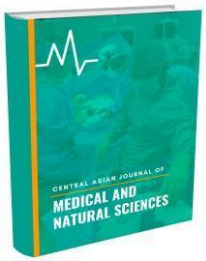

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*Article*

# Design and Development of a Mental Health Chatbot Using Natural Language Processing for Emotional Support

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**Abstract:** Mental health is an important part of overall health, especially for those who are getting occupational therapy, since emotional strength is often a big part of healing and adaptability. This project shows a simple mental health chatbot that uses Natural Language Processing (NLP) to have helpful chats and check in on people's feelings. The chatbot's goal is to help people talk about their feelings, deal with stress, and find self-help tools in a safe, private space. The chatbot isn't a replacement for professional therapy, but it can be a useful initial step in the larger field of occupational therapy. Mental health is an essential aspect of a person's total well-being, affecting their thoughts, emotions, and behaviours in everyday life. This project shows how to design and build a simple mental health chatbot that uses Natural Language Processing (NLP) to talk to users in a friendly way. It is made to recognise fundamental feelings like grief, worry, and tension by using keyword recognition and rudimentary sentiment analysis. It then responds with consoling words, grounding techniques, or positive reinforcement.

**Keywords:** Mental Health-Emotional Resilience, Adaptation-Supportive Conversation, Professional Therapy, Occupational Therapy, Fundamental Component, Daily Life- Natural Language Processing, Basic Emotion, Positive Reinforcement

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## 1. Introduction

Technology has become a bigger part of healthcare in the last few years, changing how people get help with their mental health. One of the most important things that has happened in this field is the creation of conversational agents or chatbots that use AI to mimic human speech [70]. Natural Language Processing (NLP) makes chatbots able to understand and respond to what users say in real time, giving them a conversational experience that seems natural, personal, and helpful. This trait makes them perfect for mental health applications where anonymity, accessibility, and quick access are very important [95]. Creating a beginner-level mental health chatbot using simple NLP techniques is a new way to help people who are going through occupational therapy with their emotional needs [81]. Patients in occupational therapy typically have to deal with both physical and emotional stress because rehabilitation is so hard. This initiative intends to fill the emotional support gap between treatment sessions by giving users a pleasant, virtual companion that can help them talk about their feelings, deal with stress, and feel heard without being judged.

People who are in occupational therapy often have mental health problems such stress, anxiety, and depression [65]. These emotional problems frequently come from the difficulty of getting used to physical restrictions, dealing with pain, or dealing with cognitive deficits that come with their conditions. Occupational therapists are very important for meeting these psychological demands during sessions, but patients don't always have access to professional help outside of those times [89]. A lot of people feel sad or alone when their therapist isn't accessible, and they might not want to talk to family or friends because they are afraid of being misunderstood or criticised. Not getting regular emotional support might make recovery and general health worse. To solve these problems, the suggested chatbot wants to give users a simple yet meaningful way to talk to each other that lets them say what they feel [79]. The chatbot uses Natural Language Processing to pick up on emotional cues and respond with messages that show understanding and support. This helps users feel heard and guided through difficult times. It doesn't try to take the place of therapy or professional help; instead, it helps people think about themselves and control their emotions between sessions.

The main purpose of the chatbot is to make a digital space where people can talk about their feelings and get responses that help them feel better, understand, and calm down [69]. It can tell when someone is upset, anxious, or stressed out by using simple keyword recognition and sentiment analysis. When a user shows an emotion, the chatbot picks up certain emotional keywords and gives a response that fits the user's mental state [96]. If a user enters, "I'm worried about my therapy," the chatbot might say something like, "It's okay to feel anxious sometimes." "Take a deep breath and focus on one step at a time," or "Would you like me to give you some tips on how to relax?" Even though these answers are simple, they can help people control their feelings and come up with ways to deal with them [86]. The chatbot also wants to provide users short, motivating affirmations to help them stay positive and remember that it takes time and work to make progress.

This study shows how even simple NLP techniques may be used to make a chatbot that can respond to emotions. The project has a number of goals that fit with the bigger goals of healthcare innovation [73]. These include creating and building a working chatbot that uses natural language processing (NLP) to figure out how people are feeling, finding common emotional triggers in text inputs, and giving appropriate, caring responses that show understanding. [94] The project also aims to make sure that the chatbot is still easy to use, can be used by people with little technical skills, and can be used in occupational therapy programs [80]. The chatbot can be a starting point for more advanced mental health support technologies in the future because it is both simple and useful.

This study is in the area where Natural Language Processing and mental health support meet. NLP is a branch of AI that helps computers understand and create human language [84]. This project uses NLP methods to look at what users say, figure out what they mean by their emotions, and come up with the right responses. This chatbot is different from more complex systems that employ large-scale machine learning models [63]. Instead, it uses a rule-based, keyword-driven approach that makes it lightweight, easy to understand, and quick to change. This method is especially helpful for beginner-level implementations where ease of use and computational efficiency are more important than linguistic intricacy [93]. The chatbot's ability to use simple logic to simulate meaningful conversation shows how NLP might be used to make mental health aids that are easy to use and can be expanded in the future.

The goal of this project is to make a text-based conversational system that can give basic emotional support through simple discussion [78]. The chatbot is meant to give users a safe place to share their feelings and get helpful responses. Because it is so simple, even those who aren't very good with computers can use it well [98]. The chatbot can only recognise emotional keywords and send pre-written encouraging messages in response.

But even with this simple structure, it helps people become more conscious of their feelings and better at controlling them [68]. The system does not give clinical diagnoses or treatment suggestions; instead, it is an auxiliary tool that works with other therapeutic methods [87]. Because of this, it can be used as an extra resource in occupational therapy programs to help patients think about their feelings and practise stress management skills between professional appointments.

There were many steps in the process of making the chatbot, starting with figuring out what the problem was and what the needs were [83]. The main goal was to make a conversational agent that could talk to people and give them emotional support based on simple text clues. A rule-based approach was chosen for this because it is clear, dependable, and easy to set up. The chatbot's conversation flow was carefully planned so that users could say what they wanted to say and get useful answers [74]. We collected and sorted common emotional statements like "I feel sad," "I'm stressed," and "I'm anxious" into groups of emotional states. These phrases were used to set up the chatbot's keyword triggers and the responses that went with them. For example, if someone said "sad" or "lonely," they would get responses that offered comfort and support. If someone said "stressed" or "overwhelmed," they would get calming counsel like breathing exercises or reminders to be attentive [90].

The chatbot's main logic was built using basic if-else statements and rules for matching patterns. The computer looks for emotional keywords in the text that the user types in and then decides what mood the user is in. The chatbot then chooses the best response from its pre-made database based on this classification [72]. A rule-based structure like this makes guarantee that answers are always the same and fit the situation for simple emotional situations. Also, sentiment analysis was used to figure out the overall tone of a user's communication, which let the chatbot change its tone as needed [75]. This system is easy to use and works well without needing big datasets or complicated training techniques. This makes it a great NLP project for beginners.

The project also stressed the necessity of making the interface easy to use and accessible to users during development [77]. The chatbot was made to be easy to use, with a simple UI that only shows the discussion. Users could write their messages into a text box and get answers right away, making it feel like a real conversation [66]. We tested the chatbot by giving it different types of user input to see if it could pick up on emotional cues and reply correctly. To check if the chatbot gave the right answers, people typed in things like "I'm worried about my recovery" or "I'm happy with my progress today." The first tests showed that the chatbot could identify fundamental emotions and give helpful, caring answers [92].

The findings indicated that even a basic NLP-driven chatbot can significantly influence by offering emotional solace and support [82]. It doesn't take the place of professional counselling or therapy, but it can be a helpful friend for people who need emotional support right away. The chatbot was able to recognise basic emotions, which is a good sign for future growth [97]. Testing revealed some limits, such as trouble with complicated words and picking up on minor emotional cues. For example, the chatbot might not understand sarcasm or not respond properly when emotions are indicated instead than being openly stated [64]. These restrictions are part of rule-based systems, which use clear terms instead of understanding the context. But they also create chances for future improvements with more complex NLP methods, like recognising intent, modelling context, and using transformer-based language models.

Future improvements could include adding more emotional words to the chatbot, using sentiment analysis to make it better at detecting emotions, and using machine learning models that have been trained on user interactions [91]. Adding speech recognition could make it much easier to use, since people could talk to each other instead of typing [71]. Also, connecting the chatbot to mobile or web platforms will make it easier

for occupational therapy patients and those who need mental health care to find it [85]. Another possible upgrade is to add adaptive answer generation, which would let the chatbot change its tone and suggestions based on how the user has interacted with it in the past. This would make the experience more unique.

In conclusion, our experiment shows that a simple NLP-based chatbot might be a useful way to provide emotional support, especially for people who are in occupational therapy [67]. The chatbot may have sympathetic discussions with users that encourage self-expression, emotional awareness, and relaxation by using simple natural language understanding and rule-based decision-making [88]. It is a useful and important new idea in mental health care since it is light, easy to use, and offers real-time help. The chatbot is restricted in what it can do, but it is a step towards more advanced conversational systems that can interpret language better and have greater emotional intelligence [76]. These kinds of chatbots could become important digital friends that improve mental health and give emotional support all the time in today's healthcare world, which is becoming more and more digital.

**Literature Review**

In the last several years, mental health chatbots have gotten a lot of attention for helping people who are feeling emotionally distressed [9]. Most of the time, these chatbots employ Natural Language Processing (NLP) to talk to people, giving them quick answers and ways to deal with their problems [54]. Woebot and Wysa are two well-known chatbots that use advanced NLP models to give tailored emotional support and emphasis on cognitive behavioural therapy (CBT) [42]. But these systems are typically hard to set up since they are complicated and use advanced AI principles. This makes them harder to use for beginners or in places with few resources [29]. On the other hand, rule-based or keyword-based chatbots are a simpler and more user-friendly option.

These chatbots work by comparing what the user types to a set of keywords or phrases (such "sad," "stressed," or "anxious") and then giving a set answer based on those keywords [1]. This method is easier to use than more complicated ones, yet it can still help users by showing them basic coping methods or giving them words of encouragement [19]. Research indicates that even rudimentary chatbots employing keyword matching can deliver substantial emotional support, particularly in resource-constrained environments or for users desiring prompt, non-judgmental interactions [35].

For instance, ELIZA, one of the first chatbots, used simple keyword-based pattern matching to pretend to have conversations and make people feel better, showing how even simple digital interactions may be good for mental health [28]. But chatbots that employ keywords can't fully understand how complicated human emotions are or the context behind what users say [55]. They might have trouble comprehending statements that aren't clear or have several meanings, which could lead to reactions that aren't helpful or don't make sense [18]. Even with these problems, keyword-based solutions are still beneficial for simple projects and could work with more advanced models in the future [46].

**Project Description**

Woebot and Wysa are two mental health chatbots that use advanced Natural Language Processing (NLP) and machine learning to give people customised emotional support [10]. They use therapeutic methods including Cognitive Behavioural Therapy (CBT). These systems look at what users say to figure out how they feel and then suggest personalised solutions. But these tools frequently need a lot of resources and data, which makes them harder to use in places with few resources [61]. ELIZA, one of the first chatbots, was able to have conversations and give emotional support by using simple keyword-based pattern matching [45]. This showed that even simple systems may work. Replika and Youper both offer conversational help. Replika acts as a digital companion, while Youper focusses on psychological interventions that are based on evidence.

Tess, on the other hand, employs sentiment analysis to give therapeutic solutions in real time [30]. The suggested system's goal is to make a mental health chatbot that uses keywords to give people who are going through occupational therapy basic emotional support [36]. The system will employ Natural Language Processing (NLP) to find emotional terms or phrases in what users type, including "stressed," "anxious," or "sad." It will then use those words to create pre-defined, empathic answers [53]. The chatbot will give basic emotional assistance, like confirming how the user feels, giving them ways to deal with their feelings, and suggesting things they can do to take care of themselves [8]. The system will be built on a rule-based model, where the chatbot's reasoning is based on matching keywords and simple emotion analysis [47]. The chatbot will compare what the user enters to a list of pre-set keywords or phrases and answer based on that. If the user inputs "I'm feeling anxious," the chatbot might say, "I'm sorry you're feeling anxious." You can take a big breath and relax. "Would you like to talk about it more?"

Social Feasibility: This part looks at how well the proposed keyword-based mental health chatbot fits with the requirements and values of society and how likely the target audience is to accept and use it [17]. In this case, the people who will use it are those who are getting occupational therapy or who want emotional support [35].

**Proposed Work**

**General Architecture**

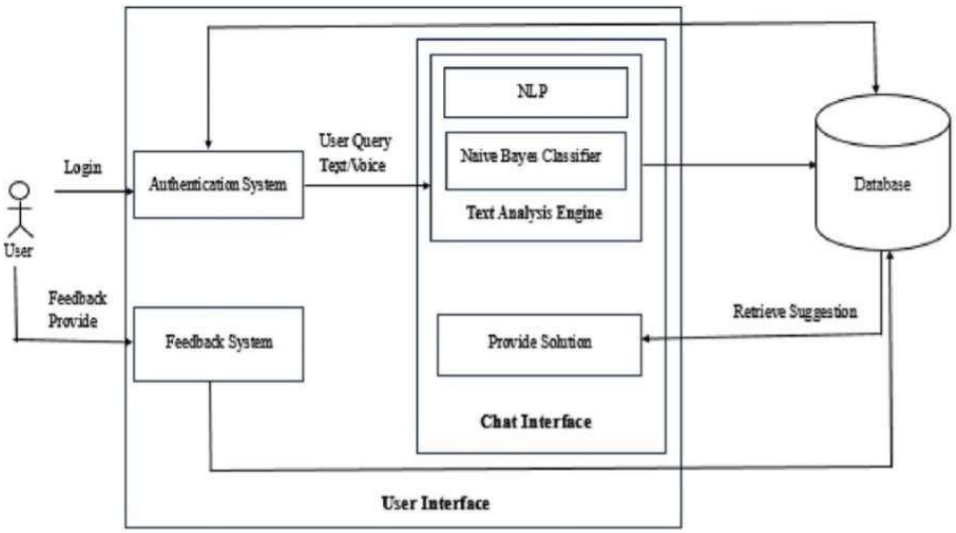


**Figure 1.** Architecture Diagram.

This figure shows the System Design Phase, which is the High-Level Design (HLD) of a chatbot-based support system [56]. It shows how a user interacts with the system, starting with logging in through an authentication module [37]. After logging in, the user can ask questions by typing or speaking [52]. Natural Language Processing (NLP) and a Naive Bayes Classifier are used by a chat interface to look at and interpret these questions [27]. After that, the system gets the right information from the database and gives the right answer. Users can also give feedback using a feedback system [2]. This design shows the main parts and how they work together to make sure that data flows smoothly and the user has a good experience (Figure 1) [62].

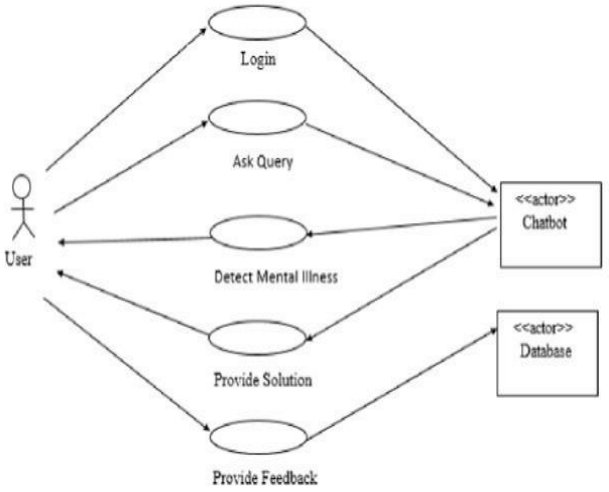


**Figure 2.** UML Diagram.

This UML use case diagram shows how a person and a mental health assistance chatbot communicate [31]. To start, the user logs in to the system and then asks a question [48]. The chatbot gets the question and looks for any indicators of mental illness in it. If the chatbot finds a mental health problem, it uses the database to find the best remedy [7]. The database has information and resources that are useful for this purpose [33]. The user can also give input after getting the answer [20]. The graphic depicts how the user, the chatbot, and the database work together to provide mental health support (Figure 2). It also shows the system's major functions [57].

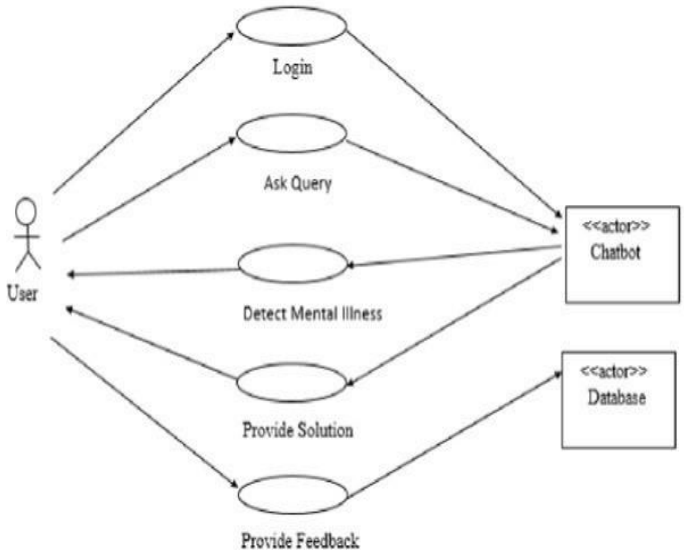


**Figure 3.** Use Case Diagram.

This Use Case Diagram demonstrates how a person uses a mental health chatbot system [51]. It shows the major things the user can do, like checking in, asking a question, finding out if they have a mental illness, getting an answer, and offering feedback [11]. The chatbot does most of these things, including figuring out what the user is asking and finding out if they have mental health problems [38]. The database helps the system by giving it solutions and keeping them safe. Figure 3 shows us in a clear way how the system works and what each part does.

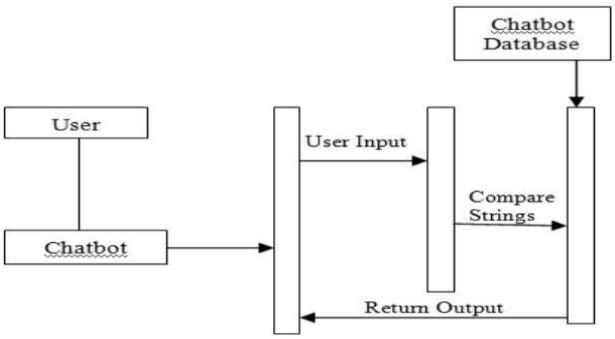


**Figure 4.** Sequence Diagram.

This is a flowchart that demonstrates how a chatbot works in steps [6]. The user sends a message to the chatbot first. The chatbot sends this message to its system to see if it can find a match in the database [41]. It looks at the message and the data it has saved and determines the best match. The system then sends a response back to the chatbot, which provides the answer to the user (Figure 4) [32].

**Description of the Module**

To make sure that the Mental Health Chatbot project runs smoothly and in an organised way, it is broken up into several components [12]. Each module is in charge of a different part of the chatbot's job, such as interpreting what the user says and coming up with useful answers [26]. Here is a short summary of each module used in the project:

Module 1: The User Interface Module: The User Interface (UI) module makes it easy for the user and the chatbot to talk to each other. It is the part of the program where users can type in questions and see answers [21]. The UI is built with frameworks like Tkinter, Flask, or Streamlit. It is meant to be clean, easy to use, and not get in the way of the user experience, especially because the matter is so sensitive [58]. There is a chat window, an input text field, a send button, and options to clear or start the conversation over. Module 2: User Management and Authentication. This module takes care of managing user identities, which makes interactions more customised and safe [39]. It can let people use it without giving their name, but it also lets registered users log in and preserve their session data. This might assist keep track of how people's moods change over time or keep conversations going. The module protects data and keeps user information private, which is very important for apps that deal with mental health [3]. Module 3: NLP Processing Module: The NLP (Natural Language Processing) module is what makes the chatbot work. It understands and processes what the user says [49]. This module does things like tokenisation, stop-word removal, lemmatisation, and sentiment analysis using libraries like NLTK, spaCy, or transformer models. It helps the system figure out how the user is feeling and what they want, which lets the chatbot answer in a more caring and suitable way [43].

Response Generation Module: Makes responses based on what the user has typed in. It can use a rule-based method with pre-set patterns or a machine learning model to give dynamic answers. In more complex setups, generative models like GPT or DialoGPT are used to make interactions more like those between people [5]. This module makes sure that the chatbot gives helpful, relevant, and non-judgmental answers, especially when users are upset or feeling sensitive [59]. Mental Health Resource Module: The Mental Health Resources Module gives users access to reliable, helpful information that can help them understand and take care of their mental health [25]. It has advice on how to deal with stress, anxiety, and depression, as well as ways to take care of yourself and how to get in touch with someone in case of an emergency [40]. The goal of this module is to give consumers the proper information and point them in the direction of expert help if they need it.

Feedback & Logging Module: The Mental Health Resources Module gives users reliable, helpful information that they may use to learn about and take care of their mental health [22]. It has information on how to deal with stress, anxiety, and depression, as well as ways to take care of yourself and emergency contact information [13]. The goal of this module is to give users the information they need and point them in the direction of expert help if they need it.

The Admin and Analytics module gives you access to the backend so you can keep an eye on chatbot activity and make performance reports [50]. It gives you information about how engaged users are, what their main concerns are, and how their feelings are changing [4]. Admins can also mark and go over sensitive information to see if it needs to be escalated or if safety measures need to be put in place [24]. This module makes sure that the chatbot stays responsible, helpful, and in line with mental health safety requirements (Figure 5).

**Implementation and Testing**

```
    <!-- Chats container -->
    <div class="chat-container"></div>

    <!-- Typing container -->
<div class="typing-container">
  <div class="typing-content">
    <div class="typing-textarea">
      <textarea id="chat-input" spellcheck="false" placeholder="How are you feeling today?" required></textarea>
    </div>
    <div class="typing-controls">
      <span id="send-btn" class="material-symbols-rounded">send</span>
      <span id="theme-btn" class="material-symbols-rounded">psychology</span>
      <span id="emergency-btn" class="material-symbols-rounded">emergency</span>
      <span id="delete-btn" class="material-symbols-rounded">delete</span>
    </div>
  </div>
</div>
      </div>
    </div>
  </body>
</html>
```

**Figure 5.** Original Image of The Subject.

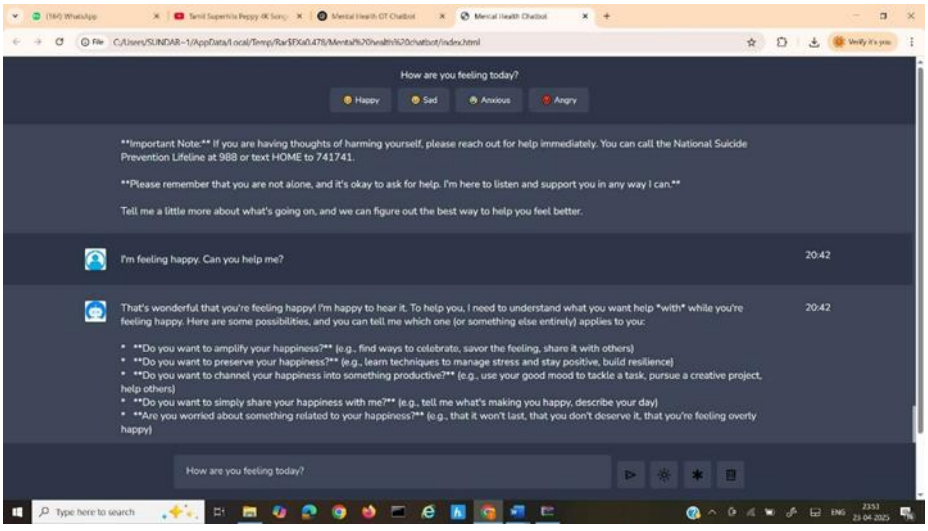


**Figure 6.** The Above shows the chatbot screenshot.

**Testing**

Testing was done to make sure the chatbot works right and answers user questions in the right way [14]. Functional testing was the major focus [34]. This checks to see if the chatbot met its criteria (Figure 6).

### Types of Testing

Unit Testing: Unit testing is a useful way to test software since it checks the efficiency and accuracy of the program by examining the units of source code (Figures 7 and 8) [16].

### Input

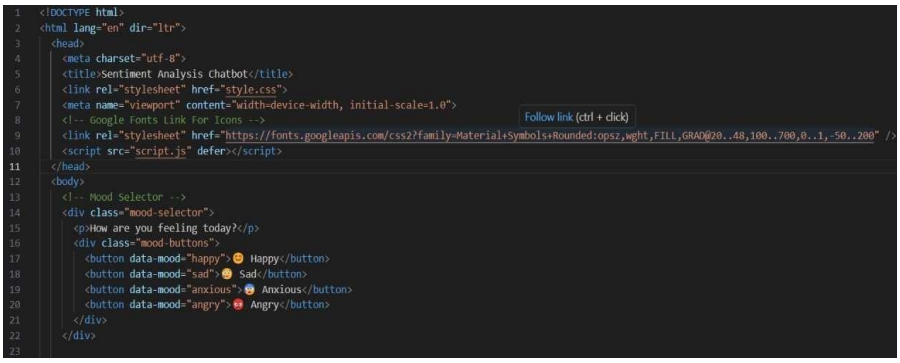


**Figure 7.** The above contains the code for the mental health chatbot.

### Integration Testing

### Input

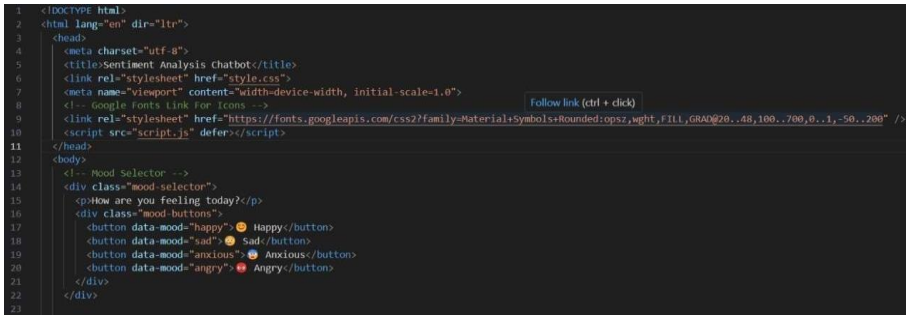


**Figure 8.** Code for Chatbot.

### Test Result

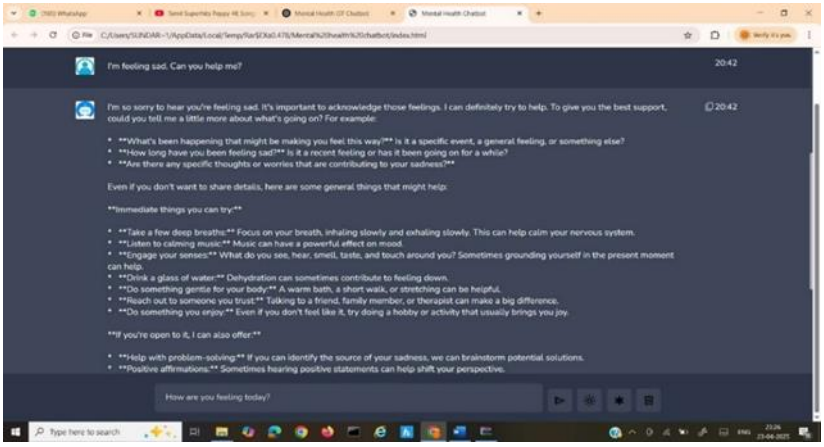


**Figure 9.** Output.

### Functional Testing

### Input Recognition

- Test Case: Type in terms like "sad," "anxious," "angry," and so on [44].
- Expected Output: The chatbot should be able to correctly recognise the term and give a response that is acceptable and shows understanding [23].

**Response Generation**

- Test Case: The system should give a specified response for each identified keyword.
- Expected Output: The answer should be helpful and appropriate for how the user is feeling.

**Invalid or Empty Input Handling**

- Test Case: Type in nonsense, blank messages, or words that aren't recognised [60].
- Expected Output: The chatbot should respond with something like, "I'm here to help [15]. Can you tell me more about how you feel?"

**Keyword Matching Logic**

- Test Case: Use different variations of emotional keywords, e.g., "feeling really sad", "I'm anxious today".
- Expected Output: The chatbot should detect keywords within full sentences and still respond appropriately [41].

**Test Result**

| Test Case | Input | Expected Output | Actual Output |
|---|---|---|---|
| Keyword Detection – Sadness | "I feel very sad today." | Empathetic response about sadness | "I'm sorry you're feeling sad. I'm here for you." |
| Keyword Detection – Anxiety | "I'm anxious about my exams." | Supportive message for anxiety | "It's okay to feel anxious. You're not alone." |
| Invalid Input Handling | "asdfghjkl" | Fallback message | "I'm here to help. Can you tell me more?" |
| Empty Input | "" | Prompt to enter a message | "Please share how you're feeling." |
| Multiple Keywords in Input | "I'm feeling sad and stressed." | Response addressing both or primary keyword | "It sounds like you're going through a lot." |

**Figure 10.** Output and Result.

## 2. Results and Discussions

The suggested Mental Health Chatbot solution works well since it can have natural interactions with users and give them emotional assistance right away [100]. It can interpret what users say, figure out how they feel, and give helpful answers in seconds thanks to Python and NLP. It is easy to use, doesn't take up much space, and works on both desktop and web platforms. It also helps people feel more comfortable talking about their thoughts by giving them a private, judgment-free area [102]. Overall, it is a quick and helpful tool for promoting mental health. The current methods generally depend on human counsellors, which might cause delays, make them less available, and cost more [99]. The suggested chatbot, on the other hand, uses natural language processing (NLP) to provide instant, round-the-clock support. It also has capabilities like sentiment analysis, anonymous talking, and automatic referrals for mental health resources [101]. This makes it easier to get to, faster, and more user-friendly for people who need emotional help right now (Figures 9 and 10).

## 3. Conclusions

The Mental Health Chatbot, which was made with Python and NLP, is an easy-to-use, caring tool that helps people take care of their mental health. The chatbot can comprehend how users are feeling, provide them consoling answers, and offer useful resources thanks to Natural Language Processing. The goal of the initiative is to give people a safe, non-judgmental place to share their views and get basic mental health help. It is not a substitute for professional care, but it is a good beginning step and motivates people to take steps towards better mental health. Adding voice support, new languages, and better emotion detection could make this chatbot better in the future. It can also put

people in touch with genuine therapists who can help them with significant problems. Making a mobile app and adding features like mood tracking or recommendations for self-care can keep users interested. These changes will make the chatbot easier to use, more useful, and friendlier for everyone.

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