

Chatbot for Student Enquiry

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Abstract – This chatbot has been designed to assist users in resolving queries related to the college, catering specifically to the needs of new students and their parents, who often have numerous questions about the admission process, fee structure, and facilities offered by the institution. By automating the enquiry process, the chatbot significantly reduces the manual effort and time spent by both the college staff and prospective students or their parents in addressing these concerns. To enhance user experience and accessibility, the bot is equipped with advanced features such as speech recognition, text-to-speech, and multilingual support. The speech recognition capability allows users to provide voice commands instead of typing, making interactions more convenient and user-friendly. Additionally, the text-to-speech functionality enables users to hear responses to their queries, further simplifying the process for individuals who may find reading difficult or inconvenient. The multilingual support feature ensures that the bot can communicate effectively in two widely used local languages, Telugu and Kannada, in addition to English, thereby making it accessible to a broader audience. The primary goal of this chatbot is to streamline and automate the operations at the enquiry desk, reducing human workload while ensuring prompt and accurate responses to user queries. This system not only improves efficiency but also enhances the overall experience for users seeking information, ensuring a hassle-free interaction process for all stakeholders.

Key Words: Natural Language Processing, Speech Recognition, Chatbot, Text-to-Speech, Pattern Matching, TF-IDF, Cosine Similarity, Spellchecker

1. INTRODUCTION

A chatbot is a computer software that, when conversed with through text or voice, replies as if it were a clever entity that understands one or more human languages using Natural Language Processing (NLP) [1]. A chatbot's primary task is to help users by providing answers to their questions by understanding what human wants and guides them to their desired outcome [2]. Chatbots have emerged as important tools in the digital age, they enable smooth interaction between users and systems.

In the college context, AI-based voice responders have become integral parts of student services, assisting with tasks like course registration, academic advising, and campus navigation. They offer round-the-clock support,

freeing up administrative staff to focus on more specialized tasks while providing students with instant access to information and assistance [3]. People prefer these chatbots to looking things up on the internet by themselves as these can easily provide a thorough, detailed answer to the questions that the users want answered. These chatbots prove to have the ability to simulate the cognitive abilities that humans have [4]. Moreover, with the increasing popularity of smart speakers and virtual assistants like Amazon Alexa and Google Assistant, colleges have begun integrating AI-based voice responders into their communication channels, offering students another convenient way to access college services and resources [3].

Conversational interfaces are platforms that can have conversation like a real human. Generally, users use Graphical user interfaces (GUI) to give commands to the computer. The computer then interprets the meaning of that command and perform the desired action. In case of Conversational interfaces, the user can communicate with computer in their natural language instead of giving command or using GUI [5]. A chatbot is a software application used to conduct an online chat conversation via text or text-to-speech, in lieu of providing direct contact with a live human agent [6].

College Chatbots are becoming increasingly popular as a means of providing quick access to helpful information. College Chatbots are used to answer common questions, provide guidance, and offer resources. Additionally, College Chatbots can be used to improve student engagement and increase student satisfaction [7]. Chat bots are the source of answers to the users' questions in any particular domain where it is operating [8]. The goal of this chatbot is to assist users with college-related inquiries. The chatbot uses NLP techniques and a relational database to provide users with accurate, context-sensitive responses in real-time. This bot helps in handling versatile range of queries such as admissions, fees, hostel facilities, scholarships, and other information related to the institution.

In an artificial intelligent field, there are some hybrid methods and adaptive methods available which are making systems more complex. Not only that but also there is a hybrid combination of natural language processing and intelligent systems. These systems can learn themselves and

renew their knowledge by reading all electronics articles available on the internet [10].

Users (humans) can ask questions to system like they would to any other human. These systems are often known as internet answering engines. In addition to the internet answering engines, currently, many applications are introduced such as chatter-robot or known as chatbot which is often aimed at giving an automatic reply or just for entertainment [10]. The task of these applications is just to answer the questions based on the knowledge stored inside them. Few of the methods used in this application are pattern-matching, natural language processing, data mining. The chatbot would match the input sentence from the speaker or user with that pattern existed in the knowledge base. Each pattern is then compared with the knowledge of chatbot [10].

2. LITERATURE SURVEY

[1] Wala Hassan et al. (2023) proposed an interactive chatbot for college inquiries, focusing on improving human-computer interaction using Artificial Intelligence (AI) and Natural Language Processing (NLP). The system is designed to assist university students by answering their queries accurately and efficiently through a user-friendly interface. The chatbot analyzes user input, interprets the context, and generates responses resembling human communication. The proposed architecture includes intelligent agents to manage communication, ensuring timely and precise answers to student queries. The system was experimentally validated, demonstrating its enforceability and efficiency in reducing search time and enhancing the user experience on educational platforms.

[2] A. Kousar Nikhath et al. (2022) proposed an intelligent college inquiry chatbot utilizing Natural Language Processing (NLP) and Deep Learning techniques, specifically Long Short-Term Memory (LSTM) networks, to enhance user interaction. The system aims to address academic and admission-related queries for freshers, students, faculty, and parents. By leveraging Recurrent Neural Networks (RNN) and NLP, the chatbot understands and analyzes user queries to provide accurate, human-like responses. This web-based application significantly reduces the need for manual intervention, offering quick resolutions to inquiries about admission processes, fee structures, departmental details, and other academic concerns. It is designed to improve the efficiency of college-related interactions.

[3] Pavithra N et al. (2024) highlighted the development and functionality of the "College Casio Bot," an AI-driven virtual assistant designed to streamline access to college-related information. Published in the International Journal of Innovative Research in Science, Engineering, and Technology, their study showcased the bot's ability to provide real-time responses to queries regarding campus navigation, department details, fee structures, and event updates. By

integrating natural language processing (NLP) and offering dual modes—text and audio—it ensures accessibility for diverse users. The research emphasized the bot's role in reducing administrative workload and improving engagement by delivering instant, accurate information, particularly for remote users and parents unable to visit campus physically.

[4] A. Balamurugan et al. (2024) proposed an AI-based chatbot integrated with voice assistance to cater to the increasing demand for advanced virtual assistants. The system combines OpenAI's GPT-3.5 large language model for intelligent conversational capabilities with a text-to-speech API for seamless audio interaction. It accepts user input as audio, converts it to text, generates a response using GPT-3.5, and then provides the output in audio format. The proposed system emphasizes user data privacy by ensuring that neither the text-to-speech API nor the GPT-3.5 API retains user data. This innovative approach bridges the gap between traditional chatbots and modern voice assistants, enhancing user accessibility and experience.

[5] Sangeeta Kumari et al. (2020) proposed an interactive chatbot system to address the challenges faced by students and parents during the college admission process. The system integrates Natural Language Processing (NLP) with text and audio-based interactions to facilitate seamless communication. By providing a platform where users can ask queries in simple English, the chatbot reduces the dependency on physical enquiry desks and minimizes repetitive tasks for admission departments. Unlike traditional methods, the system offers 24/7 assistance, improving efficiency and user satisfaction. It not only answers queries but also incorporates self-learning capabilities to enhance service quality over time. This implementation addresses the need for scalability and cost-effectiveness, making it a valuable tool in academic environments. The literature highlights the system's potential to transform inquiry management in colleges.

[6] Harshala Gawade et al. (2020) proposed a College Enquiry Chat-Bot system designed to provide a virtual assistant for resolving college-related queries. The system utilizes Artificial Intelligence and a database-driven approach to simulate human-like interactions via text or text-to-speech communication. Built with algorithms that analyze user queries, it addresses questions on admissions, fees, scholarships, timetables, and more. The chatbot leverages platforms like AIML and chat fuel to manage queries efficiently, offering responses in text, images, or card formats. The system is aimed at reducing manual effort, providing quicker resolutions, and enhancing the user experience during the academic inquiry process.

[7] Yaseen E. and Swamydoss D. (2023) proposed a College Chatbot system developed using Python Flask to provide students with a user-friendly platform for accessing college-related information. The chatbot is designed to simulate

human-like conversations, addressing queries related to admissions, academics, courses, student life, and more. Integrated with the college's system and external APIs, it delivers up-to-date and personalized responses using Natural Language Processing (NLP). The system aims to reduce the time students spend searching for information and enhance their experience by offering quick, accessible, and automated assistance. This chatbot also provides administrators with full control over chatbot data and user interaction history, ensuring efficiency and scalability.

[8] Shashank Bhalotia et al. (2018) proposed a chatbot system for college inquiries, integrating AI and Natural Language Processing (NLP) to enhance the user experience on college websites. The system efficiently handles queries related to admissions, examination details, attendance, grade points, and placement activities. By utilizing a predefined knowledge base and semantic sentence similarity algorithms, the chatbot analyzes user input and provides accurate responses. This system addresses challenges like slow website navigation and difficulty in locating information for non-students, offering a user-friendly and time-saving solution through a conversational interface. It ensures personalized and effective assistance to users.

[9] Amol Halvankar et al. (2024) proposed a college inquiry chatbot system utilizing Artificial Intelligence (AI) and Natural Language Processing (NLP) to address student queries related to admissions, academics, fees, and other activities. The chatbot integrates algorithms to analyze user questions and provide appropriate responses through a conversational user interface. Designed as a web-based application, it enhances user experience by offering a quick, accessible, and efficient platform to resolve inquiries without requiring physical visits to the institution. The system aims to reduce the workload on college staff, improve service quality, and provide 24/7 assistance for students and users across various devices.

[10] Guruswami Hiremath et al. (2020) proposed a chatbot system designed specifically for the education sector to provide automated responses to user queries. Unlike existing chatbots that rely solely on local databases, their system integrates both local and web databases, making it scalable and highly interactive. The chatbot employs techniques such as Natural Language Processing (NLP), pattern matching, machine learning, and data processing algorithms to enhance response accuracy and performance. The system aims to improve user experience by offering dynamic and context-aware answers, ensuring seamless communication and adaptability to new information.

3. SYSTEM ARCHITECTURE

The system architecture consists of a client-server model where the frontend interacts with the backend through HTTP requests. The Flask server handles user authentication, processes user inputs through NLP

techniques, and fetches appropriate responses based on predefined intents stored in a JSON file. The system also integrates with MySQL for user data management.

Users interact with the chatbot through a web-based interface. The interface supports text input, speech recognition, and multilingual functionality. Flask app acts as the middleware, managing client-server communication. Processes user inputs, performs intent detection, and generates responses. Handles requests for translation, speech recognition, and database queries. The NLP Engine preprocesses user inputs to remove noise and standardize text. Performs intent classification using TF-IDF vectorization and cosine similarity. Also, a MySQL database is used to store user credentials to support authentication. And the bot has predefined dictionaries to handle common regional terms. Google Translator API supports dynamic multilingual interactions. There are Speech-to-text and text-to-speech functionalities to enhance accessibility.

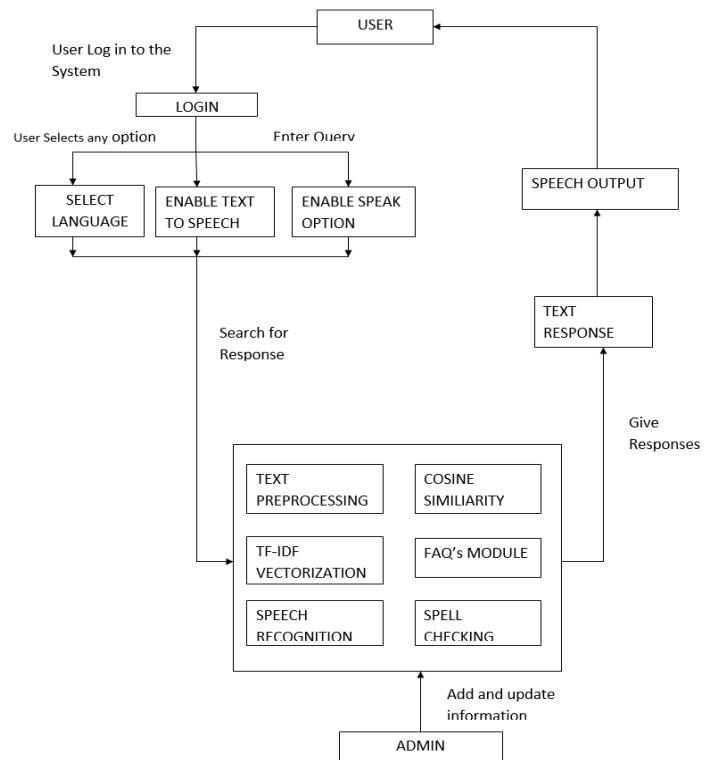


Fig -1: System Architecture

3.1 User Login:

The user logs in to the system. Then the system verifies the user's credentials.

3.2 User Input:

The user selects any of the option/s such as Select Language, Enable Text-to-Speech, and Enable Speech Option. When the user clicks on the select language dropdown, they will be

provided three options. They can select either English, Kannada, or Telugu.

When the user enables the text-to-speech feature, the user will be receiving output in the form of text as well as speech. If the user wants to stop the text-to-speech feature, they can do so by unchecking the enable text-to-speech button.

Once the user enables the speech-to-text feature by clicking the speak button, the user will be prompted to ask their query vocally. The system receives the user's input.

3.3 Processing:

The system preprocesses the user's text input. And then system converts the user's text into a vector representation using TF-IDF. If the user would have enabled speak feature to give input, then the system converts the user's speech input into text. The system compares the user's input to a database of responses using cosine similarity. The system searches for relevant responses in a database. The system checks the spelling of the user's input.

3.4 Response Generation:

The system generates a response based on the processed input. The response can be in text or speech format.

3.5 Output:

The system displays the response to the user.

3.6 Administration:

An administrator can add and update information to the system's database.

4.METHODOLOGY

4.1 Flask Application

The Flask app serves as the main backend, managing routing, database interactions, and chatbot logic. It handles user registration and login, connects to a MySQL database to authenticate users, and manages sessions. It also processes user inputs, interacts with the chatbot model to generate responses, and returns them to the frontend.

4.2 Natural Language Processing (NLP)

NLP forms the core of the chatbot's functionality, enabling the system to interpret and process user queries. The NLP pipeline begins with text preprocessing, which includes tokenization, lemmatization, and the removal of stop-words to standardize inputs.

For the algorithm to understand these sentences, require to get the words in a sentence and explain them individually to our algorithm. So, you break down your sentence into its

constituent words and save them. This process is called tokenizing, and each word is called a token [9].

Lemmatization is a text pre-processing method that helps in natural language processing (NLP) models to break a word down to its root meaning to find similarities [9].

These steps help reduce noise and ensure more accurate intent detection. A spell correction module corrects typographical errors, while predefined word dictionaries support regional language translations for Kannada and Telugu. TF-IDF vectorization transforms processed text into numerical representations, making it suitable for further computation, such as cosine similarity-based matching. This NLP layer ensures the chatbot can handle diverse phrasing and linguistic variations effectively.

4.3 Chatbot Logic

The chatbot's logic is built on a rule-based intent matching system enhanced with flexible response mechanisms. User inputs are matched against a predefined corpus of intents stored in a JSON file. If a match is found based on similarity thresholds, the corresponding response is selected and returned. For queries that do not fit predefined intents, the chatbot also uses spell checking, even in the case of spelling errors it provides the appropriate output. The chatbot logic also supports multilingual translation by using Google Translator API for dynamic response generation in the user's preferred language. Additional features, such as session management, ensure continuity during prolonged interactions. When the user is inactive for more than 30 seconds the chatbot prompts the user to enter their query.

4.4 MySQL Integration

MySQL is used for handling user data, including registration and login credentials. The module interacts with the database to store and retrieve user information, ensuring secure authentication. It also manages error handling for database operations, such as handling duplicate entries during registration.

4.5 Frontend (HTML/CSS/JavaScript)

The user interface is implemented in HTML, styled with CSS, and made interactive using JavaScript. The frontend includes a chat container for displaying user and bot messages, a language selection dropdown for multilingual support, and buttons for speech-to-text input as well as text-to-speech output. JavaScript handles user input events, enabling dynamic interactions with the backend Flask application. The layout ensures that the user experience remains seamless, with features like scrollable message histories and real-time updates enhancing usability. The chat interface supports sending messages, displays bot responses dynamically, and includes a timeout feature for displaying system messages after inactivity.

4.6 Intent Definition

A JSON file defines the structure of the chatbot's knowledge base. It includes various intents, each containing patterns (possible user inputs) and corresponding responses. The chatbot uses this file to determine the most relevant response based on the user's query. This modular setup allows for easy updates and expansions of the chatbot's capabilities.

5. CONCLUSIONS

The chatbot project is an integration of cutting-edge technologies to deliver a seamless, user-centric solution for college-related inquiries. By integrating NLP techniques, multilingual support, and robust database management, the system effectively automates repetitive tasks, thereby enhancing efficiency and reducing the workload of human operators.

This is one of the greatest strengths of the system: its ability to be adaptive with linguistic diversity, from users speaking English to those preferring regional languages such as Kannada and Telugu. Speech recognition and TTS functionality enhance the scope of its use for various demographics.

Although the chatbot is really accurate in intent detection and response generation, there is still room to improve in ambiguity handling of the user input and regional dialect handling. Future work will be the use of deep learning models in more sophisticated ways for intent recognition and further expand the language supported by the system. Personalized user interactions along with data-driven insights can also be added to improve the utility of the system even further.

This project makes clear the transformative potential of AI in educational contexts by offering a scalable, cost-effective solution that any institution worldwide can take up. It sets a benchmark on chatbots for the applications that advanced technologies can be used to meet the growing demand for automated and efficient query resolution.

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