Emotional Support Chatbot using Sentiment Analysis

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Abstract- **AI technology is advancing quickly, and its effects are being seen in various fields. One of the most significant applications of AI is in the medical field, where it can be used to improve mental health. With the help of text-Davinci003 model, which is one of the most powerful models of GPT 3, A chatbot is a promising tool to assist with user health initiatives, so a chatbot can be created that can generate text based on user input, we can provide support for users who need it without having them speak directly with a human operator. Natural language processing (NLP) is used by the system to analyse user input and determine the tone of the user's text. The system then responds appropriately using the results of the sentiment analysis. The Hugging Face model, EmoRoBERT, allows for the categorization of user conversation into 28 different emotions. which, at the conclusion of the talk, aids in determining the user's overall emotional state. By using podcasts, music & games as part of our service platform, we aim to help users in lifting their mood and providing them emotional support when they need it most.**

Key words: **chatbot, sentiment analysis, emotional support, NLP, GPT-3, Hugging Face, Open AI, Mental Health**

I.   Introduction

Mental health is a condition of mental wellness that helps people to manage life's stressors, develop their potential, study and work effectively, and give back to their communities. It is a crucial element of health and well-being that supports both our individual and group capacity to decide, form connections, and influence the world we live in.[6] A purposeful verbal and nonverbal technique to express care and compassion for one another is by providing emotional support. By offering another individual emotional support, you reassure, accept, encourage, and care for them, making them feel valuable and significant.

Recent research demonstrates that using artificial intelligence (AI) techniques to support people emotionally is a suitable strategy. Mental processes and daily decision-making are significantly influenced by human emotions. The best way to alleviate depression is through interpersonal connection, yet many people shy away from it out of a fear of being judged. Chatbots have emerged as a preferred remedy for this problem. These computer applications provide a supportive, non judgmental environment where people may express their emotions and get assistance, which makes them an important tool for fostering emotional well-being.Chatbots for mental health are a novel and creative technique to examine ones functional wellbeing.

Sentiment analysis is the process of identifying and extracting context-specific sentiments from text using contextual mining. Sentiment analysis automates the extraction or categorization of sentiment from sentiment reviews using natural language processing (NLP), text analysis, and computational approaches.Sentiment analysis is quickly becoming a crucial tool for monitoring and understanding sentiment in all forms of data, as individuals communicate their ideas and feelings more openly than ever before.[11]

Since the number of people affected by mental illness continues to climb, there is a greater demand for alternatives to specialised health experts. One of the recommended alternatives is the development of successful models that may support individuals and assist them in taking care of their mental health.There are several mental health chatbots available these days, however having a discussion might be tedious owing to the repetition of context.[3]

Chatbots can be broadly classified into two types:

Rule-Based Chatbots
Chatbots that use decision trees or follow rules reply to queries by drawing from their pre-learned knowledge.. As the name implies, they adhere to a set of regulations. These suggestions outline the categories of problems that the chatbot is familiar with and qualified to handle.Rule-based chatbots map out conversations using flowcharts. They do this in advance of a customer's inquiry and the best way for the chatbot to respond.[3]
The development of these chabots is quite simple utilising various rule-based methods, but the chatbot is not effective in responding to inquiries whose pattern does not match the rules on which the bot is taught.
The rules defined can vary in complexity from easy to complex.[11]
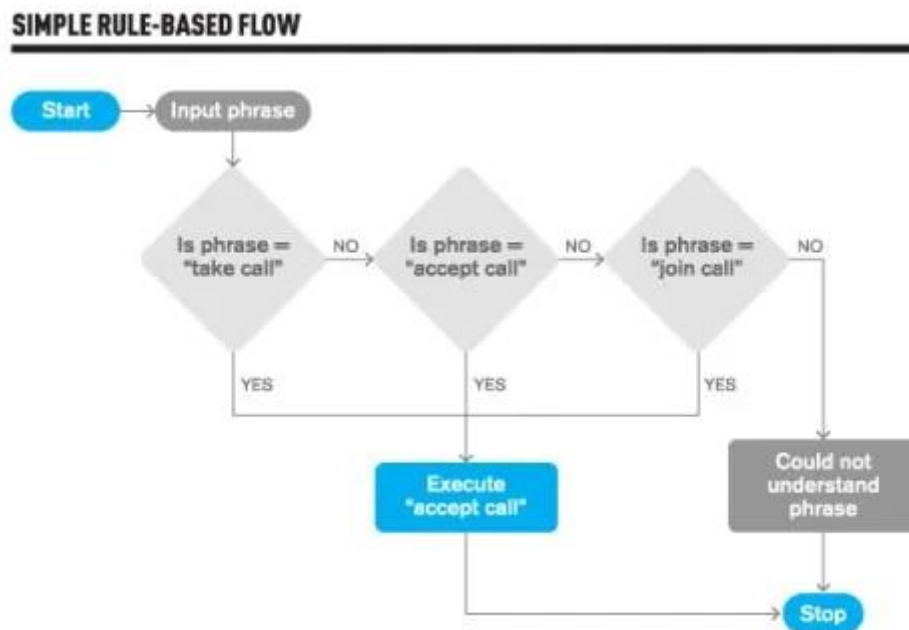
Figure 1 Flow diagram of ruled based chatbot

Generative-Based Chatbots

An open-domain chatbot programme known as a generative chatbot creates unique language combinations rather than choosing from pre-written responses. Generative chatbots can be created using seq2seq machine translation models.

Choosing a data set for generative chatbots:
While building generative chatbots, selecting the appropriate dataset is a common problem. Typical worries include:
• Data origin (e.g., Twitter, Slack, customer service conversations, etc.)
• Comparing real and made-up dialogue
• Dataset licence
• Bigotry, prejudice, or rudeness in the dataset

Format for generative chatbot input :
User input must be transformed into NumPy matrices of one-hot vectors for generative chatbots that use a Keras-based seq2seq model.
  Handling of unknown words by a generative chatbot:
Unknown words can be handled by generative chatbots in a number of ways, such as by ignoring them, asking the user to clarify, or making use of UNK> tokens.
  In this paper, we introduce a sentiment analysis AI-powered chatbot web application which support people emotionally and study the users conversation and classify it into different emotions.When a person expresses their difficult feelings and experiences, the emotional support of a conversation partner can enhance the person's psychological results. The web application includes a variety of activities in addition to the conversational chatbot function, including games. Several studies have shown that playing games helps reduce stress and improve mood.

II.   Related work
Many chatbots which were developed for the purpose of mental support used deep learning , neural network such as RNN, LSTM , seq2seq , model to generate conversation and uses methods like CBT , DBT therapy to manage anxiety and depression among the user. A few of them provide therapy session , while others include relaxing exercises such as meditation and breathing exercise.

Feasibility Study on the Use of Artificial Intelligence GPT-3 in Public Health. This feasibility study compiled the top 10 contributions of artificial intelligence to public health. We conclude that AI can participate in public health research as a team member. However, good research practice must also be followed when contributing to artificial intelligence.[1]

Conversational technologies are changing the physical landscape of human-machine trade. Thus, the current tendency in chatbot development is to create kind and emotionally intelligent bots capable of recognizing stoner thoughts and coming up with appropriate replies.
 Model Encoder-Decoder Extending Seq2Seq to get beyond its dull and meaningless answer constraints is one option to improve the paradigm that was initially proposed for creating emotionally intelligent chatbots. In several investigations, the model is developed using a bidirectional classifier that was trained using an emotionally tagged dataset.[2]

Chatbots are increasingly being utilised in a variety of fields to replace human agents in duties like as job completion, answering questions, providing advice, and providing social and emotional support. Experimenters are implementing emotional intelligence capabilities in chatbots utilising Artificial Intelligence (AI) and Natural Language Processing (NLP). To diagnose a person, it's going to ask a many questions with four answers and assign a mark to each choice. It's going to also include different rudiments which includes videotape games, music, and a chatbot to keep the druggies' minds live.[3]

The paper focus on approach to enhance data, it is processed in consideration of the facts imbalance decision and the traits of unstructured conversation data. In addition, the "surprise" classification protected each wonderful and terrible emotions, so the performance used to be categorised as lower than different emotions.By the usage of the multilabel emotion consciousness approach that considers the characteristics of unstructured dialog data, it is viable to apprehend the that means of a dialog and to apprehend precise feelings different than the consultant emotions in a sentence so that more accurate emotion cognizance is possible is growing.[4]

Chatbots are software tools that assist in the replication of human-like interactions via the use of voice commands and text-based discussions. Modern technological advancements have created a trend in healthcare towards digital health. Mental health is a widespread issue across the world. The project's goal is to create a conversational system that is free to use and provides mental health care solutions. In today's environment, bad mental health is a huge worry, and it's tough for anyone suffering from a mental illness to find help online. NLP is used to analyse text and teach robots how people speak. A neural network is an artificial intelligence technology that trains computers to analyse data in a manner similar to the human brain.[5]

This study looked at how and when emotional support from a chatbot helped participants feel less stressed and anxious.Participants reduced their fear more when receiving both emotional support and reciprocal disclosure (M = 0.64, SD = 1.08) than when receiving only emotional support (M =.30, SD =.83, p =.04, one-tailed1).Their findings revealed that the worst chatbot for relieving stress was one that just self-disclosed without supplying emotional support, but that a chatbot that offered emotional support could counteract the drawbacks of its reciprocal self-disclosure.[7]

 Programmes, which are geared at the user, were created to proactively check on patients, be there to listen to them at any time, and communicate with them whenever they want, while also suggesting activities that aim to enhance the user's mental condition.Beautiful Soup is used as a web scraping tool to extract data from online websites.The most common words uttered by depressed persons are also thought to be analysed using Twitter's sentiment analysis data.
Deep learning techniques called LSTM (RNN) are utilised to tackle the gradient problem in order to recognise the user's sentiment from chat text and respond appropriately.[8]

An vital factor of human conversation difficult for machines is conversing with empathy, which is to understand the user's emotion and reply appropriately.
Meanwhile, various latest works have tackled the trouble of empathetic speak response generation, which is perception \the user's emotion and responding appropriately, on the whole on two directions.
Reward Functions: Sentiment Look-ahead In a nutshell, given the generated machine response (s,t), an arbitrary function f will output a score $R * \in [0, 1]$ that determines how appropriate the input is, which is then used as the reward for getting to know the highest quality policy.
The authors then use REINFORCE which defines the loss feature L RL as the terrible expected reward: $R_t = h_t$ dec • W b (10) L RL = − 1 M M t=1 (R * −R t) log p(ŷ t |ŷ 1 , • • •,ŷ t−1) (11) , where W b ∈ R d×1 is a trainable parameter,R t is the baseline reward, and R * is an arbitrary reward.(Shin et al., 2021)[9]

Due to current technological advancements, there has been an upward shoulder in digital interventions aimed at both supplementing or changing face- to- face intellectual health services which correspond of the preface of intellectual fitness chatbots, that claim to furnish assistive care using a remedial approach. The paper proposes the perpetration of NLP in psychotherapy as well as an everyday evaluation of current systems done by comparing the chatbot replies to a set of destined stoner inputs applicable to heartiness and internal health enterprises. [10]

Natural language perception consists of a huge vary of colorful tasks similar as textual entailment, query answering, semantic similarity assessment, and train bracket. The authors revealed that large salutary parcels on these duties can be realized through generative pre-training of a language mannequin on a multitudinous corpus of unlabeled textbook, followed by way of discrimination fine- tuning on every specific task. This corpus has been proven to incorporate further logic type questions that different datasets like CNN or team, offering the stylish comparison for our mannequin which is trained to handle long-range surrounds. The generative model assigns advanced average token log- probability to the relaxation of the sequence after the negotiation. [12]

III.   Methodology
Open AI

A non-governmental research organisation called OpenAI is dedicated to the secure and advantageous progression of synthetic intelligence. Concentrating on diverse fields like natural language processing (NLP), robotics and computer vision among others are some objectives at OpenAI Research group. The Generative Pre-trained Transformer Language models better known as GPT language model which is an advanced technique for generating human-like responses from text inputs or answering intricate questions has been developed within this organisation.The primary target being for AI systems understanding and learning human languages with a focus towards developing beneficial technological advancements that would ensure humanity's safety according to their digital ethics.

GPT-3

GPT- 3 is a state- of- the- art natural language processing model created by OpenAI.The model is among the largest language models in actuality, with an emotional 175 billion parameters. One of the most remarkable features of GPT- 3 is its capability to induce mortal- suchlike textbook responses to different prompts similar as question- answering, language restatement, and creative jotting. GPT- 3's natural language understanding, sentiment analysis, and language restatement capabilities are exceptional, it an important tool for chatbot operations and client service. In conclusion, GPT- 3 is a groundbreaking technology that has enormous implicit in several diligence and operations. Its advanced natural language processing capabilities are emotional, but careful ethical considerations and oversight are necessary to insure its safe and salutary use.

We employed the text Davinci-003 model for our chatbot, which is one of the most powerful text generating models in GPT-3. In conversing with the user, the chatbot uses this model to provide acceptable responses. Because the model has been trained on a large number of datasets, it is capable of producing unique replies each time a user interacts with the chatbot.
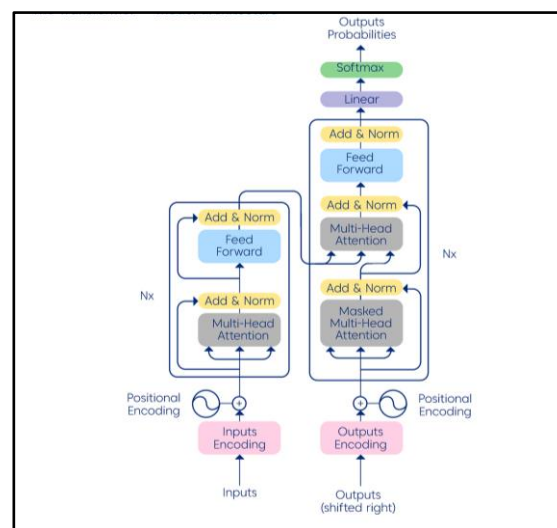

Figure 2 Transformer GPT3 architecture

Python

Python stands out as a dynamic programming language that garners widespread praise for its effortless usage and simple-to-decipher text. Its design approach gives priority to code readability, which is accomplished by indenting the script. Python comes furnished with extensive libraries and modules enabling use in numerous domains ranging from web development through data analysis over artificial intelligence projects. All things considered; Python provides an exceptional choice of high-level programming languages suitable for anyone seeking proficiency coupled with ease-of-use when learning a powerful toolset like this one.

Flask being one of the framework of python used for web development.we created a website 'bruv' which provides an interface which consists of different components like chatbot, games and enlightening quotes, with the help of this framework.

HTML

HTML, or Hypertext Markup Language, is a standard luxury language used to produce web runners. Its primary purpose is to structure content on web runners and give meaning to its rudiments, making it an abecedarian element of web development. HTML documents are plain textbook lines that can be created and edited with any textbook editor. Web cybersurfers, similar as Chrome, Firefox, and Safari, can also render these documents to display the content on the web. In addition to HTML, web inventors use CSS and JavaScript to enhance the visual style and interactivity of web runners.

We established the fundamental framework of our web page using HTML, and the styling of the web page was completed using Bootstrap. Javascript was used to make games that will assist users relieve tension.

Hugging face

Hugging Face is a New York City- grounded software company that specialize in natural language processing(NLP) and deep literacy. The company offers a broad range of NLP tools and models, including pre-trained language models and libraries. Its most popular product is the Mills, an open- source library that provides advanced NLP models for tasks similar as textbook bracket, language restatement, and question- answering. Hugging Face has developed a chatbot- structure platform known as Space that

allows inventors to produce chatbots usingpre-trained models and stoner-friendly interfaces, making it more accessible for non-experts to make chatbots.

We used RoBERTa which is one of the Hugging face model . EmoRoBERTa is finetuned model of RoBERTa which is trained using GoEmotion corpus , for our chatbot we made use of this model for sentiment analysis ; classifying emotions of user. The model can classify 28 emotions which are , happiness ,sadness ,amusement, embarrassment, gratitude , admiration , disappointment , annoyance, disgust, surprise , pride , neutral , curiosity , nervousness , caring , relief , love , approval , remorse , realisation , optimism, grief , confusion .
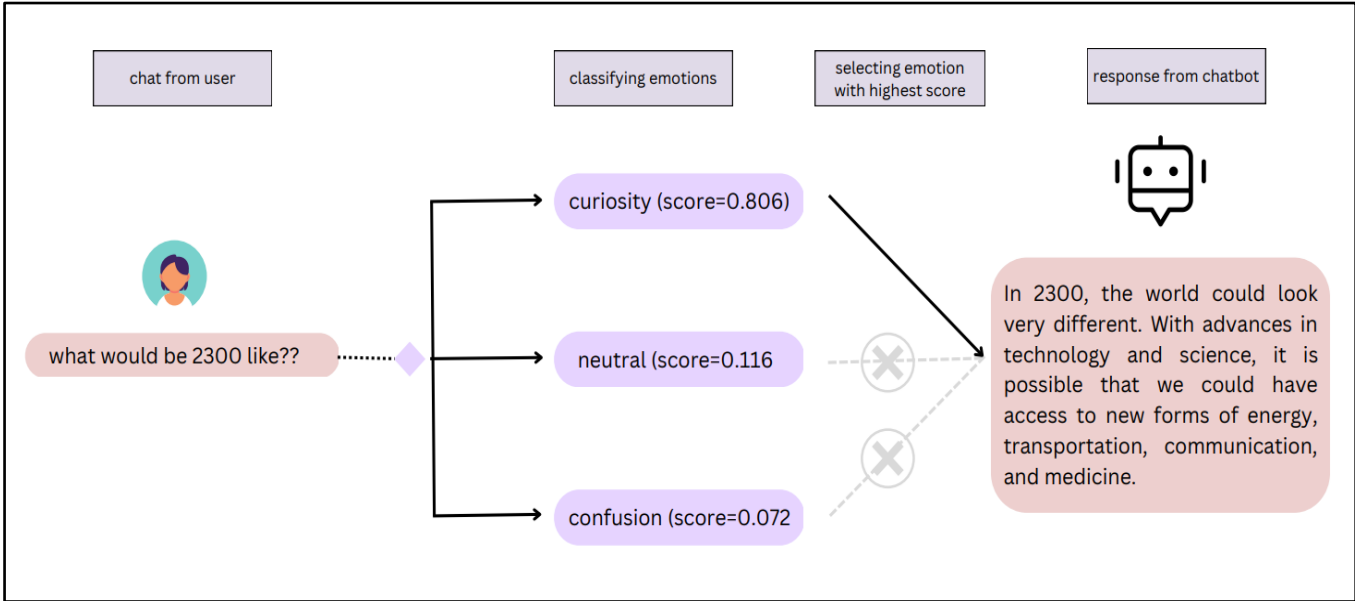

Figure 3 different emotions

Figure 4 recognizing the sentiment of the user

MySQL

MySQL is a relational database operation system based on the Structured Query Language, which is a common language for accessing and managing database entries.We have used database to store the emotions of users and then visualise it using different types of graphs.
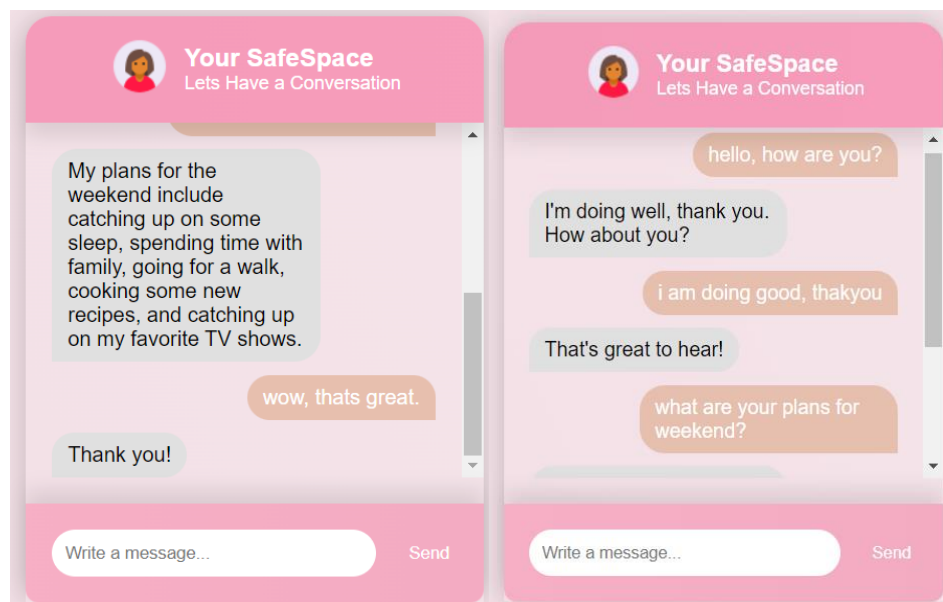
Working of our chatbot

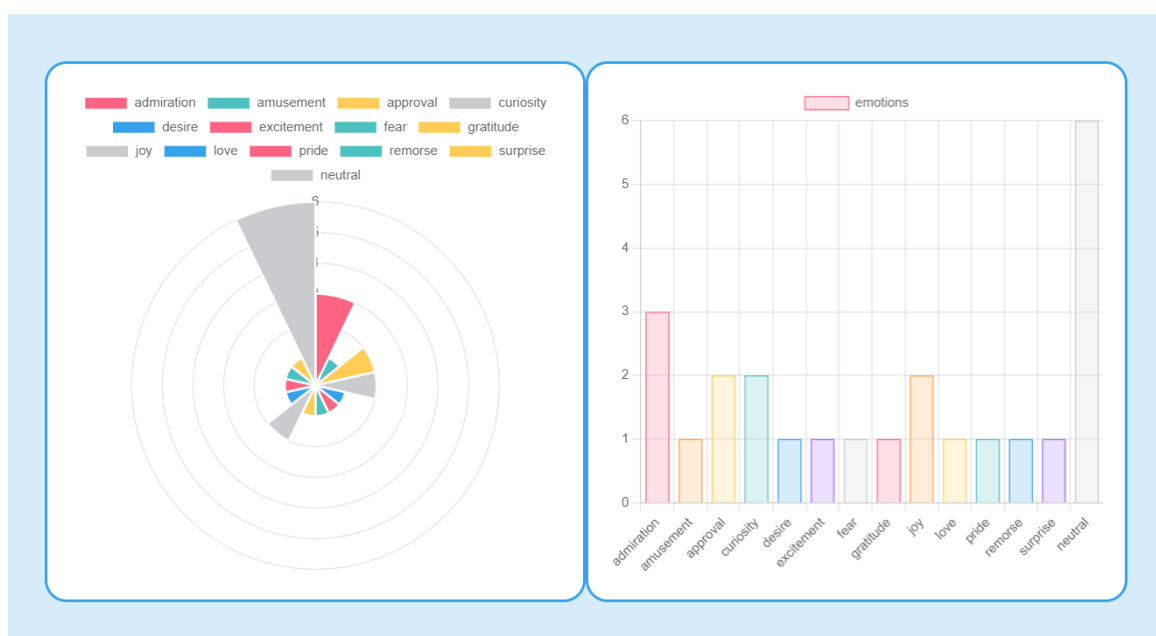**Fig 5 conversation of chatbot with user**

Fig 6 Graphs representing moods of user

IV.   Result

The goal is to build a chatbot that can help and support a person emotionally and who they can trust. The chatbot will keep track of the user's emotional condition as a result of their interactions. Apart from the feature of chatbot the website include different activities such as games and music, to help the users to uplift their mood. The website stores and displays the emotions of all the users interacted with the chatbot with the help of different types of graphs.

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