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Implementation of Mental Health Chatbot using RASA

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Abstract - *Psykh is a mental health conversational AI chatbot that can help people from depression, anxiety, stress, etc. This chatbot web application is mainly built for introverts who have trouble taking help from a mental health professional or their family. These past few years have taught us how important mental health is far more then your physical health. Psycho-therapists have very high costs per session and a middle class man cannot afford to put their money on things that are not their priority. Psykh is here for the people to use whenever they want without any cost. It can act as your friend and talk with you whenever you need it. 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). An attempt has been made to help people with mental health issues as they are hesitant in sharing these thoughts and emotions with other people.*

Key Words: Natural language Processing, Chatbot, Artificial Intelligence, Rasa, Machine learning, Mental Health Counselling, Natural language Understanding, Psychiatric counselling.

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 behaviour 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 behaviour [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 counselling 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 humanlike AI has been one of the leading research topics to date. Creating a virtual psychotherapist AI is one step closer to a humanlike 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.

Some people show hesitation in sharing their sorrows or problems with other people because of the risk of another person judging them or them getting mocked by another person. So, in such cases, chatbots or dialogue systems can be used to get the normal informative needs of the user by acting as a friend or a well-wisher. As professional assistants like counselling 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. Project Models

3.1 Dataset

Data was collected from Kaggle, Reddit and many other websites. 883 lines of a total of 36 intents were collected. Stories building is a very important task of building a Rasa Chatbot. A total of 24 stories based on happy, sad, depressed, anxious, stressed and many such moods were created.

3.2 RASA Chatbot

The most important task of this project is to create the chatbot. With the help of the Rasa Framework, we classified intents and played stories over and over to check if the chatbot was correctly answering the user. We also made the chatbot a little humourous so that if the user might be feeling stressed the chatbot would help relieve those feelings and make a normal happy atmosphere for the user.

3.3 Web Application

The web app consists of two parts i.e a front-end that only has information about the chatbot viz. Features, about and blogs and the other part is the chatbot. We've hosted the chatbot on the website using a react based chatroom component provided by scalable minds. The web app currently runs on localhost.

Django is a request/response system. We've used a react based component to let the user chat with the bot and Django to render the template. So, the conversation takes place using a request/response system.

4. Data Preprocessing

We have taken dataset from many different websites, Reddit and Kaggle being the main websites. We collected data for different moods like Happy, sad, angry, stress, depressed, etc. We have 36 intents in total with approximately 883 lines of data. A total of 24 stories were created in the rasa framework.

We created data that had intents such as depressed, mood_happy, mood_sad, stressed, etc. Intents are actual messages the user wants to say to the chatbot. Creating stories based on these intents.

5. RASA

5.1 Rasa Configuration

Let me explain about files, which are created as Initial project structure of Rasa.

__init__.py: an empty file that helps python find your actions.

actions.py: code for your custom actions. If you need the bot to write specific

config.yml: configuration of your NLU and Core models.

credentials.yml: details for connecting to other services. Remember that you need to host Rasa over https domain.

data/nlu.md: your NLU training data. Here you define Intents. Like depression or anxiety. You need to add related Sentences for that Intent. Remember if you are using Rasa-X, your training Intent and Data will be added automatically.

data/stories.md: This is required for Rasa Core. There is something called "Dialog Flow in Rasa" where Rasa Core controls the flow of the conversation between you and the chatbot, so for that flow, you need to train the chatbot using these stories. So in case you want your chatbot to be very perfect in different contexts (stories) you can add those stories here.

domain.yml: your assistant's domain. This file combines Different Intent which chatbot can detect and list of Bot replies. Remember you can define your Custom Action Server Python method name here, so that Rasa will call that python method for you.

endpoints.yml: details for connecting to channels like FB messenger. This is mainly used for production setup. You can configure your Database like Redis so that Rasa can store tracking information.

5.2 RASA NLU PIPELINE:

The NLU Pipeline is defined in the "config.yml" in Rasa. This file contains all the steps present in the pipeline that will be used by Rasa to classify the intents and perform the appropriate action. All the pipelines that we have used for this project are explained below.

5.2.1 sklearn pipeline

- **spacyNLP -** used to build information extraction, natural language understanding systems, and to pre-process text for deep learning**.**
- **spacyTokenizer -** the raw text is split on whitespace characters, similar to text.split (' '). Then, the tokenizer processes the text from left to right.
- **SpacyFeaturizer –** The tokens formed from the tokenizer are transformed into features that can be used by a machine learning algorithm.
- **SklearnIntentClassifier –** Categorizing the text data into specified intents. Ex. "I am Max", here Max is classified as the Name intent.
- **CRFEntityExtractor -** Implements a conditional random field (CRF) to do named entity recognition.
- **EntitySynonymMapper –** Maps synonymous entity values to the same value.

6. Result Comparison

For intent classification we have tried 3 different pipelines and 2 for Entity Extraction i.e DIET, Sparse Naive Bayes and SKlearn Intent classifier and CRF respectively.

CRF Entity Extractor is used with Sparse Naive Bayes Intent classifier and Sklearn intent classifier whereas DIET does intent as well as entity extraction.

Below images represents the intent classification and entity extraction accuracy comparison.

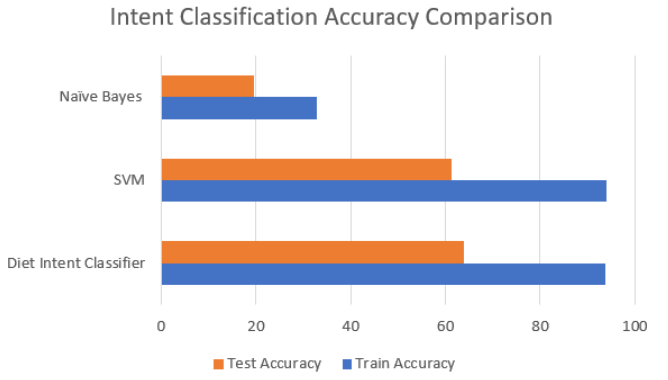

Fig 6.1: Intent Classification Algorithm Comparison

From fig 6.1 we can see that the Sklearn Intent classifier which uses SVM and DIET gives almost the same accuracy whereas Naive Bayes performs very poorly. We have used the Sklearn Intent classifier as it is fast in terms of speed and gives almost similar accuracy to DIET.

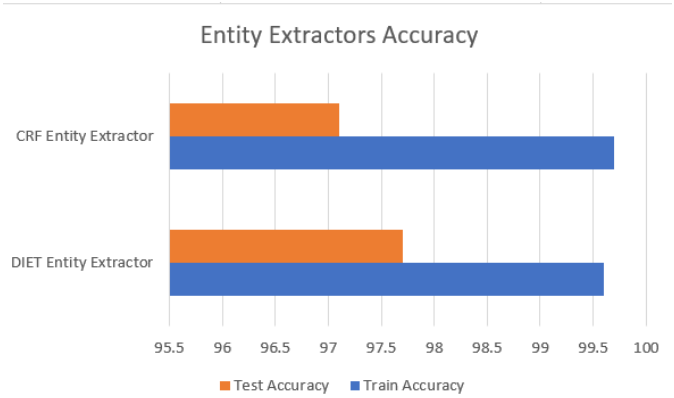

Fig 6.2:Entity Extraction Algorithm Comparison

From fig 6.2 we can see that the CRF entity extractor and DIET gives the same performance on the train set but has a big difference on the test set but we used the CRF entity extractor because the DIET entity extractor couldn't be used alone.

7. PROJECT SCREENSHOTS

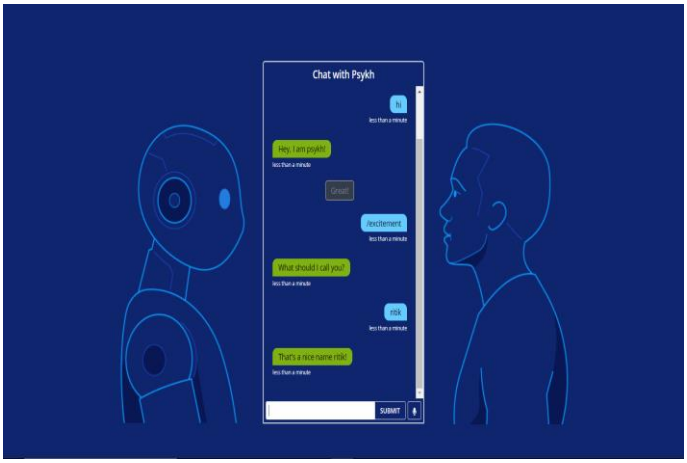

Fig 7.1:Chatbot

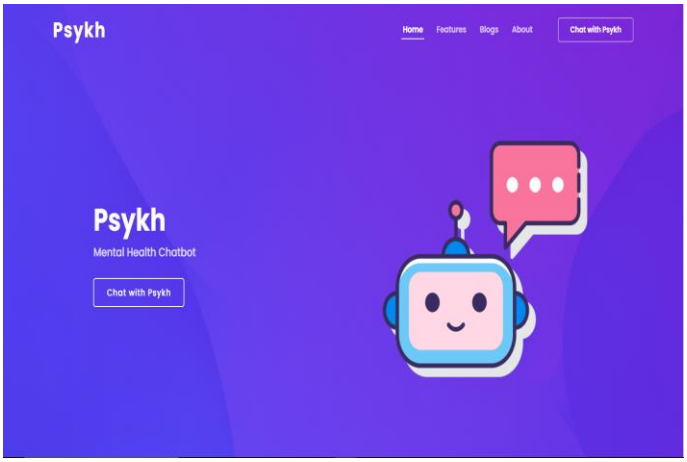

Fig 7.2 :Landing Page

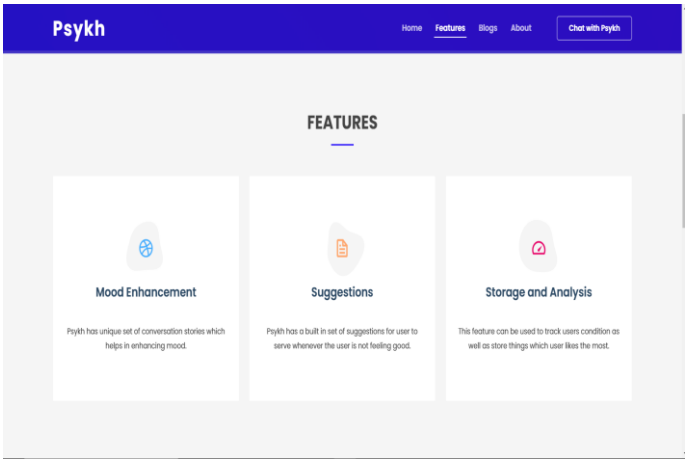

Fig 7.3 :Features

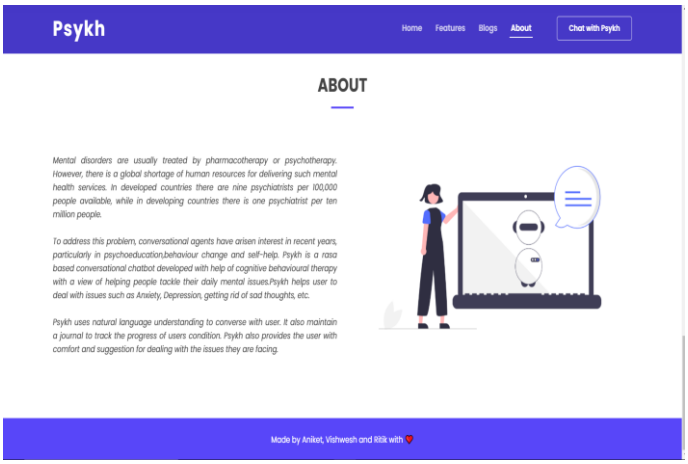

Fig 7.4 :About

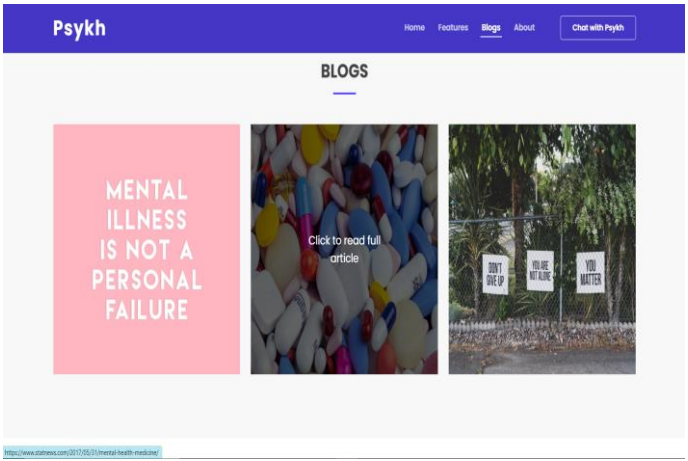

Fig 7.5 :Blogs

8. CONCLUSION & 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 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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