A

Major project

on

A NOVEL FRAMEWORK TO MITIGATE MENTAL HEALTH ISSUES USING NLP

(Submitted in partial fulfillment of the requirements for the award of Degree)

BACHELOR OF TECHNOLOGY

in

COMPUTER SCIENCE AND ENGINEERING

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Kandlakoya (V), Medchal Road, Hyderabad-501401.

2018-2022

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

CERTIFICATE

This is to certify that the project entitled "**A NOVEL FRAMEWORK TO MITIGATE MENTAL HEALTH ISSUES USING NLP"** being submitted by **R. MANASA (187R1A05M3), M. CHANDANA(187R1A05L9) & K. PAVAN(187R1A05K5)** in partial fulfillment of the requirements for the award of the degree of B. Tech in Computer Science and Engineering to the Jawaharlal Nehru Technological University Hyderabad, is a record of bonafide work carried out by him/her under our guidance and supervision during the year 2021-22. It is certified that they have completed the project satisfactorily. The results embodied in this thesis have not been submitted to any other University or Institute for the award of any degree or diploma.

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ABSTRACT

Mental Health is an integral part of the human body. People suffer from various mental health problems due to various causes which aren't recognizable easily. Direct Counseling is not affordable for many, while some are not open to express their inner thoughts to another person thinking of such problems as disabilities that affect their reputation in society. We aim to use "Cognitive behavioral therapy" which uses psycho-social intervention that aims to improve mental health. Methodologies used in this project are of Natural Language Processing focusing on "Dialogue Generation" by understanding the context of the text and "Sentiment Analysis" to detect the mental state of the person and respond accordingly by providing apt advice and analysis. If we can detect mental health issues at the correct time and provide suitable help, we might save precious lives. Facebook and Twitter are one of the biggest applications for information sharing. The data analyzed here is collected through social networking applications called Facebook and Twitter. Sentiment analysis allows us to grab a hint of inclination of people's views in favor or against of any subject. The basic motivation to use this chat is to observe, examine and analyze how the person deals a situation either by expressing their aggression, as we all condemn such inhuman activities. Chatbots are gaining their popularity in society and have triggered heated discussions in healthcare as well. A chatbot or conversational agent is software that can communicate with a human by using natural language. One of the essential tasks in artificial intelligence and natural language processing is the modeling of conversation. In this project we use chatbot and Twitter, Facebook sentiment analysis to inspect one's mental health status.

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1. INTRODUCTION

1. INTRODUCTION

1.1 PROJECT SCOPE

This project is titled "A NOVEL FRAMEWORK TO MITIGATE MENTAL HEALTH ISSUES USING NLP". This chatbot along with sentiment analysis helps users i.e people suffering with mental health issues such as Depression, Generalized Anxiety Disorders, etc. to analyze their situation with the help of chatbot that uses Natural Human language along with analysis of their Facebook and Twitter content to find out hidden/unknown mental health issues one faces which is followed by prescribed suggestion on how to mitigate them.

1.2 PROJECT PURPOSE

This project has been developed to focus on a chatbot that is designed solely to serve the purpose of understanding Human language and to find out the mental health disorders readily present in the user followed by sentiment analysis which indirectly uses the user's everyday social media interaction to do the same and help the users to cope up with these disorders with a preliminary prescribed suggestion.

1.3 PROJECT FEATURE

The main feature of this project is that the chatbot uses Human Natural Language for querying and interacting with the users to find out the mental health disorders. Additionally it has sentiment analysis of content on two social media platforms Twitter and Facebook that helps the model to conclude situation without any unforeseen biases. All the three processes highly use only Natural Human Language and not any high level stuff to analyze the mental situation and provide suggestions to deal with them preliminarily depending on the seriousness and intensity of the disorder.

2. SYSTEM ANALYSIS

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SYSTEM ANALYSIS

System Analysis is the important phase in the system development process. The System is studied to the minute details and analyzed. In analysis, a detailed study of these operations performed by the system and their relationships within and outside the system is done. A key question considered here is, "what must be done to solve the problem?" The system is viewed as a whole and the inputs to the system are identified. Once analysis is completed the analyst has a firm understanding of what is to be done.

2.1 PROBLEM DEFINITION

In today's society people suffer from various mental health problems due to various causes which aren't recognizable easily. Direct Counseling is not affordable for many, while some are not open to express their inner thoughts to another person thinking of such problems as disabilities that affect their reputation in society. People face various issues which might be common but still unknown to them. In today's generation it is no wonder to be a victim of such. Hence with this project we render to help people self-evaluate their status.

2.2 EXISTING SYSTEM

Many of the existing systems have live chats through texts and some limitations such as there is no instant response given to the users and have to wait for long hours for expert's acknowledgement or any other reason. Some of the processes may charge amount to live chat or telephony communication. However, the issues of these technologies are cost effective in clinical practice remains a consideration for future research studies. Theexisting system of chatbot analyzes the user message by regular expressions, intent classification and entity recognition. The intents and the rules should be explicitly defined which should cover all the possibilities and hence huge datasets were required.

2.2.1 LIMITATIONS OF EXISTING SYSTEM

Following are the limitations of the existing system:

- It takes more time to response to the user question.
- Pay some charges to perform live chat.

- The previous chatbots cannot identify the emotions of any subject about which human talk
- These functionalities of sentiment analysis and mental health chatbot are not ina single model.

- No better intent classification for efficient workflow.
- Complex data sets are required which are generally not available and can be used to train sentiment classifier.
- Doesn't provide tips and solutions for mental health problems encountered.

2.3 PROPOSED SYSTEM

Mental health refers to one's psychological balance and having that balance tracked is important. Although chatbots can perform many tasks, the primary function they have to play is to understand the utterances of humans and to respond to them appropriately. In the past, simple statistic methods or handwritten templates and rules were used for the constructions of chatbot architectures. The proposed framework is an online application that depends on Natural Language Processing (NLP) centering on distinguishing proof and moderation of psychological well-being issues. The groundwork is multispectral with an NLP chatbot and social media Analysis of profiles on Twitter and Facebook. The chatbot module takes part in a well-disposed discussion with the client to decide the conceivable psychological well-being issue out of the knock around by striking discussions zeroing in on the client's perspective, and encounters. Right away followed by the Social Media Analysis of two famous sites specifically Facebook and Twitter using the Vader sentiment Analyzer.

The model takes the different posts of the end user from the sources Facebook and Twitter in message design pattern, at present an archive to be transferred at the social media Analysis stage and investigate the feelings to stay away from the plausible predisposition of chatbot examination because of different issues of the nonpartisan condition of discussion, feigning, abandoning parts of the day-to-day existence and social behavior. As the proposed structure means to alleviate the recognized psychological wellness issues, the examination prompting the distinguishing proof of issue is trailed by giving tips, ideas, and sites that could

be useful to plan meeting with specific specialists for additional clinical help and to keep the most awful from occurring.

2.3.1 ADVANTAGES OF THE PROPOSED SYSTEM

The following are the advantages of the proposed system:

- Easy to use and saves user timer
- Reducing health care cost and improves the process of mental health analysis.
- Can use the service anywhere and anytime as it reduces the reaction time for mental health queries.
- Integrating social behavior and personal assessment to analyze one's mental health status

2.4 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and the business proposalis put forth with a very general plan for the project and some cost estimates. During system analysis, the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. Three key considerations involved in the feasibility analysis:

- Economic Feasibility
- Technical Feasibility
- Social Feasibility

2.4.1 ECONOMIC FEASIBILITY

The developing system must be justified by cost and benefit. Criteria to ensure that effort is concentrated on a project, which will give best, return at the earliest. One of the factors, which affect the development of a new system, is the cost it would require. The following are some of the important financial questions asked during the preliminary investigation:

- The costs conduct a full system investigation.
- The cost of the hardware and software.
- The benefits are in the form of reduced costs or fewer costly errors.

Since the system is developed as part of project work, there is no manual cost to spend for the proposed system. Also, all the resources are already available, which gives an indication that the system is economically possible for development.

2.4.2 TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

2.4.3 BEHAVIORAL FEASIBILITY

This includes the following questions:

- Is there sufficient support for the users?
- Will the proposed system cause harm?

The project would be beneficial because it satisfies the objectives when developed and installed. All behavioral aspects are considered carefully and conclude that the project is behaviorally feasible.

2.5 HARDWARE & SOFTWARE REQUIREMENTS

2.5.1 HARDWARE REQUIREMENTS:

Hardware interfaces specify the logical characteristics of each interface between the software product and the hardware components of the system.
The following are some hardware requirements:

A laptop with following features:

Processer : Any Update Processer,Ram: Min 1 GB
Hard Disk : Min 100 GB

2.5.2 SOFTWARE REQUIREMENTS

Software Requirements specifies the logical characteristics of each interface and software components of the system. The following are some software requirements:

- Operating System: Windows 10
- Python IDE: Visual Studio Code (VS Code)
- The Natural Language Toolkit (NLTK) and its dependencies.

3. ARCHITECTURE

3. ARCHITECTURE

3.1 PROJECT ARCHITECTURE

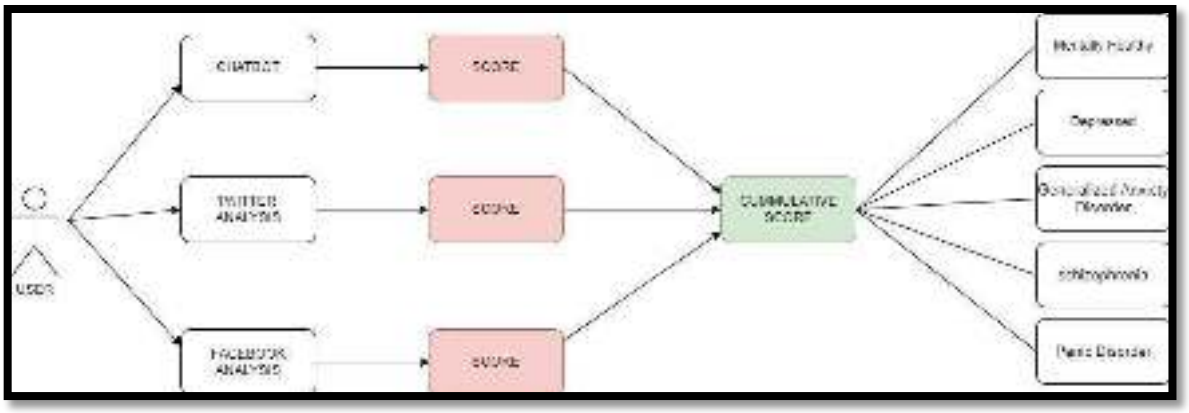


Figure 3.1: Project Architecture of Framework to mitigate Mental Health issues using NLP.

3.2 DESCRIPTION

The Methodologies used in this project are of Natural Language Processing focusing on "Dialogue Generation" by understanding the context of the text. "Sentiment Analysis" is used to detect the mental state of the person and respond accordingly by providing apt advice and analysis. If we can detect mental health issues at the correct time and provide suitable help, we might save precious lives. Twitter is one of the biggest applications for information sharing. Sentiment analysis allows us to grab a hint of inclination of people's views in favor or against of any subject. The basic motivation to use this chat is to observe, examine and analyze how the person deals a situation either by expressing their aggression, as we all condemn such inhuman activities.

In this project we use chatbot and sentiment analysis to inspect one's mental health status. We are trying to create aknowledge base for the chatbot with natural language used. The first step to create Knowledge base would be collecting dataset which we are planningto do by visiting a psychiatrist and use their domain knowledge, expertise to get better chatbot results and also available resources Kaggle.

On addition to chatbot, Twitter and Facebook analysis are planned to increase the accuracy of results and to reduce the miscalculations due to self-consciousness in chatbot analysis. We obtain data from Twitter using Twitter API Credentials. The usage of various platforms helps analyze a person's mental state in broader and better perspective. In the chatbot module, a natural language (no language constraint) conversation between the chatbot and user is bound. The conversation includes set of questions directed towards goal of identifying the mental health disorder. Followed by which a score is assigned to categorize into one of the below:

- Depression
- Generalized Anxiety Disorder
- Schizophrenia
- Panic Disorder
- Anger management Issues
- Stress
- Mentally Healthy.

The examination prompting the distinguishing proof of issue is trailed by giving tips, ideas, and sites that could be useful to plan meeting with specific specialists for additional clinical help and to keep the most awful from occurring. The model is broadly classified into three modules namely:

- Chatbot
- Facebook Sentiment Analysis
- Twitter Sentiment Analysis

Each module is briefly discussed as following to get better insights on the architecture and working of the model.

CHATBOT MODULE :

The model purposes the RASA framework to make a conversational Chatbot that includes

NLP for having conversations with the users. The RASA design can be widely found in two areas specifically –

- RASA NLU
- RASA Core.

The RASA NLU is the underlying fragment of the framework that comes into play as the discussion starts. The NLU module goes similarly to the "ear" of the structure which implies that it manages the comprehension of the client's discoursed and figures out the specific circumstance or sorts out the particular situation. This is achieved by intent classification and entity extraction. RASA NLU uses Bag-of-Word (BoW) algorithm to find intent and Conditional Random Field (CRF) to find entities. While Rasa Core deals with teaching the chatbot about how to make responses by training dialogue management set up on deep learning. Keras Policy internally uses LSTM network. Memorization Policy memorizes the conversations in training data. After this, the other module comes directly into it to set up the chatbot on the talk using significant learning - LSTM Neural Network.

LSTM is otherwise called Long Short-Term Memory which productively saves some required memory yet will eliminate some memory that isn't required. The furtherance of the chatbot can be depicted by taking the talk of the user and passing it to the Interpreter to recuperate the intents and entities where the tracker stores the conversation history in its memory. Then, at that point, the policy is used to conclude the accompanying action finally sending back the response which is completely taken by RASA Core.

Bi-LSTM:(Bi-directional long short-term memory):

Bidirectional recurrent neural networks (RNN) are really just putting two independent RNNs together. This structure allows the networks to have both backward and forward information about the sequence at every time step. Using bidirectional will run inputs in two ways, one from past to future and one from future to past and what differs this approach from unidirectional is that in the LSTM that runs backward you preserve information from the future and using the two hidden states combined you are able in any point in time to preserve information from both past and future.

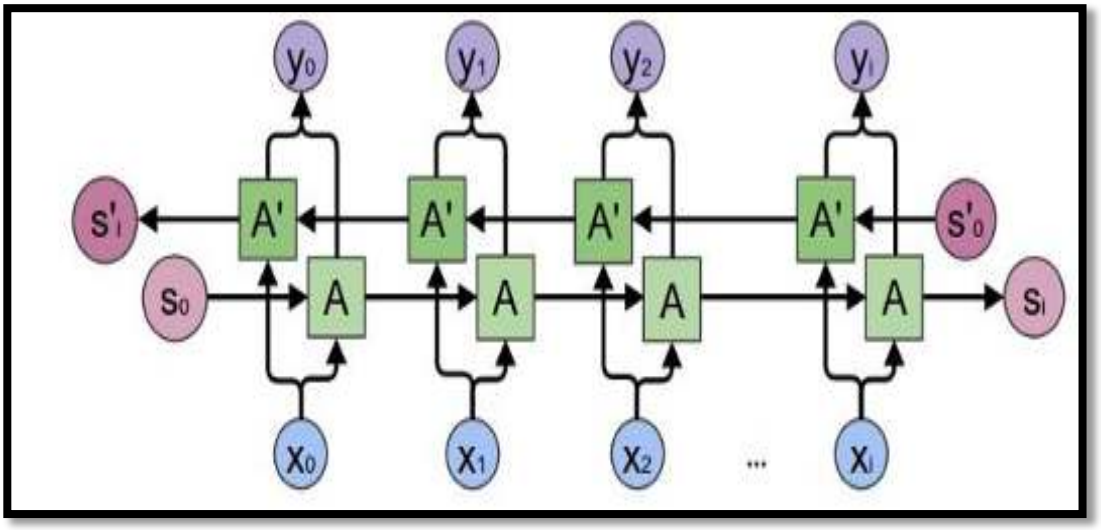


Figure 3.2 .1: Bi-LSTM Architecture

What they are suited for is a very complicated question but BiLSTMs show very good results as they can understand the context better.

In Bi-LSTM:

As in NLP , sometimes to understand a word we need not just to the previous word , but also to the coming word , like in this example: Here for the word "Teddy", we can't just say whether the next word is gonna be "Bears" or "Roosevelt", it will depend on the context of the sentence. Bi-lstm is general architecture that can use any RNN model.

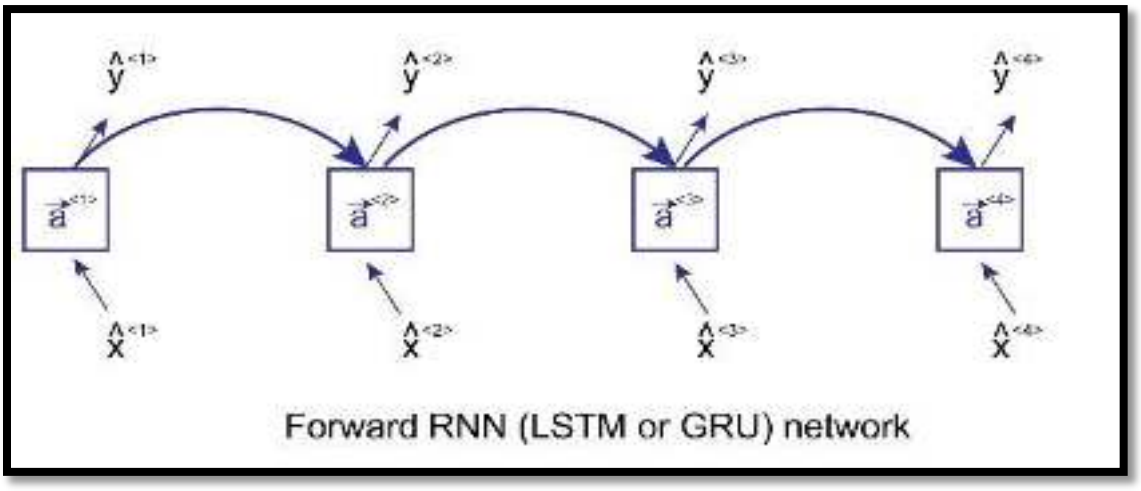


Figure 3.2.2: Forward -LSTM Architecture

Here we apply forward propagation 2 times, one for the forward cells and one for the backward cells. Both activations(forward , backward) would be considered to calculate the output y^ at time t

$$\hat{y}^{<t>} = g(W_y [\overrightarrow{a}^{<t>}, \overleftarrow{a}^{<t>}] + b_y)$$

The Architecture of chatbot built using RASA Framework can be given as following -

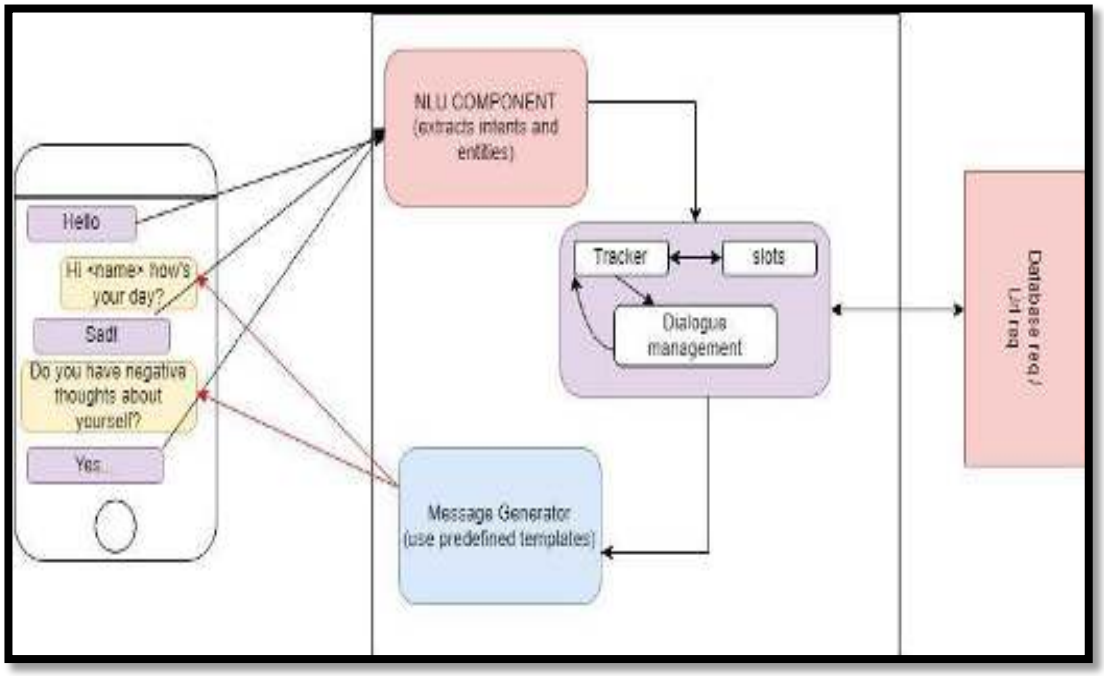


Figure:3.2.3.: RASA Architecture

TWITTER SENTIMENT ANALYSIS:

Whenever a person is affected by mental issues, usually they don't share their symptoms with doctors or any helping person as most of the cases the person suffering from issue is not aware of their condition. People tend to communicate their worries with others over social media Platforms by posting their emotions of everyday. In addition to describing simple factual information, people also use writing to express their activities, and convey their feelings, mental states, hopes and desires.

Even when writing is shaped by the way someone wants to be perceived, this text still provides important cues to help friends and family recognize important life events for them to respond to with support and encouragement. When people write digitally (e.g. on email or social media), their texts are processed automatically. Natural language processing (NLP) techniques make inferences about what people say and feel, and these inferences can trigger messages or other actions.

One of the most common uses of NLP is in the marketing sector where companies analyze emails and social media to generate targeted advertising and other forms of 'interventions' (generally aimed at changing our behavior toward buying something or following a link). However, potential applications of NLP techniques extend beyond marketing. For example, NLP techniques have been identified as an important area of growth within the artificial intelligence (AI) in medicine community (Peek et al. 2015).

Mental health applications are designed to support mental health and wellbeing in an online environment and are reliant on interdisciplinary collaboration between researchers and practitioners from areas such as computational linguistics, human-computer interaction and mental health (and mental health service delivery). Hence, we are utilizing this precious information to provide unbiased output.

The following process is followed in this module:

- After collecting the tweets from user as text document, we are preprocessing the data.
- And then, the VADER classifier classifies the tweets as positive, negative and assign score to each of it.
- This score is used along with previous modules to conclude a category of mental health disorder

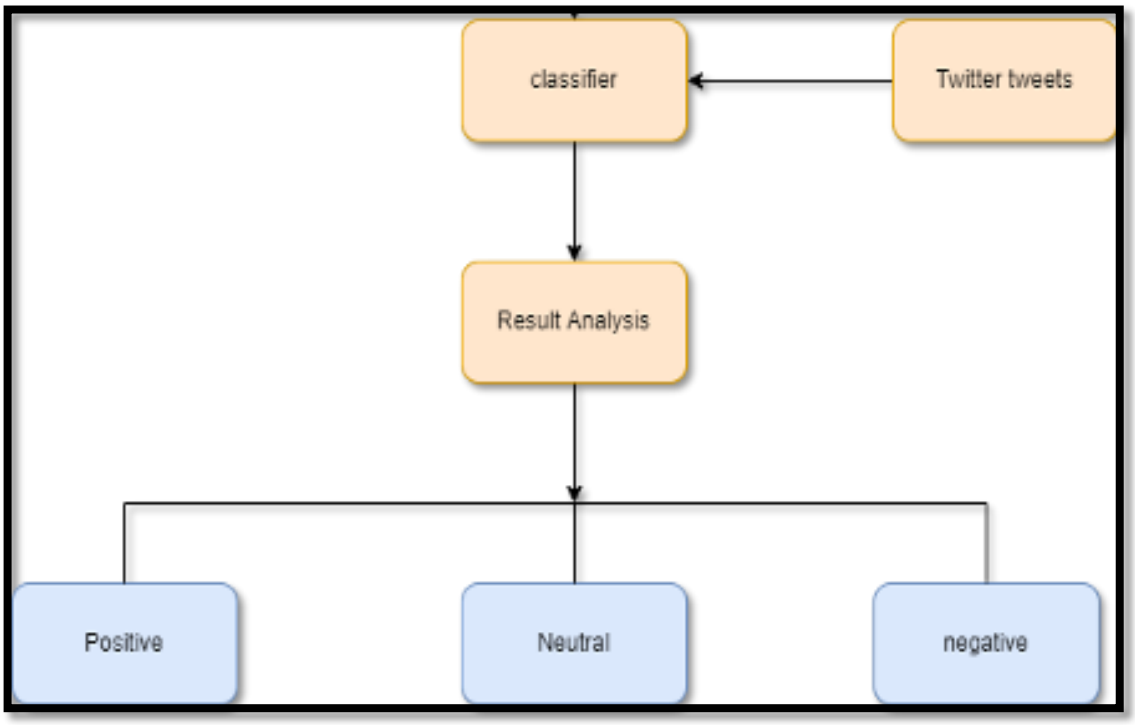


Figure 3.2.4: Twitter Sentiment Analysis Flow

FACEBOOK SENTIMENT ANALYSIS:

Twitter and Facebook are the most popular applications for information sharing. Sentiment analysis allows us to grab a hint of inclination of people's views in favor or against of any subject. On addition to chatbot, Twitter and Facebook analysis are planned to increase the accuracy of results and to reduce the miscalculations due to self-consciousness in chatbot analysis. The usage of various platforms helps analyze a person's mental state in broader and better perspective.

The steps followed are as follows:

- Downloading(fetching) Facebook comments/posts from user and save it as text format.
- Preprocessing the data through SkLearn and nltk libraries. we first tokenize the data and then after tokenizing we stematize and lemmatize.
- Vader Classifies each comment as positive, negative or neutral and assign score to each of it.
- This score is used along with previous modules to conclude a category of mental health disorder.

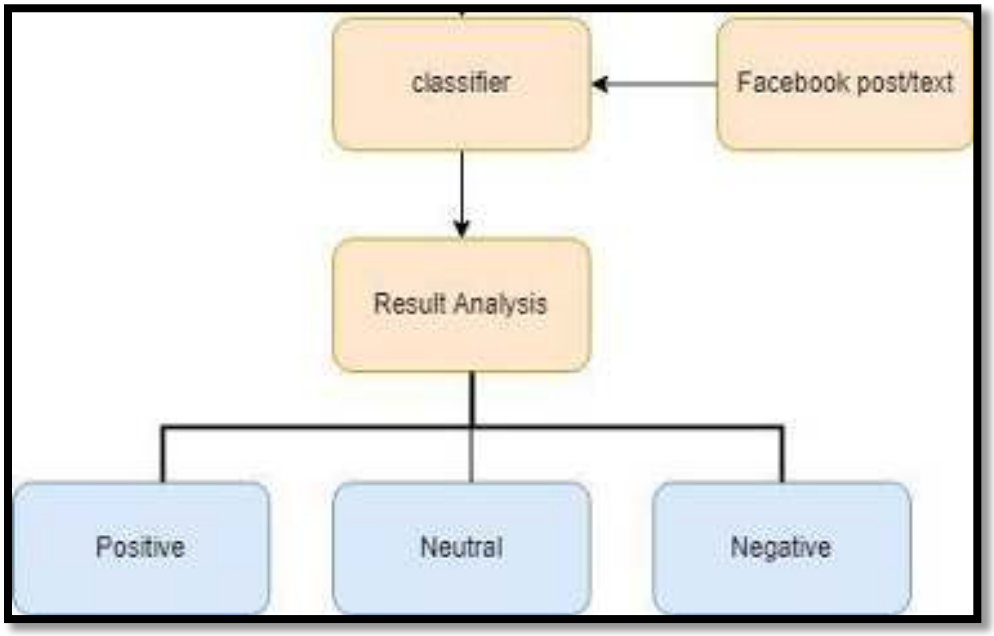


Figure 3.2.5: Facebook Sentiment Analysis Flow

VADER ANALYZER:

Sentiment analysis is a commonly used NLP (natural language processing) technique to determine whether the text is positive, negative, or neutral. It has been frequently used to look at customer satisfaction based on review sentiment or serve as an additional perspective when we doing analysis on text data. There are python packages available to calculate sentiment score directly like NLTK Vader.

VADER (Valence Aware Dictionary for sentiment Reasoning) is a model used for text sentiment analysis that is sensitive to both polarity (positive/negative) and intensity (strength) of emotion. Introduced in 2014, VADER text sentiment analysis uses a human-centric approach, combining qualitative analysis and empirical validation by using human raters and the wisdom of the crowd. Consider the following sentences: “The party is wonderful. “and “I hate that man.” Do you get a sense of the feelings that these sentences imply? The first one clearly conveys positive emotion, whereas the second conveys negative emotion. Humans associate words, phrases, and sentences with emotion. The field of Text Sentiment Analysis attempts to use computational algorithms in order to decode and quantify the emotion contained in media such as text, audio, and video.

Text Sentiment Analysis is a really big field with a lot of academic literature behind it. However, its tools really just boil down to two approaches: the lexical approach and the machine learning approach. Lexical approaches aim to map words to sentiment by building a lexicon or a 'dictionary of sentiment.'

We can use this dictionary to assess the sentiment of phrases and sentences, without the need of looking at anything else. Sentiment can be categorical — such as {negative, neutral, positive} — or it can be numerical — like a range of intensities or scores. Lexical approaches look at the sentiment category or score of each word in the sentence and decide what the sentiment category or score of the whole sentence is. The power of lexical approaches lies in the fact that we do not need to train a model using labeled data, since we have everything we need to assess the sentiment of sentences in the dictionary of emotions. VADER is an example of a lexical method. Primarily, VADER sentiment analysis relies on a dictionary which maps lexical features to emotion intensities called sentiment scores. The sentiment score of a text can be obtained by summing up the intensity of each word in the text.

VADER sentiment analysis (well, in the Python implementation anyway) returns a sentiment score in the range -1 to 1, from most negative to most positive. The sentiment score of a sentence is calculated by summing up the sentiment scores of each VADER-dictionary-listed word in the sentence. The sentiment score of a sentence is the sum of the sentiment score of each sentiment-bearing word. However, a normalization is mapped to the total to map it to a value between -1 to 1. The normalization used is-

$$\frac{x}{\sqrt{x^2 + \alpha}}$$

where x is the sum of the sentiment scores of the constituent words of the sentence and alpha is a normalization parameter that we set to 15. The normalization is graphed below.

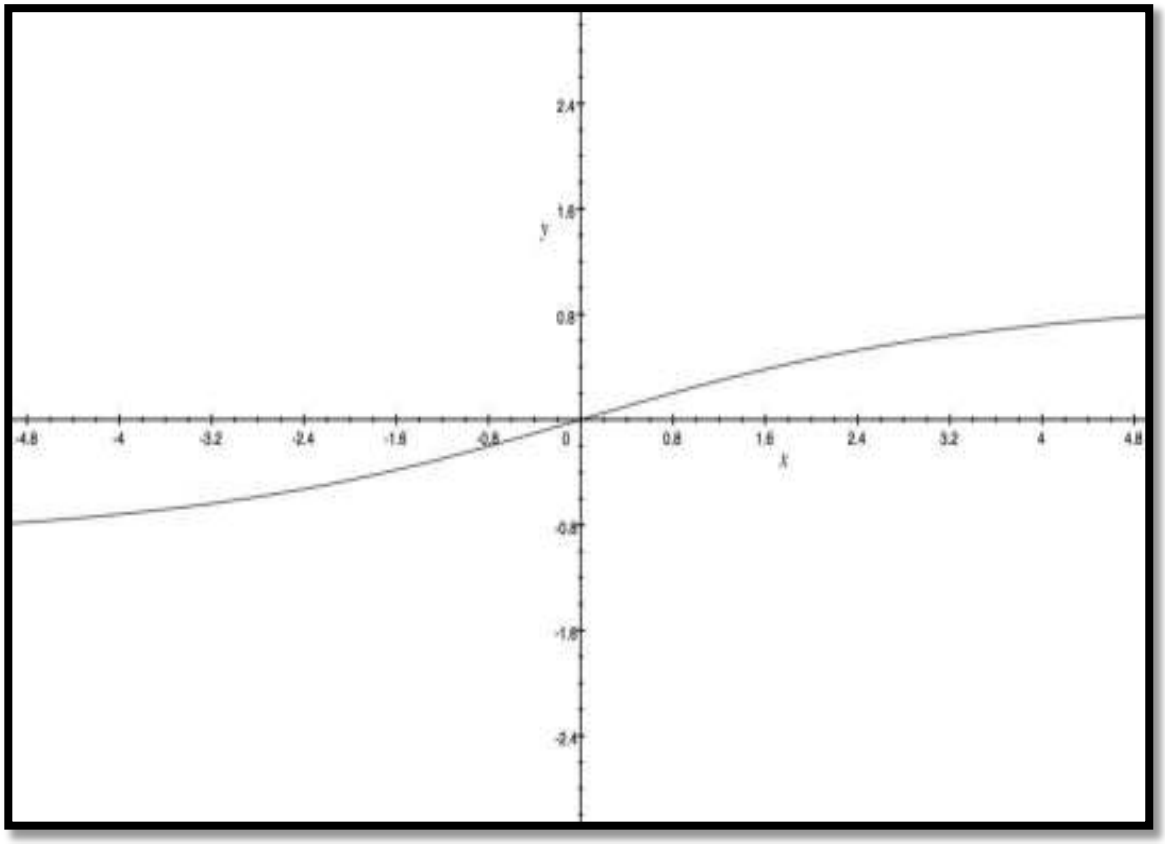


Figure 3.2.6: Normalization Graph

We see here that as x grows larger, it gets more and more close to -1 or 1. To similar effect, if there are a lot of words in the document you're applying VADER sentiment analysis to, you get a score close to -1 or 1. Thus, VADER sentiment analysis works best on short documents, like tweets and sentences, not on large documents.

VADER's SentimentIntensityAnalyzer () inputs a sentence and returns a word reference of scores in one of the four classes:

- Negative
- Neutral
- Positive
- Compound

The overall Scheme of the model can be visualized as follows:

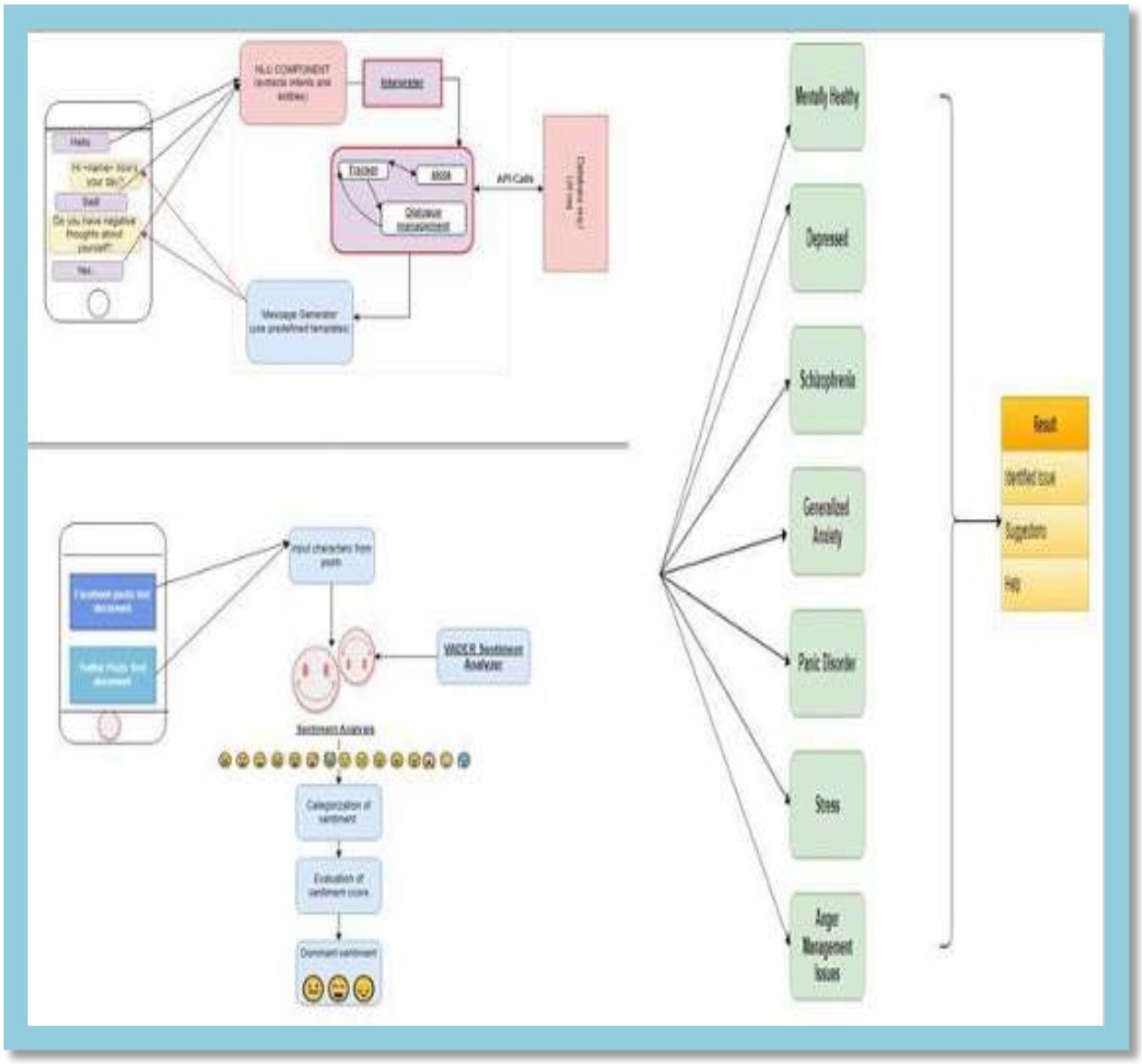


Figure 3.2.7: Architecture of the Framework to mitigate mental health issues

3.3 USE CASE DIAGRAM

In the use case diagram, we have three actors who are the user, the mobile, andthe robot vehicle. The user operates the robot vehicle through mobile.

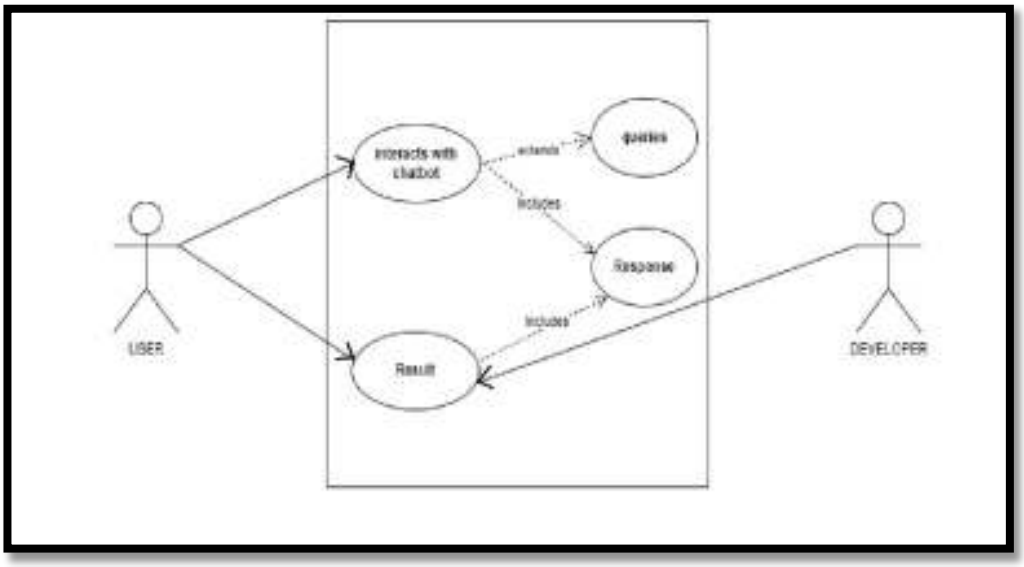


Figure 3.3: Use Case Diagram for Mental Health Analysis Using NLP

3.4 CLASS DIAGRAM

- Class Diagram is a collection of classes and objects.

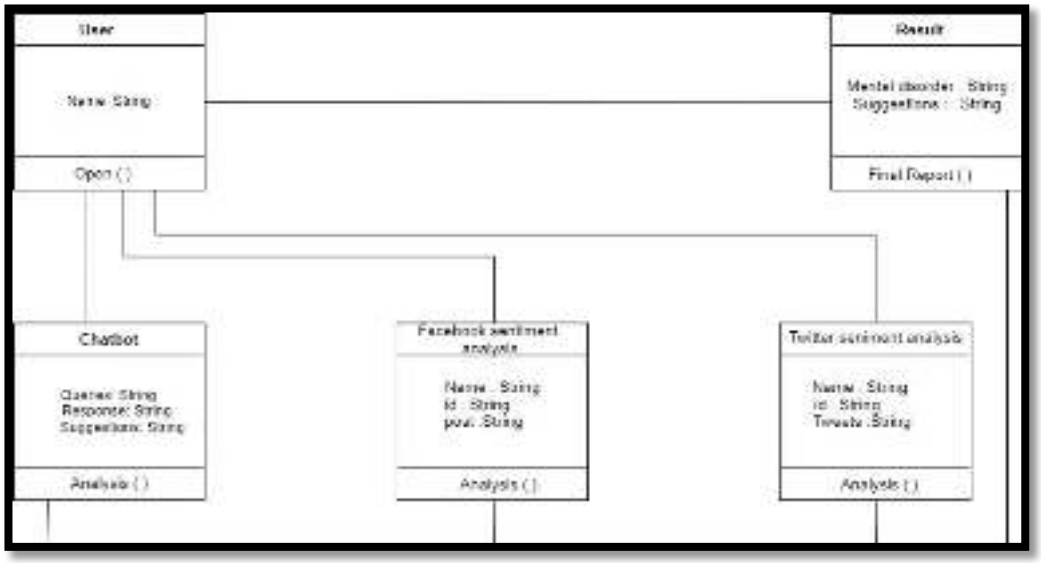


Figure 3.4: Class Diagram for Mental Health Analysis Using NLP

3.5 ACTIVITY DIAGRAM

The below Figure 3.4 depicts the Activity diagram of Mental Health Using NLP

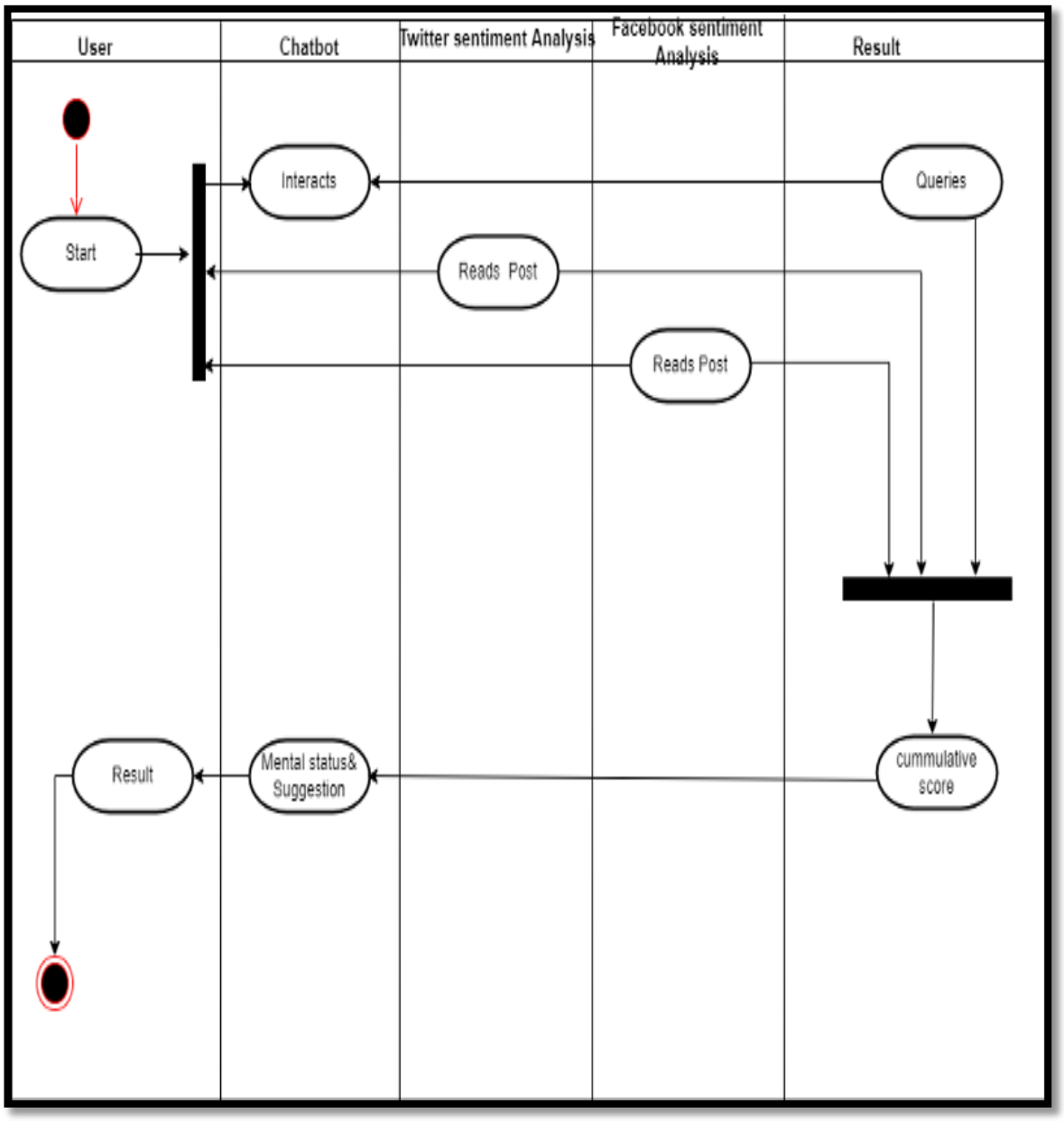


Figure 3.5: Activity Diagram for Mental Health Analysis Using NLP

3.6 SEQUENCE DIAGRAM

The Sequence diagram describes the flow of modules.

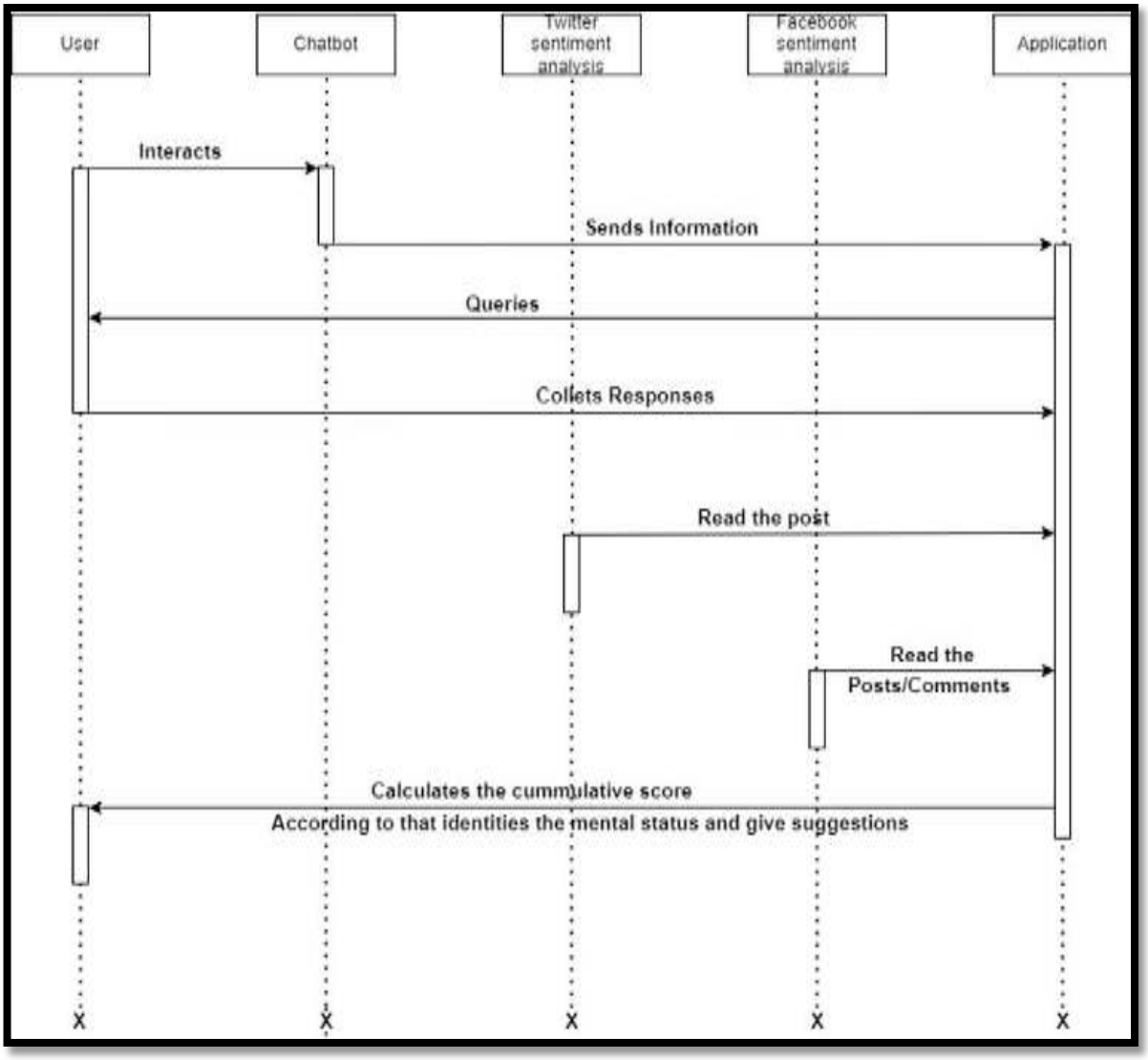


Figure 3.6: Sequence Diagram for Mental Health Analysis Using NLP

4. IMPLEMENTATION

4. IMPLEMENTATION

4.1 SAMPLE CODE

Main.py

```
from unittest import result
from flask import Flask, render_template, request, redirect, url_for, jsonify
from werkzeug.utils import secure_filename
import json
import requests
import os
import numpy as np
import nltk
nltk.download('vader_lexicon')
from nltk.sentiment.vader import SentimentIntensityAnalyzer
sid = SentimentIntensityAnalyzer()
app = Flask(_name_)
app.secret_key = 'encryption_key'
app.config['UPLOAD_FOLDER'] = str(os.getcwd())+'/static/uploads'
ALLOWED_EXTENSIONS = set(["txt"])
def allowed_file(filename):
return '.' in filename and filename.rsplit('.', 1)[1].lower() in
ALLOWED_EXTENSIONS
@app.route('/')
def home():
return render_template('home.html')
@app.route('/ai', methods=['get', 'post'])
def ai():
return render_template('chatScreen.html')
@app.route('/machineLearning/<msg>', methods=['get', 'post'])
def machine_learning(msg):
print(msg)
with open("rasa/data.json","r") as f:
sta_data = json.load(f)
sta_data["text"].append(msg)
print(sta_data)
```

```
with open("rasa/data.json","w") as f1:
sta_data = json.dump(sta_data,f1)

data1 = json.dumps({"sender": "Rasa","message": msg})
headers = {'Content-type': 'application/json', 'Accept': 'text/plain'}
res1 = requests.post('http://localhost:5005/webhooks/rest/webhook', data= data1,
headers = headers)
res1 = res1.json()
print(res1)
try:
if len(res1)>=2:
s=res1[0]['text']+"\n\n\n"+res1[1]['text']
res1=s
if len(res1)<2:
res1=res1[0]['text']
except:
res1="please can you repeat the last response"
return jsonify(data=res1)
result = ""
@app.route('/social', methods=['get', 'post'])
def social():
global result
if request.method=="POST":
print(request.files)
file1 = request.files['file_id1']
file2 = request.files['file_id2']

if file1.filename == '' and file2.filename == '':
return redirect(request.url)
if file1 and allowed_file(file1.filename) and file2 and allowed_file(file2.filename) :
print("in condition")
filename1 = secure_filename(file1.filename)
file1.save(os.path.join(app.config['UPLOAD_FOLDER'], filename1))
filename2 = secure_filename(file2.filename)
file2.save(os.path.join(app.config['UPLOAD_FOLDER'], filename2))
with open(os.path.join(app.config['UPLOAD_FOLDER'], filename1),"r") as f:
```

```
facebook = f.read()
# facebook_scores = sid.polarity_scores(facebook)
# facebook_scores.pop("compound")


# facebook_result,facebook_scores = sorted(facebook_scores.items(),key=lambda x :
x[1],reverse=True)
with open(os.path.join(app.config['UPLOAD_FOLDER'], filename2),"r") as f1:
twitter = f1.read()
social_scores = sid.polarity_scores(twitter+facebook)
social_scores.pop("compound")
social_result,social_score = sorted(social_scores.items(),key=lambda x :
x[1],reverse=True)[0]
with open("rasa/data.json","r") as f0:
user_data = json.load(f0)
zchi = user_data["text"][-2]
# zchi.pop("compound")
# zchi_result,zchi_score = sorted(zchi.items(),key=lambda x : x[1],reverse=True)[0]
with open("rasa/result.json","r") as f2:
chatbot_data = json.load(f2)
print(chatbot_data)
if "yes" in zchi.lower() or "not" in zchi.lower():
result = """</br>
<strong>"THERE IS HOPE, EVEN WHEN YOUR BRAIN TELLS YOU THERE
ISN'T"</strong>
</br>
After the analysis we conclude that you possibly could be suffering with
Schizophrenia.
</br>
Here is some tips for you : <a
href="https://www.nimh.nih.gov/health/topics/schizophreni">click here</a>!
</br>
It is highly suggested to visit a psychiatrist at earliest to avoid the worst.
</br>
Don't hesitate to reach out for help: <a
href="https://www.thelivelovelaughfoundation.org/helpline">click here</a>!
</br>
check the Doctor profile here: <a href="/profile">click here</a>."""
elif chatbot_data["result"] == "sadness":
```

```
if social_result == "neg":
result = """</br>
<strong>‘Help is available’</strong>
</br>
After the interaction we conclude that you possibly could be depressed. Here are some tips for you: <a href="https://www.nimh.nih.gov/health/publications/depression#part_6149">click here</a>!.
</br>
It is highly suggested to visit a psychiatrist at earliest to avoid the worst.
</br>
Don’t hesitate to reach out for help: <a href="https://www.thelivelovelaughfoundation.org/helpline" >click here</a>!
</br>
check the Doctor profile here: <a href="/profile">click here</a>.
"""
else:
result = """</br>
<strong>I can understand that you feel stressed....</strong>
</br>
so to get refreshed let's go for a walk and eat something nice.....
</br>
if that is not possible here is something visit this to make your mood better '<a href="https://www.thelivelovelaughfoundation.org/helpline">click here</a>!'
</br>
check the Doctor profile here: <a href="/profile">click here</a>."""
elif chatbot_data["result"] == "anger":
if social_result == "neg":
result = """</br>
<strong>“Change what you can, manage what you can’t.”</strong>
</br>
After the analysis we conclude that you possibly could be suffering with Anger Management Issues . Here is some tips for you : <a href="https://www.nimh.nih.gov/health/publications/disruptive-mood-dysregulation-disorder">click here</a>!
</br>
It is highly suggested to visit a psychiatrist at earliest to avoid the worst.
</br>
```

```
Don’t hesitate to reach out for help: <a
href="https://www.thelivelovelaughfoundation.org/helpline"> click here</a>!
</br>
check the Doctor profile here: <a href="/profile">click here</a>.
"""
else:
result = """
</br>
<strong>One of the best ways to reduce stress is to accept the things that you cannot
control</strong>
</br>
After the analysis we conclude that you  could possibly be stressed.
</br>
Here is some tips for you to keep up <a
href="https://www.nimh.nih.gov/sites/default/files/documents/health/publications/so-
stressed-out-fact-sheet/20-mh-8125-imsostressedout.pdf">click here</a>!
</br>
It is highly suggested to visit a psychiatrist at earliest to avoid the worst.
</br>
Don’t hesitate to reach out for help: <a
href="https://www.thelivelovelaughfoundation.org/helpline">click here</a>!
</br>
check the Doctor profile here: <a href="/profile">click here</a>.
"""
elif chatbot_data["result"] == "fear":
if social_result == "neg":
result = """</br>
<strong>‘It’s OK to not feel OK’</strong>
</br>
After the analysis we conclude that you possibly could be suffering with Panic
disorders . Here is some tips for you : <a href="https://www.nhs.uk/mental-
health/feelings-symptoms-behaviours/feelings-and-symptoms/anxiety-fear-panic/">
click here</a>!
</br>
It is highly suggested to visit a psychiatrist at earliest to avoid the worst.
</br>
Don’t hesitate to reach out for help:<a
href="https://www.thelivelovelaughfoundation.org/helpline">click here</a>!
```

```
</br>
check the Doctor profile here: <a href="/profile">click here</a>.
"""
else:
result = """</br>
<strong>Anxiety does not empty tomorrow of its sorrows, but only empties today of its strength</strong>
</br>
After the analysis we conclude that you  could possibly be having Anxiety issues.

</br>
Here is some tips for you to keep up <a href="https://www.nimh.nih.gov/news/media/2021/great-helpful-practices-to-manage-stress-and-anxiety">click here</a>!
</br>
It is highly suggested to visit a psychiatrist at earliest to avoid the worst.
</br>
Don’t hesitate to reach out for help: <a href="https://www.thelivelovelaughfoundation.org/helpline">click here</a>!
</br>
check the Doctor profile here: <a href="/profile">click here</a>
"""
elif chatbot_data["result"] == "joy" or chatbot_data["result"] == "love" or chatbot_data["result"] == "surprise":
if social_result == "neg":
result = """
</br>
<strong>!!Sending some good vibes and happy thoughts your way!!</strong>
</br>
After the analysis we conclude that you  are mentally healthy.
</br>
Here is some tips for you to keep up : <a href="https://www.nimh.nih.gov/health/topics/caring-for-your-mental-health"> click here </a>!
</br>
Here’s something that might help you: <a href="https://www.thelivelovelaughfoundation.org/helpline">click here </a>!</body>
```

```
</br>
"""
else:
result = """S</br>
<strong>self-care is how you take your power back</strong>

</br>
After the analysis we conclude that you  are mentally healthy.
</br>
Here is some tips for you to keep up : <a
href=https://www.nimh.nih.gov/health/topics/caring-for-your-mental-health> click
here </a>!
</br>
Here’s something that might help people with mental health issues: <a
href=https://www.thelivelovelaughfoundation.org/helpline>click here </a>!
</br>
check the Doctor profile here: <a href="/profile">click here</a>.
"""
print(result)
with open("fin_result.txt","w") as f5:
f5.write(result)
# return render_template("data_page.html", result = result)
return redirect(url_for("display_image",result=result))
else:
return render_template('social.html')
@app.route('/data_page/')
def display_image():
with open("fin_result.txt","r") as f5:
result = f5.read()
with open("rasa/data.json","w") as f1:
json.dump({"text":[]},f1)
#print('display_image filename: ' + filename)
return render_template("data_page.html", result = result)
@app.route('/profile')
def display_profile():
return render_template("profile.html")
if__name__== '_main_':
```

```
app.run(port=8008,debug=True,threaded=True)
```

Stories.md

```
## stroy 1
* greet
  - utter_greet
* answer1
  - utter_question1
* answer2
  - utter_question2
* answer3
  - utter_question3
* answer4
  - utter_question4
* answer5
  - utter_question5
* answer6
  - action_predict
  - utter_goodbye

## stroy 2
* greet
  - utter_greet
* answer1
  - utter_question1
* answer2
  - utter_question2
* answer3
  - utter_question3
* answer4
  - utter_question4
* answer5
  - utter_question5
* answer6
  - action_predict
```

```
  - utter_goodbye

## stroy 3
* greet
  - utter_greet
* answer1
  - utter_question1
* answer2
  - utter_question2
* answer3

  - utter_question3
* answer4
  - utter_question4
* answer5
  - utter_question5
* answer6
  - action_predict
  - utter_goodbye

## stroy 4
* greet
  - utter_greet
* answer1
  - utter_question1
* answer2
  - utter_question2
* answer3
  - utter_question3
* answer4
  - utter_question4
* answer5
  - utter_question5
* answer6
  - action_predict
  - utter_goodbye
```

```
## stroy 5
* greet
  - utter_greet
* answer1
  - utter_question1
* answer2
  - utter_question2
* answer3
  - utter_question3
* answer4
  - utter_question4
* answer5
  - utter_question5
* answer6
  - action_predict
  - utter_goodbye
```

5. RESULTS

5. RESULTS

5.1 SCREENSHOTS

5.1.1 HOME PAGE

This is the primary screen a client would confront which is utilized reproduce inward harmony without restless sensations of going through a conversation fixated on their emotional well-being. This screen of our model refers to chatbot module which allows the user to start the self-evaluation process by having a conversation with the bot in the most comfortable way talking.

Screenshot 5.1.1: Home screen of the web application.

5.1.2 CHAT SCREEN

Clicking on the “GO TO CHATBOT” button lands the users to the home page of chatbot where the conversation starts with a greeting and ends with one.

Screenshot 5.1.2: Chat screen of the web application.

5.1.3 FLOW OF THE CHAT

Depicting for the case Schizophrenia, the pictures show the progression of discussion between the bot and user with series of questions that are required with answers from the user.

Screenshot 5.1.3: Flow of chat between user and bot

Screenshot 5.1.4: Flow of chat between user and bot (Continuation)

5.1.4 SOCIAL MEDIA ANALYSIS SCREEN

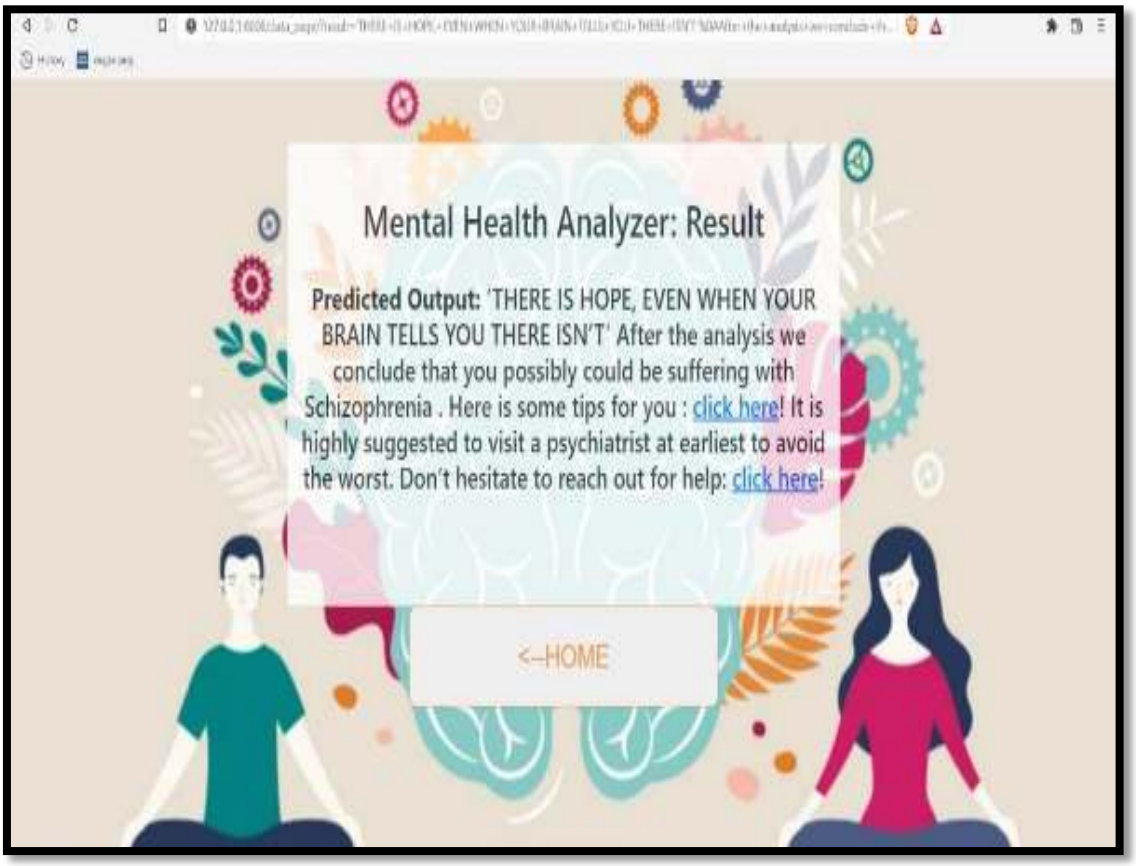
The subsequent one represents social sentiment investigation where the posts of social platforms are combined into message archives where the VADER examination gives negative feeling respecting Schizophrenia. The users are required to upload the posts from their social platforms such as twitter and Facebook by uploading the consolidated text documents.

Screenshot 5.1.5: Home Screen of Social Media Analysis Page

By clicking on choose file, the documents display tab is opened from which users upload files following the click on submit button.

5.1.5 RESULT SCREEN

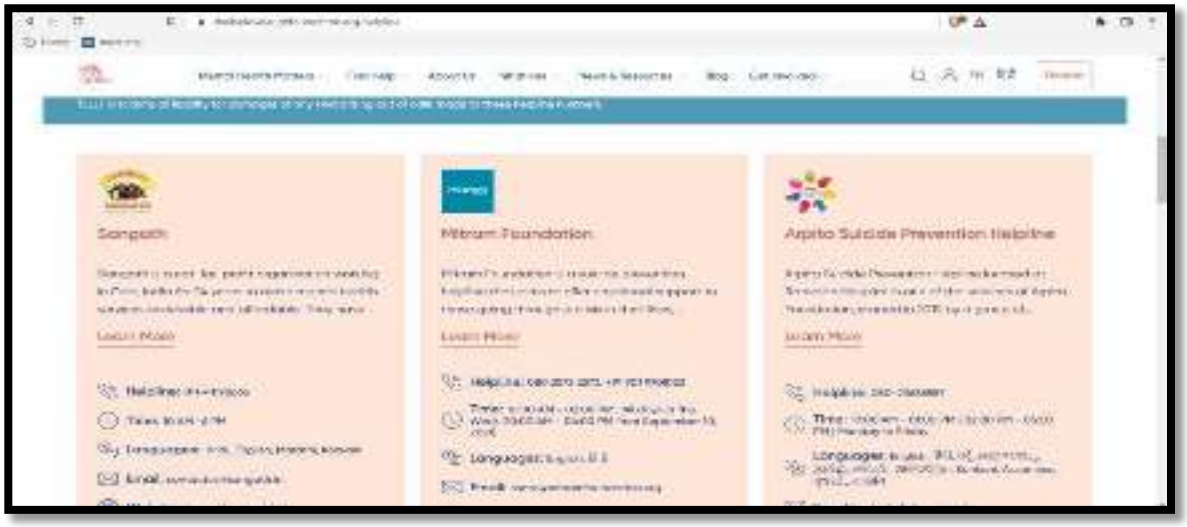
The result yielded by the chatbot is intended to zero in on following: identification of psychological well-being issue, ideas that go about as essential consideration which is a connection to a page of NIMH followed by connection to page with different assets to acquire help. And this is the outcome yielded after the discussion with bot and investigation on people social posts corresponding to the case of Schizophrenia.



Screenshot 5.1.6: Results Screen For case Schizophrenia

The following are the screens that pop up after following the hyperlinks given in the result section. The first corresponds to the NIMH Page of the disorder identified which gives broad idea about the issue, symptoms and care to be take. While the later showcases multiple ways of getting help with details of all foundations working for the similar cause.

Figure 5.1.7 : Link directing towards Schizophrenia NIMH Page



Screenshot 5.1.8 : Link directed to show sources of help available.

5.2 GRAPHS

The Accuracy of model can be characterized as the quantity of true positives and true negatives divided by the number of true positives, true negatives, false positives, and false negatives. The accuracy of the training and validation data of the model is plotted on the following graph:

$$Accuracy = \frac{Number\ of\ Correct\ predictions}{Total\ number\ of\ predictions\ made}$$

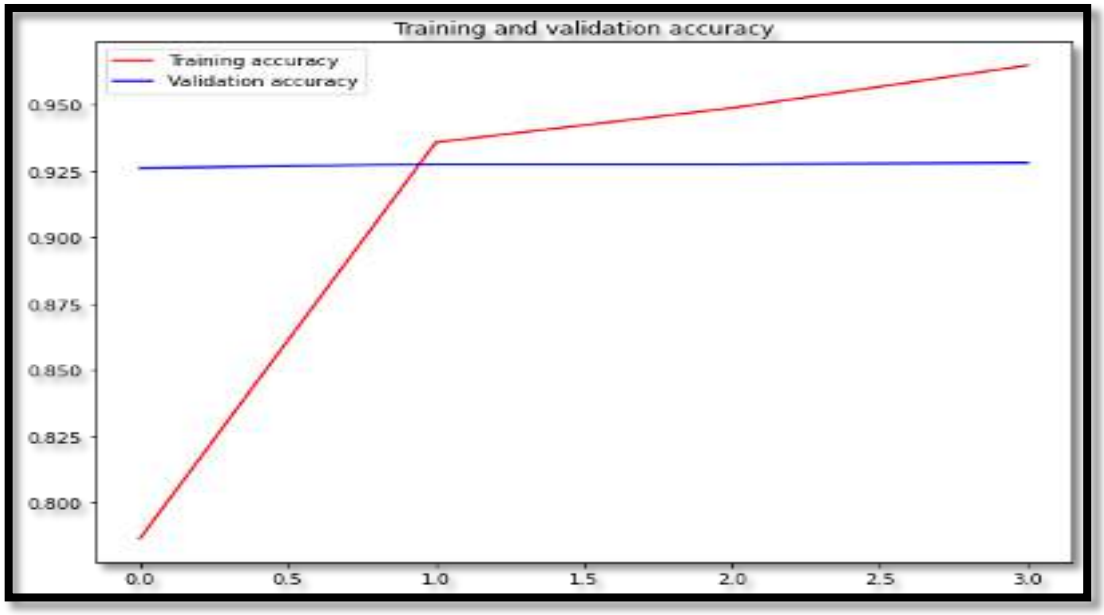


Figure 5.2.1: Accuracy of the model

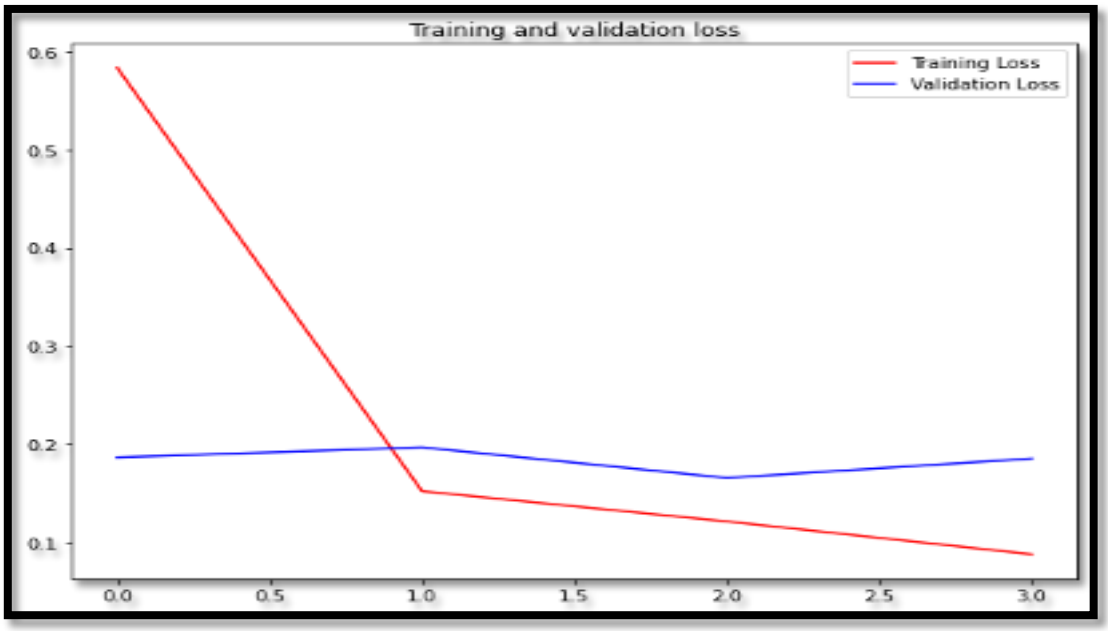


Figure 5.2.2: Loss of the model

The above curve is explaining loss score changing over the 4 set of epochs Confusion Matrix is an exceptionally well known measure utilized while taking care of classification models. It tends to be applied to paired arrangement as well with respect to multiclass order issues. Disarray grids address counts from anticipated and genuine qualities.

5.3 TABLES

The result "TN" represents True Negative which shows the quantity of negative models ordered precisely. Also, "TP" represents True Positive which shows the quantity of positive models arranged precisely. The expression "FP" shows False Positive worth, i.e., the quantity of genuine negative models delegated positive; and "FN" signifies a False Negative worth which is the quantity of real certain models named negative. The plotted confusion matrix can be visualized as:

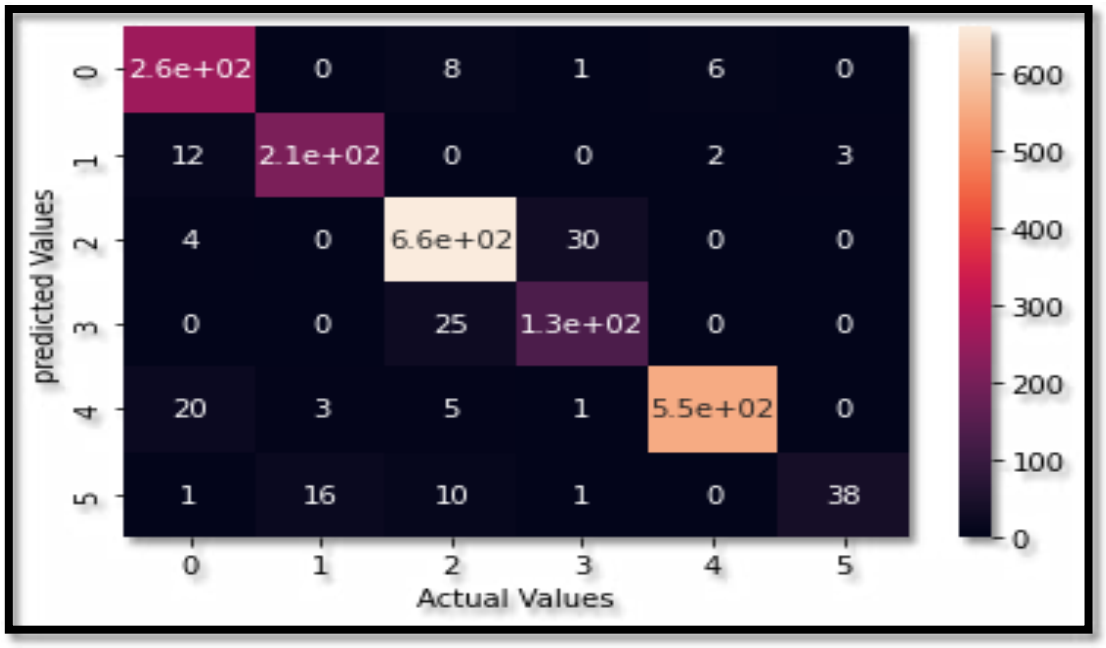


Figure 5.3.1 : Confusion Matrix

Here 0 : anger, 1: fear, 2: joy, 3: love, 4:sadness, 5: surprise

- **Precision** - Precision is the ratio of correctly predicted positive observations to the total predicted positive observations. High precision relates to the low false positive rate

Precision = TP/TP+FP

- **Recall** (Sensitivity) - Recall is the ratio of correctly predicted positive observations to the all observations in actual class – yes

Recall = TP/TP+FN

- **F1 score** - F1 Score is the weighted average of Precision and Recall. Therefore, this score takes both false positives and false negatives into account. Intuitively it is not as easy to understand as accuracy, but F1 is usually more useful than accuracy, especially if we have an uneven class distribution.

Accuracy works best if false positives and false negatives have similar cost. If the cost of false positives and false negatives are very different, it's better to look at both Precision and Recall.

F1 Score = 2*(Recall * Precision) / (Recall + Precision)

Here we are able to see precision, recall, f1-score for each emotion is given and support tell us about exactly how many test cases were considered for each emotion.

PRECISION	RECALL	F1-Score	SUPPORT
0.88	0.95	0.91	275
0.92	0.92	0.92	224
0.93	0.95	0.94	695
0.80	0.84	0.82	159
0.99	0.95	0.97	581
0.93	0.58	0.71	66
ACCURACY		0.93	2000

Table 5.3.2 : Metrics Evaluation

6. TESTING

6. TESTING

6.1 INTRODUCTION TO TESTING

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner.

6.2 TYPES OF TESTING

6.2.1 UNIT TESTING

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application. This is a structural testing that relies on knowledge of its construction and is invasive.

6.2.2 INTEGRATION TESTING

Integration tests are designed to test integrated software components to determine if they actually run as one program. Integration tests demonstrate thatalthough the components were individually satisfactory, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6.2.3 FUNCTIONAL TESTING

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation. Functional testing is centered on the following items:

- Valid Input: identified classes of valid input must be accepted.
- Invalid Input: identified classes of invalid input must be rejected.
- Functions: identified functions must be exercised.
- Output: identified classes of application outputs must be exercised.

6.4 TEST CASES

6.4.1 WORKING OF MODEL

Test Case ID	Test Case Name	Purpose	Input	Output
1	Mentally Healthy	To analyze the condition of person mentally healthy	User's chat is joyful and social media Analysis is positive.	Result displayed with mentally healthy status and general help page.
2	Schizophrenia	To analyze the condition of person possibly suffering with schizophrenia	User's chat shows symptoms of the same and Social media Analysis is negative.	Result displayed with Schizophrenia status , NIMH page about the disorder and general help page.
3	Depression	To analyze the condition of person possibly suffering with	User's chat shows the emotion sadness and Social media Analysis is negative.	Result displayed with Depression status , NIMH page about the disorder and general help page.
4	Stress	To analyze the condition of person possibly suffering with	User's chat shows the emotion sadness, anger and Social media Analysis is positive.	Result displayed with Stress status, NIMH page about the disorder and general help page.
5	Anger Management Issues	To analyze the condition of person mentally healthy	User's chat shows the emotion anger and Social media Analysis is negative.	Result displayed with Anger issues status, NIMH page about the disorder and general help page.
6	Panic Disorder	To analyze the condition of person mentally healthy	User's chat shows the motion fear and Social media Analysis is negative.	Result displayed with Panic Disorder status NIMH page about the disorder and general help page.
7	Generalized Anxiety	To analyze the condition of person mentally healthy	User's chat shows the emotion fear and social media Analysis is positive.	Result displayed with Anxiety status, NIMH page about the disorder and general help page.

Table 6.1: Results of the Model

7. CONCLUSION

7. CONCLUSION & FUTURE SCOPE

7.1 PROJECT CONCLUSION

With ongoing turns of events, it is clear that the clinical area is being affected extraordinarily by new innovative arrangements. Emotional well-being is a vital piece of the human body. Henceforth the utilization of trend-setting innovations like NLP, and RASA in the field of psychotherapy can deliver instruments that assist with stretching out the assistance to many out of luck. This model helps track person's mental health status anywhere, anytime with just a simple text conversation and social media history to provide feedback that helps them. By integrating mental health assessment tools into the chatbot interface, along with regular therapy can be helpful to deal with mild symptoms.

7.2 Future Scope

Because of the limit of foundation, the bot was created to carry the specific arrangement of inquiries and answers restricting the extent of discussion which can be covered by the usage of cutting-edge machines. The bot predominantly centres around specific arrangements of emotional well-being issues which can be expanded with profound exploration and cooperation with psychology specialized peers. The model can be overhauled to such an extent that virtual entertainment investigation requires no transferring of archives expressly but instead happens inside with the authorization of the client. With cooperation with different firms, the model can be incorporated with ideas of suggestions from doctors, scheduling of appointments, and booking arrangements.

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8. BIBLIOGRAPHY

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8.3 GITHUB LINK

https://github.com/Manasaramaka/project/tree/master