A CHATBOT FOR COLLEGE ENQUIRY USING NLP

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Abstract:

In the digital era, the demand for instant academic information is increasing, especially for prospective students and parents. This paper presents a web-based College Enquiry Chatbot designed to provide 24/7 automated assistance related to academic departments, courses, faculty, placements, and facilities of an educational institution.The chatbot employs Natural Language Processing (NLP) techniques such as tokenization, lemmatization, and fuzzy string matching to interpret varied user queries.

The system uses a JSON-based knowledge base to maintain flexibility and ease of updates without database integration. To enhance accessibility, text-to-speech (TTS) functionality is included for vocalizing responses. The chatbot ensures real-time, accurate, and context-aware replies while reducing the dependency on human-operated enquiry desks. Testing results demonstrate reliable response accuracy and efficient performance, with most responses generated in under 2 seconds. This project contributes to bridging communication gaps in academic environments and sets a foundation for scalable digital enquiry systems.

Keywords — **NLP, Tokenization, Chatbot, Query, Lemmatization.**

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I. Introduction

In today's digital-first academic landscape, students and parents increasingly expect immediate access to College- related information without navigating complex websites or relying on in-person assistance. Traditional enquiry systems, often limited by working hours and staff availability, can lead to delays and miscommunication. Chatbots have emerged as effective tools for automating information delivery, offering real-time support across platforms. This project introduces a rule-based College Enquiry Chatbot focused on the CSE and ITCA departments of Andhra University College of Engineering. The chatbot answers common questions related to courses, faculty, infrastructure, placements, and more. It aims to improve user experience, reduce manual workload, and ensure 24/7 access to institutional data. Its design prioritize ease of use, and cost-effectiveness.

The system leverages Natural Language Processing (NLP) techniques like tokenization, lemmatization, and fuzzy matching to interpret and respond to a wide range of user inputs. Developed using Django framework for the backend and JavaScript for the frontend, it employs a JSON-based knowledge base to store

question patterns and corresponding answers. Text-to-speech (TTS) functionality has been integrated to make the system inclusive, especially for users with visual impairments or reading difficulties. The chatbot offers consistent, fast, and accurate responses, improving communication between the institution and its stakeholders. Additionally, it supports voice output and a mobile-friendly interface. This research explores the design, implementation, and evaluation of the chatbot, emphasizing its impact on academic engagement and digital transformation.

II. Literature Survey

Janapreethi S. et al. [1] designed a chatbot using the ChatterBot library and Flask framework, enabling college-level queries to be answered through pattern-matching on predefined dialogue templates.

Patil R. et al. [2] proposed a chatbot built on the RASA framework that utilizes intent classification and entity extraction for structured academic enquiry handling with contextual understanding.

A. K. Nikhath et al. [3] developed an LSTM-based deep learning chatbot capable of interpreting student queries through sequential modeling, improving adaptability to user language variations.

A. K. Karunamurthy et al. [4] implemented a structured NLP-based chatbot to address college-related queries such as course and department information by classifying and matching input intents.

D. Mandlik et al., [5] The paper presents a multi-modal chatbot powered by transformer models like BERT and GPT for improved intent understanding and natural response generation.

S. Pawar et al., [6] This study designs a chatbot using fuzzy matching and pattern recognition techniques to manage college-related enquiries.

P. Jain et al., [7] The authors propose a chatbot model that applies iterative learning to improve the quality of responses over time. The system learns from user interactions to adjust and refine its response strategy. By incorporating feedback loops, the chatbot becomes more accurate and context-aware with usage.

K. Bala et al., [8] This paper presents a chatbot system for comprehensive college management, from enrollment processes to event updates. The model is built using the ALICE (Artificial Linguistic Internet Computer Entity) markup language to define response rules.

C. D. Manning et al., [9] This foundational work discusses the core NLP components like tokenization, lemmatization, POS tagging, and named entity recognition, as implemented in the Stanford Core NLP toolkit.

S. Bird et al., [10] The book provides a comprehensive guide to Natural language processing using the NLTK library. It includes practical implementation of techniques such as tokenization, lemmatization, and part-of-speech tagging.

D. Jurafsky et al., [11] The textbook covers foundational concepts in speech and language processing, emphasizing the significance of preprocessing techniques like tokenization and lemmatization.

CH. Bheema Sreenu et al., [12] This paper presents a college enquiry chatbot that utilizes machine learning models such as Naive Bayes, Random Forest, and Support Vector Machines for accurate query classification.

Ch. Lavanya Susanna et al., [13] The authors develop a web-based chatbot using the CodeIgniter PHP framework and a MySQL backend to assist students with academic and administrative queries.

Xu, Chen et al., [14] This study employs NLU methods like named entity recognition (NER) and sentiment analysis to enhance chatbot response accuracy.

Li, Wu et al., [15] The paper focuses on managing multi-turn conversations using context-

aware NLP methods. Dialogue state tracking and context retention help maintain coherent responses across multiple exchanges.

III. Proposed System

The proposed system is a web-based College Enquiry Chatbot designed to provide instant, automated responses to user queries related to the institution, specifically the CSE and ITCA departments. It leverages Natural Language Processing (NLP) techniques such as tokenization, lemmatization, and fuzzy string matching to interpret user input and match it with predefined patterns stored in a JSON file. The backend is developed using Django, while the frontend employs HTML, CSS, and JavaScript, ensuring a responsive and interactive user interface. The chatbot allows users to ask questions in natural language and receive relevant, human-like responses in real time, enhancing the accessibility of information without requiring human intervention.

To make the system more inclusive and engaging, text-to-speech (TTS) functionality has been integrated using the Web Speech API, allowing users to hear the responses in addition to reading them. The chatbot icon remains fixed at the bottom right of the website, and upon activation, a clean chat interface appears where users can interact. Unlike traditional enquiry systems that require navigating through multiple web pages or contacting administrative staff, this system centralizes information access into a single conversational interface. By supporting 24/7 availability and minimizing response time, the chatbot improves user satisfaction and offers a modern, scalable solution for college enquiry automation.

Additionally, the system is designed to be easily updatable and scalable. The use of a structured JSON file for intents allows administrators to add or modify questions and responses without altering the core codebase. This flexibility ensures the chatbot can evolve with changing institutional needs and student queries. Future enhancements may include the integration of speech-to-text (STT) for voice-based input and an admin dashboard for dynamic content management, further enhancing the usability and reach of the system.

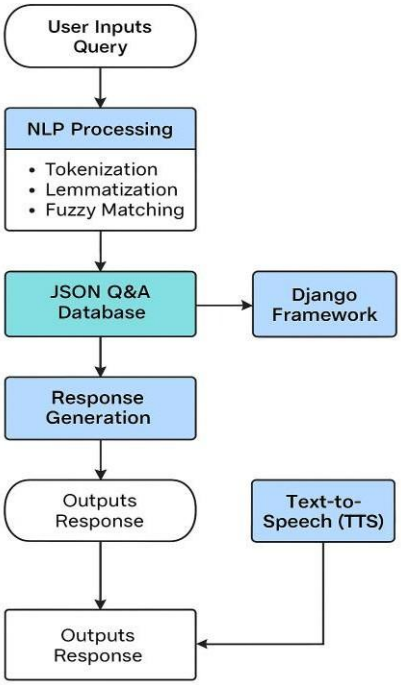

Figure:1 Flow Diagram of Chatbot

IV. Methodology

Our chatbot works as a client-server-based web application. The system consists of a Django backend acting as the server, responsible for processing user queries, and a responsive frontend interface built using HTML, CSS, and JavaScript. Users interact through a chatbot icon displayed on the bottom-right corner of the college website UI, enabling access to an instant conversational interface.

The chatbot identifies the user's input, processes it using natural language techniques, and provides a relevant response. Voice-based replies are also triggered through an integrated text-to-speech (TTS) module for a more engaging experience.

A. Web Application

The chatbot is embedded within the official or prototype college website and acts as a real-time help assistant. Upon clicking the chatbot icon, a conversational window appears with a welcome message such as “Hi! How can I assist you today?”. The user then types their question — for example, "What are the courses offered in ITCA?" — and the chatbot replies with the corresponding response from its knowledge base. This interaction mimics a human chat experience and is continuously available. The frontend interface ensures that the design is simple, clean, and mobile-friendly, allowing both students and parents to comfortably use it.

B. Components

- **User Input**: A text-box in the chatbot interface captures natural language input from the user.
- **Preprocessing Engine**: The NLP system converts user queries into tokens, applies lemmatization, and normalizes the text for processing.
- **Intent Matching**: The user’s processed query is compared to a predefined set of patterns using fuzzy matching to determine intent.
- **Response Generator**: Once the matching intent is identified, a corresponding response is selected from a static JSON file.
- **Text-to-Speech Output**: The final message is converted into voice using the Web Speech API and read out to the user.

C. Chatbot Approach

Natural language processing is the crucial component that enables the chatbot to understand human-like queries. It involves tokenization, lemmatization, and pattern recognition to derive meaning from the user’s sentence. Instead of expecting strict command phrases, the chatbot can interpret informal, varied user inputs such as “Where is the ITCA department?” or “Location of ITCA department?”. Fuzzy string matching allows the system to tolerate minor typos and differences in phrasing. The chatbot intelligently identifies the user’s intent and responds with clear, human-readable answers stored in the knowledge base.

D. Django Server

Django is used as the web server framework in this system. It manages routing, handles AJAX requests from the frontend, and links the chatbot logic with the web interface. When user sends a message, an AJAX POST request is sent to the Django backend. There, the message is processed, passed through the NLP module, and a response is returned in JSON format. Django is chosen for its stability, clean project structure, built-in admin interface, and scalability. The system ensures quick response delivery (typically under 2 seconds) and efficient request handling, even under moderate load.

E. Training and Response Handling

Instead of relying on live training with neural networks, this system uses a **static intents.json file** that contains common questions and predefined answers. These are manually curated and updated to reflect real-world queries related to college admissions, faculty, placements, departments, and facilities. Although the model does not "learn" dynamically, the use of fuzzy logic allows it to respond appropriately to a wide range of natural phrasing. This makes the chatbot lightweight, fast, and reliable for college environments where FAQs remain relatively stable.

V. Results and Discussion

The chatbot successfully responded to a wide range of user queries related to college departments, courses, placements, and faculty within 1–2 seconds. It accurately matched varied

input phrases using fuzzy logic and delivered consistent responses. Text-to-speech and Speech-to-Text functionality worked smoothly across supported browsers. Overall, the system demonstrated efficiency, accuracy, and ease of use in a real-time academic enquiry setting.

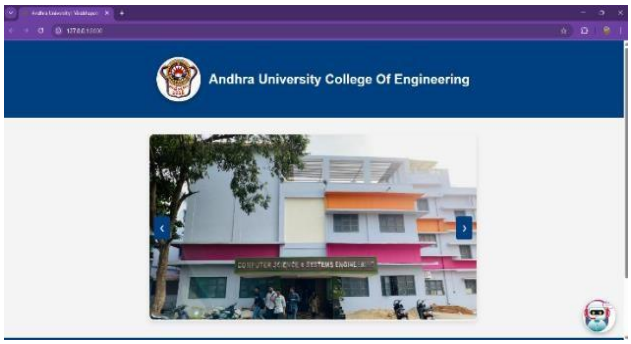

Figure:2 Main Website UI

Figure 2 shows the main page of the college website. A chatbot icon is available at the bottom left corner. When clicked, it opens a chatbot interface where users can ask questions related to the college.

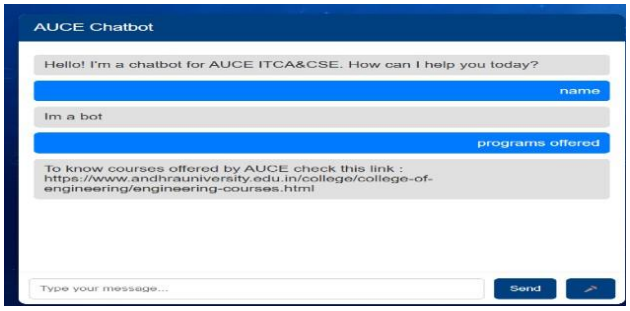

Figure:3 Chatbot UI

Figure 3 shows the user interface of the chatbot where users can type and send queries related to the college.

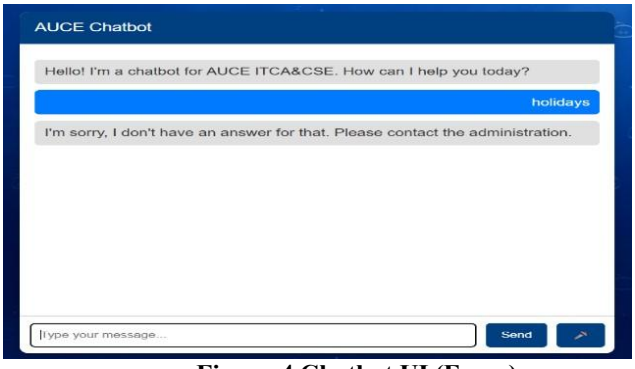

Figure:4 Chatbot UI (Error)

Figure 4 shows the chatbot's response when a user query does not match any intent in the JSON file. In such cases, the chatbot replies with a default message: "I'm sorry, I don't have an answer for that. Please contact the administration." This ensures users are guided properly even when an answer is not available.

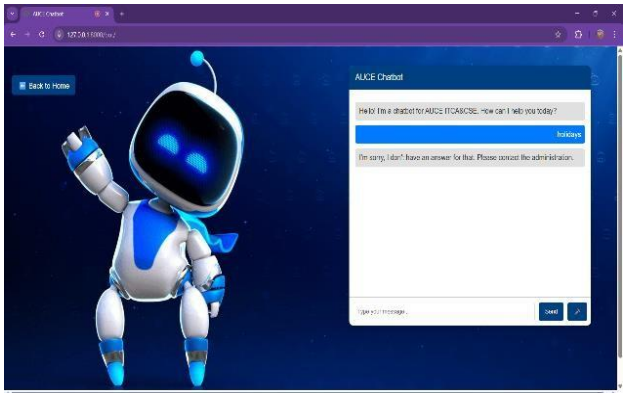

Figure:5 Chatbot UI (Speech-to-Text)

Figure 5 shows the chatbot interface with an added speech input feature. Users can click the microphone icon to ask questions using their voice.

VI. Conclusion & Future Scope

The College Enquiry Chatbot provides an efficient and scalable solution for automating responses to student and parent queries in academic institutions. By leveraging Natural Language Processing (NLP), fuzzy string matching, speech-based interfaces, the chatbot ensures instant, accurate, and accessible information delivery.

The system reduces manual workload for college staff and enhances the overall experience for users by offering 24/7 availability and multi-user support. The successful implementation of features like Text-to-Speech (TTS), Speech-to-Text (STT), and responsive web integration demonstrate the chatbot's potential as a practical tool for digital transformation in higher education support systems.

Future Scope: In the future, this chatbot can be made even more helpful by adding support for different languages, so students from various regions can use it comfortably. Another useful improvement would be adding memory, so it can remember previous questions in a conversation and respond more naturally. With these upgrades, the chatbot can become a more interactive, personal, and reliable assistant for students and parents.

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