MEDIBOT

A PROJECT REPORT

Submitted by

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in partial fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE AND ENGINEERING

GOVERNMENT COLLEGE OF ENGINEERING

ERODE – 638 316

ANNA UNIVERSITY : CHENNAI – 600 025

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BONAFIDE CERTIFICATE

Certified that this project report **"MEDIBOT"** is the bonafide work of **DHANAPAL M (731120104008), MANOJ T(731120104028), NARENDRAN B (731120104031), NAVEEN KUMAR V (731120104032)** who carried out the project work under our supervision.

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ABSTRACT

As a result of the rapid technological development and the development of the chatbot concept and the time and effort it can save. Many specialized frameworks have emerged to undertake chatbot creation and development.

By relying on artificial intelligence, the chatbot has integrated machine learning within it, and it has become more comprehensive and wider for various technological fields.

The project “MediBot” addresses the need for a user-friendly digital assistant aimed at providing suggestions for the mental illness problems for the user.

This chatbot aims to revolutionize mental health treatment by leveraging AI Chatbot and Machine Learning technologies.

By addressing the incomplete alleviation of depression symptoms, attrition, and loss of follow-up, our system seeks to provide personalized and continuous support for individuals undergoing mental health intervention.

As a conclusion, it lies in answering frequent and common questions by people and providing the answer to these questions at any time the person wants.

LIST OF FIGURES

LIST OF ABBREVIATIONS

AI	-	Artificial Intelligence
CBT	-	Cognitive Behavioural Therapy
EHR	-	Electronic Health Records
HCI	-	Human Computer Interaction
LSTM	-	Long Short Term Memory
NLP	-	Natural Language Processing
NLTK	-	Natural Language Tool Kit
RCT	-	Randomised Control Trial

CHAPTER 1

INTRODUCTION

Chatbot is a computer program that humans will interact with in natural spoken language and including artificial intelligence techniques such as NLP (Natural language processing) that makes the chatbot more interactive and more reliable.

A chatbot is a computer program that simulates human conversations or chat through AI. Artificial Intelligence (AI) increasingly Integrates our daily lives with the creation and analysis of intelligent software and hardware, called intelligent agents. Intelligent agents can do a variety of tasks ranging - sophisticated operations. A chatbots a typical example of an AI system and one of the most elementary and widespread examples of intelligent Human-Computer Interaction (HCI).

It is a computer program, which responds like a smart entity when conversed with through text and understands one or more human languages by Natural Language Processing (NLP). In the lexicon, a chatbot is defined as “A computer program designed to simulate con-versation with human users,especially over the Internet”.

Chatbots are also known as smart bots, interactive agents, digital assistants, or artificial conversation entities. Chatbots can mimic human conversation and entertain users but they are not built only for this. They are useful in applications such as education, information retrieval, business, health-care and e-commerce. “MediBot” aims to develop a user-friendly digital assistant providing suggestions for the mental depression for the users.

1.1 PROBLEM STATEMENT

How might utilize the AI CHATBOT and Machine learning to address the challenges of incomplete alleviation of depression symptoms, attrition and loss of follow-up in mental health treatment.

Depression, a prevalent mental health condition, often presents challenges in treatment effectiveness.

Current approaches frequently result in incomplete symptom alleviation, high attrition rates, and loss of follow-up.

Through this initiative, these issues underscore the need for an innovative solution to enhance the overall efficiency of mental health interventions.

1.2 OBJECTIVES

- Designing an AI Chatbot system capable of providing personalized mental health support and interventions tailored to individual needs and preferences.
- Implementing machine learning algorithms to analyse user input, behavioural patterns, and sentiment analysis to identify individuals at risk of incomplete alleviation of depression symptoms, attrition, or loss of follow-up.
- Implementing AI algorithms to continuously monitor user progress, symptom severity, and treatment adherence. The system should be able to detect deviations from the expected trajectory and provide timely interventions or adjustments to the treatment plan.
- Establishing mechanisms for gathering user feedback, monitoring system performance, and iterating on the AI Chatbot platform to continually improve its effectiveness in addressing the challenges of incomplete alleviation of depression symptoms, attrition, and loss of follow- up in mental health treatment.

1.3 SCOPE

- Conducting thorough research and analysis to understand the underlying causes of incomplete alleviation of depression symptoms, attrition, and loss of follow-up in mental health treatment. This involves reviewing existing literature, studying patient demographics, and identifying common barriers to successful treatment outcomes.
- Developing AI Chatbot systems equipped with natural language processing (NLP) capabilities to facilitate seamless communication with users. This involves designing intuitive user interfaces, implementing machine learning algorithms for sentiment analysis and personalized recommendations, and integrating with backend systems for data management.
- Collecting relevant data from various sources, including user interactions with the AI Chatbot, electronic health records (EHR), wearable devices, and other health monitoring tools. Ensuring interoperability and seamless integration of data from disparate sources to provide a comprehensive view of the user's mental health status and treatment history.
- Designing and training machine learning algorithms to analyse user data, predict treatment outcomes, detect early warning signs of relapse or attrition, and personalize interventions. This involves selecting appropriate machine learning models, preprocessing and feature engineering, model training, validation, and optimization.
- Conducting rigorous clinical validation studies to assess the effectiveness of the AI Chatbot platform in improving treatment outcomes, reducing attrition rates, and enhancing patient engagement. This involves collaborating with mental health professionals, conducting randomized controlled trials (RCTs), and collecting qualitative and quantitative feedback from users.

- Prioritizing user-centred design principles to create engaging and interactive experiences within the AI Chatbot platform. This includes designing personalized interventions, providing real-time feedback and support, and incorporating gamification elements to encourage continued engagement and adherence to treatment plans.
- Ensuring compliance with relevant regulations, such as HIPAA, GDPR(General Data Protection Regulation), and ethical guidelines for the responsible use of AI in healthcare. Implementing robust data privacy and security measures to protect sensitive health information and maintain user trust.
- Planning for scalability and deployment of the AI Chatbot platform to reach a wide audience of users across different geographical regions and demographic groups. This involves designing scalable infrastructure, optimizing performance for high concurrency, and addressing potential challenges related to cultural and linguistic diversity.

CHAPTER 2

SYSTEM ANALYSIS

2.1 EXISTING SYSTEM

1. Traditional Therapy and Counselling

The most common approach involves in-person therapy sessions with mental health professionals such as psychologists, psychiatrists, or counsellors. While effective for many individuals, this approach can be limited by factors such as cost, availability of qualified professionals, and stigma associated with seeking help.

2. Teletherapy and Online Counselling Platforms

With the advancement of technology, teletherapy and online counselling platforms have become increasingly popular. These platforms allow individuals to receive therapy remotely via video calls, phone calls, or text- based messaging. While offering greater accessibility and convenience, these platforms may still face challenges related to engagement, quality of care, and user satisfaction.

3. Mobile Applications for Mental Health

There is a growing number of mobile applications designed to provide mental health support, self-help tools, and resources. These apps often offer features such as mood tracking, meditation exercises, cognitive behavioural therapy (CBT) techniques, and peer support communities. However, the effectiveness of these apps can vary widely, and they may struggle to address complex mental health issues or provide personalized intervention.

4. Digital Therapeutics

Digital therapeutics are evidence-based interventions delivered through software programs or devices to prevent, manage, or treat medical conditions, including mental health disorders. These interventions typically incorporate elements of cognitive behavioural therapy (CBT), mindfulness, and psychoeducation. While promising, the efficacy of digital therapeutics for depression and other mental health conditions is still being evaluated through clinical trials.

5. Chatbots and Virtual Assistants

Some organizations have developed AI-powered chatbots and virtual assistants to provide mental health support and guidance. These chatbots leverage natural language processing (NLP) algorithms to engage in conversations with users, offer psychoeducation, provide coping strategies, and offer referrals to mental health professionals when needed. However, their effectiveness in addressing the challenges of depression symptoms, attrition, and loss of follow-up may vary depending on factors such as the sophistication of the AI algorithms and the quality of the content.

2.2 DRAWBACKS IN EXISTING SYSTEM

Some potential drawbacks or limitations of the existing systems mentioned

1. Limited Accessibility

Traditional therapy and counselling services may be inaccessible to certain populations due to factors such as geographical location, cost, lack of insurance coverage, or long wait times for appointments. This limitation can prevent individuals from receiving timely and adequate support.

2. **Stigma and Barriers to Seeking Help**

Despite efforts to reduce stigma surrounding mental health, many individuals still face internal and external barriers to seeking help. Fear of judgment, discrimination, or social repercussions may deter people from accessing therapy or counselling services, leading to untreated or under-treated mental health conditions.

3. **High Attrition Rate**

Attrition rates in traditional therapy settings can be significant, with many individuals discontinuing treatment prematurely. Factors contributing to attrition include dissatisfaction with treatment progress, logistical challenges (e.g., scheduling conflicts, transportation issues), lack of engagement or rapport with the therapist, and perceived lack of effectiveness.

4. **Resource Constraint**

The availability of mental health resources, including qualified professionals, specialized treatment programs, and support services, may be limited in certain regions or healthcare systems. This scarcity can result in long wait times for appointments, limited treatment options, and disparities in access to care based on socioeconomic factors.

5. **Privacy and Security Concern**

The use of digital platforms for mental health support raises concerns about data privacy, confidentiality, and security. Users may be hesitant to disclose sensitive information or engage in therapeutic activities online due to fears of data breaches, unauthorized access, or misuse of personal information.

2.3 PROPOSED SYSTEM

A proposed system for addressing the challenges of incomplete alleviation of depression symptoms, attrition, and loss of follow-up in mental health treatment using AI Chatbot and machine learning could include the following components.

Key Features

1. AI-Powered Chatbot Interface

Develop an AI-powered chatbot interface that serves as a virtual mental health companion for users. The chatbot should be designed to engage users in natural language conversations, provide empathetic responses, and offer personalized support and interventions.

2. Machine Learning Algorithms for Personalization

- Implement machine learning algorithms to analyse user data, including demographic information, treatment history, symptom severity, and behavioural patterns.

- These algorithms should generate personalized treatment recommendations, adaptive interventions, and targeted support based on individual needs and preferences.

3. Behavioural Tracking and Monitoring

Integrate machine learning algorithms to continuously track and monitor user behaviour, adherence to treatment plans, and progress towards treatment goals. This involves analysing user input, activity logs, and sensor data from wearable devices to assess treatment efficacy.

4. Privacy and Security Measures

Implement robust privacy and security measures to protect user data, ensure confidentiality, and comply with regulatory requirements such as HIPAA. This includes encryption protocols, access controls, and regular security audits to safeguard sensitive health information.

CHAPTER 3

CHATBOTS

3.1 CHATBOT

A chatbot is a computer program that can simulate a conversation or chat with a user in natural language through messaging applications, website, or mobile applications and interact with users according to their input and should be available 24/7. Chatbots are developed and became so popular due to the increased use of smart devices and IoT technology.

3.2 TYPES OF CHATBOTS

Base-line chatbot

It is a chatbot that is based on a database and uses if / then logic to create a conversation flow and that takes a lot of time to ensure the understanding of the question and the answer needed.

AI chatbot

This type of chatbot is more complex than base-line but it is more interactive and personalized and needs big data training to be impressive if the problem is matched to their capabilities.

Hybrid Model

A hybrid approach mixes the Base-line & AI chatbot to make it smart and his behaviour more expected by depending on database and Ai algorithm to work together.

3.3 WORKING OF CHATBOTS

Briefly and as mentioned in the definition, humans interact with chatbots. There are two ways to interact with a chatbot

Text chatbot analyses the inputted text and matches the text with predefined data called intents which are categorized to manage the conversation. The user utterance is tagged with one of these intents, even if what the user says stretches over two or more intents. Most chatbots will take the intent with the highest score and take the conversation down that avenue.

3.4 OPTIONS TO BUILD CHATBOTS

From Scratch

At first have to identify the opportunities for our chatbot and decide its field and scope to achieve efficiency and accuracy. and a precise understanding of the customer needs is required to solve the operational challenges. Then the design of the bot comes to be a significant stage to decide the user engagement with app or website. and this can be categorize chatbot interactions as structured and unstructured interactions.

- Structured interaction. Already know about this kind of interaction. This know what customers will ask and can design it easily it's just like an FAQ section of app or website. This information will link to contact information, services, products, etc.
- Unstructured interaction. The unstructured conversation flow includes freestyle plain text. It's hard to predict what queries will emerge and it looks like an extempore speech competition for chatbot. the role of AI comes to lights here, it decodes the context of the text based on NLP analysis. while the same NLP will provide a voice to the chatbot.

The later choice will need specialized chatbot developers with an understanding of programming languages, machine learning, and AI.This can use some of the code-based frameworks to build and handle the chatbot like wit.ai and api.ai.

Using platforms

It is similar to scratch chatbots but the only difference is not to hire a specialized developer and use the chatbot builder platforms like Chatfuel, Botsify and Rasa, it's not hard or impossible to achieve it. but it's not possible to create a NLP-enabled chatbot that can deal with unstructured data.

3.5 CHATBOTS PLATFORM ALTERNATIVES

IBM Watson: IBM Watson is touted as a question-and-answer system that can be used to build applications and chatbots. The IBM Watson platform allows us to create an application that shares a dialog interaction between our chatbot andusers on Quick n' Easy Projector Rentals. The IBM interface is simple to use, and no back-end coding is shown at first glance. The chatbot can be easily integrated into other applications such as Slack, Facebook, and Twilio.

Google Dialogflow: Dialogflow is an easy to understand conversational agent. Theoretically, this can have a bot up and running by understanding 3 core concepts: intents, entities, and dialog control. As stated earlier, these general concepts are followed across a majority of the chatbot platforms played with.

Rasa: Rasa is an open source chatbot that is equipped with a natural language processing tool. The open source tool is called Rasa NLU. Tweak and customize the machine learning algorithm that Rasa uses so that created model provides the desired results.

Rasa NLU can be run, and none of training data has to be passed over to Google, Microsoft, Amazon, or Facebook to train chatbot.

3.6 SELECTED PLATFORM

Highly customisable with various pipelines can be employed to process user dialogues.

Rasa has its disadvantages like

1. server requirements although spacy is a very fast NLP platform, it seems to be very memory hungry.

2. Learning curve- Installation, configuration and training phases require machine learning expertise (at least basic level)

3. Context based conversation not available out of the box- Rasa-nlu does not maintain the context automatically. This has to be programmed separately into the chat service.

CHAPTER 4

REQUIREMENT AND ANALYSIS

4.1 REQUIREMENT SPECIFICATION

4.1.1 FUNCTIONAL REQUIREMENTS

Functional requirements for addressing the challenges of incomplete alleviation of depression symptoms, attrition, and loss of follow-up in mental health treatment using AI Chatbot and machine learning include:

1. User Authentication and Profile Creation

- Users should be able to create accounts and provide relevant demographic and health information.
- Authentication mechanisms should ensure the security and privacy of user data.

2. AI Chatbot Interface

- Develop a conversational AI interface capable of engaging users in natural language conversations.
- The chatbot should be able to understand user queries, provide empathetic responses, and offer mental health support.

3. Personalized Assessment and Monitoring

- Conduct personalized assessments of users' mental health status, including depression symptoms, using validated scales and questionnaires.
- Implement machine learning algorithms to continuously monitor user behavior, symptom severity, and treatment progress.

4. **Early Detection and Intervention**

- Develop machine learning models to detect early warning signs of worsening symptoms, attrition, or loss of follow-up.
- Trigger proactive interventions, such as personalized support messages, coping strategies, or referrals to healthcare providers.

5. **Feedback and Continuous Improvement**

- Collect user feedback through surveys, ratings, and qualitative feedback mechanisms to evaluate the effectiveness and usability of the system.
- Use feedback to iteratively improve the AI Chatbot interface, machine learning algorithms, and overall system functionality.

4.1.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements for addressing the challenges of incomplete alleviation of depression symptoms, attrition, and loss of follow-up in mental health treatment using AI Chatbot and machine learning include:

1. **Performance**

- The system should respond promptly to user queries and interactions, with minimal latency.
- Machine learning algorithms should be optimized for efficiency to handle large volumes of user data and provide real-time insights.

2. **Scalability**

- The system should be scalable to accommodate increasing user demand and growing datasets.

- It should be able to handle spikes in usage without degradation in performance.

3. Reliability

- The system should operate reliably without frequent downtime or disruptions.
- Measures should be in place to ensure data integrity and prevent data loss or corruption.

4. Security

- Robust security measures should be implemented to protect user data from unauthorized access, tampering, or breaches.
- Encryption protocols should be employed to secure data transmission and storage.

5. Usability

- The system should have an intuitive user interface that is easy to navigate and understand.
- It should be accessible to users with varying levels of digital literacy and cognitive abilities.

6. Compatibility

- The system should be compatible with a wide range of devices and platforms, including web browsers, mobile devices, and assistive technologies.
- It should support interoperability with existing healthcare systems and electronic health records (EHR) platforms.

7. Maintainability

- The system should be designed with modularity and maintainability in mind, allowing for easy updates.
- Codebase documentation and version control should be maintained to facilitate ongoing development and support.

8. Ethical Considerations

The system should adhere to ethical guidelines for the responsible use of AI in healthcare, including transparency, fairness, and accountability. Bias mitigation techniques should be implemented to ensure equitable treatment across diverse user populations**.**

4.2 SYSTEM REQUIREMENTS

4.2.1 HARDWARE REQUIREMENTS

- Processor : i3/i5 and above
- RAM : 8GB and above
- System Type : 64-bit OS, x64-based processor
- Hard Disk : 20GB for 64 BIT.

4.2.2 SOFTWARE REQUIREMENTS

- Operating system : Windows7, 8, 8.1,10 and11
- Language : Python
- Framework : Streamlit
- Python Modules & Libraries : NLP (0.4.0)
  Tensorflow (2.1.5)
  Keras (2.12.0)
  LSTM (0.8.0)
  Pandas (1.5.2)

4.3 SOFTWARE DESCRIPTION

Python

Python is a high-level, interpreted, interactive and object-oriented scripting language Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

- Python is Interpreted - Python is processed at runtime by the interpreter. One does not need to compile the program before executing it. This is similar to PERL and PHP.

- Python is Interactive - One can actually sit at a Python prompt and interact with the interpreter directly to write programs.

- Python is Object-Oriented - Python supports Object-Oriented style or technique of programming that encapsulates code within objects.

- Python is a Beginner's Language Python is a great language for the beginner- level programmers and supports the development of a wide range of applications.

Install Python IDE

Python is available from its website, python.org. Once there, hover the mouse over the Downloads menu, then over the Windows option, and then click the button to download the latest release. Alternatively, click the Downloads menu button and select a specific version from the downloads.

Install Python

Once the package is downloaded, open it to start the installer.It is safe to accept the default install location, and it's vital to add Python to PATH. If Python is not added to the PATH, then Python applications won't know where to find Python (which require in order to run). This is not selected by default, so activate it at the bottom of the install windows.

NUMPY

- Numpy is a widely-used Python library for numerical computing that provides powerful tools for manipulating large arrays and matrices of numeric data.
- NumPy is utilised for array operations to encode input and target sequences into numerical arrays, facilitating efficient processing of textual data during model training. It enables vectorized operations, speeding up computations and enhancing the scalability of the chatbot model.

KERAS

- Keras is used to define the layers of the neural network model, including input, hidden, and output layers. It provides a wide range of layer types, such as dense, convolutional, recurrent, and embedding layers, allowing for flexible model architectures.
- It supports feature extraction and transformation through its various layer types. It enables the extraction of meaningful features from input data, which are essential for learning representations of mental health-related concepts and patterns.

PANDAS

- The Pandas is employed to load the dataset containing mental health-related questions and answers from a CSV file (**mentalhealth.csv**). It enables efficient loading, manipulation, and exploration of tabular data, ensuring easy access to the dataset for preprocessing and analysis.
- Pandas facilitates data preprocessing tasks, such as cleaning, filtering, and transforming the dataset. It allows for removing duplicate records, handling missing values, and formatting data to prepare it for model training, ensuringthe quality and consistency of input data for the chatbot model.

TENSORFLOW.KERAS

- TensorFlow.keras is used to construct the neural network model architecture for the chatbot. It provides high-level APIs for defining and configuring layers, enabling the creation of complex models with ease.
- It used to construct the neural network model architecture for the chatbot. It provides high-level APIs for defining and configuring layers, enabling the creation of complex models with ease.
- Facilitates model training through its built-in optimization algorithms and loss functions.

NLTK (Natural Language Toolkit)

- NLTK provides powerful tokenization tools that can split text into individual words or sentences, a fundamental preprocessing step in natural language processing tasks. It enables the chatbot to parse user input and understand the structure of queries and responses.
- NLTK offers built-in stop-word lists for various languages, allowing for the removal of common words like "the", "is", and "and" that do not carry significant meaning. This preprocessing step reduces noise in the text data and improves the relevance of generated responses.
- NLTK includes algorithms for part-of-speech tagging, which assigns grammatical categories (e.g., noun, verb, adjective) to words in a sentence. POS tagging helps the chatbot understand the syntactic structure of sentences and generate grammatically correct responses.
- NLTK supports stemming and lemmatization, two techniques for reducing words to their base forms (e.g., "running" to "run" or "better" to "good").

CHAPTER 5

SYSTEM DESIGN

USECASE DIAGRAM

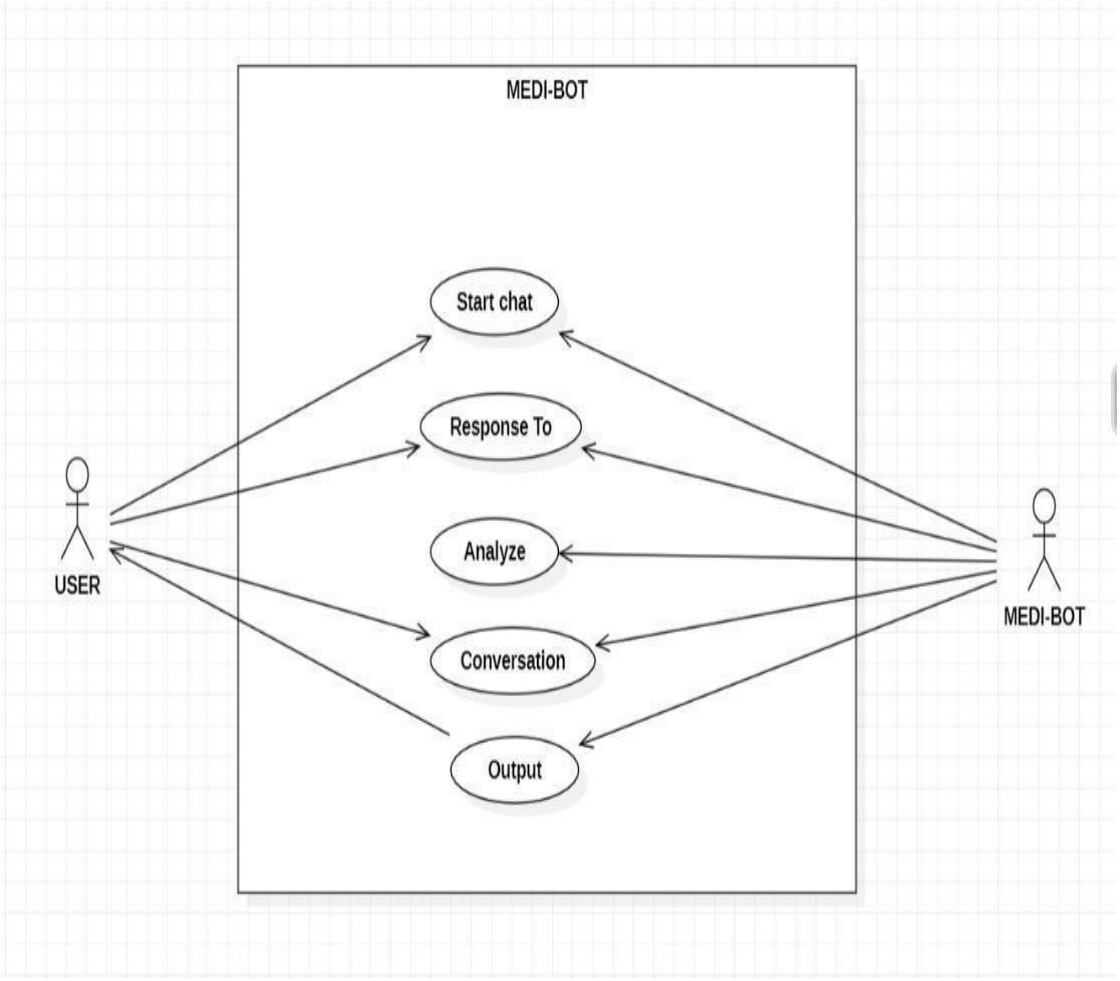

Figure 6.1 Use case Diagram

The user initiates a chat by clicking on "Start chat". The user interacts with the chatbot through conversation. The chatbot analyzes the conversation to understand the user's intent. Based on the analysis, the chatbot provides a response or output.

SEQUENCE DIAGRAM

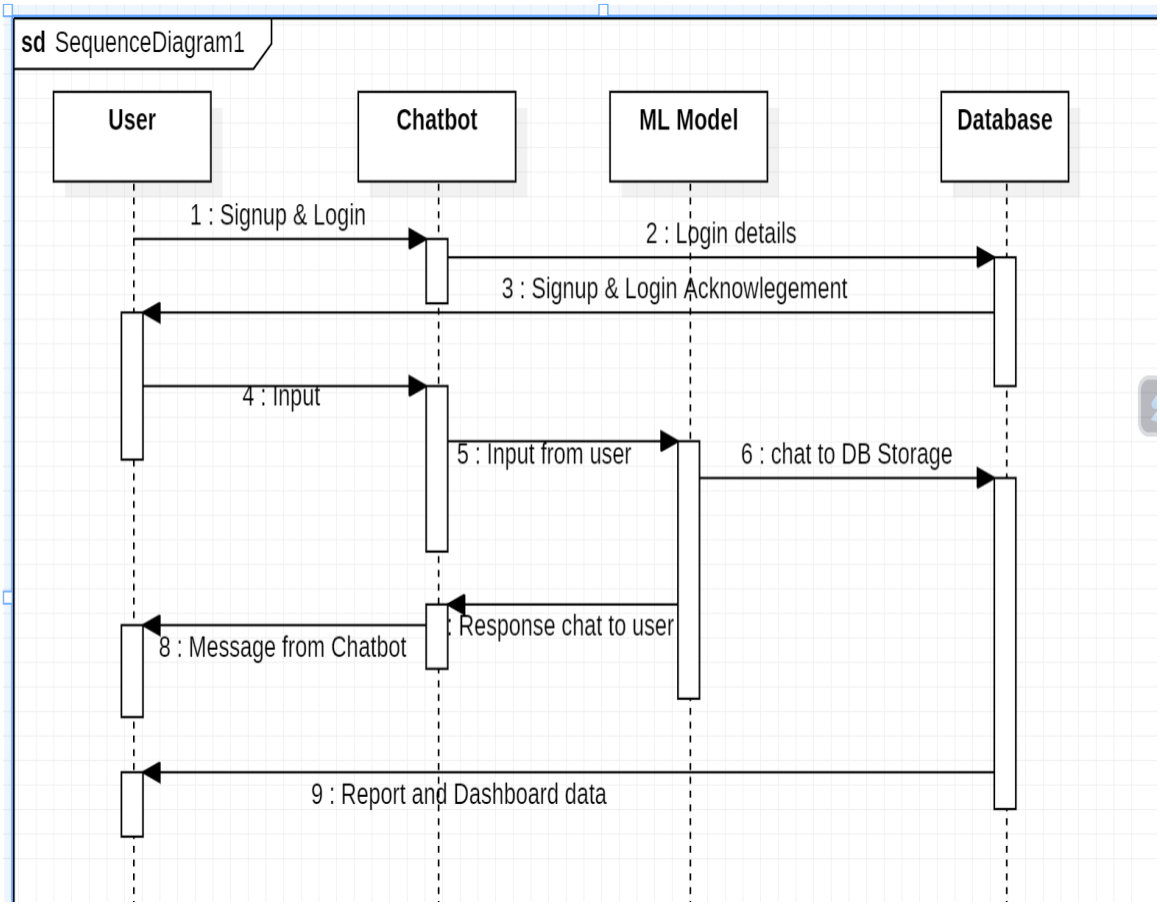

Figure 6.2 Sequence Diagram

The user initiates the interaction by signing up and logging in. The system acknowledges the login details. The user sends a message to the chatbot. The chatbot processes the message and retrieves relevant data from the database. The chatbot generates a response and sends it back to the user.

ACTIVITY DIAGRAM

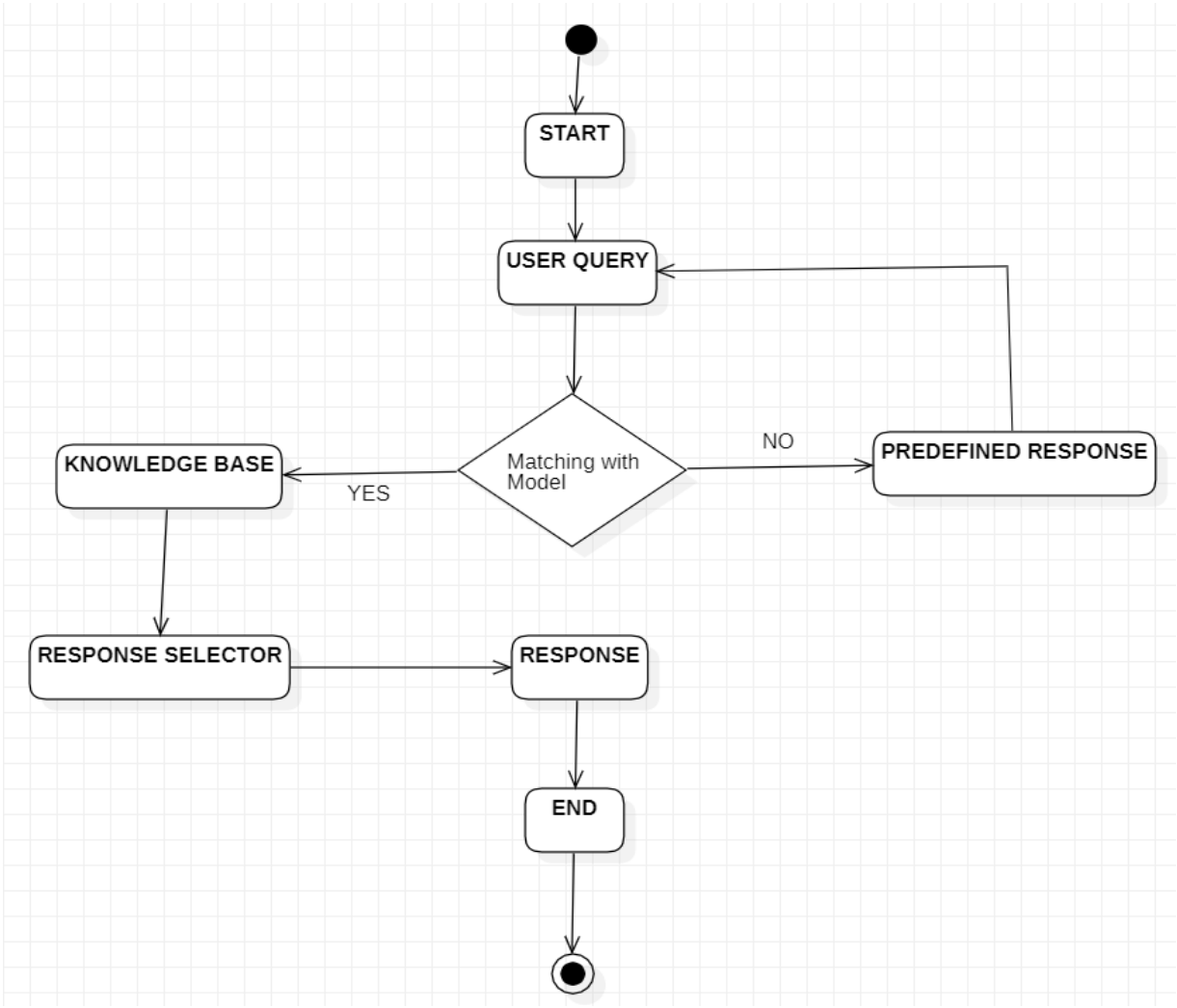

Figure 6.3 Activity Diagram

The user submits a query. The system checks the knowledge base to see if there's a predefined response. If a match is found, the system retrieves the corresponding response. If there's no match, the system moves on to the next step. The user receives a response from the system.

DATAFLOW DIAGRAM

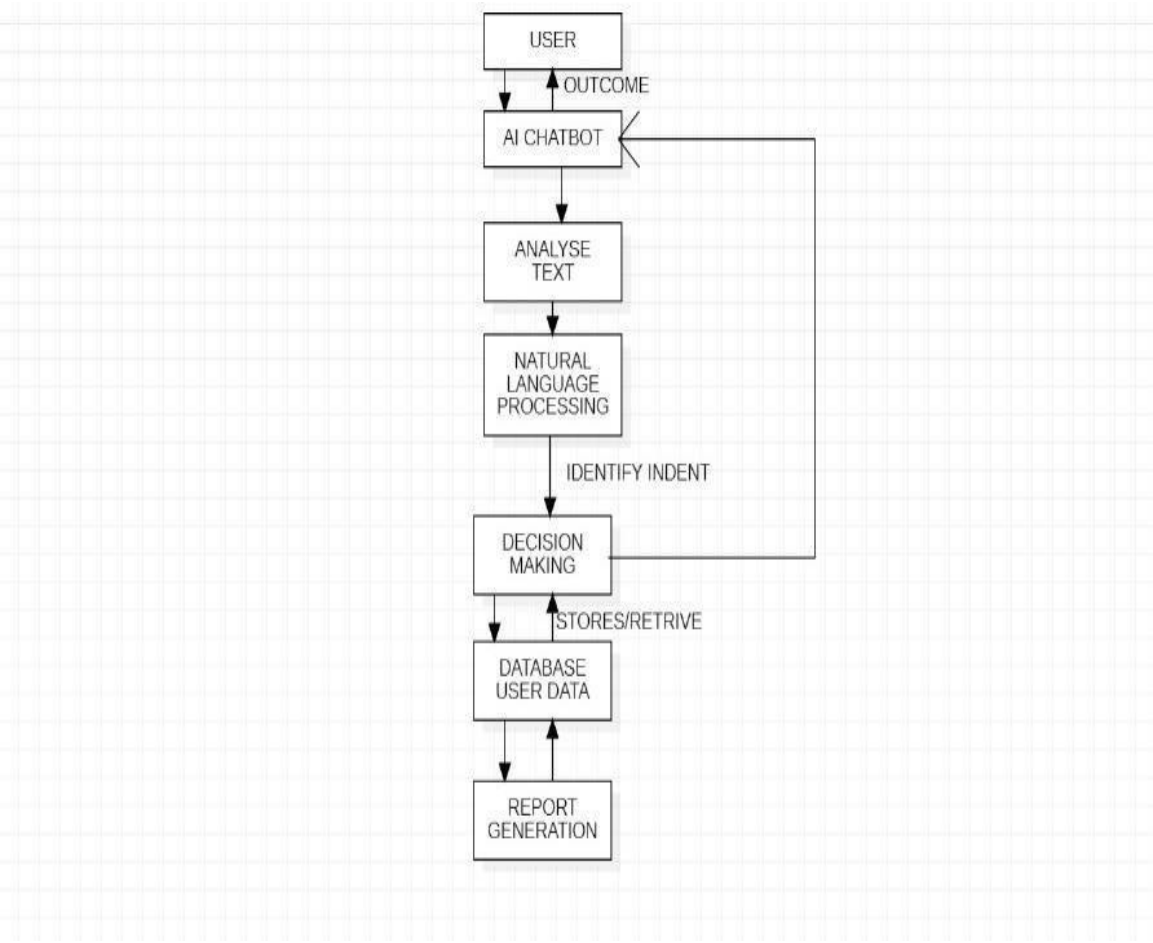

Figure 6.4 Dataflow diagram

Identify the website's goals. Analyze text through Natural Language Processing (NLP). Make decisions based on the analysis.

CHAPTER 6

PROJECT DESCRIPTION

The project aims to develop an AI chatbot for mental health illness treatment, leveraging artificial intelligence (AI) technology to provide accessible, personalised, and effective support for individuals experiencing mental health challenges. The chatbot will serve as a virtual companion, offering psychoeducation, coping strategies, emotional support, and resources for self-care and professional intervention. Through natural language processing (NLP) algorithms and machine learning techniques, the chatbot will engage users in empathetic and meaningful conversations, adapting its responses based on user input, preferences, and behavioural patterns. The chatbot will also integrate with existing mental health services, facilitating seamless referrals to human therapists or counsellors when more intensive intervention is needed. The project prioritises the development of a user-friendly interface, stringent data privacy and security measures, and adherence to ethical guidelines and best practices in mental health care delivery. Ultimately, the AI chatbot for mental health illness treatment aims to bridge the gap between individuals in need of support and the resources and services that can help them manage their mental health and well-being effectively.

6.1 MODULE DESCRIPTION

USER INTERFACE (UI)

- Design an intuitive and user-friendly interface for interacting with the chatbot, incorporating features such as text input, buttons, menus, and multimedia content.

NATURAL LANGUAGE PROCESSING (NLP)

- Develop NLP algorithms such as seq2seq, LSTM to analyse user input, extract meaning, and generate appropriate responses using techniques such as tokenization, named entity recognition, and sentiment analysis.

MACHINE LEARNING (ML)

- Train machine learning models to improve the chatbot's understanding and responsiveness over time, incorporating techniques such as supervised learning, reinforcement learning, and deep learning.

KNOWLEDGE BASE

- Create a comprehensive knowledge base of mental health resources, information, coping strategies, and self-help techniques to provide accurate and helpful responses to user queries.

USER MANAGEMENT

- Implement user authentication, registration, and profile management functionalities to personalise the chatbot's responses and track user interactions over time.

DATA STORAGE AND SECURITY

● Set up secure databases and data storage systems to store user data, conversation history, and analytics, ensuring compliance with data privacy regulations and best practices.

INTEGRATION WITH EXTERNAL SERVICES

● Integrate the chatbot with external APIs and services, such as crisis hotlines, therapy directories, and mental health assessment tools, to enhance its capabilities and provide additional support to users.

FEEDBACK AND REPORTING

• Incorporate feedback mechanisms to gather user input, suggestions, and ratings, enabling continuous improvement and optimization of the chatbot's performance.

CHAPTER 7

SYSTEM TESTING

System testing is a crucial phase in the software development lifecycle aimed at verifying that the entire system meets the specified requirements and functions correctly as a cohesive whole. It involves testing the integrated components, modules, and interactions to ensure that the system behaves as expected and fulfills its intended purpose. For the given problem statement of developing an AI Chatbot and machine learning-based mental health support system, system testing involves various types of testing, including unit testing and integrity testing.

This project has undergone the following testing procedures to ensure its correctness

- Unit testing
- Integrity testing

7.1 UNIT TESTING

Unit testing focuses on testing individual components or modules of the system in isolation to verify their correctness and functionality. For the AI Chatbot and machine learning-based mental health support system, unit testing would involve:

1. Testing individual modules such as the AI Chatbot interface, machine learning algorithms, user authentication, and database operations.

2. Writing test cases to validate the behavior of each module under different scenarios and edge cases.

3. Mocking dependencies and external services to isolate the unit being tested.

4. Performing tests for boundary conditions, error handling, and edge cases to ensure robustness.

5. Automating unit tests using testing frameworks and tools to streamline the testing process and ensure consistency.

7.2 INTEGRITY TESTING

Integrity testing, also known as integration testing, focuses on testing the interactions and interfaces between integrated components to ensure that they function correctly together. For the AI Chatbot and machine learning-based mental health support system, integrity testing would involve:

1. Testing the integration between the AI Chatbot interface and backend services, including machine learning algorithms, user authentication, and database operations.

2. Verifying that data flows correctly between components and that interactions follow specified protocols and standards.

3. Testing API endpoints and data exchanges to ensure proper communication and interoperability between system components.

4. Performing end-to-end tests to validate the system's functionality from user input through the AI Chatbot interface to backend processing and database operations.

5. Identifying and resolving integration issues, such as data inconsistencies, communication failures, or interface mismatches, to ensure system integrity and reliability.

CHAPTER 8

CONCLUSION AND FUTURE ENHANCEMENT

8.1 CONCLUSION

In conclusion, the development of an AI chatbot for mental health illness treatment represents a significant advancement in the field of mental health care delivery. Through the application of natural language processing, machine learning, and user-centric design principles, the chatbot offers accessible, personalised, and effective support for individuals experiencing mental health challenges. By providing round-the-clock access to psychoeducation, coping strategies, emotional support, and resources, the chatbot addresses barriers to care such as stigma, accessibility, and affordability, ultimately empowering individuals to take control of their mental health and well-being.

However, while the AI chatbot holds promise in expanding access to mental health support and interventions, it is essential to address potential limitations and ethical considerations surrounding its use. Rigorous testing, continuous monitoring, and adherence to privacy and security standards are critical to ensuring the reliability, effectiveness, and ethical use of the chatbot. Moreover, the chatbot should complement rather than replace traditional mental health services, with appropriate referrals and integration mechanisms in place to facilitate seamless collaboration between human therapists and digital interventions. With careful implementation and ongoing refinement, the AI chatbot has the potential to revolutionize mental health care delivery, providing valuable support and resources to individuals worldwide.

8.2 FUTURE ENHANCEMENT

Personalization and Adaptive Learning: Implement advanced machine learning techniques to enhance the chatbot's ability to personalize interactions based on individual user preferences, behaviour patterns, and treatment progress. Adaptive learning algorithms can dynamically adjust the chatbot's responses and interventions to align with users changing needs and circumstances over time.

Continuous Monitoring and Feedback: Implement mechanisms for continuous monitoring of user engagement, satisfaction, and outcomes, allowing the chatbot to gather feedback and insights to inform ongoing optimization and improvement efforts. User feedback loops can help identify areas for enhancement, refine conversational algorithms, and tailor interventions to better meet users' needs and preferences.

Peer Support and Community Engagement: Facilitate peer support and community engagement features within the chatbot platform, allowing users to connect with others facing similar challenges, share experiences, and provide mutual support. By fostering a sense of community and belonging, the chatbot can complement professional interventions and promote social support networks as a vital component of mental health care.

CHAPTER 9

APPENDIX

9.1 SOURCE CODE

Generative_based.ipynb

Loading Data & Preliminary Analysis

```
%pip install -r 'requirements.txt'
import nltk
path_to_csv = 'mentalhealth.csv'
import re
import random
import pandas as pd
import numpy as np
from tensorflow.keras.utils import plot_model
from keras.models import load_model
import matplotlib.pyplot as plt
pd.set_option('mode.chained_assignment', None)
data=pd.read_csv(path_to_csv, nrows=20)
```

Data Preprocessing

```
for i in range(data.shape[0]):
  data['Answers'][i]=re.sub(r'\n', ' ',data['Answers'][i])
  data['Answers'][i]=re.sub('\(', '',data['Answers'][i])
  data['Answers'][i]=re.sub(r'\)', '',data['Answers'][i])
  data['Answers'][i]=re.sub(r',', '',data['Answers'][i])
  data['Answers'][i]=re.sub(r'-', '',data['Answers'][i])
  data['Answers'][i]=re.sub(r'/', '',data['Answers'][i])
  data['Answers'][i]=re.sub(r'/', '',data['Answers'][i])
```

```
input_features_dict = dict([(token, i) for i, token
enumerate(input_tokens)])

target_features_dict = dict([(token, i) for i, token in
enumerate(target_tokens)])

reverse_target_features_dict = dict((i, token) for token, i in
target_features_dict.items())

input_features_dict
```

Encoder – Decoder Model

```
max_encoder_seq_length = max([len(re.findall(r"[\w']+|[^\s\w]",
input_doc)) for input_doc in input_docs])

max_decoder_seq_length = max([len(re.findall(r"[\w']+|[^\s\w]",
target_doc)) for target_doc in target_docs])

encoder_input_data = np.zeros(

   (len(input_docs), max_encoder_seq_length, num_encoder_tokens),

   dtype='float32')

decoder_input_data = np.zeros(

   (len(input_docs), max_decoder_seq_length, num_decoder_tokens),

   dtype='float32')

decoder_target_data = np.zeros(

   (len(input_docs), max_decoder_seq_length, num_decoder_tokens),

   dtype='float32')

encoder_input_data[line, timestep, input_features_dict[token]] = 1.

   for timestep, token in enumerate(target_doc.split()):

      decoder_input_data[line, timestep, target_features_dict[token]] =
1.

      if timestep > 0:

         decoder_target_data[line, timestep - 1,
target_features_dict[token]] = 1.
```

encoder_inout_data

decoder_Target_data

Training

```
from tensorflow import keras
from keras.layers import Input, LSTM, Dense
from keras.models import Model
dimensionality = 256 # Dimensionality
batch_size = 10   # The batch size and number of epochs
epochs = 500
```

Prediction And Evaluation

```
from keras.models import load_model
training_model = load_model('training_model.h5')
encoder_inputs = training_model.input[0]
encoder_outputs, state_h_enc, state_c_enc =
training_model.layers[2].output
encoder_states = [state_h_enc, state_c_enc]
encoder_model = Model(encoder_inputs, encoder_states)

latent_dim = 256
decoder_state_input_hidden = Input(shape=(latent_dim,))
decoder_state_input_cell = Input(shape=(latent_dim,))
decoder_states_inputs = [decoder_state_input_hidden,
decoder_state_input_cell]

decoder_outputs, state_hidden, state_cell =
decoder_lstm(decoder_inputs, initial_state=decoder_states_inputs)
```

```
decoder_states = [state_hidden, state_cell]

decoder_outputs = decoder_dense(decoder_outputs)


decoder_model = Model([decoder_inputs] + decoder_states_inputs,
[decoder_outputs] + decoder_states)


training_model = load_model('training_model.h5')

encoder_inputs = training_model.input[0]

encoder_outputs, state_h_enc, state_c_enc =
training_model.layers[2].output

encoder_states = [state_h_enc, state_c_enc]

encoder_model = Model(encoder_inputs, encoder_states)
```

9.2 SCREENSHOTS

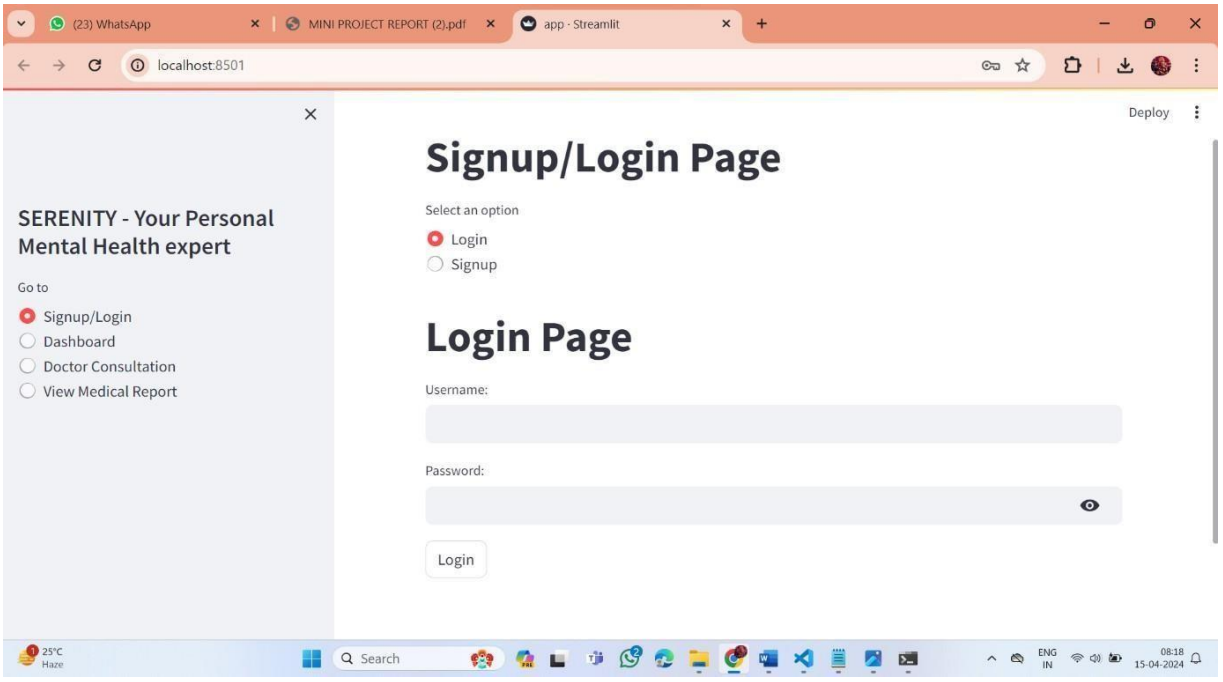

Figure 9.1 LOGIN IN\ SIGN IN PAGE

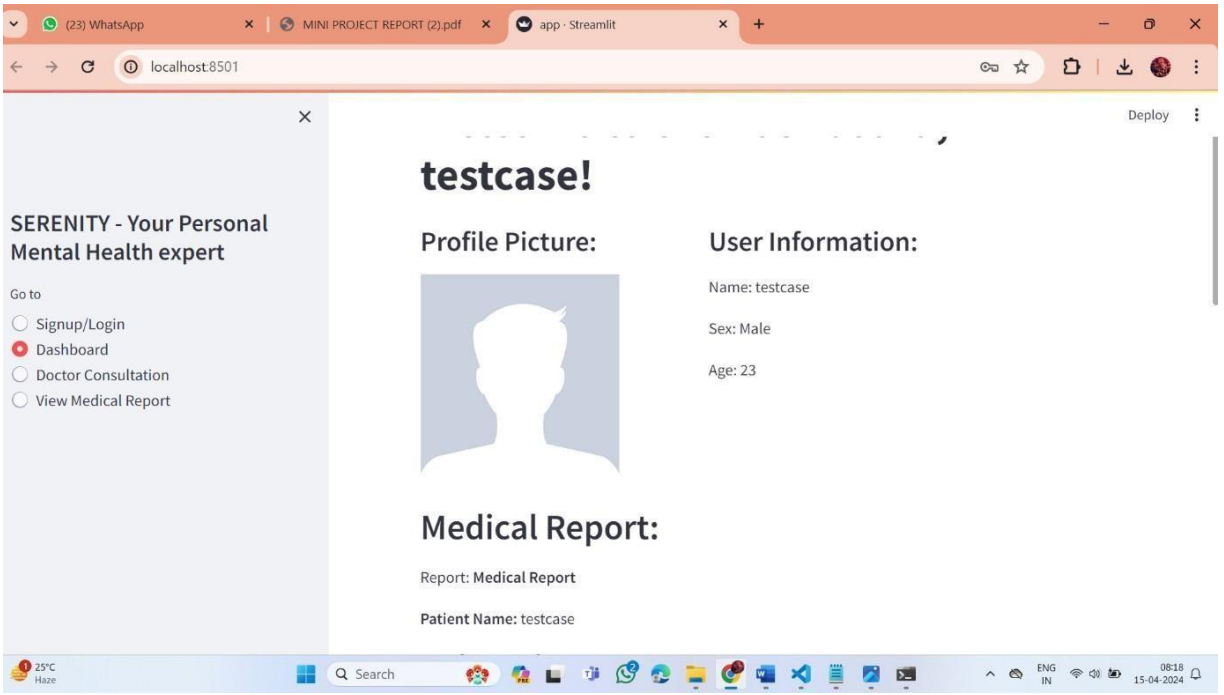

Figure 9.2 USER DASHBOARD

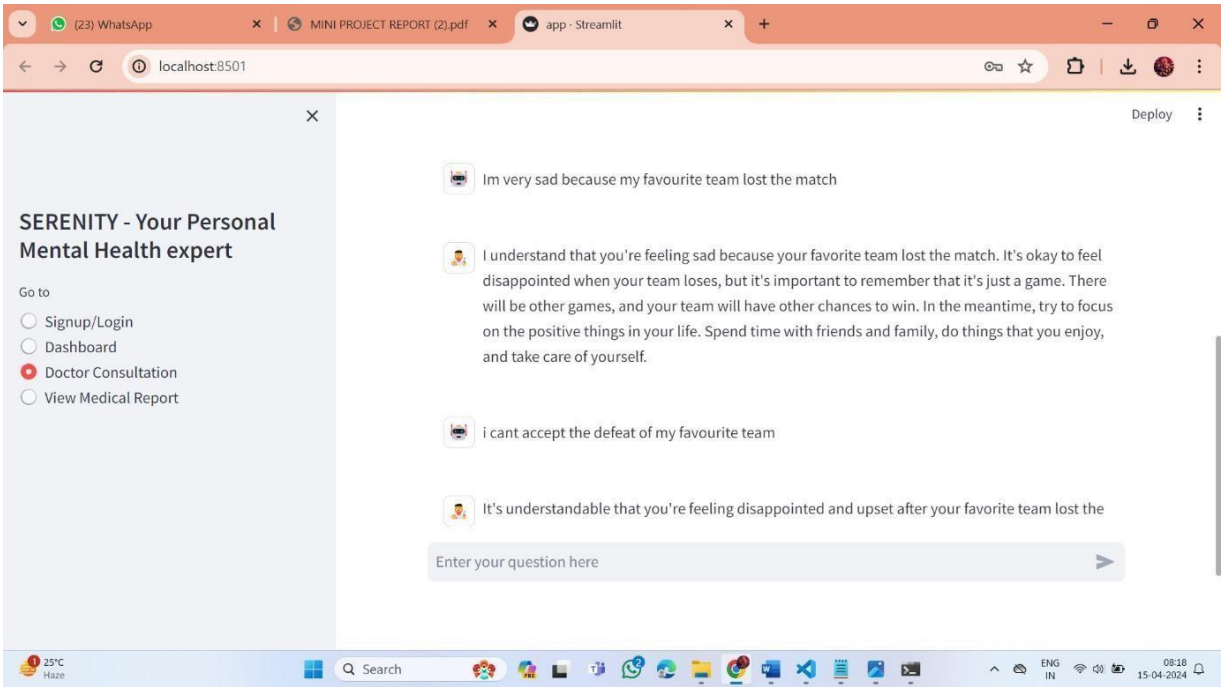

Figure 9.3 CHAT INTERFACE

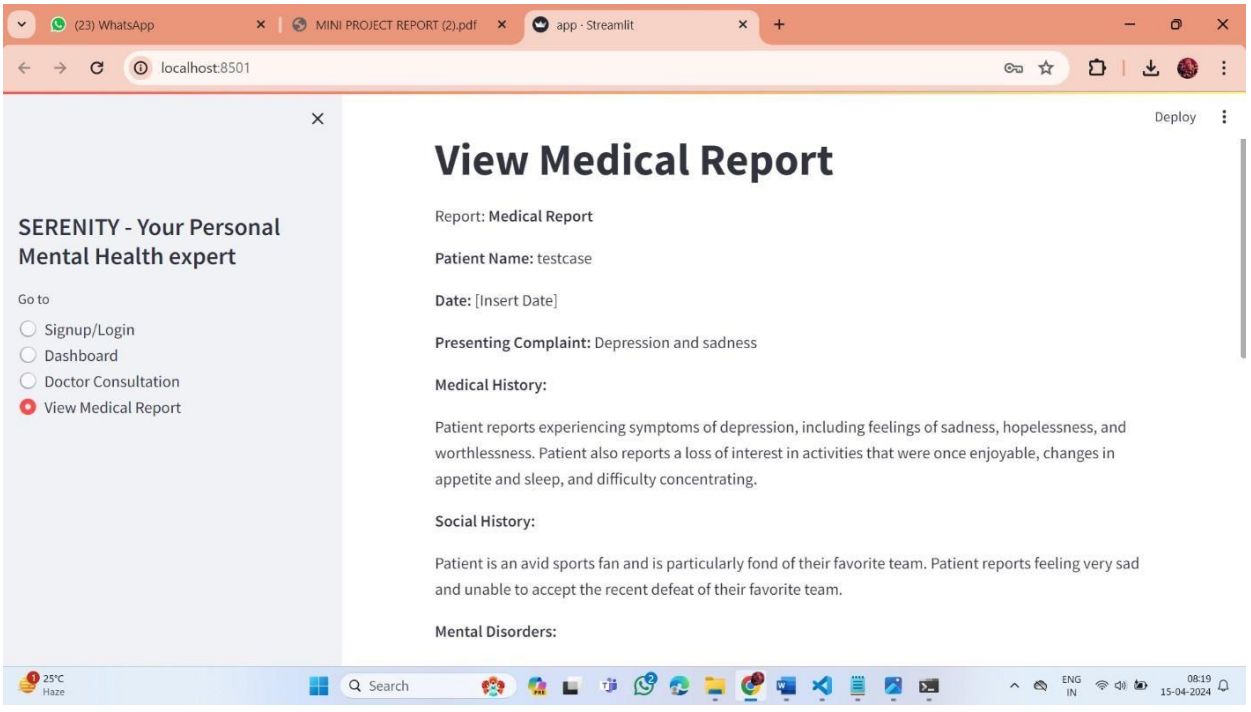

Figure 9.4 USER MEDICAL REPORT 1

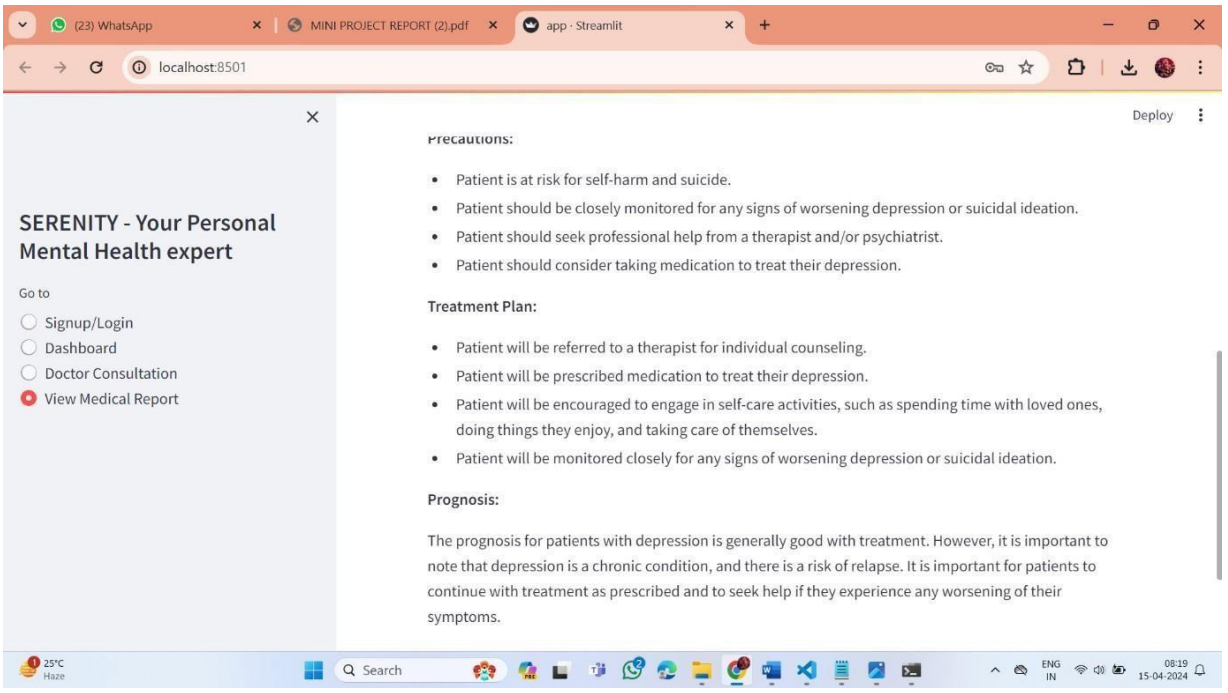

Figure 9.5 USER MEDICAL REPORT 2

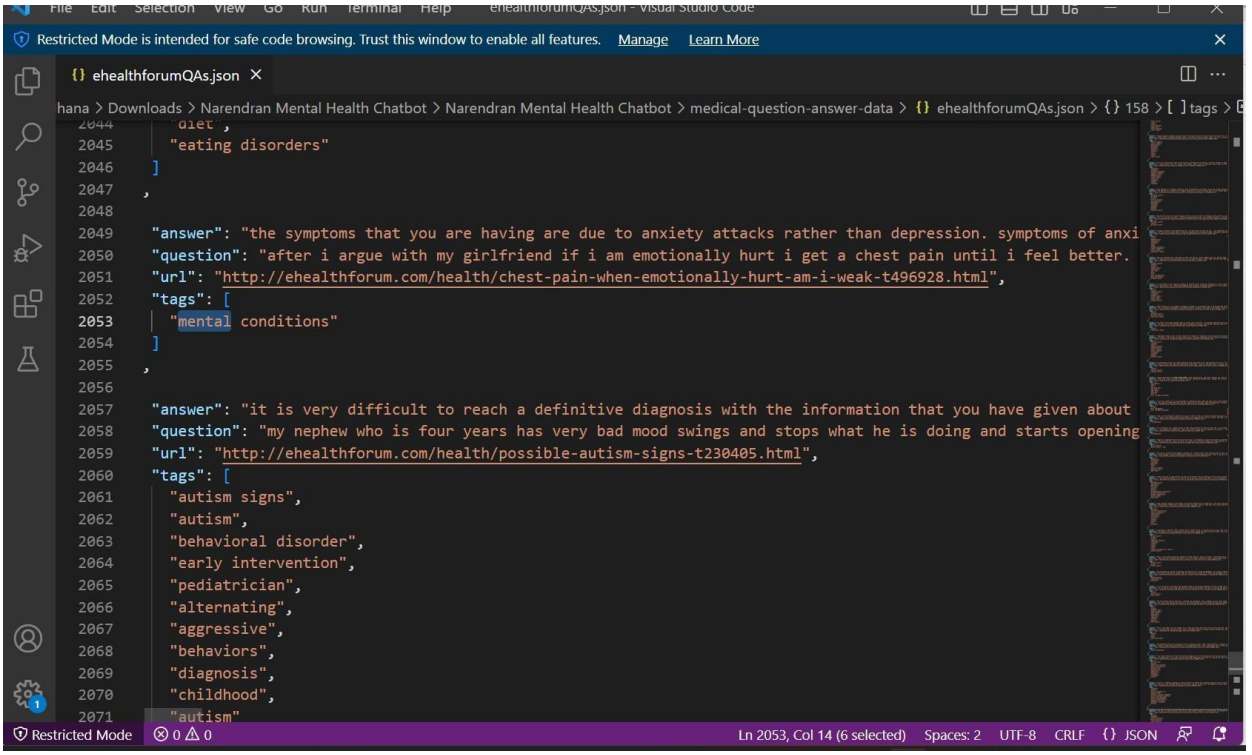

Figure 9.6 DATASET

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