

# **STRESS MANAGEMENT CHATBOT**

*A Mini Project Report*

*submitted to*

*the APJ Abdul Kalam Technological University*

*in partial fulfillment of the requirements for the degree of*

***Bachelor of Technology***

*by*

**ALBERT JOSE(VML21CS034)**

**ALEN CHERIAN(VML21CS038)**

**AMAL C S(VML21CS044)**

**GERALD SIRIAC(VML21CS091)**

*under the supervision of*

**Mr. RIJIN I K**

**Assistant Professor**



DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**VIMAL JYOTHI ENGINEERING COLLEGE CHEMPERI**

CHEMPERI P.O. - 670632, KANNUR, KERALA, INDIA

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**INSTITUTIONS, CHEMPERI - KANNUR**  
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**Mr. RIJIN I K**  
(Project Guide)  
Assistant Professor  
Dept.of CSE  
Vimal Jyothi Engineering College  
Chemperi

**Mr. Coordinator**  
(Project Coordinator)  
Assistant Professor  
Dept.of CSE  
Vimal Jyothi Engineering College  
Chemperi

Place : VJEC Chemperi  
Date : 01-04-2024

Head of the department

(Office Seal)

## **DECLARATION**

We hereby declare that the project report **STRESS MANAGEMENT CHATBOT**, submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bona fide work done by us under supervision of **Mr. RIJIN I K**

This submission represents our ideas in our own words and where ideas or words of others have been included, we have adequately and accurately cited and referenced the original sources.

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**ALEN CHERIAN**  
**AMAL C S**  
**GERALD SIRIAC**

## **ACKNOWLEDGEMENT**

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**ALBERT JOSE**

**ALEN CHERIAN**

**AMAL C S**

**GERALD SIRIAC**

# **Abstract**

This project aims to develop a stress detection and therapy chatbot designed to offer personalized support to users dealing with stress. Using advanced language technology, the chatbot understands when users are stressed and offers personalized advice. Key features include a user-friendly interface for seamless interaction, robust privacy measures to safeguard user data, scalability to ensure optimal performance even under high loads, and feedback mechanisms for ongoing refinement. By providing accessible and tailored assistance, the chatbot seeks to revolutionize stress management support, ultimately promoting enhanced mental well-being among users within online academic communities and beyond. By providing accessible and tailored assistance, the chatbot seeks to revolutionize stress management support, ultimately promoting enhanced mental well-being among users within online academic communities and beyond.

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# **Chapter 1**

## **Introduction**

### **1.1 Overview**

The stress detection and therapy chatbot project aim to develop an innovative solution for assisting individuals in managing stress effectively. Leveraging advanced natural language processing (NLP) algorithms, the chatbot identifies stress indicators within user messages and delivers personalized therapeutic interventions. Key components of the project include the development of robust stress detection algorithms, the creation of a user-friendly interface for seamless interaction, the implementation of stringent privacy measures to safeguard user data, and the incorporation of scalability features for optimized performance.

### **1.2 General Background**

In today's fast-paced and interconnected world, stress has become a prevalent issue affecting individuals across various demographics. The pressures of academic, professional, and personal life often contribute to heightened stress levels, impacting mental well-being and overall quality of life. Recognizing the significance of addressing stress-related challenges, there has been a growing interest in leveraging technology to provide support and assistance to individuals experiencing stress. Chatbots, powered

by artificial intelligence and natural language processing algorithms, have emerged as promising tools for delivering personalized interventions and guidance to users in managing stress effectively.

### 1.3 Problem statement

Many individuals face challenges in managing stress due to limited access to resources, the stigma surrounding mental health issues, and the overwhelming volume of information available online. Traditional methods of seeking assistance, such as therapy sessions or self-help resources, may be inaccessible or costly, exacerbating feelings of isolation and distress. Furthermore, the lack of personalized support tailored to individual needs can hinder individuals from effectively addressing their stressors. To mitigate these challenges, there is a critical need for accessible and personalized solutions that can help individuals identify and cope with stress effectively. This project aims to address this need by developing a stress detection and therapy chatbot that utilizes advanced natural language processing (NLP) algorithms to provide personalized support and guidance to users experiencing stress, thereby enhancing accessibility and effectiveness in stress management.

### 1.4 Scope of the system

The chatbot aims to provide personalized support, offering therapeutic interventions tailored to the specific needs and preferences of individual users. Privacy and security measures will be prioritized to safeguard user data. Additionally, the chatbot will be designed to be scalable and optimized for performance, capable of handling varying levels of user demand while maintaining reliability and responsiveness. It targets a diverse audience, including students, researchers, educators, and academic professionals, who may encounter stress-related challenges in their academic pursuits. The project aims to enhance mental well-being and promote academic success among its users by addressing their unique stress-related challenges.

## 1.5 Objective

The objective of this project is to develop a stress detection and therapy chatbot that utilizes advanced natural language processing (NLP) algorithms to provide personalized support and guidance to users experiencing stress. The primary goal is to accurately identify stress indicators in user messages through the development of robust stress detection algorithms. Additionally, the project aims to create an intuitive and user-friendly interface that ensures accessibility for individuals from diverse backgrounds. A key focus is on offering a repository of personalized therapeutic interventions tailored to individual user needs and preferences, encompassing various stress management techniques and strategies. Privacy and security measures will be implemented to safeguard user data and ensure confidentiality during interactions with the chatbot. Moreover, the project seeks to ensure scalability and optimized performance of the chatbot to meet growing user demands and provide reliable support under varying usage conditions. Feedback mechanisms will be incorporated to continuously enhance the chatbot's functionality and effectiveness in providing support for stress management. Ultimately, the deployment of the chatbot within online academic communities and beyond aims to promote accessibility and enhance mental well-being among users.

# **Chapter 2**

## **Literature Review**

### **2.1 Detection and Analysis of Stress-Related Posts in Reddit's Acamedic Communities**

#### **• BRIEF SUMMARY**

The study used machine learning [1] to detect stress in Reddit's [1] academic communities, achieving high accuracy with Logistic Regression. It found varying stress patterns across academic levels, highlighting common stressors like academic workload. It highlights the importance of monitoring stress levels in the digital era and proposes automatic stress detection [1] in text as a proactive measure for managing stress and protecting mental well-being. The study utilizes the Dreaddit dataset for training and collects posts from various academic subreddits for analysis. Through classification algorithms [1] and feature extraction [1] methods like Bag of Words, the study achieves promising results in detecting stress in academic texts.

#### **• METHODOLOGY**

The paper begins by collecting data from both the Dreaddit dataset and academic subreddits using the Python Reddit API Wrapper. The obtained data is then described, focusing on post titles, content, scores, and associated tags to

understand prevalent topics. Methodologies for stress detection involve robust preprocessing techniques and feature extraction using the Bag of Words (BoW) approach. Machine learning [1]classification algorithms [1], such as Logistic Regression [1], are applied to detect stress within the text.

**- Advantages**

Comprehensive Approach

Real-World Data

Practical Applications

**- Disadvantages**

Limited Generalizability

Lack of Human Annotation

## **2.2 A review of mobile chatbot apps for anxiety and depression and their self-care features**

**• BRIEF SUMMARY**

The research paper investigates the quality and characteristics of chatbots designed for anxiety and depression available on Android and iOS platforms. It recognizes the escalating prevalence of mental health issues, particularly during the pandemic, and explores the potential of smartphone-based chatbots to address this gap in mental health care. Inclusion criteria focus on free apps with chatbot features specifically targeting anxiety or depression and having ratings above four stars. The study adapts mHONcode principles to objectively assess app quality. Despite its systematic approach, the study's reliance on ratings and potential for missing newer apps are acknowledged limitations. Nevertheless, it underscores the importance of leveraging mobile technology to improve mental health interventions.

- **METHODOLOGY**

The research paper utilizes a systematic review methodology to examine chatbots designed for anxiety and depression on Android and iOS platforms. Employing PRISMA guidelines, the study searches app stores using relevant keywords and applies inclusion criteria focusing on free apps with chatbot features targeting anxiety or depression and having ratings above four stars. The quality of identified apps is assessed using mHONcode principles, evaluating aspects like usability and credibility. Acknowledging limitations such as reliance on ratings and potential omissions of newer apps, the paper highlights the significance of mobile technology in addressing mental health issues, especially amid the pandemic, and suggests avenues for future research and development in this domain.

- **Advantages**

- Accessibility

- Cost-effectiveness

- Self-care features

- **Disadvantages**

- Lack of human interaction

- Limited effectiveness.

## 2.3 Chatbot for Mental Health Care

- **BRIEF SUMMARY**

It introduces a Healthcare Chatbot leveraging Artificial Intelligence and Natural Language Processing to offer basic health-related guidance, particularly focusing on mental health care. Users can interact with the Chatbot, which employs a Sequential algorithm to analyze their inputs and provide relevant assistance. Additionally, users can create profiles specifying their symptoms, allowing the

Chatbot to suggest doctors and offer dosage reminders. The Chatbot is designed to diagnose diseases, provide remedies, and offer mental health support.

### • **METHODOLOGY**

The methodologies employed in the paper encompass various approaches to developing mental health chatbots and control systems. One notable method involves utilizing conversational guidance and the digital-SAT technique to develop a Chatbot course for self-mental care, enhancing mental health improvement effects by addressing user withdrawal and simplifying the questionnaire process.it also includes Long-Short Term Memory and Convolutional Neural Networks (CNNs).

#### – **Advantages**

Affordable

Anonymous mental health help

#### – **Disadvantages**

Accuracy of information

user privacy concerns

## 2.4 Stress detection using natural language processing and machine learning over social interactions

### • BRIEF SUMMARY

This paper explores sentiment and emotion analysis on social media to detect individual stress levels. Leveraging machine learning algorithms and BERT for sentiment classification, alongside Latent Dirichlet Allocation for topic identification, the study aims to predict users' emotions online, potentially indicating stress or depression. Results demonstrate promising detection rates, offering valuable insights for mental health well-being through social media analysis.

### • METHODOLOGY

It have an approach combining natural language processing (NLP) and machine learning (ML) techniques to analyze social media interactions for stress detection. Leveraging large-scale Twitter datasets, the study utilizes machine learning algorithms such as logistic regression, decision trees, and random forest for sentiment analysis. Additionally, deep learning models like BERT are employed for sentiment classification tasks, enhancing the accuracy of emotion detection. The study also incorporates Latent Dirichlet Allocation (LDA), an unsupervised ML method, for topic modeling to identify relevant topics within social media data.

#### – Advantages

Early Intervention

Large Data Source

#### – Disadvantages

Accuracy Concerns

Privacy Issues

## 2.5 Semi-supervised approach for tweet-level stress detection

- **BRIEF SUMMARY** Researchers have introduced the "Self-training Method for Tweet-level Stress Detection (SMTSD) [2]," a semi-supervised approach aimed at identifying stress in tweets. This method leverages sarcasm cues to predict pseudo-labels, which are subsequently employed to train logistic regression classifiers using Twitter data obtained through the Tweepy API. SMTSD exhibits superior performance compared to basic self-training and supervised models, as well as advanced techniques like Bi-LSTM, demonstrating enhanced efficacy as sample sizes increase.

- **METHODOLOGY**

It employs a semi-supervised learning approach to identify stress in tweets. It integrates labeled and unlabeled data to enhance model performance, capitalizing on a larger dataset. Logistic regression classifiers serve as the primary machine learning model in SMTSD, trained using the pseudo-labeled data generated through the semi-supervised learning process. Data collection is facilitated through the Tweepy API, enabling access to real-time Twitter data for training and evaluation. By combining these methodologies, SMTSD demonstrates improved accuracy in stress detection.

- **Advantages**

- Improved Performance

- Scalability

- Addressing Labeled Data Scarcity

- **Disadvantages**

- Complexity

- Algorithmic Bias

# Chapter 3

## Requirement Specification

### 3.1 Functional Requirements

- Stress Detection
- Personalized Intervention
- Privacy and Confidentiality
- Real-time Interaction
- User feedback gathering

### 3.2 Non Functional Requirements

- **Performance** : The chatbot should respond quickly to user queries, with minimal latency, ensuring a seamless user experience.
- **Security** : Robust security measures must be in place to protect user data and ensure privacy during interactions with the chatbot.
- **Scalability** : The system should be capable of handling increased user loads without compromising performance or responsiveness.

- **Usability** : The chatbot interface should be intuitive and easy to navigate, catering to users with varying levels of technical expertise.
- **Reliability**: The chatbot should operate reliably without unexpected failures or downtime, providing consistent support to users.

### 3.3 Software Requirements

- **FRONT END**

- **HTML**

HTML is an acronym which stands for Hyper Text Markup Language which is used for creating web pages and web applications. Let's see what is meant by Hypertext Markup Language, and Web page. Hyper Text: HyperText simply means "Text within Text." A text has a link within it, is a hypertext. Whenever you click on a link which brings you to a new webpage, you have clicked on a hypertext. HyperText is a way to link two or more web pages (HTML documents) with each other. Markup language: A markup language is a computer language that is used to apply layout and formatting conventions to a text document. Markup language makes text more interactive and dynamic. It can turn text into images, tables, links, etc.

- **CSS**

CSS is a language for specifying how documents are presented to users — how they are styled, laid out, etc. A document is usually a text file structured using a markup language — HTML is the most common markup language, but you may also come across other markup languages such as SVG or XML. Presenting a document to a user means converting it into a form usable by your audience. Browsers, like Firefox, Chrome, or Edge , are designed to present documents visually, for example, on a computer screen, projector, or printer. CSS can be used for very basic document text styling .

- **JavaScript**

JavaScript is a scripting or programming language that allows you to implement complex features on web pages — every time a web page does more than just sit there and display static information for you to look at — displaying timely content updates, interactive maps, animated 2D/3D graphics, scrolling video jukeboxes, etc.

- **BACK END**

- **Django**

Django is a free and open-source, Python-based web framework that follows the model–template–views (MTV) architectural pattern. It is maintained by the Django Software Foundation (DSF), an independent organization established in the US as a non-profit. Django's primary goal is to ease the creation of complex, database-driven websites. The framework emphasizes reusability and "pluggability" of components, less code, low coupling, rapid development, and the principle of don't repeat yourself. Django also provides an optional administrative create, read, update and delete interface that is generated dynamically through introspection and configured via admin mode

# **Chapter 4**

## **Proposed system and Design**

### **4.1 Proposed system**

Stress management chatbot is a stress detection and therapy chatbot designed to provide personalized support and guidance to individuals experiencing stress. It incorporates advanced natural language processing (NLP) algorithms to accurately identify stress indicators in user messages and deliver tailored therapeutic interventions.

### **4.2 Feasibility Study**

#### **4.2.1 Technical Feasibility**

The study assesses the availability of resources, including hardware, software, and development tools, to ensure that the necessary technology infrastructure is in place. Evaluate whether the necessary hardware, software, and development tools are readily available or can be acquired within the project budget. Ensure compatibility with existing systems, platforms, and databases, considering factors such as integration requirements and interoperability.

### 4.2.2 Operational Feasibility

Operational feasibility focuses on assessing the impact of implementing the chatbot on existing operations and workflows within the organization. Factors such as organizational readiness, user acceptance, and change management strategies are considered to ensure smooth integration and adoption of the chatbot. User acceptance testing may be conducted to gauge user preferences, attitudes, and perceived benefits, informing the development of strategies to address potential resistance to change and promote user engagement.

### 4.2.3 Economic Feasibility

Estimate the development costs, including expenses for hardware, software licenses, development tools, infrastructure, and personnel. Determine the potential financial benefits of the project, such as cost savings, revenue generation, or competitive advantages, and compare them with the projected costs and also conduct a cost-benefit analysis to evaluate whether the expected benefits outweigh the costs and whether the project is financially viable in the long run.

## 4.3 Design

### 4.3.1 Architecture Diagram

The architecture diagram provides a high-level overview of the stress detection and therapy chatbot system's structure and components. It illustrates how different modules interact to facilitate stress detection, personalized interventions, and user interaction.

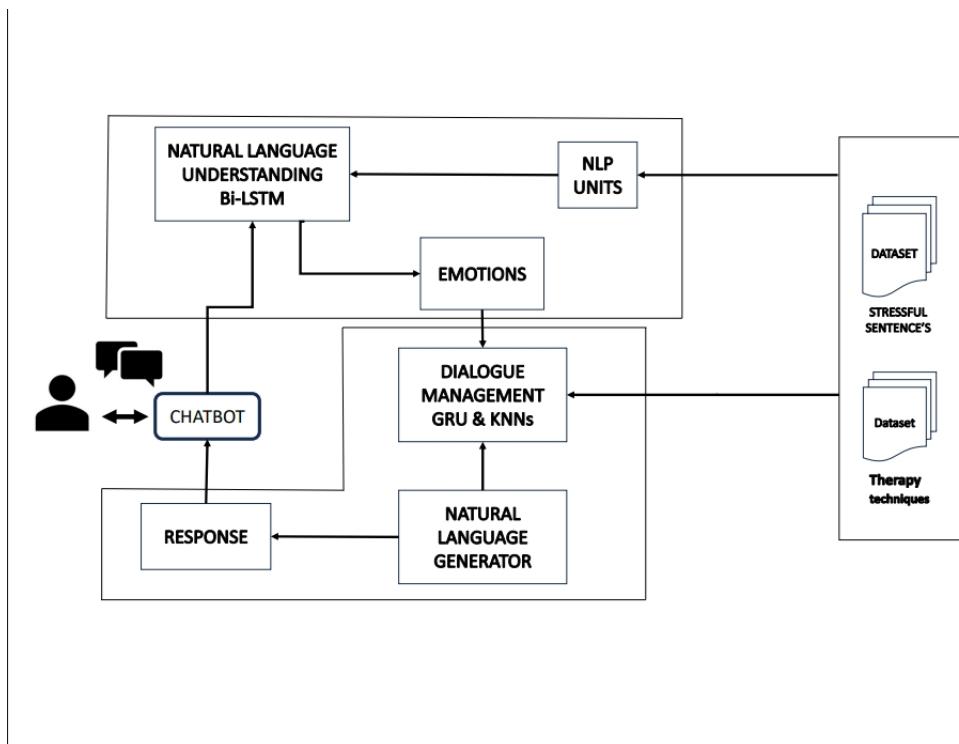


Figure 4.1: Architecture Diagram

### 4.3.2 Use Case Diagram

The use case diagram provides a visual representation of the functional requirements of the stress detection and therapy chatbot system, illustrating the interactions between users and the system's functionalities.

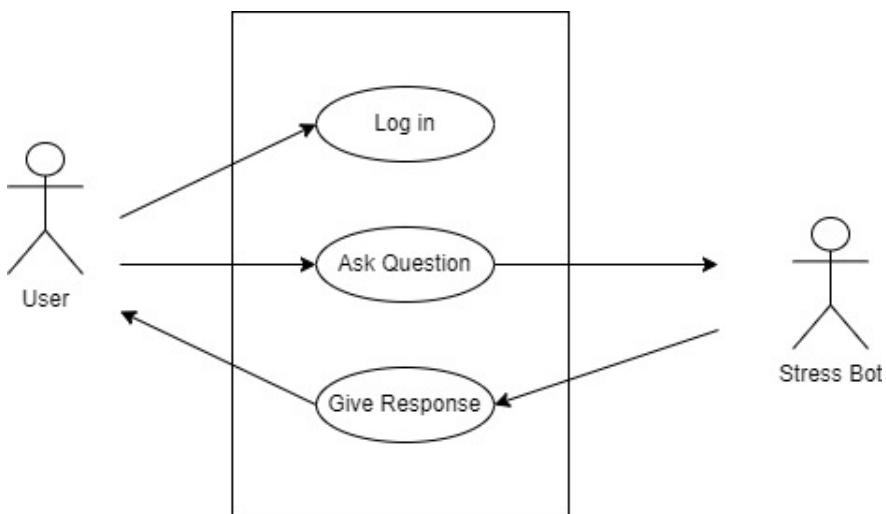


Figure 4.2: Use Case

### 4.3.3 Data Flow Diagram

- Level 0 :

The diagram showing the relationship between a user, a text message, and a stress management system. The text message triggers the stress management system, which then sends a response message to the user.

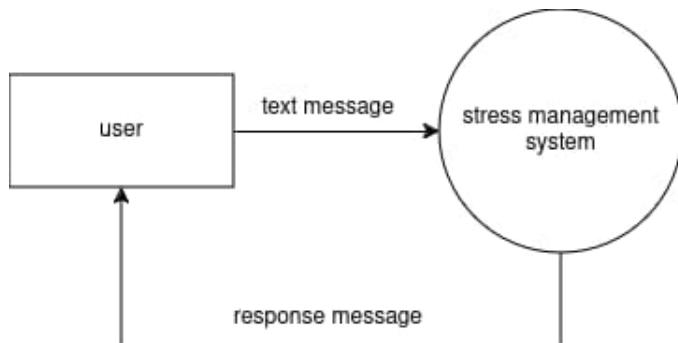


Figure 4.3: Level 0

- Level 1 :

Level 1 data flow diagram depicts a stress management chatbot. Users text the chatbot about their stress. The system analyzes this message using natural language processing to understand their feelings. Based on this analysis, the chatbot generates a response tailored to their stress level. This response might include relaxation techniques, stress management tips, or simply supportive messages.

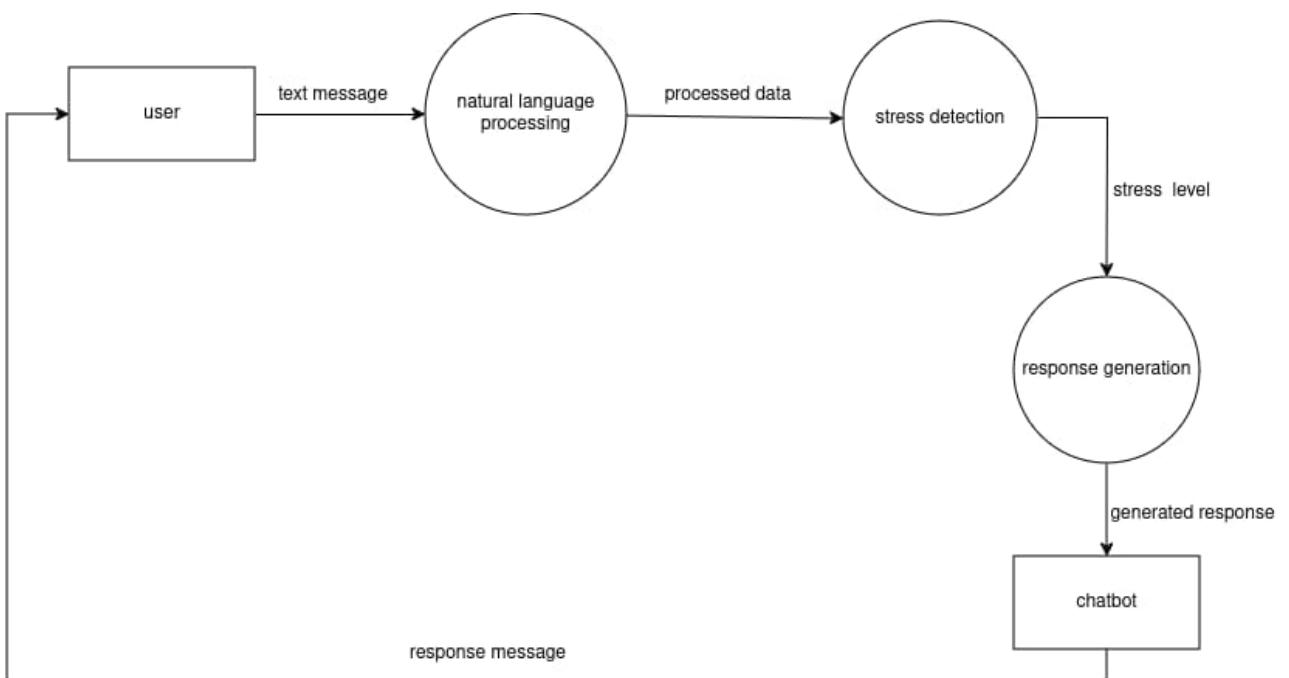


Figure 4.4: Level 1

#### 4.3.4 ER Diagram

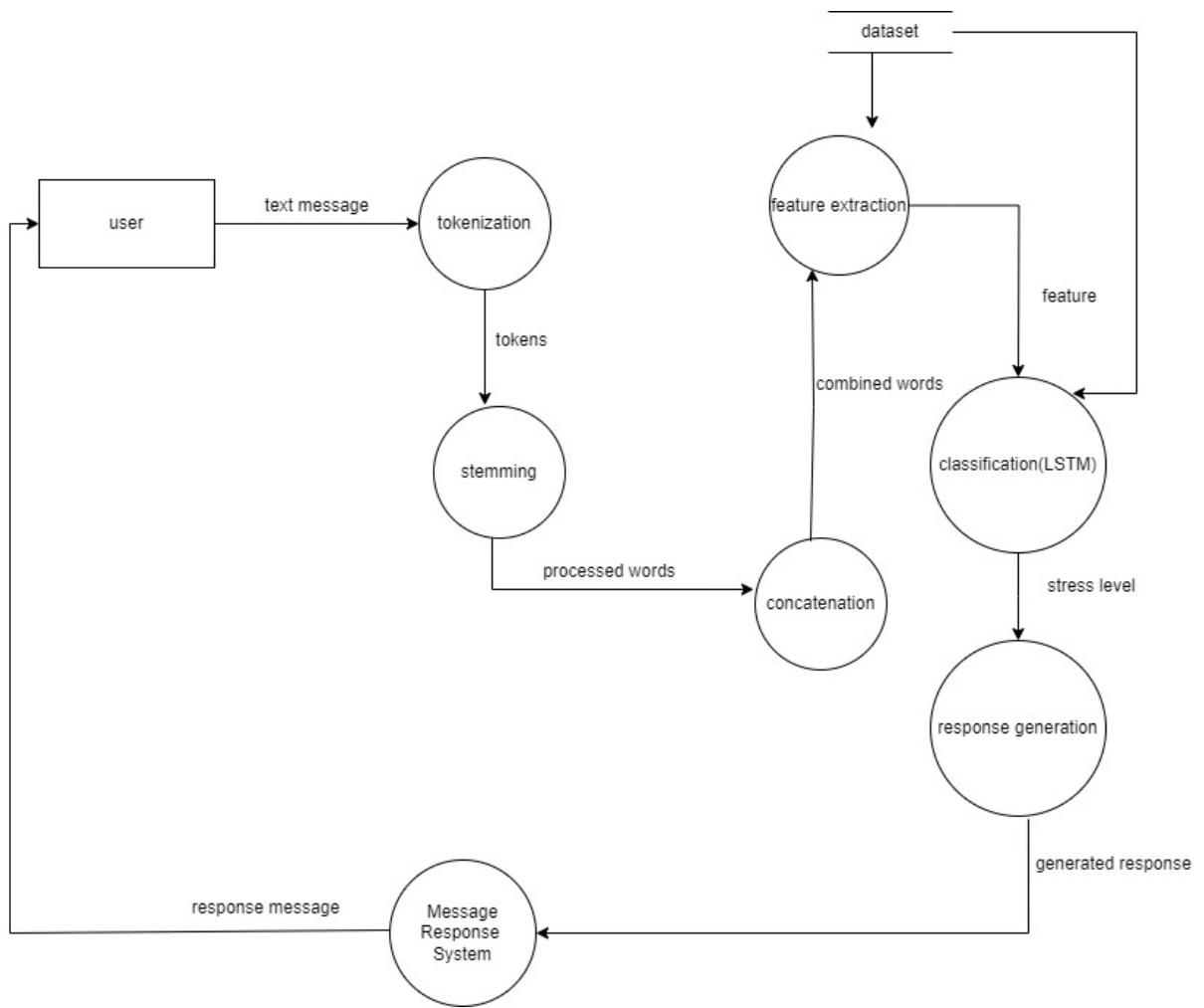


Figure 4.5: Level 2

#### 4.4 Gantt Chart

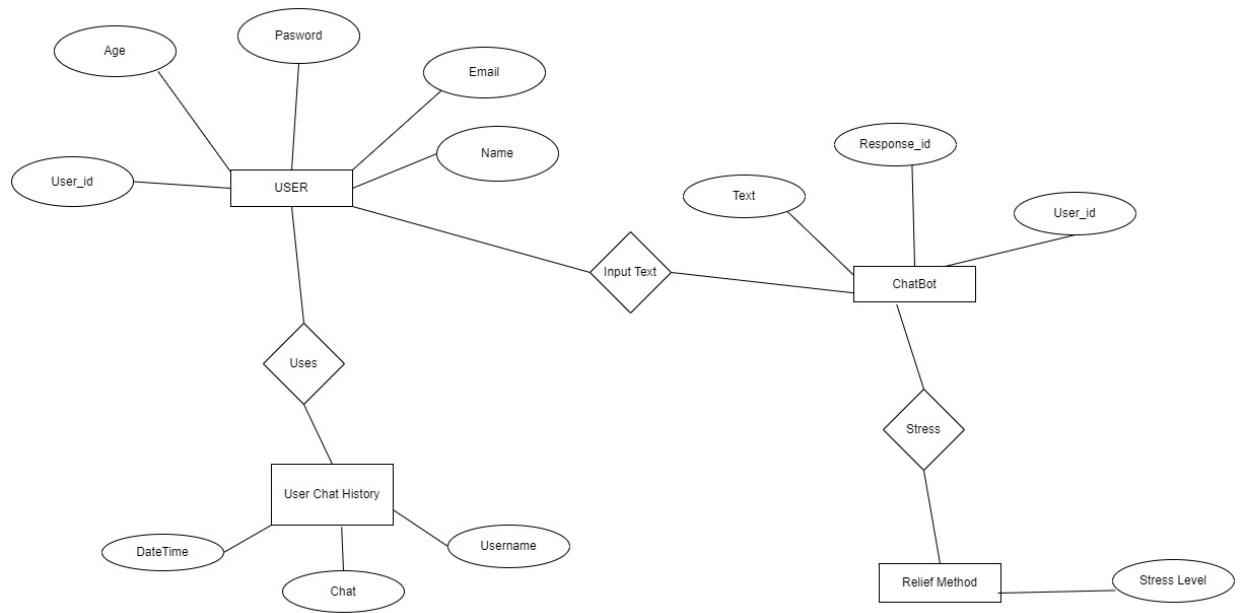


Figure 4.6: ER Diagram

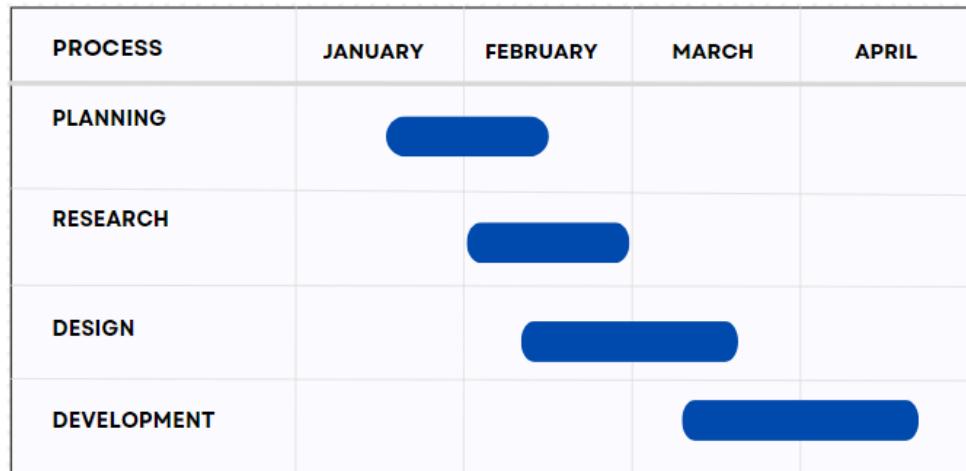


Figure 4.7: Gantt Chart

## References

- [1] N. Oryngozha, P. Shamoi, and A. Igali, “Detection and analysis of stress-related posts in reddit’s acamedic communities,” *IEEE Access*, vol. 12, pp. 14 932–14 948, 2024.
- [2] P. KVTKN and T. Ramakrishnudu, “Semi-supervised approach for tweet-level stress detection,” *Natural Language Processing Journal*, vol. 4, p. 100019, 2023. [Online]. Available: <https://www.sciencedirect.com/science/article/pii/S294971912300016X>