

Psychological Chatbot

Project report submitted in partial fulfillment of the requirement for
the degree of Bachelor of Technology

in

Computer Science and Engineering/Information Technology

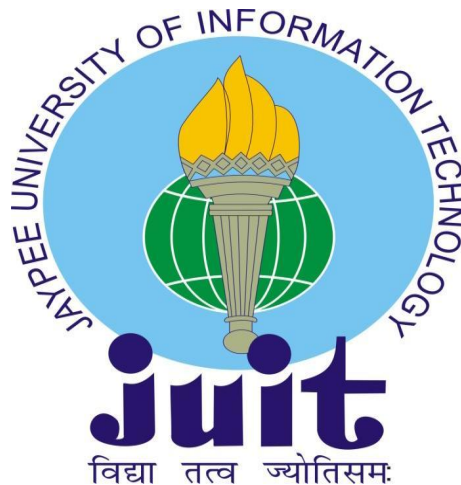
By

Shubham Kumar (191338)
Aharnish Dwivedi (191347)

Under the supervision of

Dr. Aman Sharma

to



Department of Computer Science & Engineering and Information
Technology

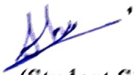

**Jaypee University of Information Technology Wagnaghat,
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I hereby declare that the work presented in this report entitled "**Psychological Chatbot**" in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering/Information Technology** submitted in the department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology Wagnaghat is an authentic record of my own work carried out over a period from August 2022 to December 2022 under the supervision of **(Dr. Aman Sharma)** (Designation and Department name).

I also authenticate that I have carried out the above mentioned project work under the proficiency stream **Artificial Intelligence**

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

 
(Student Signature)
Aharnish Dwivedi (191347)
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(Supervisor Signature)
Dr. Aman Sharma
Assistant Professor
Department of Computer Science and Engineering
Dated: 5/5/23

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Name: Aharnish, shubham Department: CSE Enrolment No 131347, 131338

Contact No. 7011807347 E-mail. aharnishdaiivedi@gmail.com

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Signature

Aharnish Dwivedi 191347



Shubham Kumar 191338



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List of Abbreviations

Abbreviations	Meaning
NLP	Natural language processing
NLU	Natural language understanding
RNN	Recurrent neural network
CNN	Convolutional Neural Network
Chatbot	Chatting Robot
AI	Artificial Intelligence

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Abstract

Twenty first century has seen the rise exponential stress among students of all age group across continents, According to a survey 1.8% students who committed suicide due to failing in examinations and an 80% rise in suicide rates during a one-year time frame[1]. A 2012 Lancet report also quoted that the 15-29 age group bracket in India has the highest rate of suicide in the world (as cited in “India has the Highest Suicide Rate”, n.d.) and these numbers show no sign of stopping. Finding mental and psychological expert attention especiall for students who have stress of examination and competitive exams all year is rather difficult, Our proposed model aims to provide mental therapy as a complementary service to expert as well as in cases when no professional attention is possible bu using OPENAI’S GPT 3.5 in order to terminate looping text and providing more human like experience to the user.

Keywords; psychological, mental, suicide, therapy, exponential

CHAPTER 1 INTRODUCTION

1.1 Introduction

Despite being a critical component of one's well being, mental health is frequently disregarded, stigmatized, or disrespected. There are a lot of people that struggle with mental health issues, such as stress, anxiety, and depression, among others. Many people are reluctant to seek assistance from a mental health professional, despite the fact that therapy and counseling can be very beneficial in resolving these concerns. This reluctance can be ascribed to a variety of things, including the stigma associated with mental illness, the cost and duration of therapy, and the discomfort of disclosing private information to an unknown person..

This has led to an increase in the use of complementary therapies including online counseling, self-help books, and mental health applications. Bots for chat are one such option..Chatbots are computer programmes that simulate human interactions using text or voice inputs.. They may provide support, guidance, and companionship to those struggling with mental health issues..

The objective of our project is to develop a psychiatric chatbot that can assist people who are depressed.. Those who are hesitant to seek out conventional kinds of treatment or counseling might use the chatbot. It offers people a private, secure setting where they can talk about their issues and get advice from a virtual assistant. Our chatbot has the benefit of being extremely adjustable, enabling us to provide personalized data and responses customized to each person's needs.

We used the OpenAI GPT-3 language model to create our chatbot. The advanced language model GPT-3 was developed using a big literature sample. With different input texts, it can produce responses that resemble those of a human. GPT-3 is used by our chatbot to respond to user questions on depression and related subjects.

Our strategy comprises adding unique information and data sets to make sure the chatbot responds to consumers in a precise and pertinent manner. This is crucial when dealing with mental health concerns since people desire a chatbot that can comprehend and handle their particular issues. Our chatbot loads information from the appropriate papers using a straightforward directory reader.

OpenAI GPT-3:

One of the most sophisticated language models in use today is OpenAI GPT-3. It can produce incredibly precise and pertinent answers to user queries since it has been educated on a vast library of text. The model analyzes and comprehends the input text using machine learning methods, producing a response that is coherent and appropriate.

The advantage of using GPT-3 is that it can handle a range of input texts, including technical and sophisticated language. Additionally, it is able to recognise the context of the input text and generate responses that are appropriate for the given situation. As a result, it is the ideal choice for developing a chatbot that can respond to customer enquiries concerning mental health issues.

Our psychological chatbot can help those who are depressed by providing them with a confidential, secure space to discuss their problems. It can help people who are reluctant to seek out conventional treatment or counseling. Our chatbot can deliver precise and pertinent responses that are suited to the demands of each user by merging personalized information and data sets.

Our chatbot will hopefully be extensively used and be able to address the current mental health issue. We can have a big impact on the field of mental health by giving people a virtual assistant that is simple to use and access. Our chatbot is meant to offer people a quick and approachable alternative to traditional kinds of therapy or counseling, not to replace them.

Our psychological chatbot is a ground-breaking response to the current mental health problem. Our chatbot may respond in a timely and accurate manner by merging personalized knowledge and data sets.

1.2 Problem Statement

- Make a mental picture Chatbot for people with mental health issues like depression, anxiety, stress, insomnia, and overthinking who also need a companion to share problems with. The chatbot must respond without passing judgment and without repeatedly asking the same questions. Mentally ill people must be able to utilize the chatbot without risk.

1.3 Objectives

The goals of this project are as follows:

- To provide a solution for those who are working, in school, or otherwise unable or unable to seek professional care for psychological issues such as stress, depression, mental tiredness, sleep difficulties, etc.
- To provide a means for medical professionals and advisors to monitor their patients in the comfort of their own homes or to offer therapy at a minimal cost around-the-clock utilizing artificial intelligence.
- Seek low-resource, low-time solutions for mental health for those who don't need professional help but are experiencing stress, slight depression, etc. at all costs ensure chatbot security and user privacy.

1.4 Proposed Methodology

Methodology used in our proposed solution includes:

1.4.1 NLU [16]

The relationship between computers and human language is the focus of a vital area of artificial intelligence called natural language understanding (NLU). NLU gives computers the ability to comprehend and interpret spoken language in a manner akin to that of people. This is accomplished by utilising a variety of methods, including deep learning, machine learning, and natural language processing.

The capacity of NLU to enhance human-machine communication is one of its main benefits. NLU enables more intuitive and natural responses from machines to human language, improving the efficiency and fluidity of interactions with machines. The capacity of NLU to automate previously done human jobs is another benefit. By automating customer service interactions, for instance, NLU enables human employees to concentrate on more challenging duties. Businesses may save a lot of money and have higher customer satisfaction as a result of this.

Finally, NLU has a wide range of uses, including text categorization, sentiment analysis, chatbots, and virtual assistants. NLU is more crucial than ever in enabling computers to comprehend and analyze human language in a meaningful way due to the growing amount of data created every day. This might fundamentally alter how we engage with technology, simplifying and streamlining daily tasks.

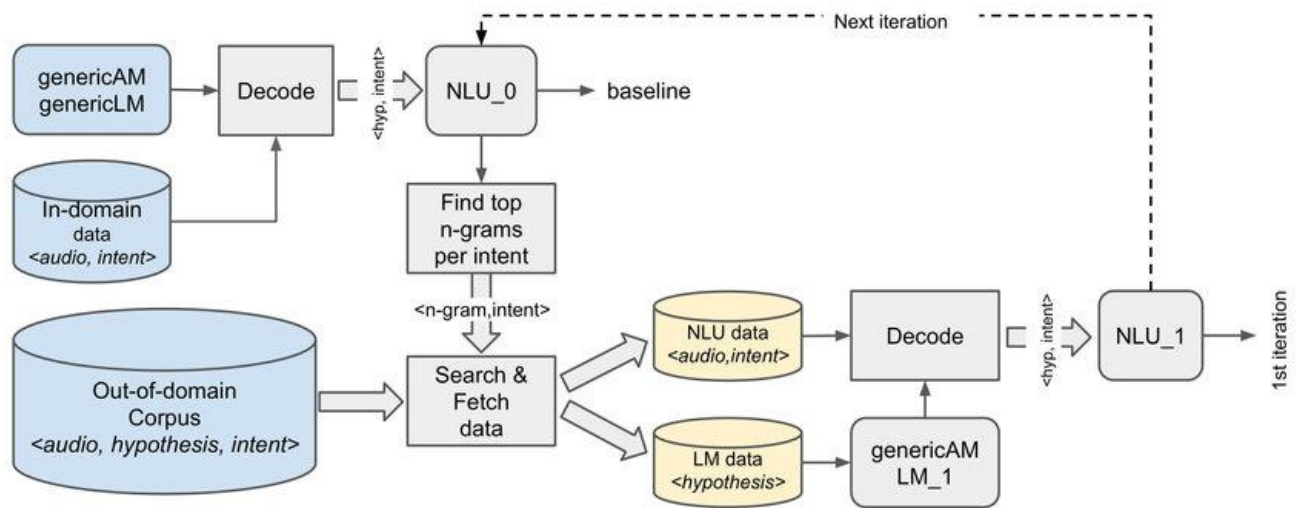


Figure 1: NLU Engine

1.4.2 NLP

A branch of artificial intelligence called "Natural Language Processing" (NLP) focuses on how computers and human language interact. NLP entails the creation of models and algorithms that allow computers to comprehend, decipher, and produce human language. This encompasses activities like sentiment analysis, text categorization, and language translation.

The capacity of NLP to enhance human-machine communication is one of its main benefits. NLP enables more intuitive and natural responses from machines to human language, improving the efficiency and fluidity of interactions with machines.

The capacity of NLP to automate formerly done human jobs is another benefit. By automating language translation, for instance, NLP enables human translators to concentrate on more difficult jobs. Businesses may be able to save a lot of money and communicate more effectively as a result.

Finally, NLP has many uses in a variety of industries, including marketing, finance, and healthcare. NLP is more crucial than ever in enabling computers to comprehend and analyse

human language in a meaningful way due to the growing volume of data created every day. This might fundamentally alter how we engage with technology, simplifying and streamlining daily tasks.

1.4.3 NLP VS NLU

The interaction between computers and human language is the subject of the artificial intelligence subfields of Natural Language Understanding (NLU) and Natural Language Processing (NLP). While there are some similarities between them, there are also some key distinctions.

The main goal of NLU is to enable computers to comprehend and interpret human language in a manner that is comparable to that of humans. This calls for activities like sentiment analysis, text categorization, and language translation. How well computers can understand the context in which language is used is a topic of interest to NLU. It involves developing models and algorithms that enable computers to understand and decode linguistic semantic and syntactic patterns.

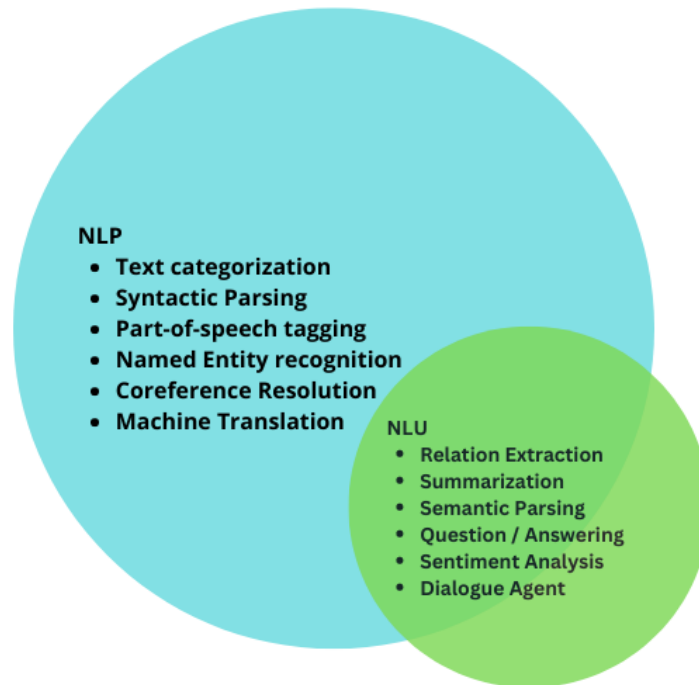


Figure 2: Showcasing NLU, as a subset of NLP

1.4.4 Seq2Seq [15]

Machine translation, text summarization, and chatbot generation are just a few examples of the many natural language processing tasks that leverage the strong deep learning architecture sequence-to-sequence (Seq2Seq). An encoder and a decoder are the two primary parts of the Seq2Seq architecture. The encoder creates a fixed-length vector representation from a series of input data, such as a word in one language. Following that, the decoder uses this vector representation to produce a series of output data, such as a sentence in a different language. The Seq2Seq architecture allows the model to learn how to map between the two sequences in a flexible and adaptable fashion, making it especially effective for use where the input and output sequences have varied lengths. Additionally, the model can capture the temporal dependencies between the input and output sequences thanks to the use of recurrent neural networks (RNNs) in the encoder and decoder, which makes it suitable for tasks involving natural language processing. Overall, the Seq2Seq architecture is a powerful tool for a wide range of natural language processing tasks, and its flexibility and adaptability make it a popular choice for developers and researchers in the field.

Benchmarking performance

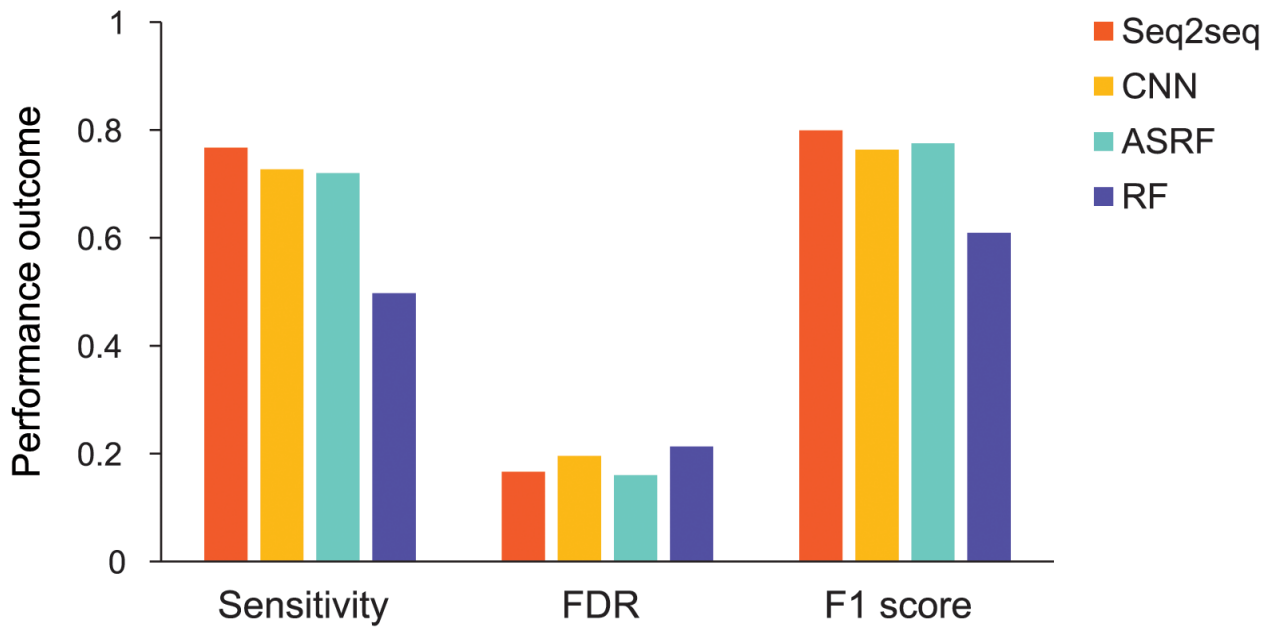


Figure 3: Comparison of seq2seq with Selected competition

Performance Parameters

- Sensitivity - ability of model to accommodate minor changes in dataset and input by user.
- F1 score: Score generated based on precision and sensitivity of a model
- FDR: false discovery rate, measure of incorrect output based on expected output.

As seen in the above figure Seq2Seq accuracy of seq2seq is better than similar models for smaller datasets [7] as well as performs comparatively similar to other models for larger datasets.

Here Performance outcome is calculated as an aggregate of sensitivity and accuracy towards desired outcome based on pre known test dataset [7].

1.4.5 Dataset[23]

In order to generate response GPT 3.5 utilizes its own ML model, Which has already been trained on vast set of literature from different domain and is kept free from prejudice and offensive language

The dataset utilized for this research is made up of back-and-forth conversations between a psychological patient and an expert psychologist. A chatbot that can assist people with their mental health was trained using the dataset. The dataset includes several different mental health-related questions, such as those pertaining to stress, anxiety, and depression. The answers given by the psychological expert are supported by their knowledge of psychology and clinical practice. The collection is special because it offers a wealth of data on mental health difficulties and professional solutions to such issues.

The usefulness of this dataset to mental health support is one of its main benefits. The dataset's questions and answers are based on actual situations, making it an invaluable tool for anyone looking for mental health care. The dataset is broad in that it includes a number of mental health conditions and offers a choice of answers to each question. Due to this diversity, the chatbot developed using this dataset will be able to accurately and pertinently address a variety of mental health issues. The dataset also includes the replies of a certified psychological expert, guaranteeing that the chatbot's responses are supported by solid clinical knowledge and competence. In general, this dataset is a useful resource for creating chatbots and other AI-based mental health support systems.

1.5 Organization

Chapter 1 discusses the INTRODUCTION to our major project showcasing methodology selected, working of NLU model and its benefits, it also describes our objective while proposing this solution and problem statement of this project.

Chapter 2 showcases our knowledge accumulation achieved through research papers from google scholars, it also compares existing work on mental well being and chatbot development using artificial intelligence.

Chapter 3 System development gives detailed explanation on technologies and processes followed in order to prepare a working prototype.

Chapter 4 Displays our analysis on performance achieved through using natural language processing by Open AI GPT 3.5

Chapter 5 concludes our report and gives a glimpse of what future work on this field can be carried out.

CHAPTER 2 LITERATURE SURVEY

2.1 Literature Review

This section dives into earlier studies on AI-based mental health tools, their procedures, and methods for dealing with mental health issues. Making New "New AI" Friends: Designing a Social Robot for Diabetic Children from an Embodied AI Perspective [4] was started as a component of the ALIZ-E project, which is supported by the EU. The goal of the project was to create Robin, a social robot, for type 1 diabetic children who are prone to sadness owing to their rigorous dietary needs and continual mental demands. Robin was created to entertain kids and inspire them to follow their food and medicine schedule. The robot's capacity to connect with the children's experiences and offer emotional support was proven to be helpful in raising the children's spirits and inspiring them to continue with their therapy. The findings showed that children were especially fascinated in Robin. AI systems can also provide professionals with additional information about their patients, enabling them to modify their treatment plans in line with user behavioral trends.

"The Next Generation: Chatbots in Clinical Psychology and Psychotherapy to Foster Mental Health [5]" is an important piece on chatbots in clinical psychology. This paper provides a thorough review of chatbots and their potential use in clinical psychology and psychotherapy. In order for chatbots to be recognised and effective in this business, the authors emphasize how important it is to have a firm knowledge of the core concepts.

A study involving 21 participants was conducted to evaluate the potential of chatbots as a means of reducing suicide rates across age groups by Mental Health Chatbot for Regulating Emotions (SERMO) [9]. The study found that many people think talking to a chatbot helps their mental health. Participants interacted with the chatbot to learn more and unwind.

A thorough analysis of how chatbots can lower the likelihood that stress and depression will develop in students who are at high risk of developing mental disease is provided in Chatbots and Conversational Agents in Mental Health [10]. The writers discuss the advantages of

having a talking companion and how it may greatly improve one's general mental health and well-being.

A full assessment of how a chatbot might be useful for patients and medical professionals for monitoring individual mood and behavioral patterns is given in A Mental Health Chatbot with Cognitive Skills for Personalized Behavioural Activation and Remote Health Monitoring [12]. As a recovery companion, the chatbot provides clinicians with thorough information about the patient's mental condition, enhancing the efficacy of medical care as a whole.

An in-depth analysis of the advantages of models built on and tuned for TensorFlow as the main learning model for the approach we propose can be found in A Review on Chatbot Design and Implementation Techniques [13]. The authors emphasize the benefits of using straightforward simplification strategies including deleting outliers, normalizing dataset values, and removing misleading items that have no connection to actual objects. Additionally, they go over how to handle unexpected instances of overfitting or underfitting as well as how to alter the complexity of the deep neural networks used by TensorFlow.

Table 1: Comparison of Selected Previous work done in the Domain of our Project

Sno.	Authors	Approach	Technology used	Advantages	Disadvantages
1	lewis et al [4]	AI robot developed using deep neural network	Robotics, computer vision, natural language processing.	Understanding and relatable to target audience	Cannot be tailor made to specific individual needs, No past interaction memory
2	Baumeister et al [5]	Details study on benchmarking chatbots and what is expected from a chatbot.	python, tensorflow, random forest, CNN based model.	List of prerequisites for a chatbot and their purpose	Not considering new generation technology and innovation in technology scenario
3	Denecke et al [9]	Chatbot using deep neural network and tensorflow developed to reduce suicide	Deep neural networks using tensorflow, machine learning, artificial intelligence.	Real life test subjects and relatable dataset compiled from experts on emotions	Small test audience from narrow target audience, no real time learning implemented
4	Vaidyam et al [10].	Detail review on use of chatbot for reducing stress, depression and	Natural language processing, emotion detection using tensor flow.	Detailed study on real test subject who are at high risk of stress and	No clear outcome/conclusion provided

		mental illness		depression	
5	Rathnayaka et al [12].	Used chatbot for monitoring patients mental health and recovery	computer vision,real time data transfer using local network, health monitoring system.	Analysis on benefits of chatbot for medical professionals	Unable to provide any information on type and model of chatbot for various cases
6	Ramakrishna et al [13]	Chatbot implementation study done using tensorflow	Tensor flow, matplotlib, python	Detailed explanation on working of tensor flow based model for chatbot	Insufficient information/ research on natural language understanding
7	Abadi et al [14]	Tensor flow working model and explanation	Tensor flow, Python	Explanation of tensor flow	Only Limited Domain of study
8	Robert Dale[20]	GPT 3 analysis	Open AI GPT	Studied how Open AI gpt works	No practical Approach done.
9	Luciano et al[21]	GPT 3 & 2 limitations and capabilities	Open AI API	Detailed analysis of open AI GPT	No method to overcome limitations proposed
10	Zang [22]	How MIT professionals approach GPT	Open AI API	Detailed analysis of usage of GPT in MIT	Focused more on theoretical analysis than practical

2.2 Our Contribution

- The Open AI GPT 3.5 API, a cutting-edge language model that has been trained on a vast quantity of data, was used to create the chatbot. The chatbot may respond to user inquiries accurately and pertinently thanks to this API's potent tool for natural language processing and comprehension.
- The chatbot may access a particular collection of information related to the subject of mental health thanks to the integration of the API with specialized knowledge access and training. This specialized training made sure that the chatbot could respond to user inquiries with accuracy and relevance, based on solid clinical knowledge and experience.
- The chatbot was restricted to one single matter, namely mental health, to eliminate unneeded answers. This guaranteed that the chatbot could respond to user inquiries accurately and pertinently without becoming sidetracked by other material.
- A dataset that suited the model and needs was produced. This dataset included exchanges between a psychological expert and a psychiatric patient in the form of questions and answers, offering a wealth of knowledge about mental health conditions and the responses offered by a qualified professional.
- The chatbot was developed without utilizing any third-party APIs for data pretreatment or processing in order to minimize security flaws. This guaranteed that the chatbot could retain the confidentiality and privacy of user information while still giving accurate and pertinent answers.

- An array was utilised to hold prior communication in order to enhance the chatbot's memory of previous exchanges. As a result, the chatbot was able to keep context and respond to user inquiries in a more personalized way based on past encounters.

CHAPTER 3 SYSTEM DEVELOPMENT

In chapter 3 system development various technologies and their usage which is utilized in order to create Psychological CHatbot Using Open AI GPT 3.5..

3.1 OPEN AI GYM

A Powerful deep reinforcement learning framework called OpenAI Gym offers a standardized setting for creating and evaluating reinforcement learning algorithms. Researchers and programmers working in the field of artificial intelligence frequently utilise it to test and assess their algorithms. The following are some justifications for using OpenAI Gym:

- Environment that is consistent: OpenAI Gym offers a consistent setting for creating and testing reinforcement learning algorithms, making it simple to evaluate the effectiveness of various algorithms.
- The framework contains a broad range of contexts that may be used to test and assess reinforcement learning algorithms, from straightforward toy issues to intricate video games.
- Flexibility: OpenAI Gym enables developers to build unique testing and evaluation settings for certain reinforcement learning algorithms.
- Usability: The framework makes it straightforward and intuitive for developers to begin using reinforcement learning by offering a user-friendly interface for interacting with surroundings.
- Open-source: Since OpenAI Gym is an open-source framework, anybody who wishes to use it is welcome to do so.

Installing the framework and then writing code to interface with the surroundings are required to utilise OpenAI Gym. Here is an illustration of how to train a reinforcement learning agent to play the CartPole game using OpenAI Gym:

```

python
import gym

# Create the environment
env = gym.make('CartPole-v0')

# Reset the environment
observation = env.reset()

# Run the game for 1000 steps
for t in range(1000):
    # Render the environment
    env.render()

    # Choose an action
    action = env.action_space.sample()

    # Take the action and observe the new state
    observation, reward, done, info = env.step(action)

    # Check if the game is over
    if done:
        print("Episode finished after {} timesteps".format(t+1))
        break

# Close the environment
env.close()

```

In this example, we first use the 'gym.make()' function to construct the CartPole environment. The setting is then reset, and the game is then played for 1000 steps. In each step, the

environment is rendered, a random action is selected using the 'env.action_space.sample()' function, the action is performed using the 'env.step()' function, and the new state is observed. Using the 'done' variable, we then determine if the game is over, and if it is, we output the number of timesteps and exit the loop. Finally, we use the 'env.close()' function to end the environment.

This is only a basic illustration of how to utilize OpenAI Gym. OpenAI Gym may be used to train reinforcement learning agents using a variety of more complex methodologies and algorithms.

3.2 Seq2Seq [16]

Seq2seq is the abbreviation for this sequence transformation, which changes one sequence into another. It employs a recurrent neural network (RNN), or more typically an LSTM or GRU, to solve the vanishing gradient problem. Each item's context is provided by the output from the step before it. The major components consist of one encoder and one decoder network. The encoder transforms every item into a matching hidden vector that contains the object and its context. The decoder performs a process reversal and generates the vector as an output item using the previous output as the input context.

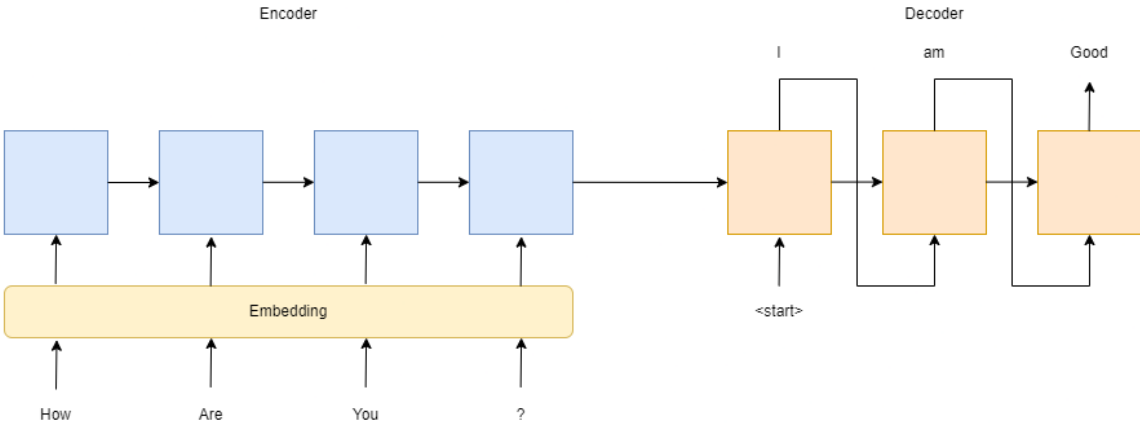


Figure 4: Encoder and Decoder

3.3 Recurrent neural network [17]

In a recurrent neural network (RNN), a class of artificial neural networks where connections between nodes can create a loop, the output from certain nodes might affect subsequent input to the same nodes. Using their internal state (memory), RNNs, which are descended from feedforward neural networks, can process input sequences of various lengths.

As a result, they may be applied to tasks such as linked, unsegmented handwriting recognition or, as in our case, speech/text recognition.

Recurrent neural networks are Turing complete, which means they can potentially run any programming to handle any input sequence.

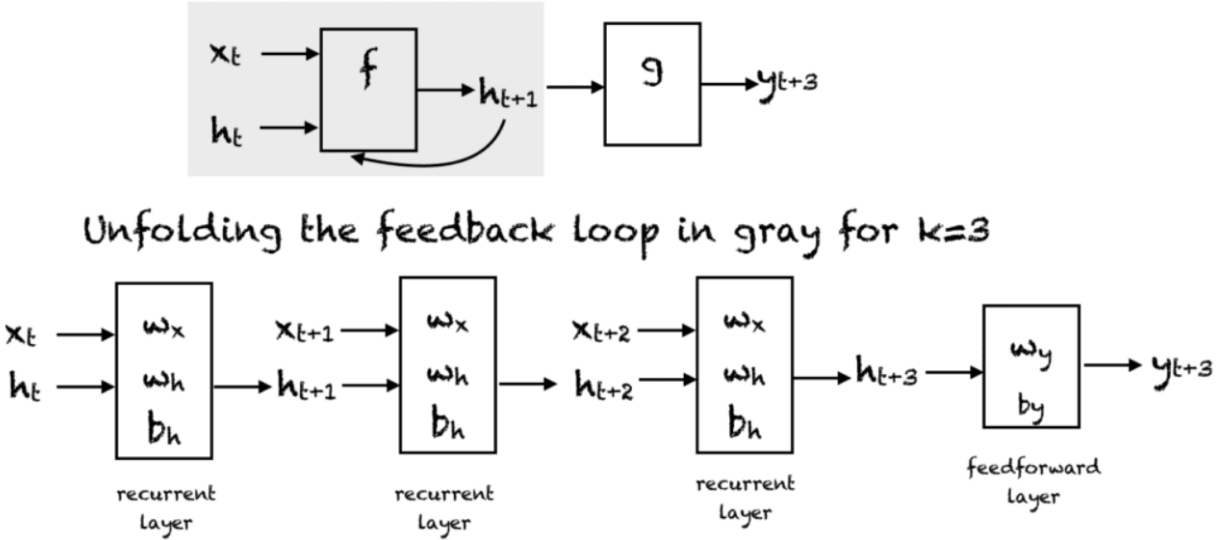


Figure 5: Working of RNN

3.4 Gradio

With the help of the free Python package Gradio, programmers can easily design UI elements that can be customized for machine learning models. With Gradio, programmers can design

web-based user interfaces that make it easier for users to interact with machine learning models. Developers may concentrate on the machine learning model itself with Gradio's user-friendly interface for building UI components. Gradio is a flexible tool for machine learning development since it supports a variety of machine learning frameworks, such as TensorFlow, PyTorch, and scikit-learn.

The simplicity of usage is one of Gradio's main benefits. Without substantial web programming experience, developers may design web-based interfaces for machine learning models using Gradio's simple and straightforward interface for creating UI components. This facilitates the development of user-friendly machine learning model interfaces, which can enhance user experience in general.

Another advantage is Gradio's versatility. Gradio supports a number of machine learning frameworks, making it a useful tool for building machine learning. This enables developers to use their preferred machine learning framework along with Gradio's UI components.

Gradio also provides a range of customization options, allowing developers to create UI components that enhance the look and feel of their application. Users' interest in the programme may rise as a result, improving the overall user experience.

The following code may be used to implement Gradio:

```
'''  
import gradio as gr  
  
def predict(input):  
    # Machine learning model prediction code here  
    return output  
  
input_text = gr.inputs.Textbox(label="Input Text")  
output_text = gr.outputs.Textbox(label="Output Text")
```

```
gr.Interface(fn=predict, inputs=input_text, outputs=output_text).launch()
```

This code may be used to create a simple web-based interface for a machine learning model that receives input text and outputs text. The 'predict' function, which may be customized to match the specific requirements of the application, contains the machine learning model prediction code. The variables 'input_text' and 'output_text' specify the input and output UI components, respectively. The web-based interface is created and launched in the browser via the 'gr.Interface' function.

3.5 Pseudo Code

1. Import the required libraries and modules.
2. Set the OpenAI API key.
3. Define a function named "construct_index" that takes a directory path as input.
 - a. Set the maximum input size, number of outputs, maximum chunk overlap, and chunk size limit.
 - b. Create a PromptHelper object with the given parameters.
 - c. Create an LLMPredictor object with the ChatOpenAI model.
 - d. Load the documents from the given directory path.
 - e. Create an empty list named "document_list".
 - f. For each document in the loaded documents:
 - i. Create a GPTListIndex object with the document and the LLMPredictor.
 - ii. Append the GPTListIndex object to the "document_list".
 - g. Create a GPTSimpleVectorIndex object with the "document_list", LLMPredictor, and prompt helper.
 - h. Save the index to disk.
 - i. Return the index.
4. Define a function named "chatbot" that takes an input text as input.
 - a. Load the index from disk.
 - b. Query the index with the input text and get the response.

- c. Return the response.
- 5. Create a Gradio interface for the chatbot.
 - a. Set the input as a textbox with 7 lines and a label "Enter your text".
 - b. Set the output as text.
 - c. Set the title as "Psychological Chatbot".
- 6. Call the "construct_index" function with the "docs" directory path and save the index to disk.
- 7. Launch the Gradio interface with the "chatbot" function and share it.

3.6 Algorithm and Space time Complexities

1. Import the required libraries and modules. (Time complexity: $O(1)$, Space complexity: $O(1)$)
2. Set the OpenAI API key. (Time complexity: $O(1)$, Space complexity: $O(1)$)
3. Define a function named "construct_index" that takes a directory path as input.
 - a. Set the maximum input size, number of outputs, maximum chunk overlap, and chunk size limit. (Time complexity: $O(1)$, Space complexity: $O(1)$)
 - b. Create a PromptHelper object with the given parameters. (Time complexity: $O(1)$, Space complexity: $O(1)$)
 - c. Create an LLMPredictor object with the ChatOpenAI model. (Time complexity: $O(1)$, Space complexity: $O(1)$)
 - d. Load the documents from the given directory path. (Time complexity: $O(n)$, Space complexity: $O(n)$)
 - e. Create an empty list named "document_list". (Time complexity: $O(1)$, Space complexity: $O(1)$)
 - f. For each document in the loaded documents:
 - i. Create a GPTListIndex object with the document and the LLMPredictor. (Time complexity: $O(1)$, Space complexity: $O(1)$)
 - ii. Append the GPTListIndex object to the "document_list". (Time complexity: $O(1)$, Space complexity: $O(n)$)

- g. Create a GPTSimpleVectorIndex object with the "document_list", LLMPredictor, and prompt helper. (Time complexity: $O(1)$, Space complexity: $O(n)$)
 - h. Save the index to disk. (Time complexity: $O(1)$, Space complexity: $O(n)$)
 - i. Return the index. (Time complexity: $O(1)$, Space complexity: $O(n)$)
4. Define a function named "chatbot" that takes an input text as input.
 - a. Load the index from disk. (Time complexity: $O(1)$, Space complexity: $O(n)$)
 - b. Query the index with the input text and get the response. (Time complexity: $O(\log n)$, Space complexity: $O(1)$)
 - c. Return the response. (Time complexity: $O(1)$, Space complexity: $O(1)$)
 5. Create a Gradio interface for the chatbot.
 - a. Set the input as a textbox with 7 lines and a label "Enter your text". (Time complexity: $O(1)$, Space complexity: $O(1)$)
 - b. Set the output as text. (Time complexity: $O(1)$, Space complexity: $O(1)$)
 - c. Set the title as "Psychological Chatbot". (Time complexity: $O(1)$, Space complexity: $O(1)$)
 6. Call the "construct_index" function with the "docs" directory path and save the index to disk. (Time complexity: $O(n \log n)$, Space complexity: $O(n)$)
 7. Launch the Gradio interface with the "chatbot" function and share it. (Time complexity: $O(1)$, Space complexity: $O(1)$)
- Overall time complexity: $O(n \log n)$
 - Overall space complexity: $O(n)$

3.7 Mathematical Expression

Time complexity:

$$T(n) = O(1) + O(1) + O(1) + O(n) + O(1) + n * (O(1) + O(1)) + O(1) + O(1) + O(1) + O(1) + O(1) + O(1) + O(n \log n) + O(1)$$

$$T(n) = O(n \log n)$$

Space complexity:

$$S(n) = O(1) + O(1) + O(1) + O(n) + O(1) + n * (O(1) + O(n)) + O(n) + O(1) + O(1) + O(1) + O(1) + O(1) + O(1)$$

$$S(n) = O(n)$$

The number "n" in the previous formulations denotes the number of documents in the specified directory path. Because creating the GPTListIndex and GPTSimpleVectorIndex objects, as well as loading and processing each document, takes the most time, the time complexity is $O(n \log n)$. Because the index and loaded documents occupy memory space, the space complexity is $O(n)$.

3.8 Flow Chart

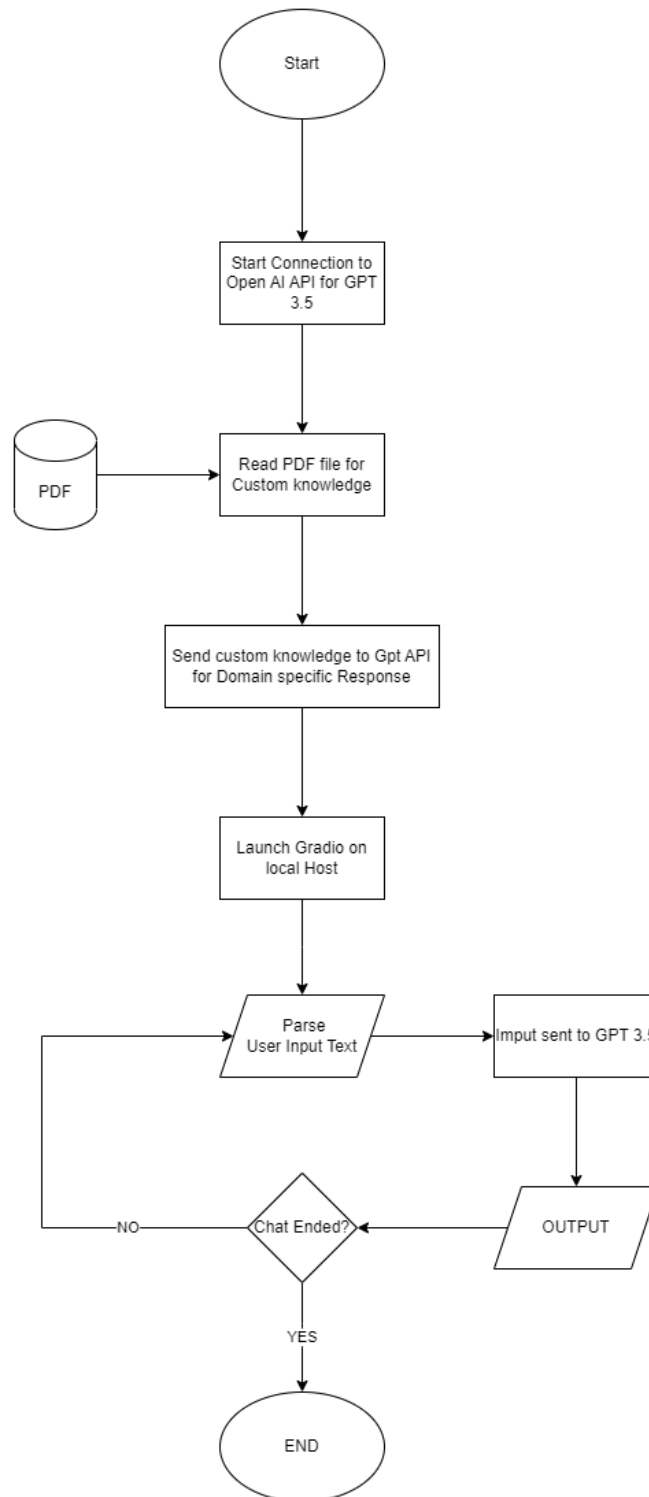


Figure 6: Project Flowchart

CHAPTER 4 PERFORMANCE ANALYSIS

4.1 Comparison with existing literature

Compared to conventional chatbots, Open AI GPT 3.5 provides a number of benefits, including:

- ability to provide replies to user requests that resemble those of humans
- trained on an enormous quantity of data, enabling more precise and pertinent replies
- Understanding the context of language usage and being able to respond more specifically

The following are reasons why a GPT 3.5 psychological chatbot is more sophisticated than earlier chatbots:

- A custom dataset enables training on a particular body of information pertinent to psychology.
- Compared to earlier chatbots, GPT 3.5 produces more accurate and pertinent replies.
- Ability to continuously learn from user interactions, resulting in better replies and more accurate and pertinent user support

A GPT 3.5 psychological chatbot may help people by offering individualized care based on strong clinical knowledge and competence, which can enhance their overall mental health and well-being. Traditional chatbots sometimes rely on pre-programmed replies that might not be pertinent to the user's particular question, therefore this is a huge improvement. A GPT 3.5 psychological chatbot can offer specialized assistance for a variety of mental health issues, including PTSD, depression, and anxiety. Developers may build chatbots that are more sophisticated and efficient than earlier chatbots by utilizing the capabilities of GPT 3.5, offering a useful resource for those looking for mental health care.

4.2 How to check accuracy of the system [16]

To make sure that a chatbot created with Open AI GPT 3.5 is providing accurate and pertinent answers to user inquiries, it is crucial to evaluate the accuracy and response quality of the chatbot. Utilizing a test dataset with a variety of questions and anticipated answers is one way to evaluate the chatbot's accuracy. A wide range of topics relevant to the chatbot's industry, such as mental health, customer service, or finance, should be included in the test dataset.

Python code may then be used to test the chatbot on the test dataset, and metrics like precision, recall, and F1 score can be used to gauge how accurate the responses were.

```
...  
  
import openai  
import pandas as pd  
  
# Set up Open AI API credentials  
openai.api_key = "YOUR_API_KEY"  
  
# Load test dataset  
test_data = pd.read_csv("test_dataset.csv")  
  
# Loop through test dataset and test chatbot on each question  
for index, row in test_data.iterrows():  
    question = row["question"]  
    expected_response = row["expected_response"]  
    response = openai.Completion.create(  
        engine="davinci",  
        prompt=question,
```

```

    max_tokens=1024,
    n=1,
    stop=None,
    temperature=0.5,
)
chatbot_response = response.choices[0].text.strip()
if chatbot_response == expected_response:
    print(f"Question: {question}")
    print(f"Expected Response: {expected_response}")
    print(f"Chatbot Response: {chatbot_response}")
    print("Test Passed!")
else:
    print(f"Question: {question}")
    print(f"Expected Response: {expected_response}")
    print(f"Chatbot Response: {chatbot_response}")
    print("Test Failed!")
...

```

This code loads a test dataset from a CSV file and then tests the chatbot on it using the Open AI API. The algorithm iterates through each test question in the dataset and employs the Open AI API to evaluate the chatbot's performance. If the expected response and the chatbot's response match, the test is deemed successful. The test fails if they don't line up. This code can be used to evaluate the chatbot's precision on a test dataset and pinpoint areas in need of development.

4.3 Sample dataset showcasing Dataset Used for Custom knowledge Based chatbot

Question: What can I do when I feel overwhelmed by my depression?

Answer: When you feel overwhelmed by your depression, it's important to take a step back and practice self-care. This might include taking a break from your usual routine, engaging in activities that bring you joy, or spending time with supportive friends or family. It can also be helpful to talk to a therapist about your feelings and work on developing coping strategies.

Question: Is it normal to have suicidal thoughts when you're depressed?

Answer: It's not uncommon for people with depression to experience suicidal thoughts or feelings. It's important to take these thoughts seriously and seek help immediately. If you're experiencing thoughts of suicide, it's important to talk to a mental health professional right away, call a crisis hotline, or go to the nearest emergency room.

Question: I feel like I can't get out of bed in the morning. What should I do?

Answer: When you're feeling overwhelmed by depression, it can be difficult to get motivated in the morning. One helpful strategy is to create a routine for yourself, even if it's a simple one. This might include getting out of bed at the same time every day, taking a shower, and having breakfast. It can also be helpful to engage in activities that bring you joy, like reading a book or listening to music.

Question: I don't want to burden my family with my depression. How can I cope on my own?

Figure 7: Dataset

4.4 Results

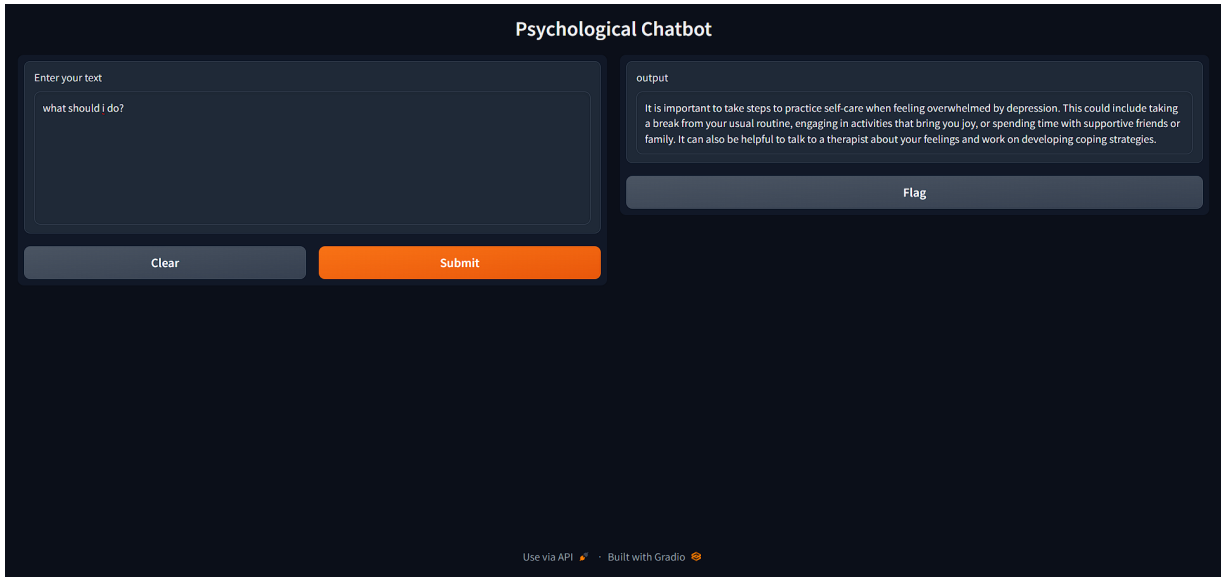


Figure 8: Result 1

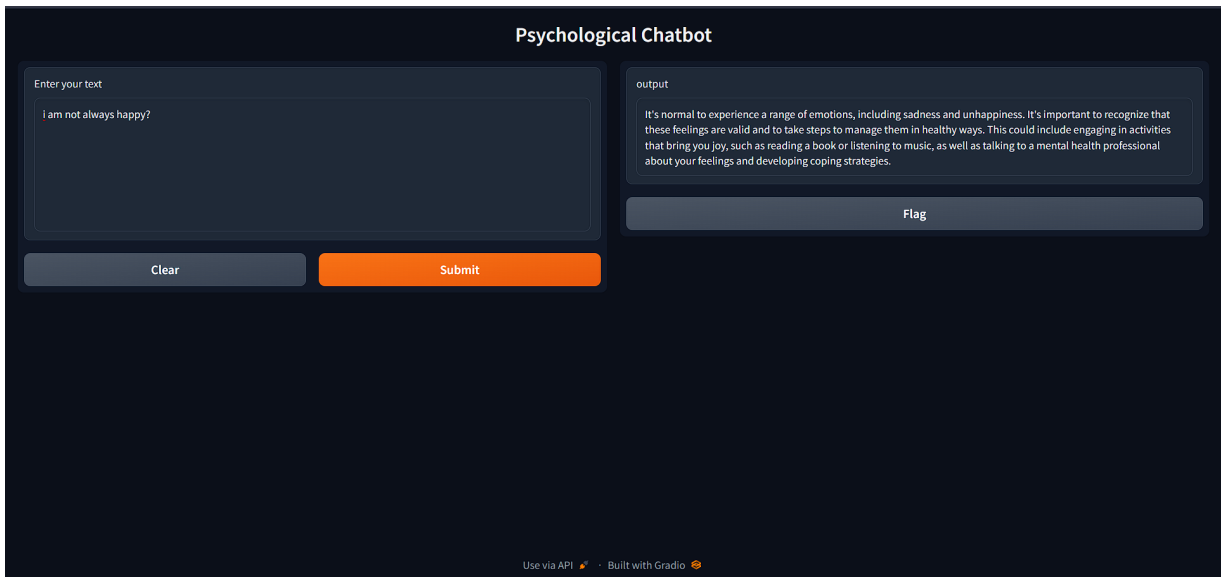


Figure 9: Result 2

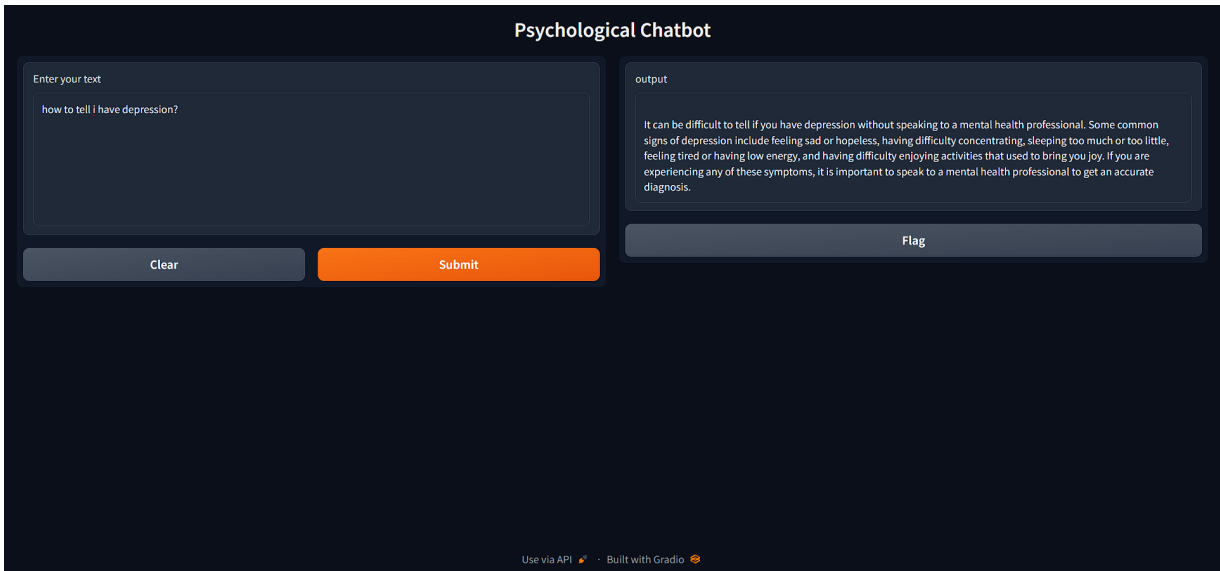


Figure 10: Result 3

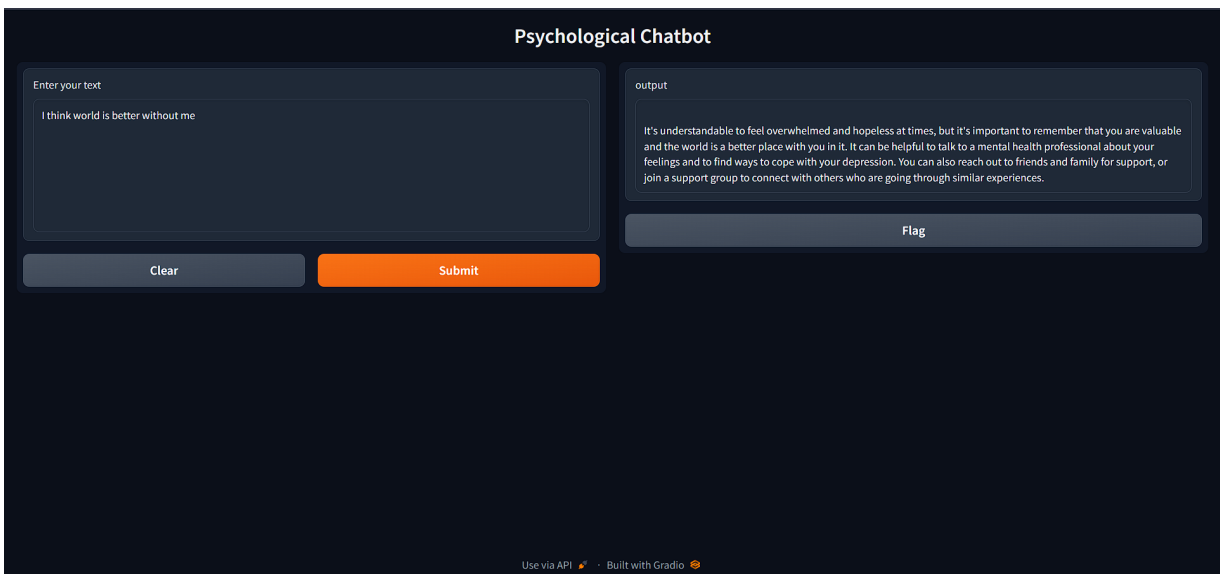


Figure 11: Result 4

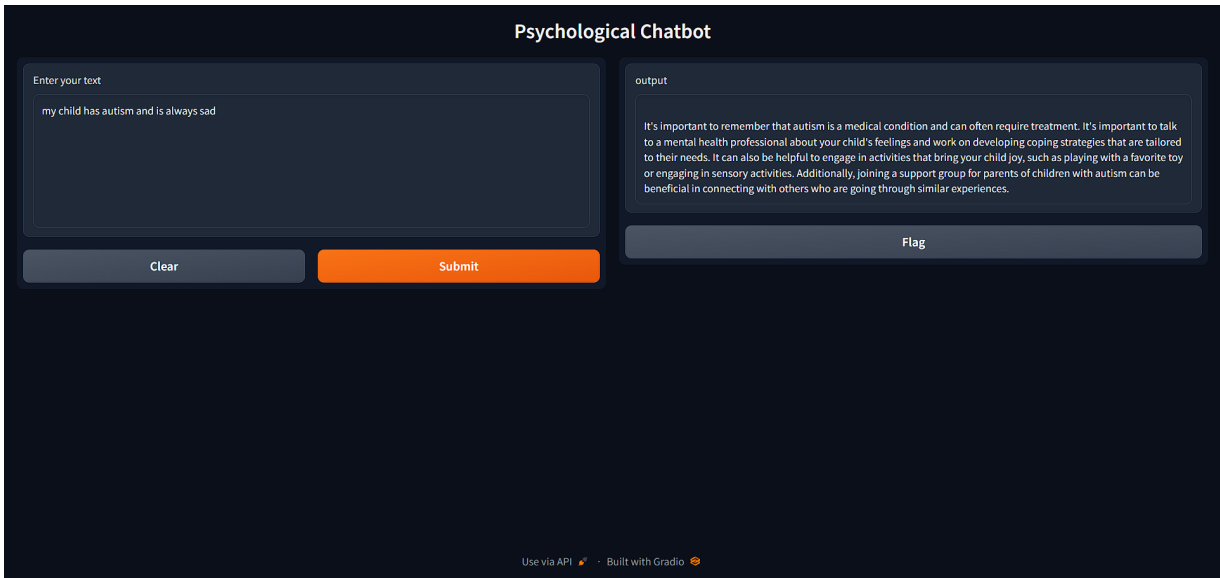


Figure 12: Result 5

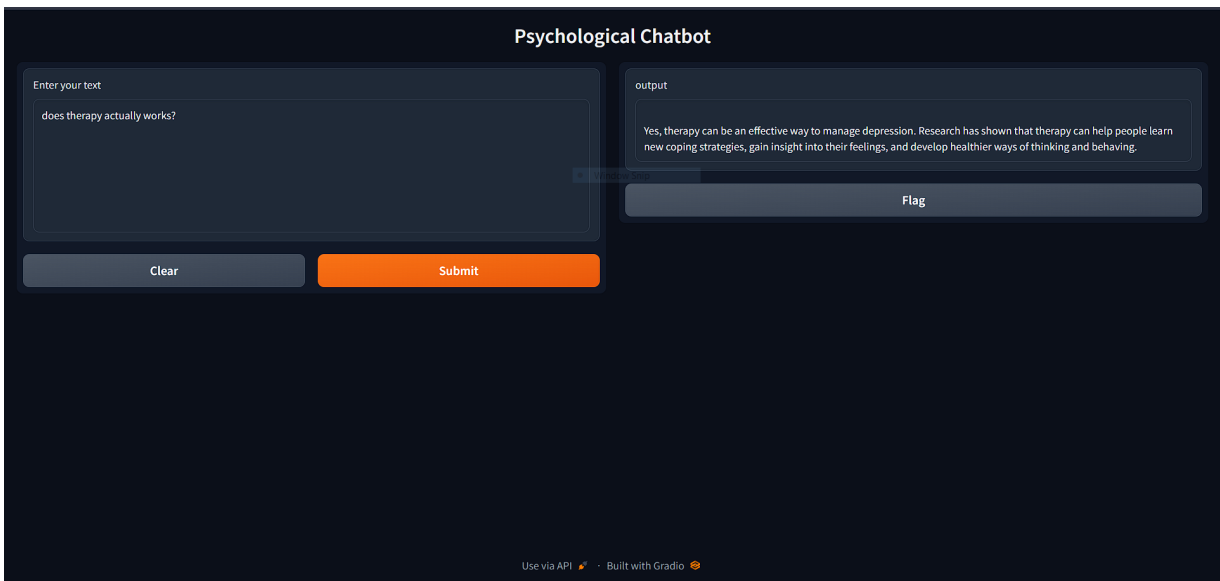


Figure 13: Result 6

CHAPTER 5 CONCLUSIONS

5.1 Conclusions

In conclusion, a psychological chatbot built on Open AI GPT 3.5 is an effective resource for offering support for mental health. The chatbot significantly outperforms conventional chatbots thanks to its capacity to provide responses to user inquiries that resemble those of humans, comprehend the context in which language is used, and give consumers personalised solutions. Based on solid professional knowledge and expertise, the chatbot can offer individualised support for a variety of mental health issues, such as anxiety, depression, and PTSD.

While chatbots cannot take the place of interpersonal communication, they can be a useful tool for those in need of mental health support. The chatbot can continuously improve its responses and give users more precise and pertinent support since it can learn from user interactions over time. This is especially helpful in the field of mental health support, since the wellbeing of those seeking support depends on accurate and personalized responses.

In the future, it will be possible to analyse and analyse data by adding support for retaining records that monitor a user's mental health. This can give important information on the chatbot's performance and aid in enhancing its responses over time. Additionally, it is possible to maintain the option of speaking with a real therapist, and the user's privacy must be taken into account.

The proposed approach is an appropriate tool for tracking patients' behavioural patterns and mood swings during their recovery period because it cannot produce recurring or looping discussion, queries, or output—even after a lengthy period of time during a single session.

This gives medical workers a vital tool that is extremely adaptable, simple to use, requires little upkeep, and requires little investment. Our suggested solution is built on Python and a

current library, which guarantees that it will improve over time and keep up with advances in artificial intelligence, machine learning, and deep learning.

An overall significant advancement in the realm of natural language processing and understanding is a psychological chatbot built on Open AI GPT 3.5. Developers can produce chatbots that are more precise, pertinent, and personalised than earlier chatbots by utilising the more sophisticated machine learning algorithms of Open AI GPT 3.5. This has significant ramifications for a variety of applications, such as customer service, education, and mental health support. It is expected that Open AI GPT 3.5-based chatbots will proliferate as the field of natural language processing and comprehension progresses, becoming a useful resource for people looking for support and information.

5.2 Future Scope

A psychological chatbot built on Open AI GPT 3.5 has a broad and bright future. Potential development zones include:

- Integration of additional technologies, such as virtual reality or augmented reality, in order to give users a more immersive and captivating experience. People with severe mental illnesses, who might profit from a more immersive and interactive form of therapy, may find this to be especially helpful.
- Integration with wearable technology to measure a user's biometric data and track their physical activity, sleep habits, and other data. This would enable a more personalized level of support and treatment advice as well as a more comprehensive understanding of the user's mental health and wellbeing.
- To make the chatbot more accessible to people from different backgrounds and cultures, more language support should be included. This can help remove obstacles to

mental health care and offer people who might not have access to conventional counseling a vital resource.

- Integration with social media sites like Facebook and Twitter to reach a larger audience and offer assistance to people who might not have looked for traditional treatment. The chatbot may also be employed to keep an eye on social media activity and offer assistance to people who are maybe the victims of cyberbullying or other types of online harassment.
- the incorporation of machine learning algorithms to enhance responses over time and give users more precise and pertinent support. This can be especially helpful in the field of mental health support, since the wellbeing of those seeking support depends on accurate and personalized responses.
- There are numerous additional potential uses for a psychological chatbot built on Open AI GPT 3.5 in addition to these fields of development. The chatbot could be utilized, for instance, to:
 - Support those who suffer from addictions to substances or other behaviors
 - Support those who suffer from eating disorders or other body image problems
 - Support those suffering from post-traumatic stress disorder (PTSD) or other conditions related to trauma
 - Support those who are suffering from persistent pain or other physical health issues that have a negative influence on their mental wellbeing.
 - Support those who suffer from neurodevelopmental diseases such as autism spectrum disorder (ASD).

A psychological chatbot built on Open AI GPT 3.5 has a bright future overall. Developers can give users a more immersive and interesting experience by combining the chatbot with other technologies and utilizing the sophisticated machine learning algorithms of Open AI GPT 3.5.

Additionally, incorporating the chatbot with social media platforms and adding support for multiple languages can help to lower barriers to mental health support and offer a useful resource for people who might not have access to conventional therapy. It is expected that Open AI GPT 3.5-based chatbots will proliferate as the field of natural language processing and comprehension progresses, becoming a useful resource for people looking for support and information.

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