural language processing as the major technology behind the computational algorithm. The system has been trained by the DAIC-WOZ database. This corpus contains clinical interviews designed to support the diagnosis of psychological distress conditions such as anxiety, depression, and post-traumatic stress disorder, the compiled database contains audios, transcriptions and facial features of interviews. All the interviewees were assigned a PHQ-8(Patient Health Questionnaire) score that describes the depression level of the individual. The algorithm used is Bi-directional LSTM (Long Short Term Memory) which is a type of RNN (Recurrent Neural Network) that analyses the text based on the sequence of words used by the individual both in forward and reverse direction.

Fig. 1: Dataset with tokenised phrases

All the answers given by the user are classified to the level of depression that they indicate using the algorithm. After answering all the questions, the user receives a final score of depression based on the answers provided. A final report is given to the user consisting of the various activities to be done in order to tackle their mental health problems.

5. Conclusion

The behaviour of depressed people can be analysed through his text patterns, this makes the whole process more human like in learning about the user. The output can show progress over a certain time period.

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