

Chatbot For College Enquiry Using AI

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Abstract— The rapid advancement of artificial intelligence has led to the development of intelligent systems capable of automating human interaction. This project presents the design and implementation of a Smart AI Chatbot developed for Sharadchandra Pawar College of Engineering and Technology (SPCOET). The chatbot is designed to provide instant and accurate responses to user queries related to admissions, courses, fees, placements, and campus facilities. The system integrates Natural Language Processing (NLP), intent detection, semantic search using vector embeddings, and AI-based response generation to deliver context-aware responses. A structured knowledge base is used to store institutional information, which is retrieved using similarity matching techniques. Additionally, the chatbot maintains conversation memory to enhance interaction quality and supports multilingual communication. The system reduces manual effort, improves response time, and ensures consistent information delivery, making it an effective solution for modern educational environments.

Keywords: - Artificial Intelligence, Chatbot System, Natural Language Processing (NLP), Semantic Search, Intent Detection, Conversational AI, Knowledge Base.

I. INTRODUCTION

In the modern digital era, the demand for efficient and intelligent communication systems has increased significantly across various domains, including education. Educational institutions often receive numerous inquiries from students, parents, and stakeholders regarding admissions, courses, fees, placements, and campus facilities. Traditionally, such queries are handled manually through administrative staff or static websites. However, these approaches are often inefficient, time-consuming, and unable to provide instant

responses.

The rapid advancement of artificial intelligence and natural language processing has enabled the development of chatbot systems capable of simulating human-like conversations. These systems can understand user queries, process them intelligently, and provide appropriate responses in real time. The primary objective of this project is to design and implement a Smart AI Chatbot that can automate the process of handling institutional queries.

The chatbot is developed using a combination of NLP techniques, semantic search algorithms, and AI-based response generation. It is capable of understanding natural language input, identifying the intent behind the query, and retrieving relevant information from a knowledge base. By integrating these technologies, the system aims to provide a seamless and interactive user experience while reducing the workload on administrative staff.

II. PROBLEM STATEMENT

Educational institutions face several challenges in managing a large volume of repetitive queries. Students and parents frequently seek information about admissions, course details, fee structures, and campus facilities. Handling these queries manually requires significant time and effort from administrative staff, which can lead to delays and inefficiencies.

Moreover, traditional methods such as static websites lack interactivity and fail to provide personalized responses based on user queries. This often results in user dissatisfaction and incomplete

information delivery. Additionally, manual processes are prone to human errors, which can lead to inconsistencies in the information provided.

The problem addressed in this project is to develop an intelligent system that can automatically handle user queries, understand their intent, and provide accurate and real-time responses. The system should be capable of processing natural language input, retrieving relevant information from a structured knowledge base, and generating meaningful responses. It should also maintain conversation context to improve the quality of interaction.

III. MOTIVATION

The motivation behind this project stems from the need to improve communication efficiency within educational institutions. With the increasing number of students and inquiries, it becomes essential to adopt automated solutions that can handle repetitive tasks effectively.

Advancements in artificial intelligence and NLP have made it possible to develop systems that can understand and process human language with high accuracy. These technologies provide an opportunity to create intelligent systems that can enhance user experience and reduce manual workload.

By implementing a chatbot system, institutions can provide 24/7 assistance to users, ensuring that queries are addressed promptly and accurately. This not only improves accessibility but also enhances the overall efficiency of the institution. The project aims to leverage these technological advancements to create a smart and reliable chatbot system.

IV. LITERATURE SURVEY

- S. Young et al. (2023) proposed an intelligent conversational system using transformer-based language models for handling user queries in real time. Their approach focused on improving contextual understanding by leveraging deep learning techniques. The study demonstrated that modern language models significantly enhance chatbot response accuracy and user engagement compared to traditional rule-based systems.
- M. Brown and A. Smith (2022) explored the use of Natural Language Processing techniques such as tokenization, lemmatization, and entity recognition for chatbot applications. Their research highlighted the importance of preprocessing steps in improving the quality of user input understanding and enabling more precise intent detection in conversational systems.
- R. Kumar and P. Sharma (2021) developed a semantic search-based chatbot using vector embeddings and similarity matching techniques. Their model utilized sentence transformers and vector databases to retrieve relevant information based on meaning rather than exact keywords. The study showed that semantic search improves the relevance of responses in information retrieval systems.
- L. Chen and D. Wang (2020) introduced an intent detection model using machine learning algorithms for classifying user queries into predefined categories. Their system applied keyword-based scoring and classification techniques to identify user intent, improving the efficiency and accuracy of chatbot responses in domain-specific applications.
- A. Gupta and N. Verma (2024) proposed a multilingual chatbot system capable of handling queries in multiple languages using NLP and translation models. Their work emphasized the importance of language adaptability in improving accessibility and user experience, particularly in diverse user environments.

V. PROPOSED SYSTEM

The proposed system is a Smart AI Chatbot designed to provide automated responses to user queries related to SPCOET. The system is built using a modular architecture that integrates multiple components to process user input and generate appropriate responses.

When a user submits a query, the system processes the input using NLP techniques to extract relevant information. The intent detection module identifies the purpose of the query, and the semantic search module retrieves relevant data from the knowledge base. The AI response engine then generates a

natural language response based on the retrieved information.

The system also includes a conversation memory module that stores previous interactions, allowing it to provide context-aware responses. This improves the quality of interaction and makes the chatbot more intelligent. Additionally, the system supports multiple languages, making it accessible to a wider audience. Intelligence, making compliance checking faster, more accurate, and accessible to everyone.

VI. SYSTEM ARCHITECTURE

The proposed Smart AI Chatbot system follows a layered and modular architecture designed to efficiently process user queries and generate accurate responses. The architecture consists of multiple interconnected components, including the user interface, backend server, NLP processing module, intent detection system, knowledge base, response generation module, memory handling, and an administrative panel.

The interaction begins when the user submits a query through the frontend interface, which is developed using web technologies such as HTML, CSS, and JavaScript. This interface provides an interactive and user-friendly environment where users can communicate with the chatbot in real time. The frontend sends the user query to the backend server using HTTP requests.

The backend is implemented using a Flask-based framework, which acts as the central processing unit of the system. It handles incoming requests, manages data flow between different modules, and ensures smooth communication across the system. Upon receiving a request, the backend first performs input validation and preprocessing to ensure the data is clean and suitable for further processing.

The processed input is then passed to the Natural Language Processing (NLP) module. This module performs several important tasks such as text cleaning, tokenization, stop-word removal, and normalization. These steps help in extracting meaningful information from the user query and preparing it for further analysis.

After NLP processing, the query is forwarded to the intent detection module. This module identifies the

purpose of the user query by analyzing keywords and patterns. It classifies the query into predefined categories such as admission, fees, courses, or facilities. This classification helps the system understand what kind of information the user is seeking.

Simultaneously, the system interacts with a conversation memory module, which stores previous interactions. This allows the chatbot to maintain context and provide more relevant responses based on earlier queries, thereby improving the overall conversational experience.

Once the intent is identified, the system accesses the knowledge base, which is stored in a structured JSON format. The knowledge base contains detailed information about the institution, including courses, admissions, contact details, and facilities. The system retrieves relevant data from this knowledge base based on the detected intent and query context.

The retrieved information is then passed to the response generation module. This module uses AI-based techniques to generate a natural and user-friendly response. It ensures that the response is not only accurate but also conversational in nature, making the interaction more engaging.

Finally, the generated response is sent back to the frontend and displayed to the user as chatbot output. The entire process is completed in a short time, ensuring real-time interaction. Additionally, the system includes an admin panel that allows administrators to manage and update the knowledge base. This ensures that the chatbot always provides up-to-date and accurate information. The admin panel plays a crucial role in maintaining the reliability and scalability of the system.

Overall, the architecture is designed to be efficient, scalable, and modular, enabling seamless integration of various components and ensuring high performance in handling user queries.

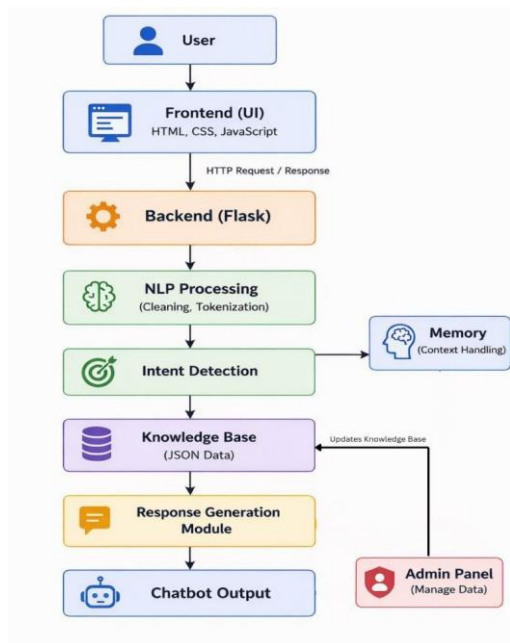


Fig. 1: System Architecture of Smart AI Chatbot

VII. METHODOLOGY

The chatbot system follows a structured methodology to process user queries. The first step involves input validation and preprocessing, where the system ensures that the input is meaningful and free from errors. This step improves the reliability of the system and prevents invalid data from being processed.

The second step involves NLP processing, where the input text is analyzed using techniques such as tokenization, stop-word removal, and keyword extraction. These steps help in understanding the structure and meaning of the text.

The third step is intent detection, where the system identifies the purpose of the query using keyword-based scoring methods. This allows the system to classify queries into different categories.

The fourth step involves semantic search, where the system retrieves relevant information from the knowledge base using vector similarity techniques. This ensures that the retrieved data is contextually relevant to the query.

The fifth step involves AI-based response generation, where the system generates a natural language response based on the retrieved information. The final step involves delivering the response to the user and storing the interaction in memory for future reference.

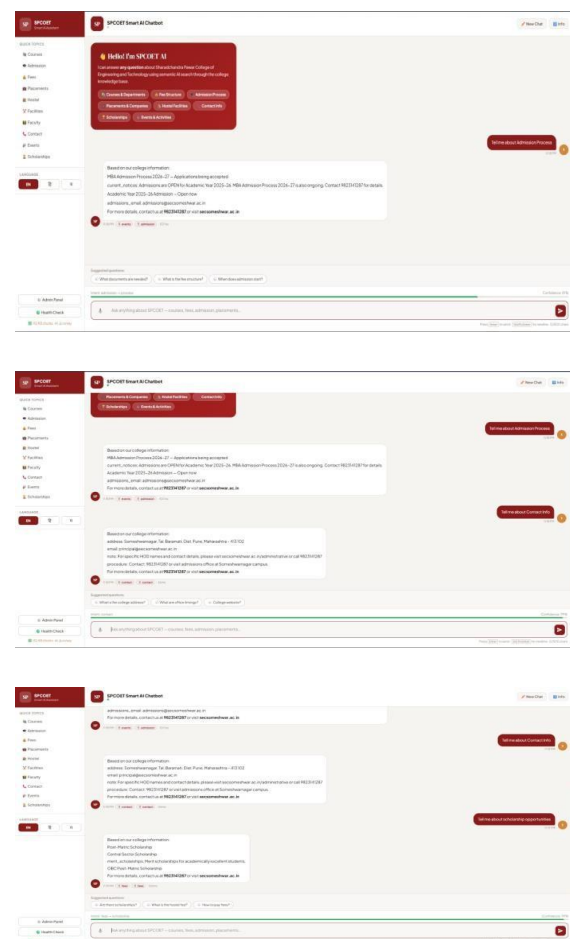
VIII. RESULTS AND DISCUSSION

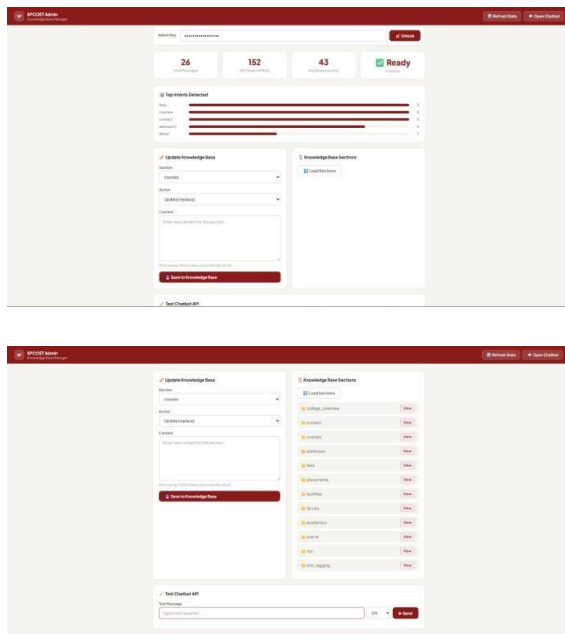
The chatbot system demonstrates effective performance in handling user queries and providing accurate responses. The integration of NLP and semantic search techniques improves the ability of the system to understand user input and retrieve relevant information.

The use of AI-based response generation enhances the quality of interaction by producing natural and user-friendly responses. The system also maintains conversation context, which improves the overall user experience.

The chatbot is capable of handling multiple types of queries related to institutional information and provides consistent responses. The results indicate that the system is efficient, reliable, and suitable for real-world applications.

IX. OUTPUT





X. CONCLUSION

The Smart AI Chatbot developed in this project provides an efficient solution for automating communication in educational institutions. By integrating NLP, semantic search, and AI-based response generation, the system delivers accurate and context-aware responses to user queries.

The project demonstrates the potential of artificial intelligence in improving communication systems and reducing manual workload. The system is scalable and can be extended to other domains, making it a valuable tool for future applications.

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