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Mental Health Chatbot (Psykh)

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Abstract: *Mental Health is one of the most important aspects of living a happy life. Due to the Covid-19 pandemic, mental health issues are on the rise. Due to the shortage and affordability issues in India, the mental health of people is left untreated. This leads to worsened mental health, suicide attempts, instability, and incarceration in daily life. Conversational agents and chatbots are on the rise for a couple of years as the world of AI builds itself towards higher limits. Taking a step towards that direction, we introduce to you a website integrated with a chatbot, Psykh that implements methods from cognitive behaviour therapy (CBT) to support mentally ill people in regulating emotions and dealing with day-to-day thoughts and feelings. Psykh helps users tackle negative thoughts and emotions. It determines the basic emotions of a user from the natural language input using natural language processing and the tools of RASA (Open Source Conversational AI framework). The chatbot would somewhat work as a psychotherapist helping people to tackle daily life struggles. Additional functionalities include the positivity Journal, where responses of user's emotions will be stored to keep a tab on the progress.*

Keywords: *Natural language Processing, Chatbot, Artificial Intelligence, Rasa, Machine learning, Mental Health Counselling, Natural language Understanding.*

1. INTRODUCTION

The COVID-19 global pandemic has had a profound impact on our mental health and made us aware of how important it is. A study examining suicidal behavior during India's COVID-19 lockdown by the International Journal of Mental Health Systems has found a 67.7% increase in online news media reports of suicidal behavior [1]. Over 60% reported disruptions to mental health services for vulnerable people, including children and adolescents (72%), older adults (70%), and women requiring antenatal or postnatal services (61%) [2]. 67% saw disruptions to counseling and psychotherapy; 65% to critical harm reduction services; and 45% to opioid agonist maintenance treatment for opioid dependence[2]. More than a third(35%) reported disruptions to emergency interventions, including those for people experiencing prolonged seizures; severe substance use withdrawal syndromes; and delirium, often a sign of a serious underlying medical condition [2]. 30% reported disruptions to access to medications for mental, neurological, and substance use disorders [2]. Around three-quarters reported at least partial disruptions to school and workplace mental health services (78% and 75% respectively) [2]. 70% of people have had more stress and anxiety at work this year than any other previous year [10]. This increased stress and anxiety have negatively impacted the mental health of 78% of the global workforce, causing more stress (38%), a lack of work-life balance (35%), burnout (25%), depression from a lack of socialization (25%), and loneliness (14%) [10].

Mental disorders are usually treated by psychotherapists. However, there is a global shortage of human resources for delivering such mental health services. In developed countries, there are nine psychiatrists per 100,000 people available, while in developing countries there is one psychiatrist per ten million people [3]. According to the WHO, about 45% of people in developed countries and 15% of people in developing countries have access to psychiatric services [3]. This shortage and expense issues have made the AI industry take matters into its hand. Building conversational AI systems to create a human-like AI has been one of the leading research topics to date. Creating a virtual psychotherapist AI is one step closer to a human-like AI dream. The chatbot simulates a realistic conversation partner by giving the user appropriate answers in a language that he or she understands. Chatbots were mainly used in marketing to enhance customer experiences.

As professional assistants like counseling are expensive, people are looking towards a more reliable and efficient solution to better mental health. With the increase in technology where machines can think like humans, we've come to a solution that will repress these issues. Chatbots are a system that can converse with humans using natural languages which eliminates the need for interacting with a professional.

2. LITERATURE SURVEY

The conversational AI industry has been on the rise for a few years now. Eliza is one of the first natural language processing computer programs created in 1964 by Joseph Weizenbaum [12]. It was developed at the MIT Artificial Intelligence Laboratory [12]. Eliza is a pretty basic bot that was built in 1964, which is something to be respectful about. It's 2021 now and the conversational bots have come a long way. A few chatbots that help in anxiety and depression are Woebot, Wysa, and Joyable. Woebot is a therapy chatbot helping its users monitor their mood and improve themselves. This is one of the top mental health chatbots to be found in the AI world right now. Woebot uses humour to familiarize the user with the environment and make them comfortable. Using puns, gifs, and funny jokes to help users cheer up their mood. Woebot uses Cognitive Behavioural Therapy (CBT) to help users cope with symptoms of depression and anxiety. CBT is one of the most effective approaches to depression anxiety developed to date. Wysa also uses humour and CBT to help users but unlike Woebot, the conversations are repetitive at times. One thing that stands out from Wysa is the diary of positive thoughts that are stored to cheer up users when they are going through stressful times. Wysa also provides an option to book a therapy session with an actual therapist.

These chatbots won't ever replace therapists, because nothing can match the human connection. They are here because there are millions of people in this world who wouldn't go to a psychiatrist although doing so would help them tremendously. There are many reasons why people find it hard to reach out. We always say we should talk to someone if we are feeling low but we forget the fact that for some people that's not an option. This is why chatbots come into existence. Chatbots are nowhere near perfect but it's a start.

3. PROPOSED SYSTEM

Psykh is a conversational AI chatbot that uses natural language understanding at its core to understand user input. It is specially made to tackle day-to-day mental health challenges. The bot uses natural language processing to understand what the user is saying and makes a conversation like a psychotherapist. The chatbot is equipped with some humour to make the user comfortable and ready to share a few details. It asks a few questions to understand the user's current mental state. The answer to those questions gets stored in the Journal called the Happiness Journal and the bot chats through with the user to help him overcome his difficulties. The main aspects the bot deals with are anxiety, depression, and stress. To achieve this the bot gets trained on a lot of stories that are explained in the RASA architecture. Different stories are created to decide the flow of the conversation and the amount of time the conversation is driven by the chatbot. This whole process can be broken down into several components. Once the user sends a message, we use a tokenizer to split the sentence into tokens. A featurizer is used to transform the tokens into features that can be used by machine learning algorithms. The intent classifier is used to classify the intents based on input features. and once the model gets trained Rasa X is used.

Rasa X is a tool for conversation-driven development(CDD) that helps in improving the chatbot by providing an interactive learning interface [11]. The interface is used as an interactive GUI, and it helps in improving the responses of the chatbot if a mistake is made by the bot to understand the user's reply.

Fig 1. Natural Language Processing Pipeline

4. ARCHITECTURE

System Architecture

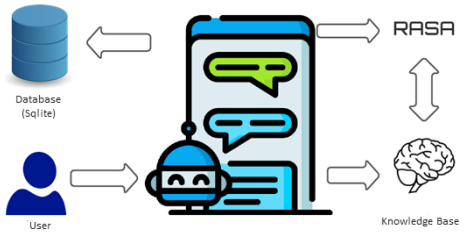

Fig 2. System Architecture

The system architecture is mainly distributed into four subparts. These parts are as follows: Database, User, Knowledge base(Data), Rasa. The database is used for a Journal that keeps tabs on things the user is happy about in his life and whenever he feels depressed about something we can always remind him of these things he is happy about. The Journal is also used to keep track of the progress of the user's mood daily. SQLite is used as the primary database.

The user is the person who interacts with the bot and engages in conversation. Data is used on machine learning

algorithms to predict the user's intent or what kind of emotion the user is going through.

RASA Architecture

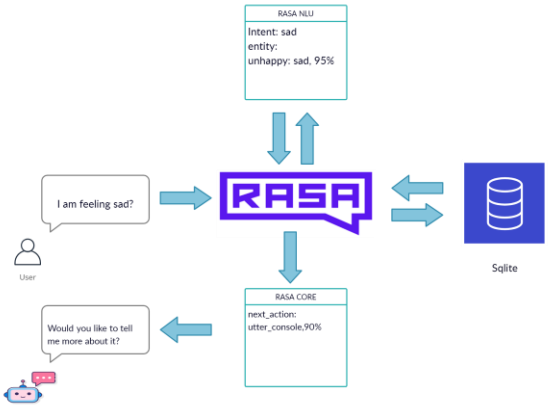

Fig 3: Rasa Architecture

Two primary components of rasa are Rasa NLU i.e Natural Language Understanding and Rasa Core. Rasa NLU is the part that handles Natural Language Processing. Classifying intents, entity extraction, and response retrieval. Rasa Core is the dialogue management component that decides the next action in a conversation based on the context.

Rasa core and Rasa X acts as the driver of the bot and engages in conversation with the user. Rasa X is an interactive learning interface that learns while conversing with the user. Rasa is an open-source machine learning framework to automate text and voice-based conversations. Rasa X is part of the Rasa repo. It is a dialogue management solution that tries to build a probability model that decides the set of actions to perform based on the previous set of user inputs.

Component Diagram

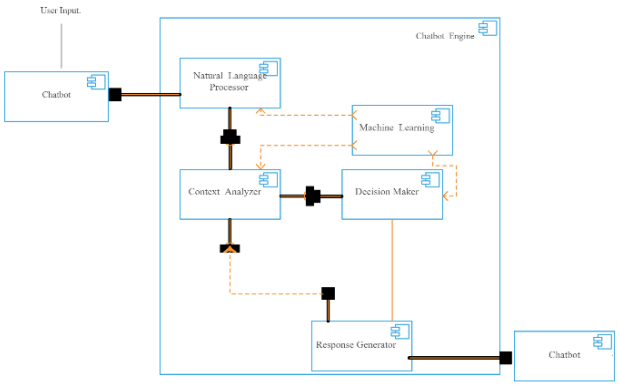

Fig 4: Component Diagram

In the component diagram above it is evident how the conversation is driven between the user and the bot. When the user gives his input in conversation, it is processed further by the Natural Language Processor(NLP). After which intents and emotions are classified using machine learning models. The context analyzer processes the conversational input and sends it to the response generator. After the analysis is done and prediction is made, a decision regarding the user's input is taken by the bot and sent to the context analyzer. After the analysis is done the response generator generates the response and is forwarded to the chatbot, where the bot expresses its response.

5. ALGORITHM

- Step 1: Getting user input.
- Step 2: Convert text to words.

  Tokenization is the processor converting the meaningful piece of data into a random string of characters called a token.
- Step 3: Convert words to features.

  Word2vec is used to produce word embeddings. It produces a vector space where each unique word is assigned to a corresponding vector in the space.
- Step 4: Labelling Features(uses sklearn Label Encoder)

  Intents are categorized by a label given in training data. In our case, some of the intents are happy, sad, anxious, etc.
- Step 5: Classify Intent.

  Finally, the vector space is passed into a model to classify the intent based on the training data.

6. ADVANTAGES

- With the help of pshyk, users will be easily able to deal with day-to-day stress, depression, and anxiety.
- The user's data and progress about the user's mental health conditions will be stored and analyzed.
- The user's mood can be enhanced and cheered up using a positive approach, humour, and CBT.

- CBT will be used in the form of suggestions to help users lessen the effects of daily stress, depression, and various other mental health problems.

- Psykh uses machine learning to predict and analyze the user's mental state and focus on 3 primary emotions of Anger, Happiness, and Sadness.

7. CONCLUSION AND FUTURE SCOPE

Psykh helps support users and gain mental stability. Psykh can keep a track record of a user's mental health and later can be used to analyze and review. Human connection is not something that can be achieved with a chatbot but helping people who don't have the resources to treat themselves. Even though chatbots can make a conversation they only mimic understanding but they don't exactly understand. This can cause resistance as chatbots are prone to mistakes. These mistakes are something that can be avoided and worked upon in the future.

One of the most important aspects when dealing with users is to keep a conversation going. Understanding every detail the user chats about and this is where the future of chatbots relies upon. Keeping an option of interacting with an actual therapist is also feasible. The user's privacy has to be taken into consideration. The information that the user shares with the bot has to be kept confidential.

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