



## Chatbot for Mental Health Care

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### ABSTRACT—

This paper introduces a Healthcare Chatbot that utilizes Artificial Intelligence to assist in resolving basic health-related queries before consulting a doctor, thereby reducing time and cost. The Chatbot uses Natural-Language-Processing to communicate with users and a Sequential algorithm to make decisions based on the user's input. Additionally, users can create a profile specifying their symptoms, which the Chatbot utilizes to suggest doctors and provide dosage reminders. This Chatbot is a useful tool for individuals seeking primary care advice and can also serve as a virtual doctor for minor mental health issues. The Chatbot can diagnose diseases based on the symptoms provided and suggest appropriate remedies and precautions. The system also features voice output music for relax and games, as well as appointment scheduling with time-slots. Conversational agents, such as this Chatbot, utilize NLP and ML techniques to understand user queries and provide intelligent responses. The Chatbot is available 24/7, free of cost, and can facilitate more open communication between users and healthcare providers. In addition to its primary functions, the Healthcare Chatbot can be programmed to offer a variety of healthcare services, including medical check-ups, therapy sessions, and lifestyle advice. For instance, the Chatbot can offer personalized fitness plans based on the user's health status, dietary habits, and exercise preferences. It can also provide mental health counseling and support for individuals struggling with stress, anxiety, or depression. One of the key advantages of the Healthcare Chatbot is its accessibility. Since it can be accessed through any device with an internet connection, individuals living in remote areas or with limited access to healthcare facilities can benefit from its services. The Chatbot can also be programmed to support multiple languages, making it a valuable tool for individuals with diverse linguistic backgrounds. Overall, the Healthcare Chatbot represents a significant breakthrough in healthcare technology, offering an effective, accessible, and affordable means of accessing primary healthcare services. With its intelligent algorithms and advanced NLP capabilities, the Chatbot has the potential to revolutionize the way individuals receive healthcare services, providing personalized, convenient, and reliable care to people across the globe. In conclusion, this Healthcare Chatbot is a useful tool for individuals seeking preliminary healthcare advice and can assist in reducing healthcare costs and time.

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**KeyWords:-** *Machine Learning (ML), Natural Language Processing (NLP), Automation , Intelligent task.*

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### I. Introduction

Recent research from the World Health Organization reveals that depression affects approximately 264 million people worldwide. Stress and anxiety are prevalent among individuals who are between the ages of 15 and 28 and experiencing symptoms of depression may be eligible for manifest in various ways within this age group. Unfortunately, many people suffering from mental illnesses often perceives it as a phase and fail to comprehend its impact on their brain cells. Chatbots could provide real-time assistance for individuals who lack the financial resources to seek professional help. The internet's greatest advantage is its ability to share information and offer services to all users, and chatbots can address the shortcomings of mental health professionals in any region.

Despite having access to health assistance, some individuals may delay seeking treatment due to various reasons, including underestimating the severity of their emotions or fearing judgment from others. Chatbots are available 24/7, eliminating the need for appointments and making mental healthcare more accessible to people. Chatbots are not designed to replace human health practitioners; instead, they assist them in providing better services. These interactive and user-friendly tools, particularly the chatbot therapist, are more efficient and cost-effective in treating depression.

Therefore, self-mental healthcare techniques using chatbots have been developed to reduce stress and motivate users. The chatbot therapist is an advanced method of therapy, consisting of different modules that work together to provide assistance to users. The chatbot analyzes the user's inputs to identify their stress level and provides constructive thoughts and self-help techniques to help them cope. By utilizing Natural Language Processing technology, the software is able to recognize the mood of the user and provide relevant content accordingly. Previous studies have utilized various technologies to improve chatbot performance and achieve better results.

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### II. Related Work

[1] In 2019, A Mental Healthcare Chatbot System used SAT Counseling Method:

In 2019, T. Kamita, A. Matsumoto, T. Munakata, and T. Inoue, along with T. Ito, conducted a study on the effectiveness of a chatbot for enhancing user motivation and reducing stress in DIY or self-directed mental healthcare courses. However, the study had a limited sample size, and the assessment of user motivation and stress reduction was based on a single use of the course. The authors began by digitizing the structured association technique counseling method into a digital format and developed an independent mental health support system to achieve their objective. The system incorporated a Virtual Reality (VR), which had previously received positive evaluations for stress relief in other studies conducted by Kamita et al. [1,12,13,14]

**[2] In 2019, A Mental Health Care Chatbot using CBT Method:**

The automated bot offers assistance to individuals dealing with mental health issues, while adhering to certain minimum standards. These standards include respecting the privacy of users, relying on evidence-based practices, and ensuring their safety. To get started, the user is asked to complete a brief survey, and based on their responses, a report is generated to assess their progress. While analyzing the report may take some time, it is an important step in providing effective support to those in need. [2]

**[3][4] AI for Chatbots in Mental Health-2019:**

One approach to developing chatbots for mental health support is to ensure that the system aligns with the recommendations of healthcare professionals and is cognizant of the treatment goals outlined in therapeutic sessions. However, a major hurdle in this process is accurately identifying emergency situations and responding appropriately once an emergency has been detected. This presents a significant challenge that must be overcome in order to provide effective and safe support to those in need. [3, 4]

**[5] In 2018, Review on Analysis of Chatbot in Mental Healthcare :**

The purpose of this chatbot is to offer mental support to students who experience varying levels of stress, which may potentially trigger depression. However, further research is necessary to explore different aspects of its effectiveness. [5]

**[6] M. Househ, A Review of Their Self-Care Features:**

The prevalence of mental health disorders such as anxiety, depression, nervousness, and melancholy has surged to an all-time high globally, affecting over 264 million individuals of all ages with depression alone. To locate existing chatbot applications designed for managing anxiety and depression, a thorough search was carried out in both the App Store and Google Play Store, following the PRISMA protocol, which is a standardized reporting guideline for systematic reviews and meta-analyses. The apps' eligibility was evaluated based on predetermined criteria by two reviewers, and meta-data regarding the chatbots and their attributes were extracted from the descriptions and post-installation. The quality of the information was assessed based on adherence to the mHONcode principles. [1, 6, 15]

**[7] Depression Detection and Emotion Recognition and using Deep Learning-2020:**

The Recognition and Detection Chatbot is developed using Recurrent Neural Network (RNN) for its encoding and decoding mechanism, which allows for the extraction of key characteristics from sentences. This approach is utilized to implement a chatbot with the necessary features for effective recognition and detection. [7]

**[8] In 2022, Divya Madhu -Voice assist using Python in AI-based HealthCare Chatbot system:**

Divya Madhu suggests that Artificial Intelligence (AI) can be utilized to predict potential illnesses and recommended list of possible treatments after considering the symptoms that were given. With regular analysis, AI can even assist in the early detection of diseases before they become apparent. However, the expenses associated with researching and developing the technology, along with government backing to ensure proper implementation, must be taken into consideration. [8].

**[9] In 2022, Hameed-Ullah Kazi-Voice assist using Python in AI-based HealthCare Chatbot system:**

Hameed-Ullah Kazi suggested the creation of an open-source medical chatbot called Chatter Bean, specifically intended for use by medical students. The chatbot uses AIML and can accurately interpret human language queries and translate them into SQL queries. However, generating and organizing groupings based on the number of issues in each group can be a lengthy process. [9].

**[10] Zhang, X.-D. A Matrix Algebra Approach, The development of a chatbot:**

In the past, "chatbots" or Artificial Intelligence systems for human-machine interaction were widely used. To interact accurately with users, a chatbot to be effective, it needs to possess the ability to comprehend the intent of the user, along with the context in which the interaction is taking place, and the sentiment behind their messages. Machine Learning has played a crucial role in chatbot development, where the process of creating a chatbot involves using a mathematical framework that is trained on data to make predictions or decisions without explicit programming. Recent research has focused on utilizing Convolutional Neural Networks (CNNs) as classifiers, combined with specific tokenization tools. CNNs are a type of deep learning algorithm with a hierarchical structure, where each layer learns from the previous one. Text is processed using a technique called "Word Embedding," which converts it into numerical form. For this purpose, Word2Vec technique was employed, which offers a vast amount of pretrained data and enables users to train their own datasets. Additionally, Word2vec technique enables obtaining vectors from other vectors using vector operations. This preprocess is necessary to insert data into the CNN. Various CNN architectures were utilized in this study of research. [10, 11]

**[11] In 2017, K. Oh, D. Lee, B. Ko and H. Choi, "A Chatbot for Psychiatric Counseling in Mental Healthcare Service Based on Emotional Dialogue Analysis and Sentence Generation,"**

Early studies have explored the use of chatbots to encourage users to seek psychiatric counseling, leading to positive changes in their drinking habits through intervention approaches. However, these studies did not take into account the user's psychiatric to seek psychiatric counseling. Intervention approaches used in such studies have led to positive changes in drinking habits. However, limitations in these studies include a lack of consideration of the user's psychiatric status during conversations, inadequate monitoring, and ethical considerations in the intervention process. Therefore, we propose a conversational service for psychiatric counseling that incorporates more accurate and continuous emotion recognition, providing better satisfaction for users in need of mental health care. Our approach includes high-level natural language understanding (NLU) methodologies and multi-modal emotion recognition to enable the sensitive observation of emotional changes over time. Additionally, we provide appropriate and suitable responses for clinical psychiatric counseling. [22,27]

**[12] Du Preez, S.J, Lall, Manoj, Sinha, S. "An intelligent web-based voice chatbot" in 2009:**

This article describes the development of an intelligent chatbot that utilizes voice recognition technology. The chatbot is designed to function as a web service and a framework is proposed to support its operation. Through controlling the communication structure between the server and client platforms, the web service enables clients to access it from any platform. An interface is generated to facilitate XML processing and ensure extensibility, thus improving the service's lifespan. The chatbot employs an artificial brain to provide customized user responses that are consistent with the desired character. In cases where the chatbot is unable to comprehend a question, the system employs an online intelligent research assistant, which is a third-party expert system, to process the inquiry and archive the response, thereby enhancing the chatbot's artificial intelligence for future responses. [23, 27]

**[13] In Ferry Wahyu Wibowo, "Chatbot Using a Knowledge in Database: Human-to- Machine Conversation Modeling", Intelligent Systems Modelling and Simulation :**

A chatbot, also known as a chatterbot, the design is used to facilitate a conversation between human and machines responses. The machine is programmed with the ability to comprehend sentences and independently make decisions in order to respond to questions. The response mechanism involves matching the user's input sentence with a reference sentence and determining their similarity score. To calculate the similarity score, bigram is used to divide the input sentence into two-letter segments. The chatbot's knowledge base is stored in a database, while its core and interface access this information using a RDBMS. The database is a storage unit for the chatbot's knowledge, while an interpreter employs stored program of functions and procedures sets to meet pattern-matching as per requirements. The interface is a defines as a standalone unit that is built using programming languages like Pascal and Java. [24, 27]

**[14] In 2017, Dahiya, Menal- A Tool of Conversation Chatbot and C.P. Shabariram, V. Srinath, C.S. Indhuja, Vidhya-Chatbot Application Using Expert System:**

Communication through speech and text is a crucial aspect of human interaction. According to an article," adults now days spend over 8-9 hours a day on computer or mobile display, leading to increased use of web applications such as WhatsApp, Facebook, Twitter and other Apps for speech and text-based conversations. This paper focuses on designing a chatbot application for educational purposes that can answer user-provided questions. To developed the system with ensembled learning method and random forest, was employed along with extracted features from dataset. The validation of a system produced an average F-measure score of 0.870 for various K-values under random forest, demonstrating the effectiveness of the proposed chatbot. The system has been deployed as a Telegram bot for convenient access. [25, 26, 27]

### III. Methodology Used

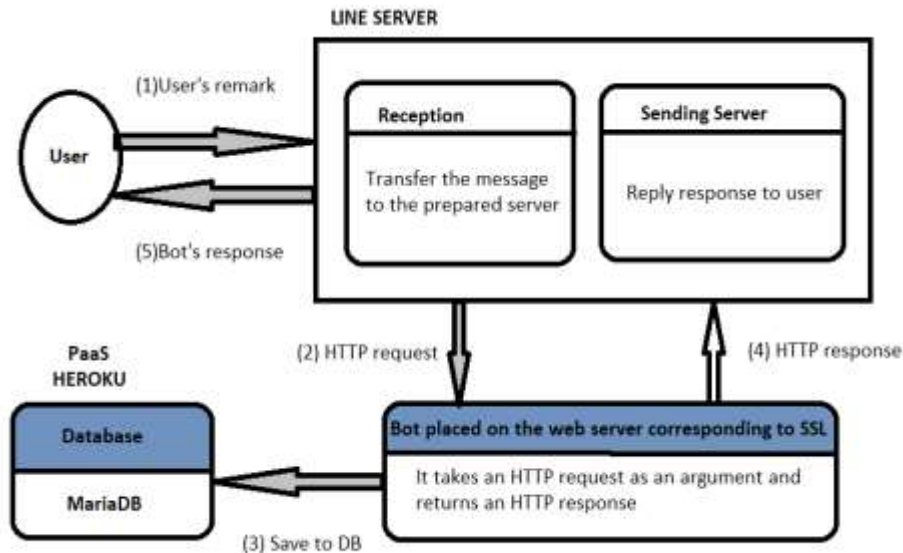
There are various studies have been conducted on mental health chatbots and control systems, categorized based on the implemented methodologies and technology utilized in the system. The exchange of messages is a crucial aspect of providing a chatbot for problem-solving and improving system efficiency. The proposed systems are classified based on the tools and implementation of the architecture. This paper provides a brief description of the various methodologies implemented in mental health chatbot and control systems.

*A Chatbot for Mental Health Care using SAT Counseling Method*

One of the biggest challenges in the conventional self-support mentalcare method is user withdrawal. To overcome this, the use of frequent smile face images and course repetition is necessary to improves the mental health improvement effect. To address this problem, a Chatbot course was developed using conversational guidance. The self-mental care system was developed using LINE, a widely used chat tool in Japan. During emotional stabilization therapy, a counselor observes the effects of the conversation on the client, such as facial expression, body language, and other gestures, and may suggest eye closure if the effect is deemed insufficient. With the digital-SAT approach, individuals can access self-guided intellectual healthcare based on the SAT technique without requiring a counselor's education. This method simplifies the questionnaire by dividing the unique questions for emotional stabilization therapy into individual queries. The Chatbot route was developed using the digital-SAT technique.

### System Configuration

The system configuration is illustrated in Figure 1, which depicts the data processing flow through the system. In this system, the chatbot service is offered through the LINE application, which is one of the most widely used social networking services (SNS) in Japan. The chatbot applications server is hosted on a commercial of HEROKU server, and the LINE server is provided by LINE. To connect the servers, the messaging API program offered by LINE is utilized. This program serves as an application programming interface, enabling data exchange between the sending and receiving server of LINE.



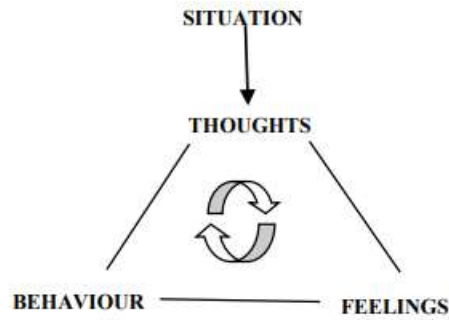
Flowchart of system configuration

- 1) The system configuration for user and LINE server interaction involves the user connecting to the LINE application, which is a social networking service used to send requests. The LINE server, which comprises of a reception component for transferring messages to the prepared server, and a sending server for replying responses to the user, is responsible for facilitating the interaction.
- 2) To enable developers to build, run, and manage applications entirely in the cloud, without having to worry about infrastructure setup, scaling, and maintenance, LINE provides the Heroku platform as a service (PaaS). Heroku is a cloud-based solution that supports various programming languages like Ruby, Node.js, Python, PHP, and, more. It also includes a MariaDB database for storing the requests and responses from the web server, corresponding to SSL. It is essential to note that "Heroku" is a registered trademark of Heroku server.

### A Chatbot System For Mental Health Care using CBT Method

Cognitive behavioral therapy (CBT) is a method, aims to replace negative and unhelpful behaviors, thoughts, and emotions with positive ones. Similar principles have been identified in various traditions. This has influenced modern CBT strategies, these techniques aim to identify cognitive distortions that can lead to the development of depression and anxiety. CBT was developed by Aaron Beck in cognitive therapy and later evolved into CBT, while Albert Ellis invented rational emotive behavior therapy (REBT) and introduced the ABC method. The ABC model involves the situation (A), our interpretation of it (B), and our reaction or behavior (C). The final goal of this CBT is to help people respond correctly, rather than replacing their thoughts or feelings.

During CBT, the therapist works on the client's thoughts, feelings, and behaviors and how they intersect. It examines how their thoughts contribute to difficult emotions and how their thoughts may be helping to maintain negative feelings. The therapist helps the client to consider situations, state of people, or themselves from a different attitudes in order to feel better. CBT is an evidence-based approach that is commonly used to treat a range of problems and issues. It is a collaborative process, where the therapist and client work together to analyze the issues being faced. Homework assignments are often given to clients to practice the skills and techniques learned in therapy outside of sessions. CBT is the combination of behavioral and cognitive psychology, where emotions, thoughts, and behaviors are all interconnected.



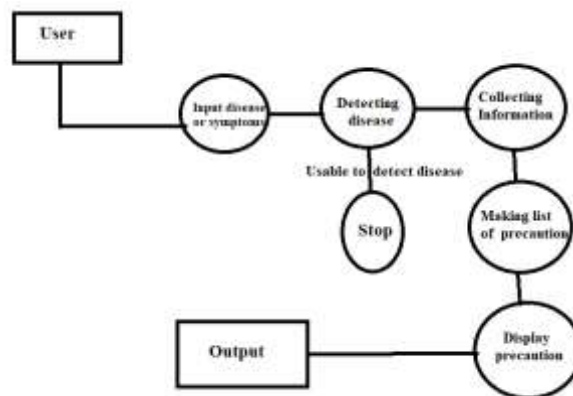
Flow of CBT mechanism

Cognitive Behavioral Therapy (CBT) is a highly structured approach to therapy that involves identifying goals that both the client and therapist agree to work on together. A distinctive feature of CBT is that the therapist actively seeks and welcomes feedback on how the therapy is progressing. This reflects the collaborative nature of the therapy, where the therapist is not seen as having greater expertise than the client, but rather brings specialized knowledge and skills to help the client address their issues.

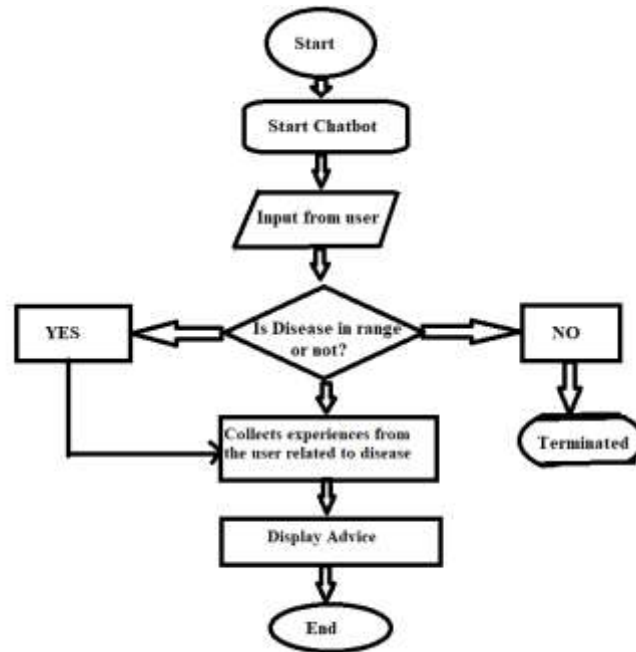
*Divya Madhu and Hameed-Ullah Kazi, Artificial Intelligence-based HealthCare Chatbot system with voice assist using Python,2022*

In their research describe a chatbot system designed to provide basic health information to users. The chatbot employs artificial intelligence and machine learning techniques to interpret natural language and respond to user inquiries. To use the chatbot, users must first register on the website. If the chatbot does not have an answer in its database, an expert system is utilized to provide In their research paper titled "Artificial Intelligence-based HealthCare Chatbot system with voice assist using Python," Divya Madhu and Hameed-Ullah Kazi describe a chatbot system designed to provide basic health information to users. The chatbot employs AI and ML techniques to interpret Natural language and respond to clients inquiries. To use the chatbot, users must first register on the website. If the chatbot does not have an answer in its database, an expert system is utilized to provide a response. Domain experts can also register and provide specific information for the chatbot. The data generated by the chatbot is stored in a database as a sample template.

To interact with the chatbot, the user types their inquiry into the user interface, which is then received by the program. The chatbot undergoes pre-processing procedures, including tokenization, stop word removal, and, features extraction based on N-grams, TF-IDF, and cosine similarity. The chatbot retrieves solution to queries from the knowledge database. The text is tokenized by splitting the words or phrases. Punctuation is removed, and stop words are eliminated to reduces the time and complexity of it . Feature extraction involves ranking the attributes of a document, and the frequency of each keyword is extracted using TF-IDF. This process is used to compute the weight of each phrase in the sentence, resulting in increased accuracy and speed of document processing.



Flowchart for User and System Interaction



Flowchart for voice assist

#### *Emotion Recognition and Depression Detection using Deep Learning*

The use of Convolutional Neural Networks (CNNs) is a popular method in Deep Learning for image analysis and recognition tasks. A CNN is capable of assigning significance to different objects and features in an input visual format

through weights. This process requires less pre-processing compared to other classification algorithms. The advantage of using CNNs for image recognition tasks is that they are able to capture spatial aspects of the input image due to the numerous filters employed in the algorithm.

#### **1. Dataset of Facial Expression :**

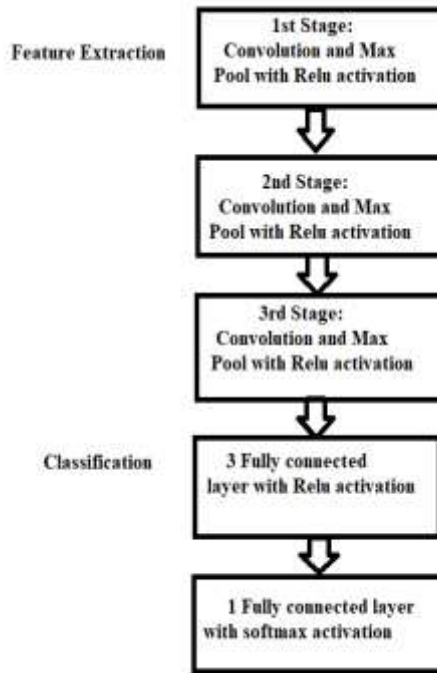
Numerous open access facial expression datasets are available in literature. For our study, we utilized a facial expression dataset sourced from Kaggle. The dataset consists of grayscale images of faces with 48x48 pixel resolution. The training set contains a total of 28,709 samples, encompassing different emotions – happy, surprised, and, angry etc.

#### **2. Image Pre-processing:**

Image preprocessing was performed to prepare the facial expression dataset for analysis. The Haar-Cascade library was utilized to detect the face boundaries in the images, and these regions of interest were cropped and saved. Additionally, the images were converted into grayscale format and fed into the neural network. This preprocessing step helped to reduce the complexity of the neural networks and improve their computational efficiency.

#### **3. Convolutional neural community architecture:**

Convolutional neural networks are used in this study to extract features from facial expression data. The proposed system CNN architecture consists with three levels of convolutional layers with 'relu' is a activation function, max-pooling layers, and three fully connected layers with 'relu' and 'softmax' activation functions. The input to the CNN is the rectangular region containing facial expressions. After passing through the convolutional and max-pooling layers, the output is fed into the fully connected layers for prediction of the seven different emotional states. Prior to this, the face circumference is detected using the Haar Cascade library, and the images are converted to grayscale to reduce the complexity of the neural networks.



CNN Model Architecture- The layers used in the construction of the CNN Model

**4. Network training:**

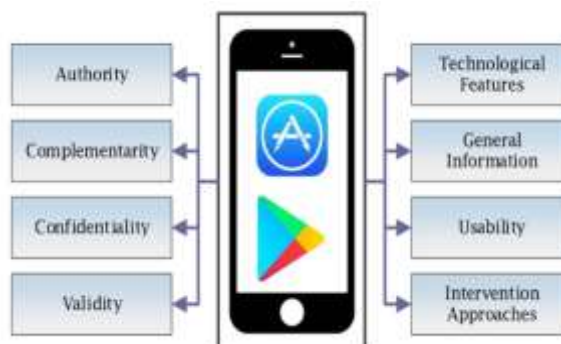
The network training was performed in Python using Keras with a TensorFlow backend. The model was trained over the course of 50 epochs.

**5. Real time testing:**

To test the effectiveness of the CNN model, real-time testing was conducted. The initial step was to detect human faces using the Haar Cascade library via the computer camera. The detected images were then forwarded to the trained model, and the predicted facial expression categories were retrieved.

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

It appears that you have provided a comprehensive overview of the methodology used in the evaluation of mobile chatbot apps for stress and depression and their self-support and care features. The study appears to have followed a rigorous search strategy, eligibility for this , app selection, information extraction, and data process. The use of the PRISMA guidelines and the adaptation of the mHONcode principles demonstrate a commitment to transparency, replicability, and quality assurance. The addition of the General Information and Technological Features categories shows the study's relevance to current needs and trends. Overall, the methodology seems sound, and the study provides a useful reference for future research and app development in this area., easy to comply with and met to aims we desired to acquire from our overview of study.



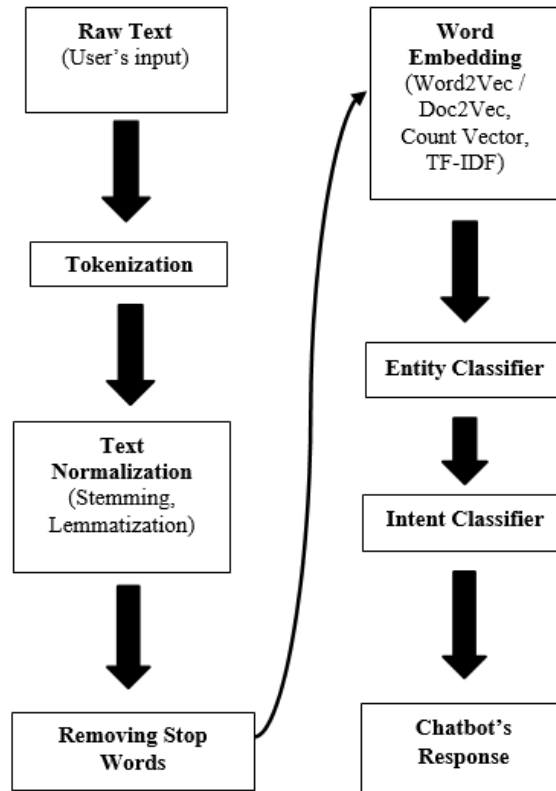
Principal Model with new version model

*The development of a chatbot using CNN method*

Developing a chatbot requires selecting an appropriate methodology for training it to understand user input in the text of the conversation. The flowchart in Fig 7 outlines the necessary steps to process. First, the data must undergo a preprocess procedure, which involves separating the raw data

input into single word, known as tokens. The tokenized strings go through input text for normalization, which can be executed through stemming or lemmatization techniques. Stemming removes word affixes to simplify the word, while lemmatization looks up each token in a dictionary and to determine the root lemma, making it slower but it gives more accuracy. This paper utilizes lemmatization.

Since algorithms are difficult to apply to text, Word Embedding is used to convert text into numbers. Word2Vec and an extension called Doc2Vec are used in this paper, with Doc2Vec taking entire sentences as input. Word2Vec offers pre-trained data online, which can be supplemented with user data. Word Embedding is followed by entity classification, which involves identifying information items such as names, numeric expressions, and location names. Intent classification follows, in which the chatbot attempts to understand the user's intention before providing a response or solution to the problem.



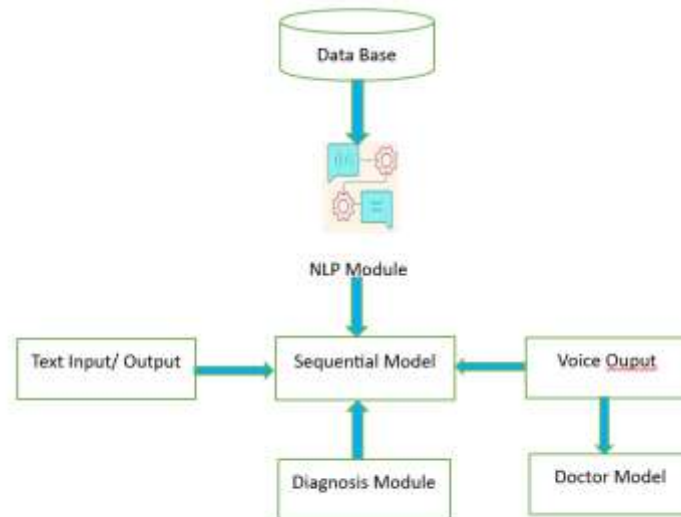
Flowchart depicts the process of how a chatbot engine receives an input and generates output

#### IV. IMPLEMENTATION

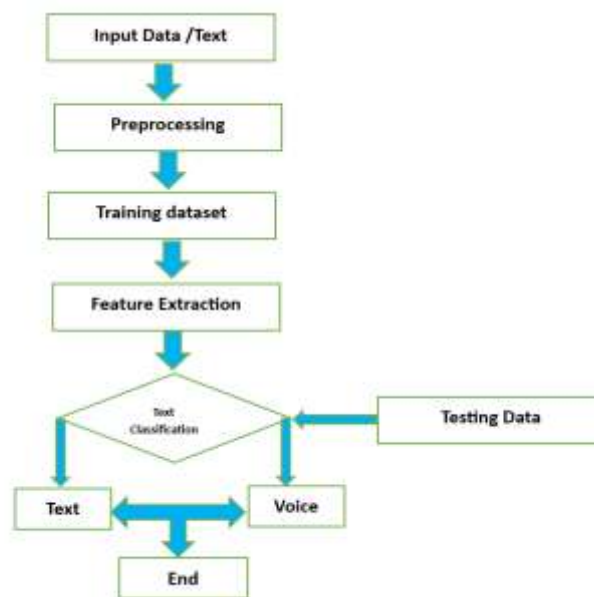
The proposed system utilizes the Sequential Algorithm for developing a mental healthcare chatbot that offers various features such as text and voice-based input and output. Users can ask questions related to mental health issues, and the chatbot provides solutions as well as diagnoses diseases based on symptoms. Additionally, it suggests doctors for specific ailments, acting as an AI healthcare consultant. The Sequential Algorithm is used for accurate prediction and high accuracy.

The dialogue manager manages text and voice-based input from users, collects and records queries, and provides responses. The chatbot selects a response by identifying specific keywords and patterns, but it does not comprehend the user's input or its own output. Responses are collected from the user's text message and then classified using the Sequential methodology, which involves applying filters to recognize input in the correct format. The result is an accurate output of text or voice related to mental health problems, which makes communication easy and saves time. The Sequential Algorithm is applicable to various classification tasks in natural language processing, and it involves sliding a window over a larger input data with an emphasis on a subset of the input matrix of data. It is critical to ensure that the data is in the correct dimensions for the learning algorithms.

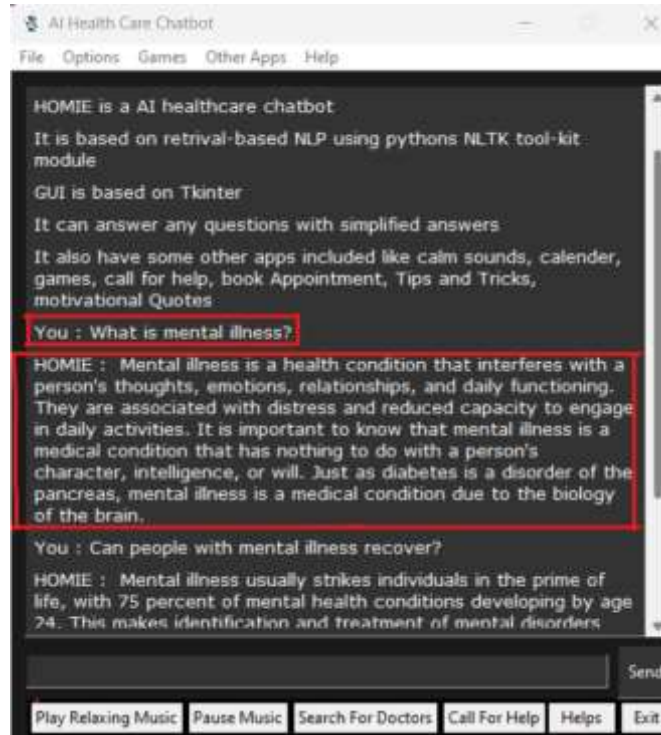




Implementation Design for Chatbot.



Flowchart for chatbot processes sing input data and gives a response.



Output Screen for Implementation.

## V. Results and Discussions

Table 1 provides a detailed explanation of the techniques utilized in the development of Chatbot for Mental HealthCare, including machine learning, deep learning, CNN, SAT Counseling Method, CBT Method, and various other techniques. The table presents the advantages and disadvantages of each technique and also highlights future directions for further research and development.

Various techniques in Chatbot system

S.No	Techniques Used	Advantages	Disadvantages	Future Directions
1.	In 2019, A Mental Healthcare Chatbot System used SAT Counseling Method[1]	The chatbot system provides users with increased motivation and support to manage and reduce their stress levels.	The study's sample size is limited, and the impact of the mental healthcare course on user motivational and stress level reduction.	Advanced algorithms be explored and enhancement in the future.
2.	In 2019,A Mental Health Care Chatbot using CBT Method[2]	The chatbot proved to be effective in helping clients identified the emotions, and understand negative emotions, thereby simplifying the process for them.	It requires a survey and creates a report of based on performance of individual person. It takes time to analysis the report	In future increases the chatbot therapy.
3.	AI for Chatbots in Mental Health-2019[3,4]	It detects the emergency situation.	The most significant obstacle is the accurate identification of emergency situations.	In the future improves the accuracy and effective detecting process in chatbot.
4.	In 2018, Review on Analysis of Chatbot in Mental Healthcare[5]	It helps to references of all review details for developing.	It requires additional review information.	In the future, the system can be improved by incorporating additional review information
5.	M. Househ, A Review of Their Self-Care Features [1, 6, 15]	It has the capability to increase the	It is difficult to use and maintain, because of high quality based on our	To gain greater trust and confidence in chatbot technology, it is important for

		capacity of mental health care and providing benefits.	assessment according to the mHON code principles.	future developers to prioritize evidence-based interventions.
6.	Depression Detection and Emotion Recognition and using Deep Learning-2020[7]	The emotion recognition and depression analyzer which is implemented in desktop application based chatbot	The current working desktop application is local. No access to everyone.	Chatbots is rising for a few years and have already gained widespread acceptance with the growth of developing technologies.
7.	In 2022, Divya Madhu -Voice assist using Python in AI-based HealthCare Chatbot system[8].	It offers a high-quality responses in a short amount of time and more efficient.	In a positive dataset possible to get the information redundancy.	In future work involves to other improves the accuracy.
8.	Hameed-Ullah Kazi-Voice assist using Python in AI-based HealthCare Chatbot system[9].	It offers a more-quality to responses in a less amount of time.	In a given dataset possible to get the details of repetition problem.	Our future work involves to explored the other methods and technics.
9.	Zhang, X.D. and A Matrix Algebra Approach, The development of a chatbot [10, 11]	It has the best accuracy, fastest training time and the least losses.	It uses Server for managing large data-set and cost is high.	In future, plan to increase accuracy and keeping the training time within limits.

Table 2 provides a detailed explanation of the techniques utilized in the development of Chatbot for Mental HealthCare, including machine learning, deep learning, CNN, SAT Counseling Method, CBT Method, and various other techniques. The table presents the advantages and disadvantages of each technique and also highlights future directions for further research and development.

#### Chatbot system implementation details

S.No	Techniques Used	Tools Used	Dataset	Layer
1.	In 2019, A Mental Healthcare Chatbot System used SAT Counseling Method[1]	LINE server, VR, and HMD	Real-time Dataset	Network layer
2.	In 2019,A Mental Health Care Chatbot using CBT Method[2]	CBT tool	Real-time Dataset	Convolutional Layer
3.	AI for Chatbots in Mental Health-2019[3,4]	DMHIs	Real-time Dataset	Network and Transport Layer.
4.	In 2018, Review on Analysis of Chatbot in Mental Healthcare[5]	Reviews on chatbot	Real-time Dataset	Application Layer and PRISMA protocol
5.	M. Househ, A Review of Their Self-Care Features [1, 6, 15]	mHON code, Android and iOS systems	Real-time Dataset.	Application Layer
6.	Depression Detection and Emotion Recognition and using Deep Learning-2020[7]	GUI tools	Real-time Database	Internet Layer
7.	In 2022, Divya Madhu -Voice assist using Python in AI-based HealthCare Chatbot system[8].	TFIDF and N-grams	Training and test data sets	Network Layer and Internet Layer
8.	Hameed-Ullah Kazi-Voice assist using Python in AI-based HealthCare Chatbot system[9].	TFIDF and N-grams	Training and test data sets	Network Layer and Internet Layer
9.	Zhang, X.D. and A Matrix Algebra Approach, The development of a chatbot [10, 11]	AlexNet, LeNet5, ResNet and VGGNet CNN architectures were utilised	Real-time Dataset and Training Dataset	Application Layer and Convolutional Layer

Table 3 provides a detailed explanation of the techniques utilized in the development of Chatbot for Mental HealthCare, including machine learning, deep learning, CNN, SAT Counseling Method, CBT Method, and various other techniques. The table presents the advantages and disadvantages of each technique and also highlights future directions for further research and development.

## Chatbot system using techniques and its accuracy

S.No	Techniques Used	Input Parameters	Output Parameters	Accuracy
1.	In 2019, A Mental Healthcare Chatbot System used SAT Counseling Method[1]	Images	Digital Output	80%
2.	In 2019,A Mental Health Care Chatbot using CBT Method[2]	Virtual face-to face	Voice Output	91%
3.	AI for Chatbots in Mental Health-2019[3,4]	Text and Images	Relatively good accuracy and speed. And text and Voice output.	94%
4.	In 2018, Review on Analysis of Chatbot in Mental Healthcare[5]	Text	Response from output screen	79%
5.	M. Househ, A Review of Their Self-Care Features [1, 6, 15]	Text Content and symptoms	Discussions of results	94%
6.	Depression Detection and Emotion Recognition and using Deep Learning-2020[7]	Virtual data	Tags Displays on Screen	60%
7.	In 2022, Divya Madhu -Voice assist using Python in AI-based HealthCare Chatbot system[8].	Text format	Text and Voice format	89.5%
8.	Hameed-Ullah Kazi-Voice assist using Python in AI-based HealthCare Chatbot system[9].	Text format	Text and Voice format	90%
9.	Zhang, X.D. and A Matrix Algebra Approach, The development of a chatbot [10, 11]	Text, Content, and Intent	Softmax	92.3%

## VI. Conclusion

The chatbot provides a user-friendly platform that is easily accessible to anyone with an internet connection. It adheres to the minimum standards of respecting user privacy, being evidence-based, and ensuring user safety. Despite its potential benefits in treating depression, many people are still unaware of this technology. The mental healthcare chatbot has the potential to encourage users to open up and discuss their problems. This project utilizes Python and employs machine learning techniques such as Sequential Model, ML, and NLP to improve the chatbot's accuracy. In the future, this desktop application-based chatbot could be developed further to incorporate video consultancy with a doctor for users who are identified as suffering from depression and stress.

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