PROJECT REPORT

On

"Sentiment Analysis on Interactive Conversational Agent/Chatbot"

Submitted by

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Submitted in partial fulfillment of the requirements
for
Degree of Bachelor of Technology

Guided By,

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DEPARTMENT OF EMERGING TECHNOLOGIES (AI&ML)

S. B. JAIN INSTITUTE OF TECHNOLOGY, MANAGEMENT & RESEARCH, NAGPUR

(An Autonomous Institute, Affiliated to RTMNU, Nagpur)

2024-2025

S. B. JAIN INSTITUTE OF TECHNOLOGY, MANAGEMENT & RESEARCH, NAGPUR

(An Autonomous Institute, Affiliated to R.T.M. Nagpur University)

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- Emerge as a leading Institute for developing competent and creative Professionals.

❖ **Institute Mission:**

- Providing Quality Infrastructure and experienced faculty for academic excellence.
- Inculcating skills, knowledge and opportunities for competency and Creativity.
- Aligning with Industries for knowledge sharing, research and development.

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- Have strong work ethics and professionalism, reflected through communication skills, leadership, teamwork and sense of responsibility towards the society.
- Be successful professionals through lifelong learning with allied objectives of higher education or research.

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SESSION 2024-2025

CERTIFICATE

This is to certify that the Project Report titled **"Sentiment Analysis on Interactive Conversational Agent/Chatbot"** submitted by **Ms. Falguni Kalambe, Mr. Samyak Manwatkar, Mr. Yash Kakde, Mr. Vidit Khairkar** has been accepted under the guidance of **Mr. Ravi Asati**. This Project work is carried out for the partial fulfillment of **"PROJECT–I (PROJAM702)"** of VII Semester of Bachelor of Technology in **Artificial Intelligence and Machine Learning, S. B. Jain Institute of Technology, Management & Research, An Autonomous Institute, Affiliated to RTMNU, Nagpur.**

Mr. Ravi Asati   **Dr. Hemant Turkar**

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Dr. S. L. Badjate

Principal

<u>DECLARATION</u>

We hereby declare that the Project Report titled **"Sentiment Analysis on Interactive Conversational Agent/Chatbot"** submitted here has been carried out by us in the Department of Emerging Technology (AI&ML) of S. B. Jain Institute of Technology, Management and Research, Nagpur under the guidance of **Mr. Ravi Asati**. The work is original and has not been submitted earlier as a whole or in part for the award of any degree/diploma at this or any other Institution/University.

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ABSTRACT

A chatbot is a computer that can understand human speech and react like a human. The more human-like a chatbot is, the more useful it will be. There are many attempts to make chatbots intelligent or human-like. One of the daily tasks at the university is to answer frequently asked questions or questions found on official websites. This work is time consuming and wasteful. Chatbots are a solution to this problem. A good chatbot can answer these questions quickly and tirelessly. But creating an intelligent or human-like chatbot is difficult. A chatbot should be able to answer both basic and advanced questions. In this study, we present a chatbot system that uses machine learning techniques. So chatbots can learn from users to improve their results. We test our chatbots by testing real-world conversations. The results show that our chatbot can answer simple questions with higher accuracy than more advanced questions. Chatbots are designed to understand sentences, determine their meaning, and continue the conversation as needed, but they cannot capture the user's intent. It can enable the chatbot to not only respond to the user, but also understand them emotionally. Through our research, we focus on building a chatbot that responds based on the user's emotions to create a more empathetic and human experience for the user.

Keywords- *Machine Learning, Chatbot, Sentiment Analysis*

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ABBREVIATION

ABBREVIATION	FULL FORM
ML	Machine learning
DL	Deep learning
NLP	Natural Language Processing
UAT	User Acceptance Testing

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CHAPTER NO. 1

INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 PROJECT BACKGROUND

A chatbot is a software used to interact with computers and humans in natural language, just like human speech. Chatbots are replacing humans in interacting with and responding to users in conversations. A chatbot is a virtual assistant designed to provide professional services and answer questions within a specific organization. Its main goal is to streamline operations, simplify communication, and increase efficiency while providing 24/7 support to users. These chatbots are widely used in education, workplaces, healthcare, and government agencies. Core capabilities include data ingestion, business automation, personalization, and natural language processing (NLP), allowing them to better understand and respond to user questions. Schools help with admissions, student services, and IT support. Companies use them for HR questions, IT issues, and customer service. Using AI and machine learning, these chatbots improve over time by learning through interactions. They integrate with backend systems like databases and CRMs and can be accessed through websites, mobile apps, or messaging platforms like WhatsApp and Slack.Benefits include reduced workload, cost effective support, improved accessibility, consistent communication, and reduced errors. They speed up the work process by working on processes such as paper delivery, document delivery, etc. Actions include devel oping chatbot concepts, integrating APIs, and testing issues to ensure performance. With the ability to transform operations and improve user experience, departmental chatbots are indispensable tools for today's organizations. The goal is to mimic human speech and make the user feel like they are talking to someone else. The chatbot application helps students access information about the university from anywhere with an internet connection. The system reduces the work of the school administration to provide information to students, while also reducing the work of staff to answer all students' questions. Sentiment analysis, which allows chatbots to understand emotions, customize responses, and instantly adapt to improve the user experience. Sentiment analysis in chatbots is a natural language processing (NLP) technique that determines whether a user's input is positive, negative, or neutral.

1.2 PROBLEM STATEMENT

Universities often face the challenge of managing multiple inquiries from students, faculty, and staff. These include admissions, registration, exam schedules, work deadlines, internships, and support. Traditional communication methods such as email, phone calls, or personal visits are time-consuming, slow, and often not immediate. Time constraints limit access to important information, frustrating users and increasing administrators' workload. Not having an impartial and effective way to provide accurate and immediate feedback can be ineffective and impact customer satisfaction. Collage chatbots must be responsive, communicative and provide 24/7 support, allowing students and teachers to quickly access the information and assistance they need. This solution not only reduces the

1.3 PURPOSE OF STUDY

The purpose of this study is to design, build, and evaluate a school department chatbot that integrates emotional intelligence. The chatbot was designed to solve problems that students, teachers, and administrators face, such as delayed access to information, poor communication, and lack of self-support. Chatbots can reduce staff productivity and increase accessibility by addressing routine inquiries related to admissions, scheduling, testing, and support. Additionally, the integration of emotional analysis enhances the chatbot's ability to detect and respond to the emotional content of user interactions, such as stress, pressure, confusion, or urgency. This emotional intelligence enables chatbots to provide insightful responses and appropriate assistance, creating a supportive and engaging experience for users. In addition to solving urgent questions, emotional analysis can provide support to medical institutions by identifying patterns of dissatisfaction or stress. The study also aims to evaluate the role of chatbots in improving overall user satisfaction, making operations more efficient, and promoting better communication. Chatbots provide 24/7 availability, making this more efficient and useful by providing students and staff with ready access to information and assistance. The results of this study will help understand how emotional awareness skills can change the management process and create a connected and emotional university ecosystem. After all, the goal of chatbots is not only to provide efficient work, but also to create trust and satisfaction by meeting users' needs and desires.

Aim: Sentiment Analysis on Interactive Conversational Agent/Chatbot

Objectives:

- **Automate Routine Queries:** To handle frequently asked questions related to admissions, course schedules, deadlines, and departmental processes, reducing the workload on staff.
- **Enhance Accessibility and Availability:** To provide 24/7 assistance, ensuring students and staff can access information and services anytime, regardless of office hours.
- **Improve User Experience:** To deliver accurate, timely, and personalized responses, improving satisfaction and streamlining interactions with the department.
- **Incorporate Sentiment Analysis:** To detect user emotions, such as frustration or confusion, and respond empathetically, fostering a supportive and engaging environment.
- **Streamline Administrative Processes:** To assist with tasks like form submissions, appointment scheduling, and notifications, increasing efficiency and reducing delays in departmental operations.

1.4   TECHNOLOGICAL BASE

- **Natural Language Processing (NLP):**
  The chatbot uses NLP to understand, interpret, and respond to user queries in a conversational format. Libraries like, NLTK, or platforms like Microsoft LUIS are commonly used for NLP integration.

- **Machine Learning (ML):**
  Machine learning models enable the chatbot to learn from user interactions and improve its response accuracy over time. Frameworks such as TensorFlow, PyTorch, or scikit- learn power this adaptive capability.

- **Sentiment Analysis Tools:**
  Sentiment analysis relies on models trained to detect emotions in user text (positive, negative, or neutral). Tools like Hugging Face Transformers, TextBlob, or pre-built APIs (e.g., Google Cloud Natural Language API) are used for this purpose.

- **Database Integration:**
  The chatbot connects to a database (e.g., MySQL) to fetch and store data like FAQs, user preferences, and conversation logs. This ensures dynamic and up-to-date responses.

- **Backend Frameworks and APIs:**
  A robust backend built using frameworks like Flask, Django, or Node.js handles logic, user authentication, and integration with departmental systems such as learning management systems or student portals.

- **Voice Integration (Optional):**
  Voice-enabled chatbots use speech-to-text and text-to-speech technologies, powered by tools like Google Speech API or Amazon Polly, to support users who prefer verbal interaction.

IMPORTANCE OF MACHINE LEARNING IN CHATBOTS

- **Understand user intent:** Machine learning allows chatbots to analyze and understand the intent behind user questions, even when they are spoken in different ways. This ensures user satisfaction by providing accurate and context-aware answers.

- **Continuous Learning and Improvement:** Chatbots powered by machine learning can learn from past interactions to improve their effectiveness over time. By analyzing u ser behavior, feedback, and FAQs, they can adapt to changing needs without the need for manual reprogramming.

- **Handle Complex Questions:** Machine learning allows chatbots to manage complex or multi-layered conversations by understanding context and managing interactions across multiple sessions.

- **Scalability:** Machine learning based chatbots can handle more queries without any performance degradation, making them suitable for large deployments.

- **Dynamic Updates:** Unlike static systems, machine learning based chatbots can learn new information or topics by training on updated information to ensure their responses are still relevant and accurate.

- **Cost And Efficiency:** By answering various questions and continuously improving their work, learning based chatbots significantly reduce the need for manual intervention and thus save time and resources.

IMPORTANCE OF SENTIMENT ANALYSIS IN CHATBOTS

Sentiment analysis is important in improving the performance, precision, and functionality of chatbots. Sentiment analysis plays a significant role in improving the overall user experience by understanding the emotions in user interactions. Here are the reasons why sentiment analysis is important in chatbots:

- **Improve user understanding:** Sentiment analysis allows chatbots to identify emotion s such as stress, happiness, or displeasure, thus better understanding the user's mood and the context of the conversation.

- **Empathic responses:** Chatbots can analyze the emotional tone of messages and produce better and more appropriate responses, making users feel valued and

- **Resolution of uncertainty:** When detecting negative emotions such as anger or confusion, the chatbot can escalate the issue to a human representative or ensure continued support before the situation escalates.

- **Increase user engagement:** Chatbots with emotional analysis can create relationships and people, thus increasing interaction and trust with users.

- **User experience:** The chatbot can adjust its voice, language, or level of detail in its responses to provide a personalized experience that fits the user's mood based on perceived needs.

- **Tips and Tricks:** Sentiment analysis helps organizations track user sentiment over time and offers recommendations on future services, products, or processes for continuous improvement.

- **Conflict management:** When dealing with dissatisfied or angry users, emotion-aware chatbots can take a proactive approach and offer solutions while maintaining a professional and good mood.

- **Monitor sentiment:** Organizations can analyze aggregated sentiment data to identify patterns, such as stress or satisfaction, and take key steps to resolve them.

CHAPTER NO. 2

LITERATURE SURVEY

CHAPTER 2

LITERATURE SURVEY

2.1 LITERATURE SURVEY

In order to carried out proposed approach we have gone through different literatures that are as follows :.

In [2] the research proposed a general framework based on sentiment analysis and machine learning, called Sentiment Analysis and Machine Learning Recommendation Framework (SAMLRF), including data preparation module, sentiment analysis module, recommendation module, human machine module and cloud computing module for a chatbot to facilitate user interaction to make recommendation.

In this paper[3] Deep feedforward neural network design shows interest while combining the main points of observational thinking and text. Due to the lightness of the model, user interaction is easy and latency is lower. The accuracy we recorded during the test was 93.45%. Chatbots can successfully interact with customers while checking their ideas. Chatbots can manage a conversation with a customer but cannot store the message if the conversation is long. The bot cannot correctly identify sarcasm or mockery in a sentence.

In [4] we developed and evaluated a ReAct based chatbot agent that uses around 7 tools to interact with computer science data. The system uses state-of-the-art technology and operating procedures to achieve this goal and has a user interface accessible through a web browser.

In this [5] paper deep learning models like CNN-RNN, LSTM , etc., and their various combinations have shown better performance compared to the machine learning algorithms. Added to this , Deep Learning Models were trained on various datasets of different d omains and the models were achieving very high percentage accuracy for test data in respective domains. Doing this ensures that the final model will account for all the possible variance in the social media. The final prediction to be made by the model will be a voted system of all the models.

In [6] this paper we see, Sentiment analysis is also called sentiment mining in machine learning. Due to the difficulty of English and other languages, knowing how to think in writing is still a long way off. Show how to classify tweets as positive, negative, and neutral. Naive Bayes classifier is used to achieve better results. You can improve the classification by trying to extract more features from tweets, trying different types of features, and adjusting the drawbacks of Naive Bayes classifier and LSTM, or trying different high level classification methods.

2.2   FINDINGS

Sr.no.	Paper Title	Publication	Abstract	Algorithms
1.	Sentiment Analysis on Interactive Conversational Agent/Chatbots	Research Article	This paper discusses incorporating sentiment analysis in Chatbot and why we need an empathetic Chatbot in first place.	Base Paper
2.	Sentiment-based Chatbot using Machine Learning for Recommendation System	Research Square (National Formosa University)	These posts can reflect the emotional state of users. It is important to study how to use machine learning technology to interpret the sentiment analysis of posts. The research proposed a general framework based on sentiment analysis and machine learning, called Sentiment Analysis and Machine Learning Recommendation Framework (SAMLRF), including data preparation module, sentiment analysis module, recommendation module, human machine module and cloud computing module for a chatbot to facilitate user interaction to make recommendations.	Sentiment Analysis and Machine Learning Recommendation Framework (SAMLRF)
3.	Chatbot Optimization using Sentiment Analysis and Time / Navigation	Journal of Theoretical and Applied Informatics	Since the first chatbot developed, many have been created but most of their problems still persist, like providing the right answer to the user and user acceptance itself. Considering such facts, in this work, we present a chatbot building framework that considers the use of sentiment	Research Article
4.	Sentimental Analysis basedon Text and Emoticons	International Journal of Innovative Technology and Exploring Engineering	Utilization of emojis via web-based networking media has expanded quickly as of late. Subsequently, we have concentrated more on how emojis assume a significant job in opinion examination.	SVM

2.3   RELATED/EXISTING WORK

- In a paper on Large-Scale Sentiment Analysis for News and Blogs, by [7], They talk about the opinions expressed in newspapers and blogs while reporting on recent events. They assigned a score to each distinct entity in the text corpus indicating positive or negative opinion.

  The idea behind it is that news can be either good or bad. For this sentiment identification phase was used and associated expressed opinion with each relevant entity was given, and for relative evaluation with others in the same class, a sentiment aggregation and score phase are used.

  The process was in three stages 1) Algorithmic Construction of Sentiment Dictionaries
  2) Sentiment Index Formation
  3) Evaluation of Significance.
  They figured out how sentiment can vary by demographic group, news source or geographic location. Also, the degree to which the sentiment indices predict future changes in popularity or market behavior.

- This study [8] examines the impact of AI chatbots as a communication medium on student engagement and support in higher education. The qualitative method and Interpretative Phenomenological Analysis (IPA) were employed as the research approach, utilizing in-depth semi-structured interviews. Purposive sampling was used to select 11 participants from the state of Kerala, India, in higher education. Data analysis followed the Systematic Text Consideration (STC), a five-step process, including framing meaning units, condensing meaning units, coding, creating sub-themes, and deriving themes. By exploring themes aligned with the UTAUT2 constructs, a comprehensive understanding of the factors influencing student engagement and support was achieved. A total of eight themes were identified, encompassing "Effectiveness and Limitations," "Beyond," "Enrichment," "Optimization,"

- The paper [9] This paper demonstrates the implementation of a multilingual healthcare chatbot system. The chatbot system supports multilingual text and speech to be particularly useful for the rural population of India which uses regional languages. The system can address the health-related queries of the users in addition to its primary function of disease diagnosis based on user symptoms. The system also provides the user with disease description and disease precautions along with the disease diagnosis. The paper has provided a comparative analysis between five Machine Learning Classification algorithms among which the Random Forest Classifier exhibits the highest accuracy of 98.43%. The proposed system implements TF- IDF and Cosine Similarity to find the most   appropriate query

- Zhao Jianqiang et.al., [11] showed that word embeddings are presented that are found on the platform of Twitter corpora that utilizes logical semantic connections and co- event factual qualities between the words in tweets. These word embeddings are joined with n-grams highlights and word conclusion extremity score highlights to make an assessment include a set methods of tweets. The preparation and expectation of supposition grouping marks are gotten with the list of capabilities being incorporated and connected with a profound convolution neural network. This model catches talk information or relevant data with the intermittent design and builds the delineation of text utilizing a convolution neural organization. This model performs higher than the best in class approaches and gauge model. This model, at last, presumes that the word vectors includes better execution inside the undertaking of Twitter feeling investigation in deep learning neural networks.
Sentiment Anlayis involves dealing with various attributes like Polarity Shift, precision associated issues, Binary Classification issue and Data sparsity downside. Guileless Bayes, Support Vector Machine, Maximum Entropy are the calculations utilized that has exclusively a confined notion arrangement classification among positive and negative.

- Ronglei Hu et.al., [12] portrayed by analyzing and ith investigating the sentiments of the contexts. It is done by the regular estimation of vocabulary and corpus, and the examination upheld on word reference, the summarized ech investigation on the traditional Al, and the assumptions on que deep learning are explained. The content based opinion investigation on Text Vectorization Technology, Convolution Neural Network, Recurrent Neural Networks are examined. The previous variation of Sentiment Analysis on Chinese and Special Texts Chinese Texts. Sentiment Analysis of Neglected Sentence Patterns are likewise examined. The ayes precision of customary Al calculations is basically reliant upon the the choice of highlights and the fulfillment of corpus. Chinese corpus is not many as of now, which is one of the disadvantages of the calculation in opinion examination of Chinese content.
The variety and intricacy of the Deep Learning Networks can be additionally considered and can also be applied in NLP's applications

- The growth of technologies like Artificial Intelligence (AI), Big Data & Internet of Things (IoT), etc. has marked many advancements in the technological world since the last decade. These technologies have a wide range of applications. One such application is "Chatterbot or "Chatbot". Chatbots are conversational AIs, which mimics the human while conversing. This technology is a combination of AI & Natural Language Processing (NLP). Chatbots have been a part of technological advancement as it eliminates the need for humans & automates boring tasks. Chatbots are used in various domains like education, healthcare, business, etc. In the study undertaken, we reviewed several papers & discussed types of chatbots, their advantages & disadvantages. The review suggested that chatbots can be used everywhere because of its accuracy, lack of dependability on human resources & 24x7 accessibility.

- The authors B. Waizmann et al [14] presents a smart technology chat bot to recruit engineering students from underrepresented groups. The chatbot helps potential students to identify their interests in engineering studies. The questionnaire in the chatbot is based on Holland's RIASEC model of vocational choice based on an expression of personality. The questionnaire asked by the chatbot are based on personality & therefore it helps students in identifying their interests in engineering domain.

  Those who might feel uncomfortable asking questions directly to the academic advisor can use chatbot as a channel for getting their queries solved. The chatbot is implemented as an app using Android Studio & it is a part of their big project "DiaMINT". This projects intention is of helping the underrepresented groups, so it performs the analysis of students interests by taking their background into account, hence it won't help students who are not in those groups. Moreover, the app is in german, the non-german speaking community won't be able to use it. The project aims at recruiting, supporting and retaining engineering students from previously underrepresented groups.

2.4   REAL-TIME SURVEY
College Chatbot System:-

Issues –

- o **Poor understanding of complex questions:**
  Many chatbots struggle to understand complex or multilayered questions, often providing incorrect or incomplete answers, which can lead to anxiety about seeking detailed help.

- o **Inability to manage emotional content:**
  Without emotional analysis, chatbots will not be able to detect when students are stressed, confused or anxious, which will result in negative or counterproductive

- o **No new information:**
  If the chatbot's information is not updated regularly, students will receive outdated or incorrect information about classes, times, deadlines, or rules.

- o **Limited functionality:**
  Some chatbots are designed to answer questions only and cannot assist with more interactive activities like submitting forms, scheduling updates, or accessing personal information.

Solutions –

- Improve understanding of complex questions: Use advanced linguistic modeling (NLP) to better understand concepts and resolve complex or ambiguous questions. Train your chatbot to improve its correct answers.

- Integrated Sentiment Analysis: Integrated sentiment analysis tools to detect emotion s such as anxiety or confusion in students' speech, for empathic processing.

- Update the knowledge base regularly: Create a system designed to update the chatbot database with the latest information about classes, programs, and program rules. Da ta synchronization.

- Extensions: Equip your chatbot with interactive features like email help, appointment scheduling, or progress tracking.

CHAPTER NO. 3

METHODOLOGY / PROPOSED WORK

CHAPTER 3

METHODOLOGY / PROPOSED WORK

3.1   PROPOSED WORK

1. **Requirement Analysis:** Conduct an in-depth analysis of the communication needs within the department, including inquiries from students, faculty, and staff.
   • Identify common queries, recurring issues, and information gaps that the chatbot can address effectively

2. **Platform Selection:** Evaluate available chatbot development platforms and frameworks to determine the most suitable option based on requirements, scalability, customization capabilities, and integration with existing systems.
   • Consider factors such as natural language processing (NLP) capabilities, multi-channel support, and ease of deployment.

3. **Chatbot Design and Development:** Design conversational flows and user interfaces that align with the department's branding guidelines and user experience best practices.
   • Develop and train the chatbot's NLP models to accurately understand and respond to user queries, considering the department-specific terminology and context.
   • Implement features such as FAQ retrieval, appointment scheduling, resource lookup, event notifications, and feedback collection.

4. **Testing and Quality Assurance:** Conduct thorough testing of the chatbot across various devices, browsers, and communication channels to ensure compatibility and functionality consistency.
   • Perform user acceptance testing (UAT) with representatives from different user groups to validate the chatbot's effectiveness and usability.
   • Address any bugs, errors, or usability issues identified during testing iterations.

5. **Deployment and Training:** Deploy the chatbot on the department's website, intranet, messaging platforms, and other relevant channels.
   • Provide training sessions and documentation for departmental staff responsible for managing and maintaining the chatbot.
   • Educate end-users (students, faculty, and staff) on how to interact with the chatbot and leverage its capabilities effectively

6. **Evaluation and Reporting:** • Regularly evaluate the impact of the chatbot on departmental communication effectiveness, user satisfaction, and operational efficiency.
   • Prepare reports summarizing key performance indicators (KPIs), insights gained, and recommendations for further enhancement or expansion of the chatbot project.
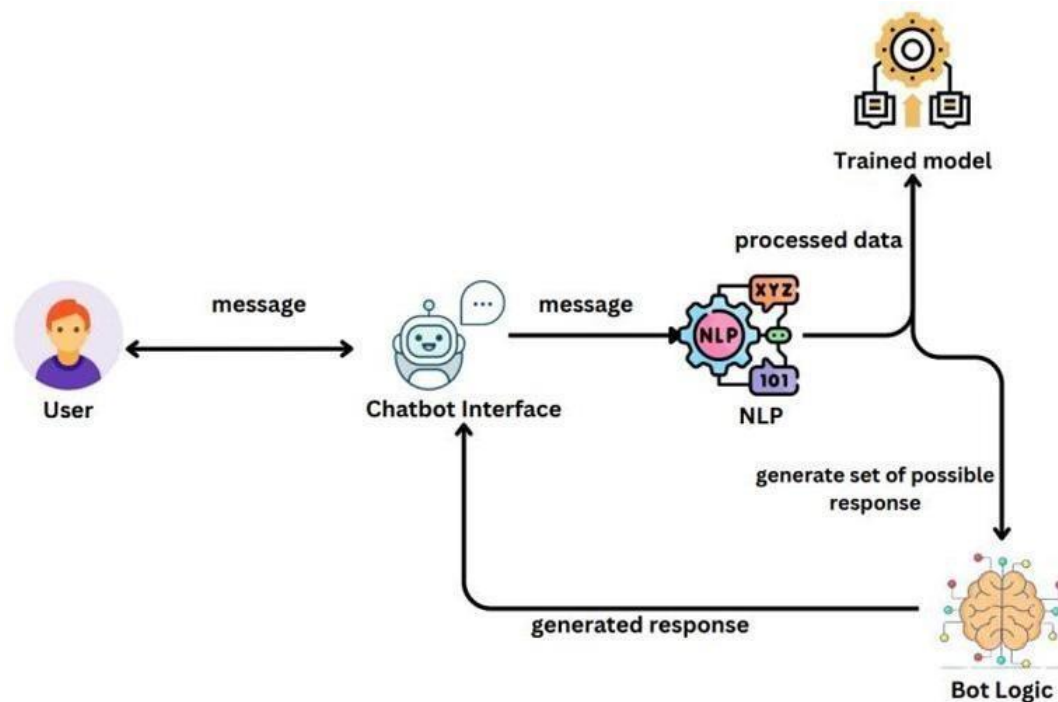
3.2   SYSTEM ARCHITECTURE

Fig 3.2. System Architecture

The proposed chatbot system is a web application which gives reply to the question of the user. This system is utilized for talking. A chatbot project is built using artificial algorithms i.e. Feed Forword neural network algorithm that analyse user requests and understand the user's message.

The system uses Natural Language Processing (NLP) and built-in artificial intelligence to answer the queries asked by the user. For the chatbot development, we have used Python programming language and NLTK library. It makes it easy to generate automated responses to a user's input with the help of a machine learning algorithm to produce different types of responses.

Students just have to query through the bot which is used for chatting purpose. Chatbot will reply to the query with the help of artificial intelligence. The proposed system will reduce the administration burden and will be able to provide necessary details to students and Faulty online.

Students will get their queries resolved without any hassle to reach out the college administration office. The System will be available for 24/7 to all students and Faculties
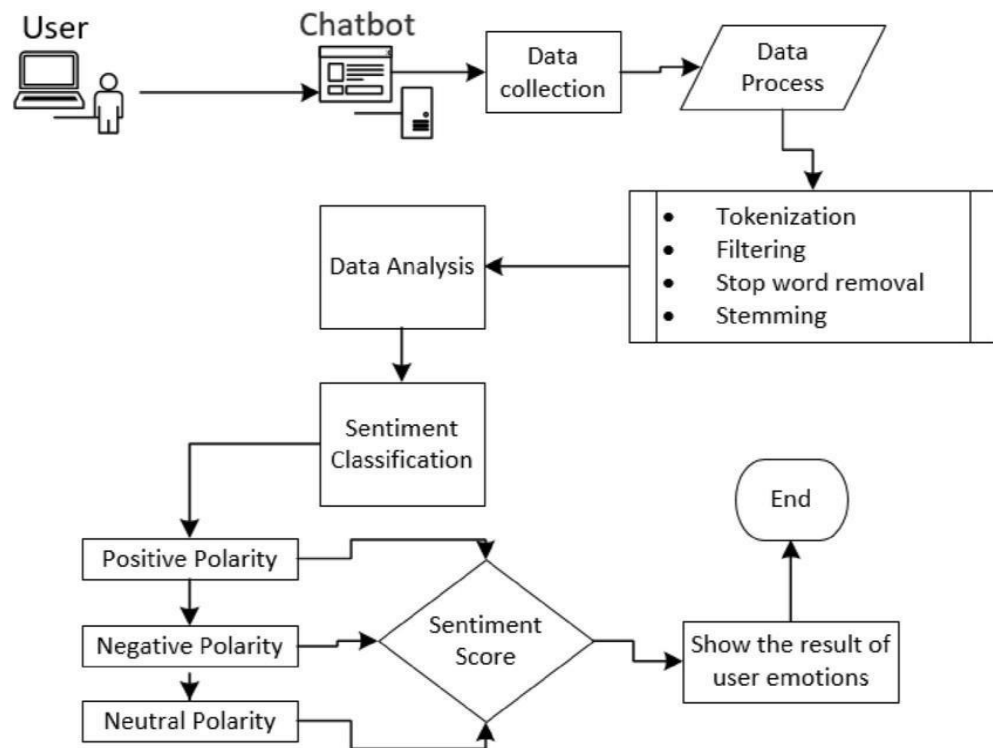
3.3   FLOW CHART

Fig 3.3. Flow Chart

Above we have shown the flow of our project.

Sentiment Analysis Flowchart Components:

1. **User Interaction (User):**
   - o Represents the individual providing input (e.g., writing a review, posting on social media).
   - o The starting point for sentiment analysis.

2. **Chatbot Interaction (Chatbot):**
   - o The chatbot receives user-generated text data.
   - o It processes and analyzes this text to determine sentiment.

3. **Data Collection (Data):**
   - o Involves gathering textual data from various sources: here we had used an Microservice for that
     - ▪ Social media posts
     - ▪ Online reviews

- Customer feedback surveys
    - This rich pool of data serves as the basis for sentiment analysis.

4. **Data Processing (Process**):
    - Text data is prepared for analysis:
        - Tokenization: Breaking text into individual words or tokens.
        - Filtering: Removing irrelevant elements (e.g., emojis, special characters).
        - Stop word removal: Eliminating common words (e.g., "the," "and").
        - Stemming: Reducing words to their root form (e.g., "running" → "run").

5. **Sentiment Classification**:
    - Determines the overall sentiment conveyed by the text:
        - Positive
        - Negative
        - Neutral
    - A numerical sentiment score may also be assigned (e.g., - 100 to 100).

6. **End Point (End):**
    - Represents the completion of the sentiment analysis process.
    - The chatbot can now provide insights or take action based on the sentiment.

CHAPTER NO. 4

TOOLS / PLATFORM

CHAPTER 4

Tools/Platform

4.1 SOFTWARE REQUIREMENT

1. **OS –** Windows 11 or above
2. **IDE –** VS code
3. **Language –** Python (3.7.9)
4. **Web Framework –** Flask
5. **Database –** MySQL & Google Firebase

1. **OPERATING SYSTEM –**

   Any Operating System which is having architecture of 64bit is supported. We have used Windows 11 64bit with NVIDIA gpu**.**

2. **IDE VS Code –**
   Visual Studio Code (VS Code) is a versatile and free code editor developed by Microsoft. Here's a brief overview:

   1. Platform and Availability:

   * Available for Windows, Linux, macOS, and even as a web- basedversion.
   * Lightweight but powerful, making it suitable for various development tasks.

   2. Features:

   * Syntax Highlighting: Color-coded highlighting for different programming languages.
   * IntelliSense: Smart suggestions as you type (auto-completion, function signatures, etc.).
   * Built-in Git Support: Manage version control directly within the editor.
   * Extensions: A vast marketplace of extensions to enhance productivity.
   * Debugging: Debug your code without leaving the editor.
   * Snippets: Reusable code snippets for common tasks.
   * Multi-Language Support: Works with JavaScript, TypeScript, Python,Java, C++, and more.

- - Customizable Themes: Choose from various themes to personalize your workspace.
  - Community and Ecosystem:
    - VS Code has a thriving community
    - Developers create and share extensions, themes, and tools in the VS CodeMarketplace.
    - It's a hub for collaboration and learning.
  - Use Cases:
    - Ideal for web development, cloud applications, and scripting. Widelyadopted by developers of all levels due to its flexibility and features

3. **Python –**
   - Python is a versatile and widely used programming language known for its readability, simplicity, and extensive community support. Here's a brief overview:

   - High-Level and Interpreted:

   - Python is high-level language, meaning it abstracts complex details away from the programmer.

   - It's also an interpreted language, which means you don't need to compile your code before running it.

   - Readability and Syntax:

   - Python emphasizes code readability through its clean and straightforward syntax.

   - The use of significant indentation (whitespace) defines code blocks, making it visually intuitive.

   - Dynamic Typing and Garbage Collection:

   - Python is dynamically typed, allowing variables to change types during runtime.

   - It also has automatic garbage collection, managing memory efficiently.

1. Versatility and Applications:
    o Python supports various programming paradigms:
        ▪ Procedural: Structured code execution.
        ▪ Object-Oriented: Organizing code around objects and classes.
        ▪ Functional: Treating computation as the evaluation of mathematical functions.
    o Common applications include:
        ▪ Web development (server-side scripting)
        ▪ Software development
        ▪ Data analytics and visualization
        ▪ Machine learning and artificial intelligence

- Rich Ecosystem:
    o Python has a vast ecosystem of libraries and frameworks:
        ▪ NumPy: For numerical computations
        ▪ Pandas: Data manipulation and analysis
        ▪ Django: Web framework
        ▪ Flask: Lightweight web framework
        ▪ Matplotlib: Data visualization
        ▪ And many more!

- Community and Popularity:
    o Python has an active and supportive community.
    o It consistently ranks among the top programming languages in popularity surveys.

Python plays a significant role in building chatbots, and its popularity in this domain continues to grow. Here's why Python is a top choice for creating chatbots:

1. Ease of Use and Readability:
    - Python's clean and straightforward syntax makes it easy for developers to write and understand code.
    - The significant indentation (whitespace) enforces readability, which is crucial for maintaining chatbotlogic.
2. Rich Ecosystem:
    • Python boasts a vast ecosystem of libraries and frameworks that simplify chatbot development:
        ▪ Natural Language Processing (NLP): Libraries like

- NLTK,spaCy, and TextBlob allow chatbots to understand and
    - process human language.
- Machine Learning: Scikit-learn and TensorFlow enable chatbots to learn from data and improve over time.
- Web Frameworks: Flask and Django help build chatbot APIs or
    - web interfaces.

Integration Capabilities:

- Python seamlessly integrates with other services and APIs:

- Voice Recognition: You can incorporate voice-based interactions into your chatbot.
- Text-to-Speech Engines: Convert chatbot responses into spoken language.

3. Community Support and Resources:

- Python's active community provides tutorials, documentation, and open-source projects related to chatbots.
- Developers can leverage existing solutions and learn from others' experiences.

4. Machine Learning and AI:

- Python's popularity in machine learning and AI extends to chatbots.
- You can train chatbots using supervised learning, reinforcement learning, or even pre-trained language models like GPT.

4.2   HARDWARE REQUIREMENT

PROCESSOR: Intel i5 10 gen or above

HARD DISK: Minimum 512 GB

RAM: Minimum 8GB

VIDEO CARD: Nvdia GEForce GTX 1650 or above

INTERNET: High speed internet connection required

CHAPTER NO. 5

DESIGN & IMPLEMENTATION

CHAPTER 5

DESIGN & IMPLEMENTATION

5.1 SYSTEM DESIGN

5.1.1 USE-CASE DIAGRAM

Actors –

1. **User**
2. **Messaging channel**
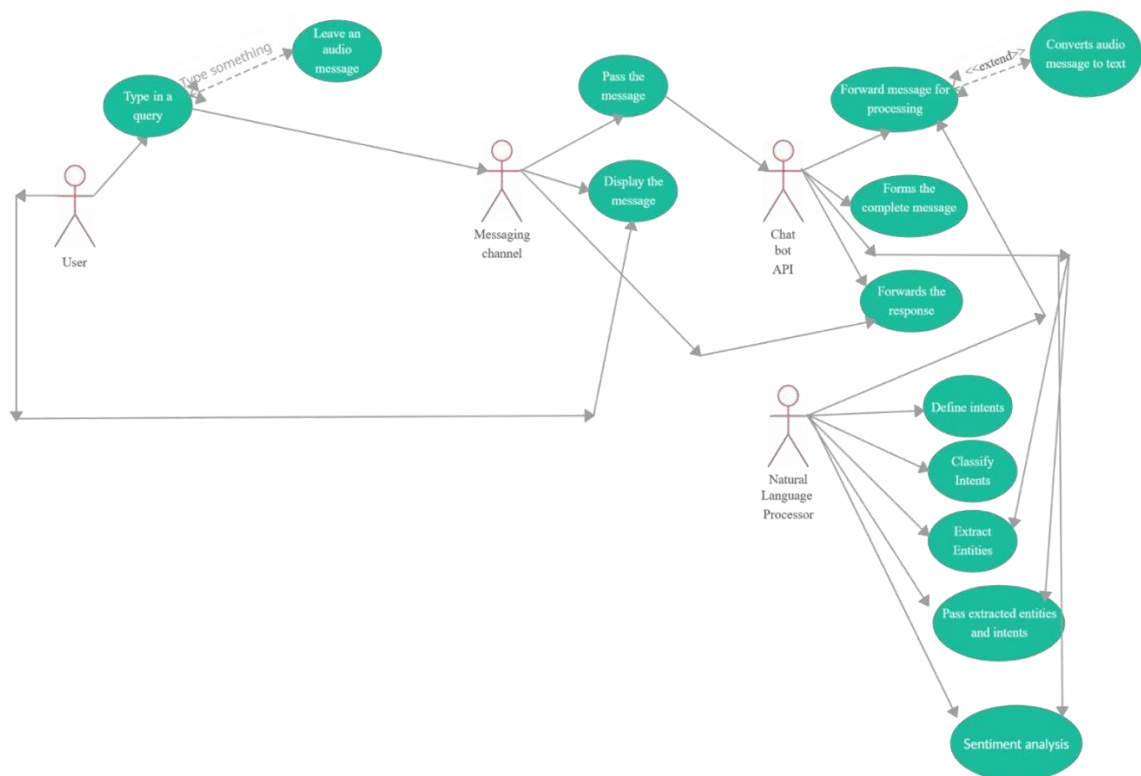3. **Chatbot API**
4. **Natural Language Processor**

Fig . – 5.1.1: Use-Case Diagram

In Use-Case diagram, the tasks performed by the users are listed below

User – A chatbot user is a person who interacts with a chatbot and opts-in to it. Chatbot users be contacts in the chatbot channel, and the chatbot can gather information about them during conversations.

1. Messaging Channel –A fast, convenient way to embed a customizable, real-time messaging platform on your website.

2. Chatbot API - A chatbot API (Application Programming Interface) is a software layer that connects a chatbot to other software systems and communication channels. It allows chatbots to access data from other applications and provide personalized responses to users. A chatbot API acts as a bridge between the chatbot and other software systems, allowing them to communicate with each other.

3. Natural Language Processor - Natural language processing (NLP) is a technology that allows chatbots to understand and respond to human speech, mimicking natural conversations. NLP chatbots can be text-based or voice- based. They use NLP to: Understand the intent of a message, extract necessary information, generate a helpful response, Recognize the context of the conversation, and Analyze patterns among users. Chatbots are able to understand the intent of the conversation rather than just use the information to communicate and respond to queries.

4. Sentimental analysis - Sentiment analysis is a process that automatically analyzes written or spoken language to determine if the emotional tone of a message is positive, negative, or neutral. Sentiment analysis tools scan text to identify the author's attitude towards a topic. The tools assign a score to each clause based on the sentiment expressed in the text. For example, -1 for negative sentiment and +1 for positive sentiment.
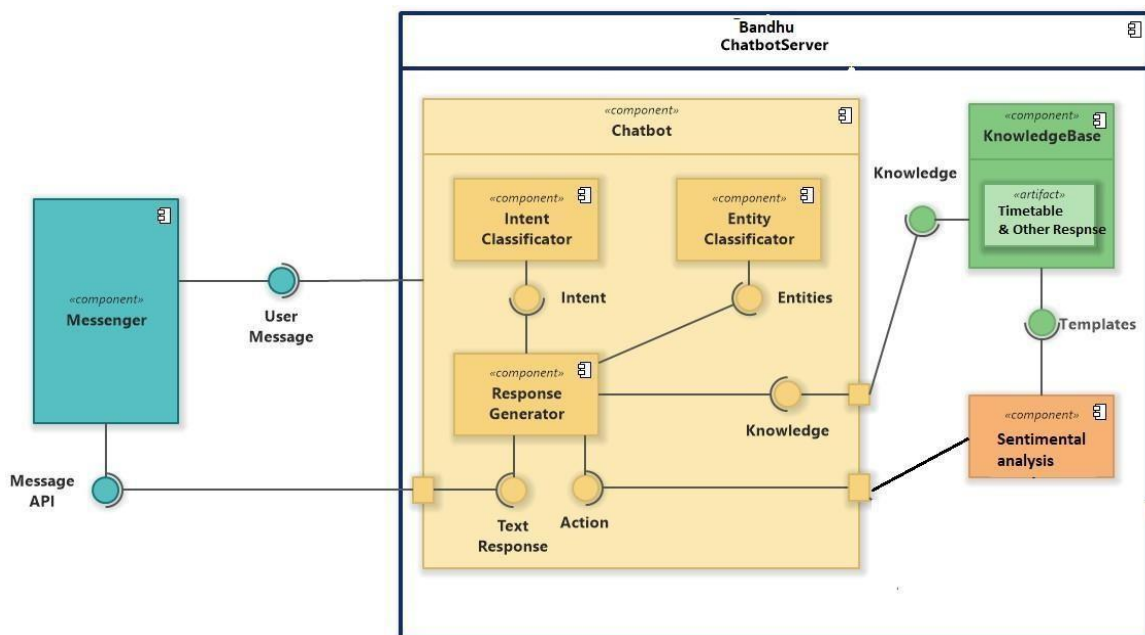
5.1.2   UML/ER/CLASS DIAGRAM

Fig . – 5.1.2: UML Component Diagram

The component diagram describes a chatbot using various components, nested components, required and provided interfaces. The interfaces show how the components communicate with each other. The modeled chatbot identifies entities and intent in a user message and forms a response based on knowledge represented by templates. A response can be a text message and sometimes also an action.

Components of a Chatbot System UML diagram

Messenger - A communication platform or interface (e.g., WhatsApp, Facebook Messenger, or custom web chat) through which users interact with the chatbot. It handles user inputs and displays chatbot responses.

Chatbot Server - Acts as the backbone of the chatbot system. It orchestrates data flow between components like the intent classifier, knowledge base, and response generator.

Chatbot - The core application that processes user inputs, understands user needs, and provides relevant responses. It integrates various subcomponents to enable seamless interaction.

Intent Classifier - This component identifies the purpose or goal of a user message .It uses machine learning models or rule-based algorithms to predict the intent.

Knowledge Base - A structured repository of information used by the chatbot to answer queries. It can include static data (FAQs) or dynamic content sourced from external databases or APIs.

Entity Classifier - Extracts specific pieces of information (entities) from a user's message, such as names, dates, locations, or product details, to personalize the response or trigger specific actions.

Response Generator - Generates appropriate responses for the user based on identified intent, extracted entities, and relevant knowledge base data. It can produce predefined text or use AI-driven natural language generation.

Message API - Facilitates communication between the chatbot server and external platforms or databases. It enables the chatbot to send and receive data securely.

Text Response - The final message sent to the user, tailored to their query. It is formulated in a user-friendly and conversational tone.

Intent - Represents the purpose or action the user wants to achieve with their message, such as requesting information or performing a transaction.

Entities - Specific data points within a message, such as names, numbers, or locations, that provide additional context for the intent.

User Message - The input provided by the user in natural language, which initiates the interaction with the chatbot.

Sentimental Analysis - Evaluates the emotional tone or sentiment of a user's message (e.g., positive, negative, or neutral). This helps the chatbot adapt its tone or prioritize responses (e.g., escalation for frustrated users).
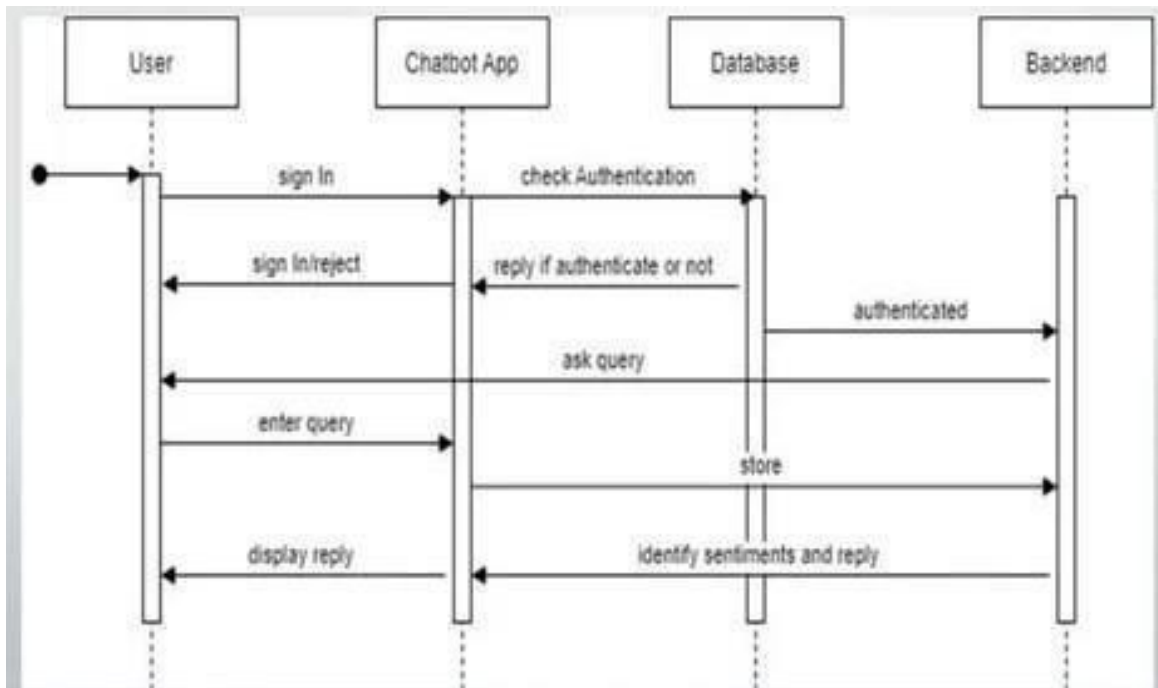
5.1.3   SEQUENCE DIAGRAM

Fig . – 5.1.3.: Sequence Diagram

1. **User Interaction:** The process begins with the "User" initiating a "sign in" action. After signing in, the user performs an "inject" action (which isn't explicitly defined).

2. **Chatbot App:** The "Chatbot App" receives the user's actions. It performs a "check_Authentication" to verify the user's credentials. If authentication is successful, the user can proceed.

3. **Database Interaction:** The Chatbot App then queries the "Database" by asking a question (presumably related to the user's input). The Database processes the query and provides a response.

4. **Backend Interaction:** Simultaneously, the Backend authenticates the user (if not already done). If authenticated, the Backend stores data (possibly related to the user's query).

5. **Sentiment Analysis:** The Chatbot App identifies sentiments (emotions) in the user's query. Based on these sentiments, it generates an appropriate reply.

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In summary, this sequence diagram illustrates how a chatbot application interacts with a user, performs authentication, queries a database, and incorporates sentiment analysis before providing responses. It's like a behind- the-scenes glimpse into how chatbots work

5.2 IMPLEMENTATION OF SYSTEM

5.2.1 HOME PAGE

Module 1 – landing page or home page

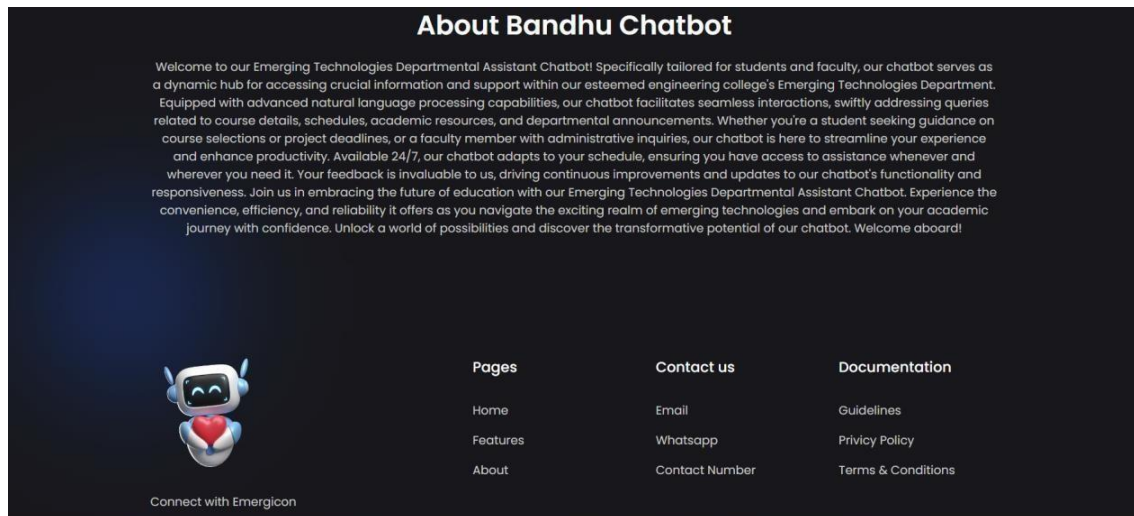- We had designed a basic user interface or home page of our chatbot web Application.
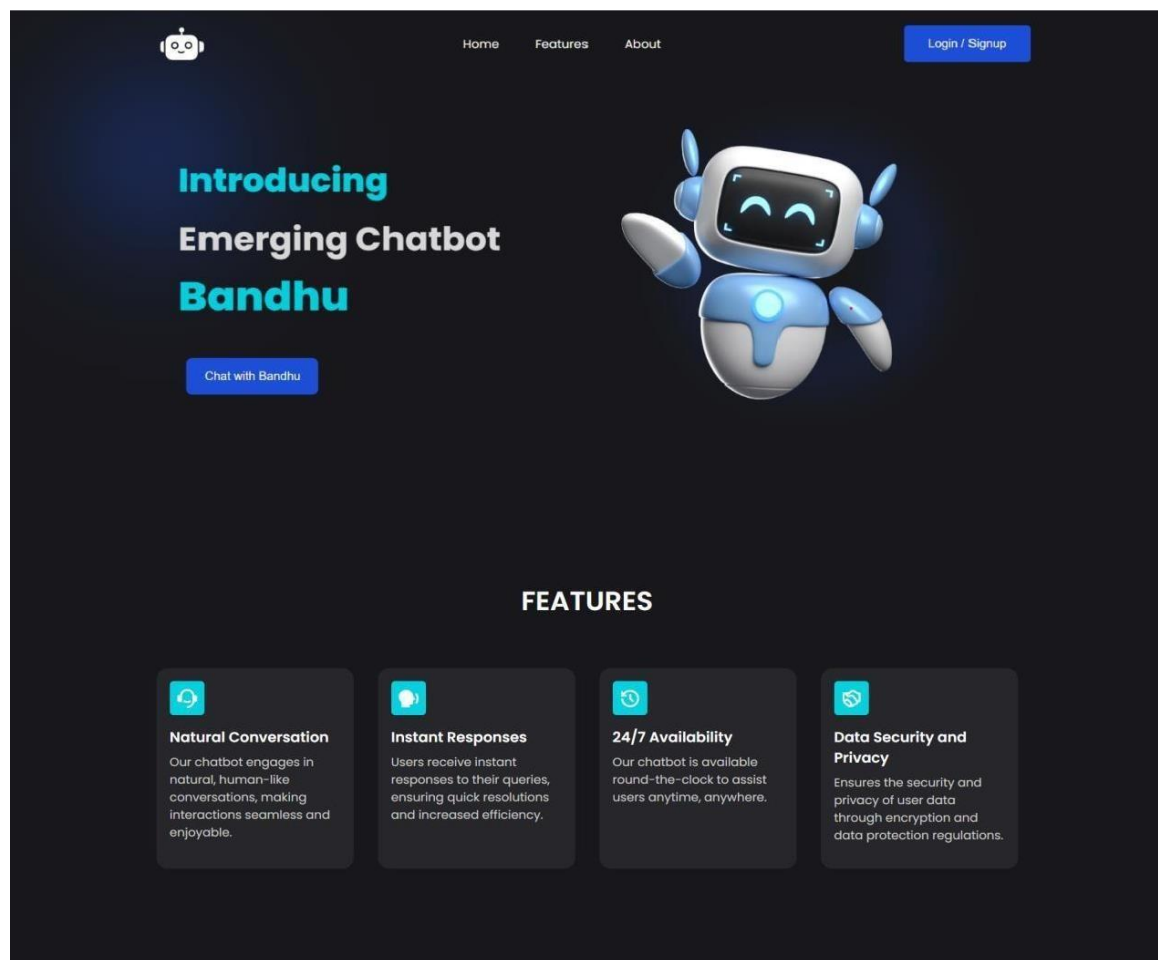
Fig . – 5.2.1.: Home Page

5.2.2   LOGIN & SIGNUP PAGE

Module 2 – Login & Signup page

A login page (also known as a sign-in page) serves as the gateway for users to access their accounts or private areas within a website or application. Here are some key points about login pages:

1. **Purpose and Functionality:**
   - **Purpose**: The primary purpose of a login page is to verify user identity and prevent unauthorized access.
   - **Functionality**: Users provide their credentials (usually a username/email and password) to gain access

   - **User Input Fields:**
- **Username/Email**: Users enter their registered username or email address.
- **Password**: Users input their secret password.

- Sometimes, additional features include:
  - **Google Authentication**: An option to keep the user logged in across sessions.

A signup page (also known as a sign-up form) allows users to create new accounts or subscribe to services. Here's what you need to know about signup pages:
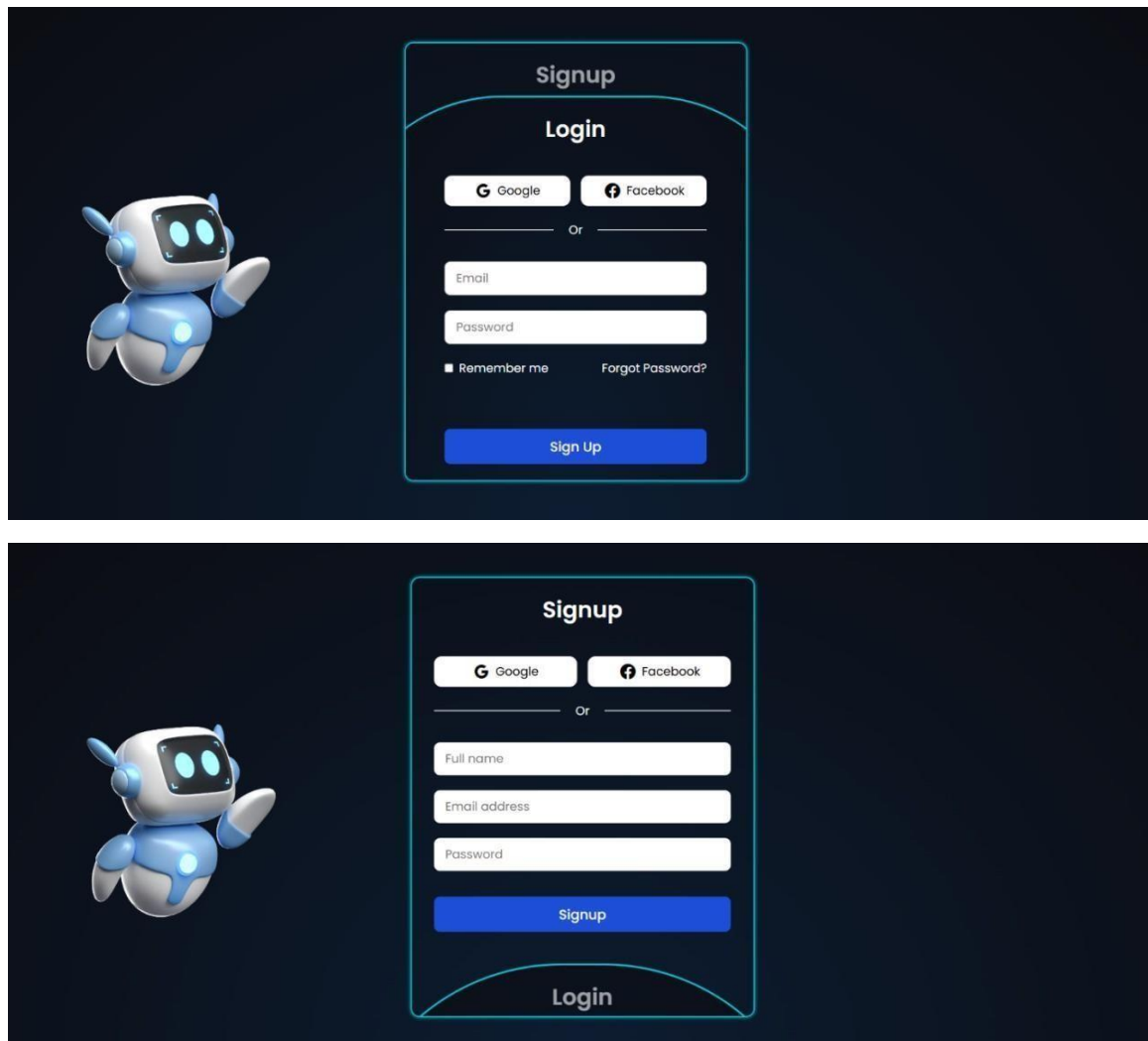
2. **Purpose and Functionality:**
   - **Purpose**: To collect essential user information before granting access.
   - **Functionality**: Users provide details required for account creation.

   Input Fields:
   - **Name**: First name and last name.
   - **Email Address**: Used for communication and account recovery.
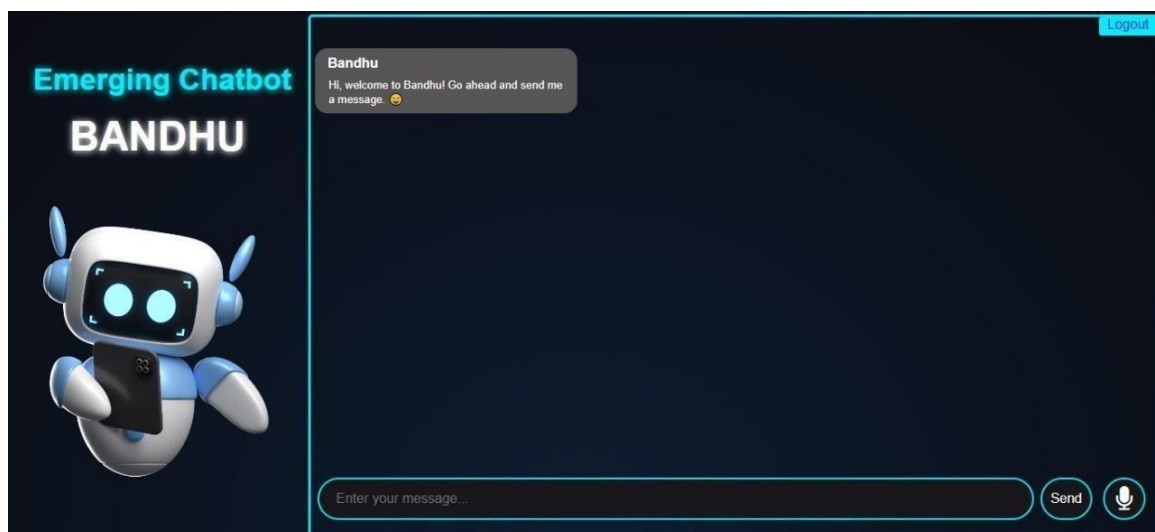
29

- **Password**: Securely chosen by the user.

Fig. – 5.2.2: Login & Signup Page
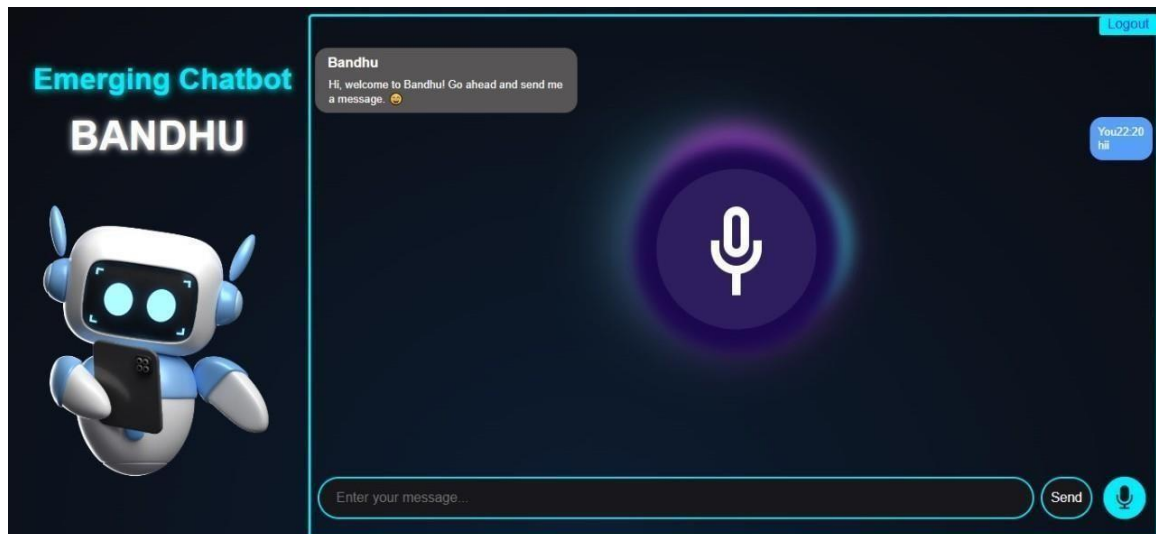
5.2.3 CHATBOT WINDOW

Fig. – 5.2.3: Chatbot Interface

5.3 SAMPLE CODE

```python
import nltk nltk.download('popular')
from nltk.stem import WordNetLemmatizer lemmatizer = WordNetLemmatizer()import pickle
import numpy as np
from pyngrok import ngrok
from flask_ngrok import run_with_ngrok from keras.models import load_model import jsonimport random
from flask import Flask, render_template, request, jsonify


# Load the model and data
model = load_model('C:/Users/User/OneDrive/Desktop/New_folder/chatbot/model.h5') intents = json.loads(open('C:/Users/User/OneDrive/Desktop/New_folder/chatbot/data.json').read()) words = pickle.load(open('C:/Users/User/OneDrive/Desktop/New_folder/chatbot/texts.pkl','rb')) classes = pickle.load(open('C:/Users/User/OneDrive/Desktop/New_folder/chatbot/labels.pkl','rb'))

def clean_up_sentence(sentence):
    # Tokenize the pattern - split words into array sentence_words = nltk.word_tokenize(sentence)#
    Stem each word - create short form for word
    sentence_words = [lemmatizer.lemmatize(word.lower()) for word in sentence_words] return
    sentence_words

def bow(sentence, words, show_details=True): # Tokenize the pattern sentence_words =
    clean_up_sentence(sentence)
    # Bag of words - matrix of N words, vocabulary matrix bag = [0]*len(words) for s in
    sentence_words:
        for i, w in enumerate(words): if w == s:
            # Assign 1 if current word is in the vocabulary position bag[i] = 1if show_details:
                print("found in bag: %s" % w) return np.array(bag)

def predict_class(sentence, model):
    # Filter out predictions below a threshold
    p = bow(sentence, words, show_details=False) res = model.predict(np.array([p]))[0]
```

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```python
ERROR_THRESHOLD  = 0.25
results = [[i, r] for i, r in enumerate(res) if r > ERROR_THRESHOLD]  # Sort by strength of probability
results.sort(key=lambda  x: x[1], reverse=True)
return_list = [] for r in results:
return_list.append({"intent": classes[r[0]], "probability": str(r[1])}) return return_list


def getResponse(ints, intents_json): tag = ints[0]['intent'] list_of_intents  =  intents_json['intents']
for intent in list_of_intents:if intent['tag'] == tag:
return random.choice(intent['responses'])  return  "I'm sorry, I didn't understand  that."


def  chatbot_response(msg):
ints = predict_class(msg, model) res = getResponse(ints,  intents)  return res


def get_timetable(file_path): try:
with  open(file_path, 'r') as file:
timetable = json.load(file) return  timetable except FileNotFoundError: return  None  except
json.JSONDecodeError: return  None


# Initialize Flask app app = Flask( name ) run_with_ngrok(app)


#  Set  the  port  that  your  Flask  app  is  running  on  port  =  5000 public_url  =
ngrok.connect(port).public_url
ngrok.set_auth_token("2jnFXncySCffOpSRytdqaU3    A7P7_7fBzPayARR6Z8a8Ebs3gy")


@app.route("/") def home():
return  render_template('index.html')


@app.route("/get") def get_bot_response():
userText = request.args.get('msg') return chatbot_response(userText)


@app.route('/timetable', methods=['GET']) def timetable():
day = request.args.get('day')  if not day:
return jsonify({'error': 'Day parameter  is missing'}), 400
valid_days  =  ["Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday",
"Sunday"]
day = day.capitalize() # Ensure  correct capitalization


if day not in  valid_days:
return jsonify({'error': 'Invalid day. Please  provide a valid day of the  week.'}),  400


file_path  =  "C:/Users/User/OneDrive/Desktop/New_folder/chatbot/timetable.json"  timetable  =
get_timetable(file_path)


if not timetable:
return jsonify({'error': 'Timetable file not found  or corrupted'}),  500


if day in timetable:
return jsonify(timetable[day])  else:
return jsonify({'error': f'Timetable not found  for  {day}'}),  404


print(' * Tunnel URL:', public_url) if name == " main ":app.run()
```

CHAPTER NO. 6

RESULTS & DISCUSSION

CHAPTER 6

RESULTS & DISCUSSION
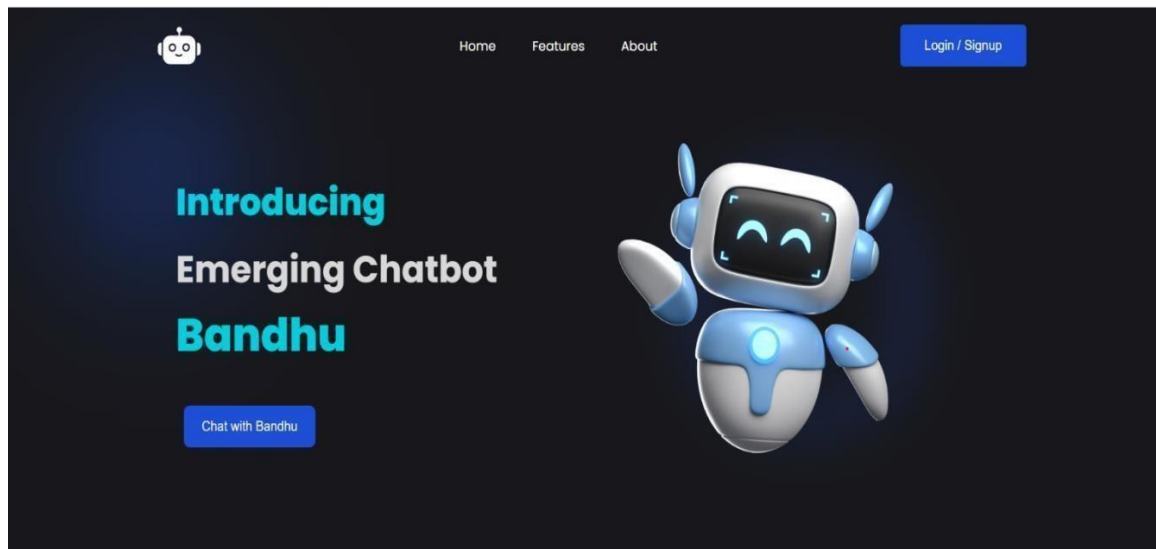
6.1 RESULTS AND DISCUSSIONS

Fig. – 6.1
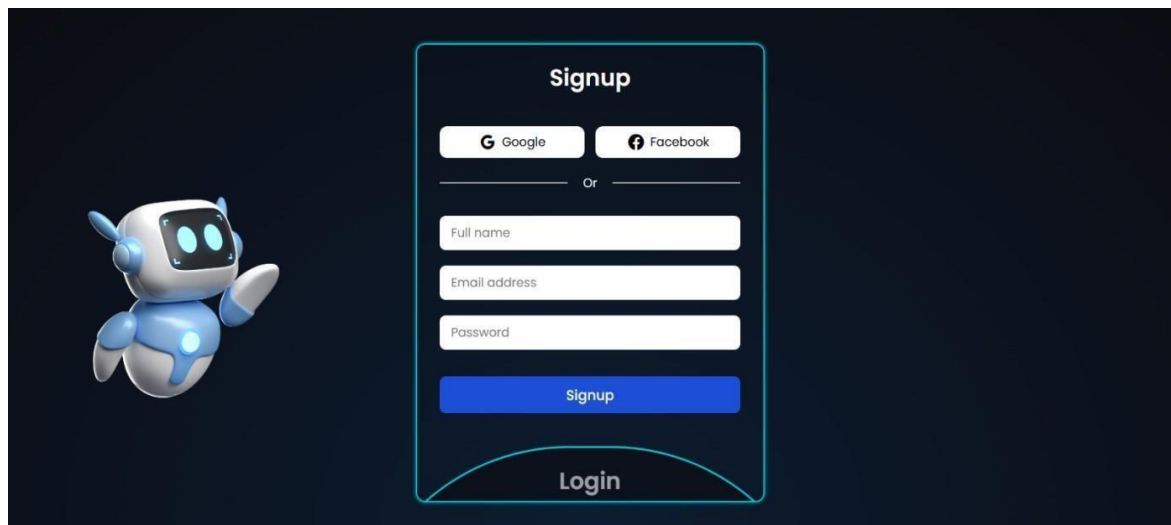
Fig. – 6.2: Login & Signup Page

On starting the application, the first scene that appears is as shown in fig 6.1 & fig 6.2. Here the user will interact with the Basic home page of web application and after that Userwill complete the registration process
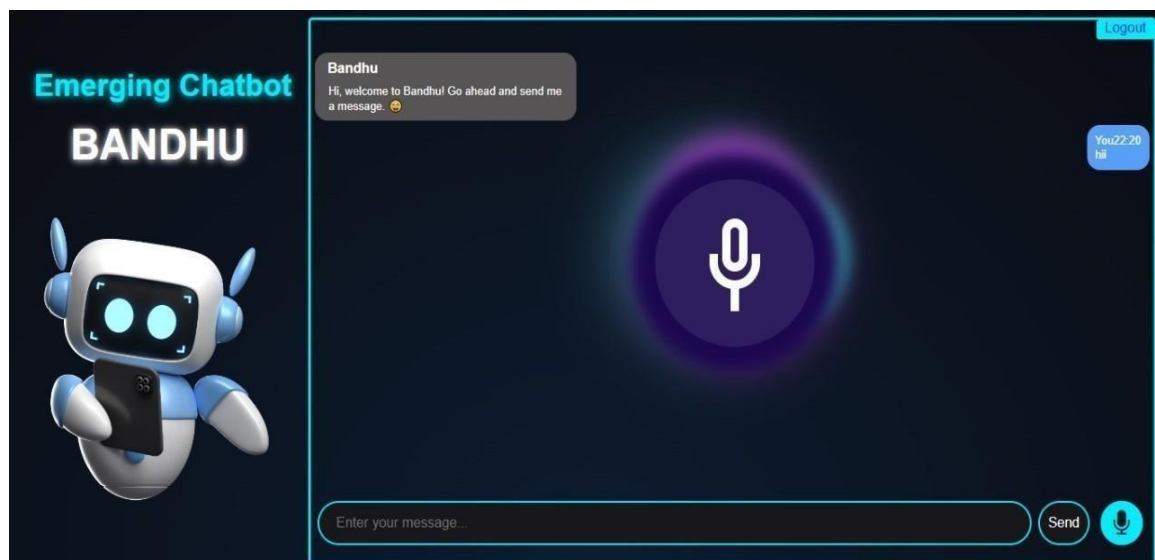
Fig. – 6.3: Chatbot Window

After Successfully completing the registration process the User will be redirected to the chatbot window where the user can ask the query and the bot will respond according to it , In the figure 6.3 & 6.4 we can see that basic conversation of the user with the chatbot
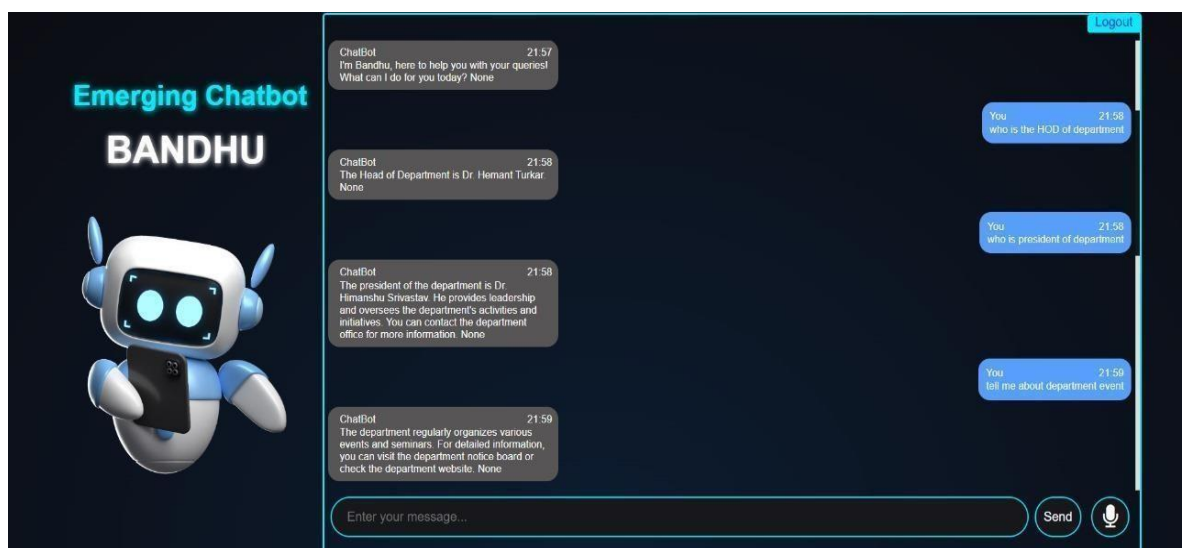
Fig. – 6.4: Chatbot Window

```
 * Running on http://7387-203-192-219-84.ngrok-free.app
 * Traffic stats available on http://127.0.0.1:4040
INFO:werkzeug:127.0.0.1 - - [03/Oct/2024 13:30:44] "GET /user.png HTTP/1.1" 404 -
1/1 ━━━━━━━━━━━━━━  0s 61ms/step
HTML Response:
---------------
|hello           |
|en              |
|neutral         |
|0.0             |
|1.0             |
|0.0             |
|0.0             |
-------------------------------------------------------------------------

Sentiment Elements:
```

Fig. – 6.3: Sentiment analysis on real-time chatting

```
Sentiment Elements:
-------------------
INFO:werkzeug:127.0.0.1 - - [03/Oct/2024 13:30:47] "GET /get?msg=hello HTTP/1.1" 200 -
INFO:werkzeug:127.0.0.1 - - [03/Oct/2024 13:30:47] "GET /bot.jpg HTTP/1.1" 404 -
INFO:werkzeug:127.0.0.1 - - [03/Oct/2024 13:30:59] "GET /user.png HTTP/1.1" 404 -
1/1 ━━━━━━━━━━━━━━  0s 23ms/step
HTML Response:
---------------
|i hate you      |
|hu              |
|negative        |
|0.0             |
|0.213           |
|0.787           |
|-0.5719         |
-------------------------------------------------------------------------

Sentiment Elements:
```

CHAPTER NO. 7

ADVANTAGES & APPLICATIONS

CHAPTER 7

ADVANTAGES AND APPLICATIONS

7.1   ADVANTAGES

1. **24/7 Availability:**
   - Ensures users can access information anytime without relying on faculty or administrative staff availability.

2. **Reduced Workload for Faculty:**
   - Handles repetitive queries about staff details, admission processes, attendance, subjects, and other college-related information.

3. **Seamless User Experience:**
   - Allows students, parents, and visitors to obtain accurate information quickly without navigating complex systems or waiting for manual responses.

4. **Multimodal Interaction:**
   - Supports text and audio input, catering to diverse user preferences and accessibility needs.

5. **Consistency in Responses:**
   - Reduces the risk of miscommunication often associated with manual interactions.

6. **Time-Efficiency:**
   - Provides real-time answers, saving valuable time for users and staff.

7. **Scalable Knowledge Base:**
   - Facilitates easy updates, ensuring the chatbot stays current with changes in policies, schedules, or courses.

8. **Cost-Effectiveness:**
   - Automates query handling, reducing the need for additional personnel.

9. Promotes Digital Transformation:

- Positions the college as a forward-thinking institution embracing modern technology.

10. Adaptability to Future Needs:

- Includes planned features like real-time attendance tracking and PDF sharing to stay relevant to evolving demands.

11. Insightful Analytics:

- Logs user interactions to provide insights into common queries and areas of interest, enabling the college to improve its services.

7.2 APPLICATIONS

1. Instant Access to Information:
- Provides instant access to details about faculty, admission processes, attendance records, subject information, and other administrative aspects.

2. Audience Inclusivity:
- Caters to a diverse audience, including students, parents, faculty, and visitors, simplifying their interactions with the institution.

3. Support for Prospective Students:
- Offersdetailed information on admission requirements, course offerings, fee structures, and important deadlines.

4. Assistance for Current Students:
- Provides access to attendance records, class schedules, and subject details.

5. Faculty and Staff Benefits:
- Delivers updates on departmental activities, policy announcements, and meeting schedules.

6. Convenience for Visitors:
- Enables easy inquiries about general information, campus facilities, and event details without requiring direct human intervention.

7. Integration with Digital Platforms:
- Seamlessly integrates into the college website or student portals, ensuring accessibility at any time.

8. Seamless and Quick Interactions:
- Facilitates smooth engagement and quick information retrieval, reducing the need for physical inquiries or prolonged wait times..

9. **Enhanced Communication:**
   - Improves communication channels between the college and its stakeholders by addressing queries promptly and accurately.

10. **Streamlined Information Dissemination:**
    - Ensures the efficient distribution of important updates and announcements.

11. **Reduced Administrative Workload:**
    - Handles repetitive queries, easing the burden on administrative staff and allowing them to focus on more complex tasks.

12. **Value in the Education Sector:**
    - Enhances operational efficiency and provides a valuable resource for streamlining academic and administrative processes.

CHAPTER NO. 8

CONCLUSION & FUTURE

CHAPTER 8

CONCLUSION & FUTURE SCOPE

8.1 CONCLUSION

The development and implementation of the departmental chatbot represent a significant milestone in enhancing communication, efficiency, and user experience within the departmental ecosystem. Through meticulous planning, collaboration, and innovation, the project has successfully addressed the diverse communication needs of students, faculty, staff, and administrators. The departmental chatbot serves as a centralized and accessible resource, providing instant assistance and information retrieval for various inquiries, ranging from course-related questions to administrative procedures and resource lookup. Its intuitive interface and natural language processing capabilities have transformed the way stakeholders interact with departmental services, offering convenience and responsiveness round the clock. Moreover, the integration of the chatbot with existing departmental systems and platforms has facilitated seamless access to up-to-date information and services, while maintaining data security and privacy stand ards. By leveraging machine learning algorithms and user feedback mechanisms, the chatbot continuously evolves to adapt to changing user needs and preferences, ensuring relevance and effectiveness over time. The project's success is further exemplified by its positive impact on communication efficiency, user satisfaction, and operational productivity within the department. Stakeholders have embraced the chatbot as a valuable tool for simplifying tasks, reducing response times, and fostering a more connected and informed community. Foundation for future enhancements and expansion of its capabilities. In conclusion, the departmental chatbot project stands as a testament to the department's commitment to leveraging technology for the benefit of its stakeholders, ultimately contributing to a more efficient, responsive, and collaborative environment conducive to academic and operational excellence.

8.2 FUTURE SCOPE

The chatbot is an AI-powered system designed to handle user queries in both audio and text formats. It converts audio input into text, processes the text using Natural Language Processing (NLP) techniques, and identifies an appropriate response. NLP involves breaking down human language into smaller components to analyze grammatical structure and understand the context and meaning of statements within a conversation. This enables the system to interpret and respond to spoken or written text effectively, mimicking human understanding. For example, if asked, "How many departments are there in the college?" the chatbot might reply, "The college has six departments." The primary aim is to alleviate the workload of college faculty by delegating the task of answering visitor queries to a web-based chatbot that can be integrated into the college website. This chatbot will handle

text and audio queries, offering a convenient solution for visitors and faculty members to get their questions addressed quickly. Additionally, the system is designed to allow

developers to easily update and expand the chatbot's knowledge base. Future enhancements include incorporating features like real-time attendance tracking and PDF integration, providing students with more useful tools. These improvements aim to make the chatbot even more versatile and beneficial for the college community.

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APPENDIX I

PLAGIARISM REPORT

PLAGIARISM REPORT

Free Online Plagiarism Checker

SIMILAR
5.3% ◑
ORIGINAL
94.7%

MAKE IT UNIQUE

Text matches these sources

Sources:

1. https://redfield.ai/twitter-sentiment_

Similarity: 5.3%

⊘ Exclude source   ☑ View source

I'm not a robot

reCAPTCHA
Privacy - Terms

processes the query and provides a response 4 backend interaction simultaneously the backend

authenticates the user if not already done if authenticated the backend stores data possibly

related to the users query image a black background with a black square description automatically

generated with medium confidence5 sentiment analysis the chatbot app identifies sentiments

emotions in the users query based on these sentiments it generates an appropriate reply in

summary this sequence diagram illustrates how a chatbot application interacts with a user

performs authentication queries a database and incorporates sentiment analysis before providing

responses its like a behind-the-scenes glimpse into how chatbots work 52 bookmark

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APPENDIX II

PUBLISHED PAPER

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Chatbot For Departmental Enquiry Using Sentimental Analysis

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APPENDIX III

PUBLICATION / CONFERENCE CERTIFICATE

S.B. JAIN INSTITUTE OF TECHNOLOGY, MANAGEMENT& RESEARCH, NAGPUR

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (MACHINE LEARNING)

"Sentiment Analysis on Interactive Conversational Agent/Chatbot"

By- Ravi Asati, Falguni Kalambe, Samyak Manwatkar, Yash Kakde, Vidit Khairkar

Abstract:

A chatbot is a computer that can understand human speech and react like a human. There are many attempts to make chatbots intelligent or human-like. One of the daily tasks at the university is to answer frequently asked questions or questions found on official websites. This work is time consuming and wasteful. Chatbots are a solution to this problem. A good chatbot can answer these questions quickly and tirelessly. But creating an intelligent or human-like chatbot is difficult. A chatbot should be able to answer both basic and advanced questions. In this study, we present a chatbot system that uses machine learning techniques. So chatbots can learn from users to improve their results. We test our chatbots by testing real-world conversations. The results show that our chatbot can answer simple questions with higher accuracy than more advanced questions. Through our research, we focus on building a chatbot that responds based on the user's emotions. They understand sentences, determine their meaning, and continue the conversation as needed, but they cannot capture the user's intent. It can enable the chatbot to not only respond to the user, but also understand them emotionally. Through our research, we focus on building a chatbot that responds based on the user's emotions to create a more empathetic and human experience for the user.

Introduction:

Over the years, developments in technologies such as artificial intelligence (AI), big data, and the Internet of Things (IoT) have marked many advancements in the world of technology. These technologies have many applications. One such application is "Chatterbot" or "Chatbot". Chatbots are conversational intelligence that behave like humans during conversations. The technology is a combination of artificial intelligence and natural language processing (NLP). Chatbots have become part of technological development because they eliminate the need for humans and perform tedious tasks. The process turned out to be a difficult task. However, it turned out that chatbots can meet human needs. As the name suggests, chatbots are software applications that simulate conversations or interactions with users, allowing users to have a human experience in their interactions with digital robots. There are two types of chatbots: those that answer questions based solely on databases and those that try to learn and adapt from previous experiences to provide and include a high level of personalization in previous interactions. Chatbots come in two types: legitimate and machine learning-based. Rule-based bots are the simplest type of chatbots that use a set of predefined rules to respond to users' questions. These requirements may vary depending on the type of application they are used in. Although rule-based bots are easier and more efficient to create, they cannot teach themselves to be malicious because they cannot respond to external questions. Intelligent standalone chatbot using machine Learning (ML). They are trained to recognize specific terms and patterns that help answer user questions. They learn from past interactions and train themselves for future interactions with minimal human intervention. Over time, chatbots have evolved from rule-based bots to intelligence-based bots programmed using natural language processing (NLP) and machine learning. They are self-learning, which allows them to update themselves based on what they have learned from past interactions. The use of NLP makes human interaction between humans and robots possible. Chatbots are used in many applications, from banking, travel, ecommerce, real estate, media, and even education and healthcare. Therefore, chatbots not only entertain people by chatting, but also help them solve their problems.
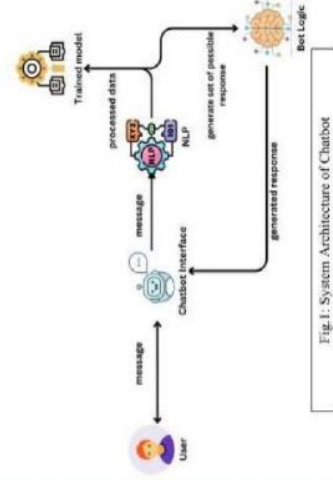
Proposed System:

Fig1: System Architecture of Chatbot

Results:

Conclusion and Future scope:

Conclusion:

In this paper, the deep feed-forward neural network established shows satisfactory results while incorporating sentimental analysis. The chatbot is successfully able to maintain conversations with the customers while keeping in check their emotional conditions. The results show that our chatbot can answer simple questions with higher accuracy than more advanced questions. A chatbot that proves itself as a user-friendly interface that has a capability of solving user queries effectively.

Future Scope

Future development is to expand the assumptions made to evaluate predictive models for various decisions that require consideration of human factors. We have thought that in the future we will add real-time attendance, also add previous years' question papers which will be helpful for the students, develop a video interface in a chatbot to enhance user experience, apply the chatbot to proactively interact with students on important time limits, activities and communication, expand the chatbot's talents to support college and group of workers with administrative tasks and sources.

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APPENDIX V

PPT HANDOUTS

S.B. JAIN INSTITUTE OF TECHNOLOGY , MANAGEMENT & RESEARCH ,NAGPUR

Department Of Emerging Technologies (AI&ML and AI&DS)

Project Title : Sentiment Analysis on Interactive Conversational
Agent/Chatbots

Team Members : Falguni kalambe (AM21053)
Samyak Mnwatkar (AM22D002)
Yash Kakde (AM22D005)
Vidit Khairkar (AM22D006)

Guide : Prof. Ravi Asati

Date : 30-11-24

Project Overview -

We'll explore the key features and benefits of an AI- Powered Departmental Information Assistant, its impact on the College & Department will be beneficial for students, parents, teaching and non-teachingstaff as well. Presently,there are various chatbots available for the students. But our chatbot "Bandhu" is designed for the students to ask Department related question.For this system a algorithm is developed to deliver an appropriate response to the user corresponding to their entered Message.

Objectives -

- **Consistency and Accuracy:** The AI assistant can provide consistent and accurate information to all employees, ensuring that everyone has access to the same knowledge base. This can help prevent misunderstandings and discrepancies within the department.
- **24/7 Availability:** Unlike human assistants who may have limited availability, an AI-powered assistant can be accessible 24/7, allowing employees to seek assistance and information at any time.
- **Productivity:** By automating routine inquiries and providing instant access to information, the AI-powered assistant can help employees complete tasks more efficiently and effectively. This can lead to increased productivity and better outcomes for the department.

Completed Task -

- Chatbot is Ready
- Literature survey and base paper is selected by guide
- Sentimental Analysis API Ready
- Voice Based Ready

Ongoing Work -

Sentiment Analysis,we show that these new features make difference in the chatbot development and even create better checkpoints to redirect users to a human attendant. Improving Contextual Understanding, Researchers are working on enhancing chatbots' ability to understand context better, ensuring more accurate sentiment analysis, especially in complex conversations. Efforts are being made to mitigate biases in sentiment analysis algorithms, ensuring fair and unbiased chatbot interactions.

Challenges Faced -

- **Data Quality and Integration:** Ensuring that the AI assistant has access to accurate and up-to-date information requires integrating data from multiple sources within the department. However, data may be scattered across different systems, in various formats, and may suffer from inconsistencies or inaccuracies.
- **Natural Language Understanding (NLU):** Developing NLU capabilities that allow the AI assistant to accurately interpret and respond to natural language queries is challenging. Understanding the nuances, context, and intent behind user inquiries requires sophisticated AI algorithms and extensive training data.
- **Being Fair to Everyone:** We have to make sure the AI doesn't treat people unfairly or show biases. It should treat everyone the same way.

Summary -

The development and implementation of the departmental chatbot represent a significant milestone in enhancing communication, efficiency, and user experience within the departmental ecosystem. Through meticulous planning, collaboration, and innovation, the project has successfully addressed the diverse communication needs of students, faculty, staff, and administrators.
The departmental chatbot serves as a centralized and accessible resource, providing instant assistance and information retrieval for various inquiries, ranging from course-related questions to administrative procedures and resource lookup. Its intuitive interface and natural language processing capabilities have transformed the way stakeholders interact with departmental services, offering convenience and responsiveness round the clock.

Next Steps -

- The future development is to extend the developed sentiment analysis predictive model to various decision making systems that require consideration of human factors.
- Voice Command Control.
- Linking the json data to the mongodb (database).
- Real Time Attendance.
- Sentimental analysis on region language (English.hindi, marathi…etc).

Citations -

- "Chatbot Optimization using Sentiment Analysis and Time / Navigatio"- Journal of Theoretical and Applied Informatics (2023)
- "Sentiment-based Chatbot using Machine Learning for Recommendation System"- Research Square (National Formosa University) (2022)
- "Sentimental Analysis based on Text and Emoticons"- International Journal of Innovative Technology and Exploring Engineering (2020)
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APPENDIX VI

USER MANUAL

User Manual

On

"Sentiment Analysis on Interactive Conversational Agent/Chatbot"

Submitted By

Ms. Falguni Kalambe

Mr. Samyak Manwatkar

Ms. Yash Kakde

Ms. Vidit Khairakar

Under the Guidance of

Mr. Ravi Asati

Department of Emerging Technology

S. B. Jain Institute of Technology Management & Research, Nagpur

1. Overview

In our increasingly digital world, AI-powered assistants, often referred to as chatbots, have become integral parts of our daily lives. These virtual helpers harness the power of artificial intelligence to interact with users, providing assistance and information in a conversational manner. Whether it's answering questions, scheduling appointments, or offering recommendations, chatbots offer a convenient and accessible way to access services and support. With their ability to understand natural language and adapt to user needs, they simulate human-like interactions, making them indispensable tools for businesses and individuals alike. As technology continues to advance, chatbots are evolving to become even more intelligent and capable, promising a future where assistance is just a conversation away. This project is focusing on creating a chatbot to be used by students to get their queries responded easily from the departmental website. The Departmental Enquiry Chatbot has the capacity to make friendly conversations; respond the course and faculty details; give the link for the academic calendar; answer the frequently asked questions; we present a chatbot system that uses machine learning techniques. So chatbots can learn from users to improve their results. We test our chatbots by testing real-world conversations. The results show that our chatbot can answer simple questions with higher accuracy than more advanced questions. Chatbots are designed to understand sentences, determine their meaning, and continue the conversation as need ed, but they cannot capture the user's intent. It can enable the chatbot to not only respond to the user, but also understand them emotionally. Through our research, we focus on building a chatbot that responds based on the user's emotions to create a more empathetic and human experience for the user. Frequently we tend to tend to pay our time interrelate with numerous chatterboxes on the net, mostly targeted at such functions or just amusement. The chatbots have embedded information that helps them acknowledge the user's question and provide an answer to it. The departmental enquiry chatbot project is meant exploitation algorithms that interpret user queries and understand user's message. This method is a web application that provides answers to the student's question. Students would really like simply question through the bot. The program analyzes the user's query and answers. Then the bot responds to the query, as if the real person were asking it. The program responds to the students' question with the help of algorithms.

2. Aim

Sentiment Analysis on Interactive Conversational Agent/Chatbots

3. Objective

Streamline Communication: Facilitate seamless communication within the department by serving as a centralized platform for inquiries, updates, and notifications, thereby fostering collaboration and transparency.

▪ Enhance Efficiency: The primary objective of the AI-powered Departmental Information Assistant is to improve the efficiency of departmental operations by automating repetitive tasks and providing quick access to relevant information.

▪ Improve Decision-Making: Provide timely and accurate information to departmental stakeholders, enabling informed decision-making processes based on real-time data and insights.

▪ Support Organizational Goals: Align the objectives of the AI-powered Departmental Information Assistant with the broader goals and objectives of the organization, contributing to its overall success and competitiveness.

▪ User-Friendly Interface: Develop an intuitive and user-friendly interface for the chatbot, ensuring ease of use for students, faculty, and staff from various colleges.

▪ Information Retrieval: Train the chatbot to efficiently retrieve relevant information such as course schedules, campus events, academic resources, and administrative procedures from each participating college.

▪ 24/7 Availability: Ensure round-the-clock availability of the chatbot to accommodate the diverse schedules of students, faculty, and staff across different time zones.

▪ Personalized Assistance: Incorporate machine learning algorithms to provide personalized assistance to users based on their preferences, academic history, and interaction patterns.

4. Proposed Approach

4.1 Home Page module:

This will be the Homepage consisting information the Bandhu chatbot it is basically a introduction page of the Chatbot the user will see three features Home, About Us, features & login signup window

4.2 Login Signup module:

A login page (also known as a sign-in page) serves as the gateway for users to access their accounts orprivate areas within a website or application. Here are some key points about login pages:

1. **Purpose and Functionality:**
   - **Purpose**: The primary purpose of a login page is to verify user identity and prevent unauthorizedaccess.
   - **Functionality**: Users provide their credentials (usually a username/email and password) to gainaccess
   - **User Input Fields:**
     - **Username/Email**: Users enter their registered username or email address.
     - **Password**: Users input their secret password.
     - Sometimes, additional features include:
       - **Google Authentication**: An option to keep the user logged in across sessions.

A signup page (also known as a sign-up form) allows users to create new accounts or subscribe toservices. Here's what you need to know about signup pages:

2. Purpose and Functionality:
- **Purpose**: To collect essential user information before granting access.
- **Functionality**: Users provide details required for account creation.

Input Fields:
- **Name**: First name and last name.
- **Email Address**: Used for communication and account recovery.
- **Username**: Unique identifier for the user.
- **Password**: Securely chosen by the user.

4.3 Chatbot Window: After successful signup the user will be redirected to the chatbot window where the user can chat with the Bandhu after that they can logout there session

5. Software Requirements

Operating System – Windows 10 or above

Modelling and Implementation Tool – Python & Flask & libraries associated with the It
IDE – Visual Studio Code
Language – Python

6. Hardware Requirements

Processor: Intel core i5 10 gen (64 bit) or above
Hard Disk: Minimum 128GB
RAM: Minimum 8GB
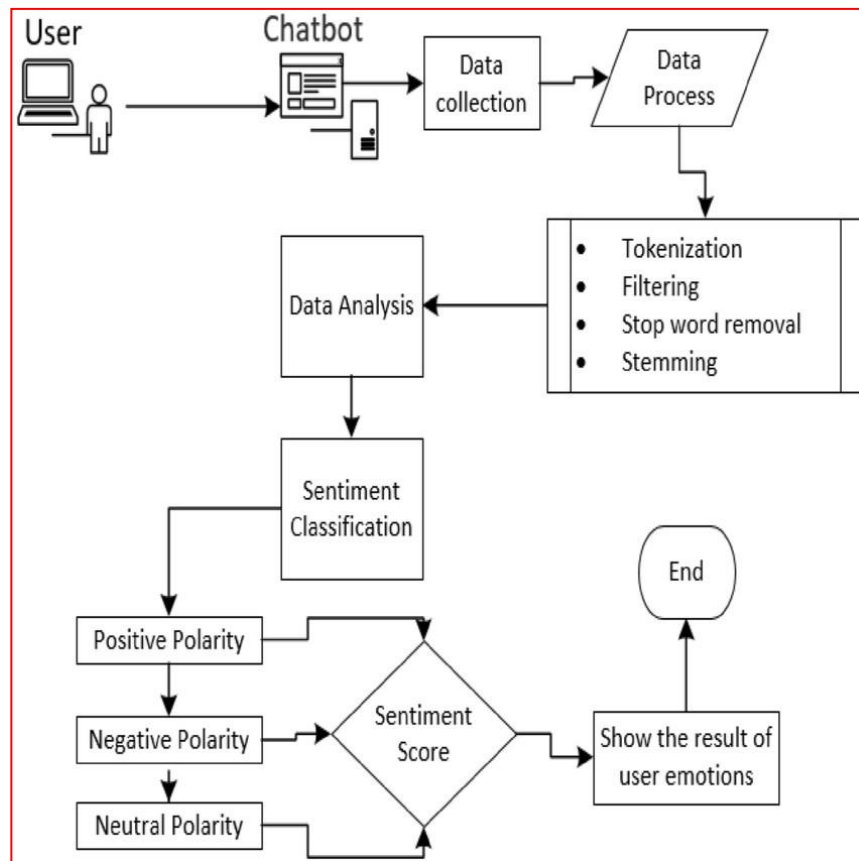Video Card: Nvidia Geforce GTX 1650ti or above

Flow Chart

**Figure 3.2.1 Flow Chart**

Steps to Run the Project

1.Home Page: This will be the Homepage consisting information the Bandhu chatbot it is basically a introduction page of the Chatbot the user will see three features Home, About Us, features & login signup window

2. Sign up / Log in Page: The user will start the web application, if the user wants to access the website, they need to login through email id and password or if they are a new user, they need to sign up by providing their name, email id. and password. Once the user successfully log in, they will first get to access the home page.

3. Chatbot Window: After successful signup the user will be redirected to the chatbot window where the user can chat with the Bandhu after that they can logout there session

4.Log out: Lastly when the user is done he/she can successfully logout from the web application.

Output/ Graph/ Observations :
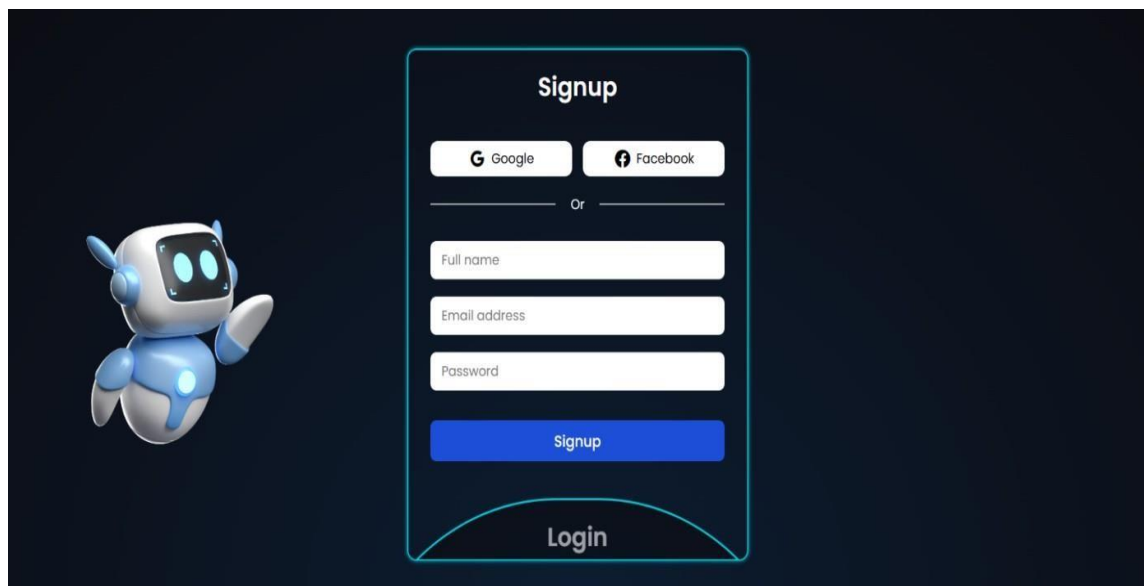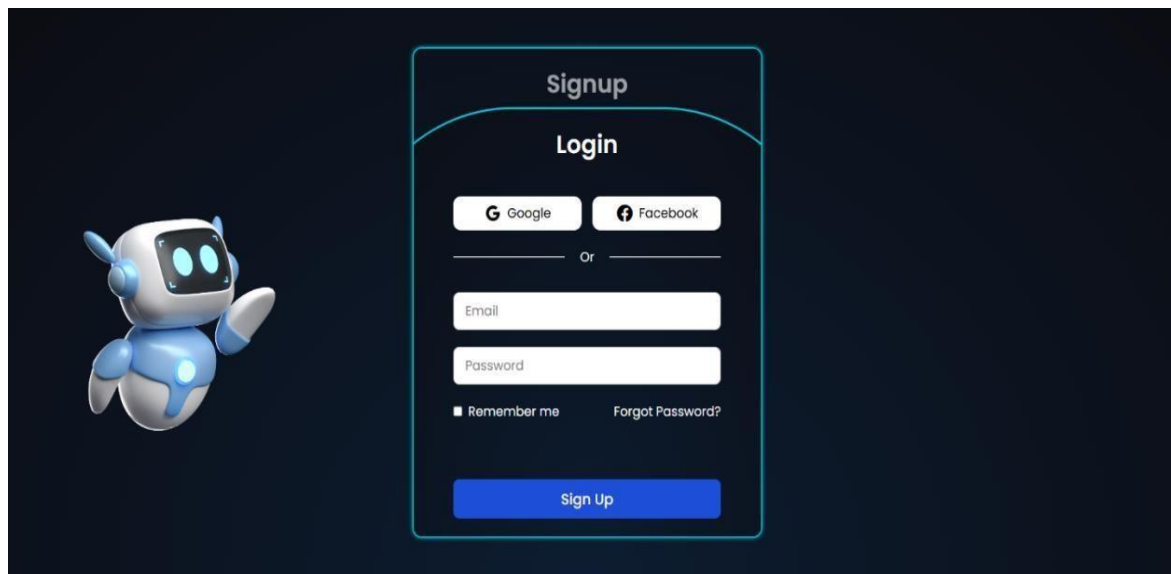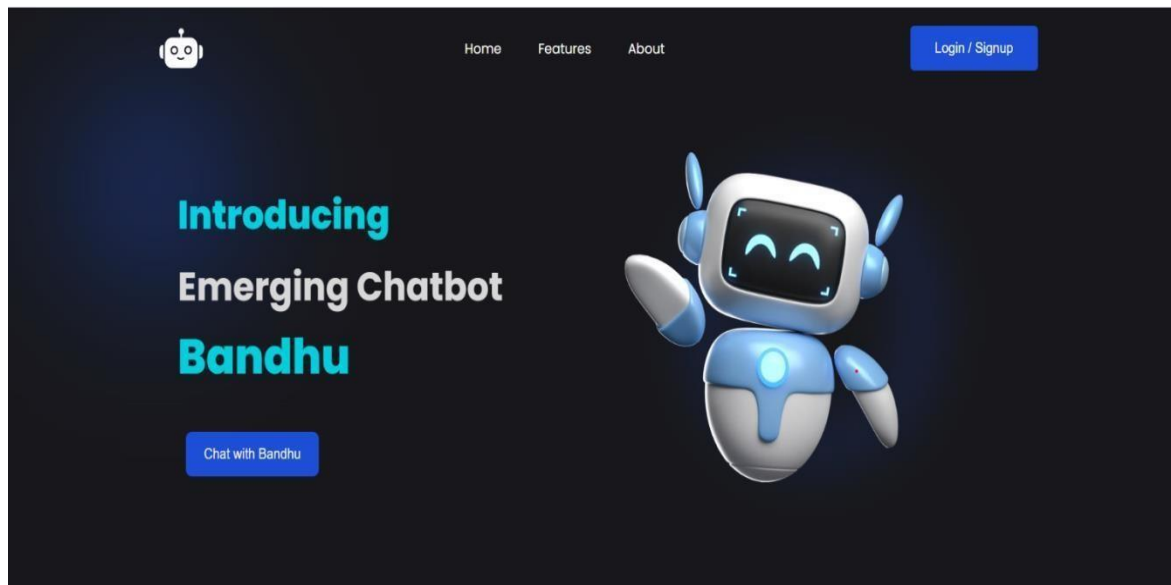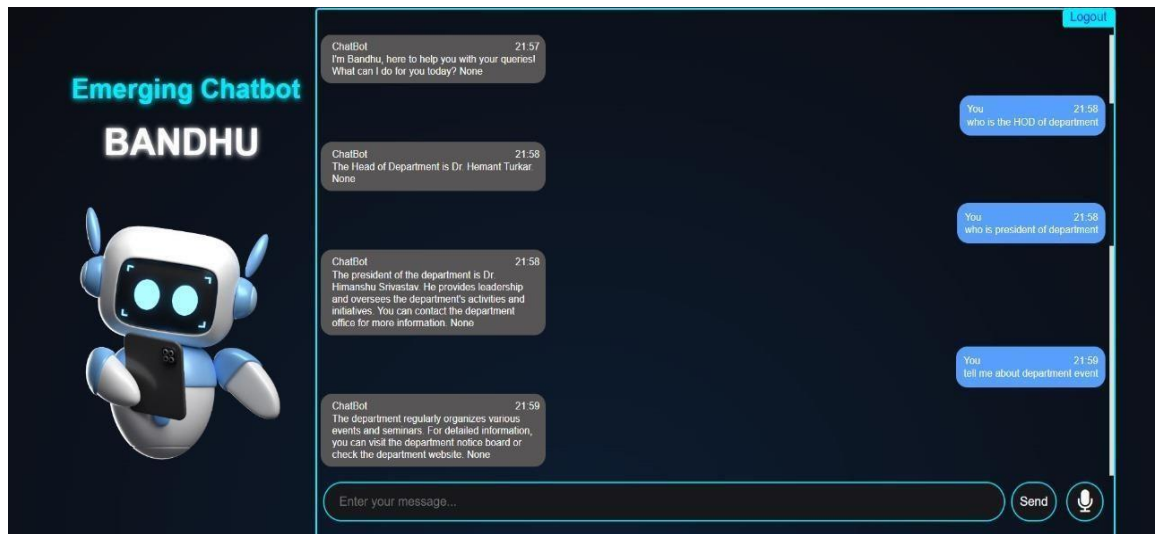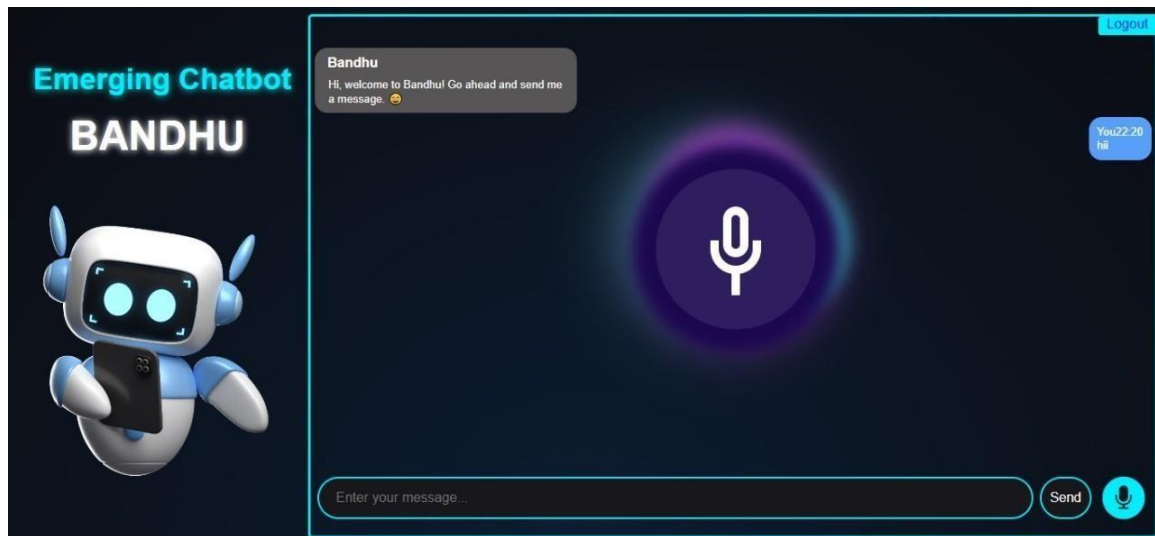
1. Future Scope

- In future, the web application the user can use multiple Languages to chat other than English. user can be able to chat in hinglish, marthi or any other indian language

- Future development is to expand the assumptions made to evaluate predictive models for various decisions that require consideration of human Factors. We have thought that in future we will add real time attendance, PDF in it which will be helpful for the students.

2. Limitations

- User cannot access the documents and there is language barrier

- Internet connect is required without that you cannot open this application.