

AI-Driven Android Chatbot for College Help Desk Automation

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Abstract: A Chatbot, also referred to as a chatterbot, is developed to interact with users through conversation. When a question is asked, the chatbot analyzes the input and identifies the appropriate response. It functions by comparing the user's input with predefined intents and their associated responses. The proposed system utilizes a pattern-matching algorithm, where input sentences are tokenized and matched against a trained set of patterns. This technical paper focuses on developing a professional college help desk system using an Android-based chatbot, integrated with artificial intelligence and virtual assistant technologies for human-machine interaction. The chatbot captures user input in natural language and transmits it to a server for processing and generating appropriate responses. The system is designed to automatically address queries related to admissions, course information, campus facilities, and student support services. Its primary objectives are to reduce administrative workload, ensure quicker response times, and provide round-the-clock assistance.

Keywords: Artificial Intelligence, Database, Intelligence Machine, Natural Language Processing (NLP), Pattern Matching Algorithm, Android Application, College Help Desk, Virtual Assistant

1. Introduction

The chatbot is primarily designed to provide quick and easy way to communicate with teacher, parent and students. It helps colleges by organizing scattered and inconsistent information related to the academic calendar, ensuring that students receive accurate and timely updates, including important notices. Smart Campus aims to bridge the communication gap between college management, faculty, and students by using the MVC architecture, which separates key functions like data management, mobile access, and communication. This structure ensures easy maintenance and makes the system accessible on student and faculty devices. With a user-friendly graphical interface, the chatbot creates a real-time conversation experience. After logging in and registering, users can access various help pages where they can ask questions about college activities. The system provides quick responses and allows users to view information such as the date and time of events.

This paper proposes a user-friendly system to keep students informed about college activities. It also includes a web-based notice board feature that allows the display of text notices and PDF files for easy access to important information.

The system will analyze user queries by extracting key terms and searching a knowledge base for relevant answers. If a match is found, the system will provide the appropriate response. If not, the message "Response to this question is not available at the moment, please check back later" will be displayed.

A chatbot, also known as a conversational agent or talk bot, is a computer program that interacts with users through text or voice conversations. By simulating human-like dialogue, chatbots can effectively communicate with users and provide assistance.

The College Inquiry Chatbot uses AI to understand user messages and provide helpful responses to college-related queries, serving as a conversational interface for users.

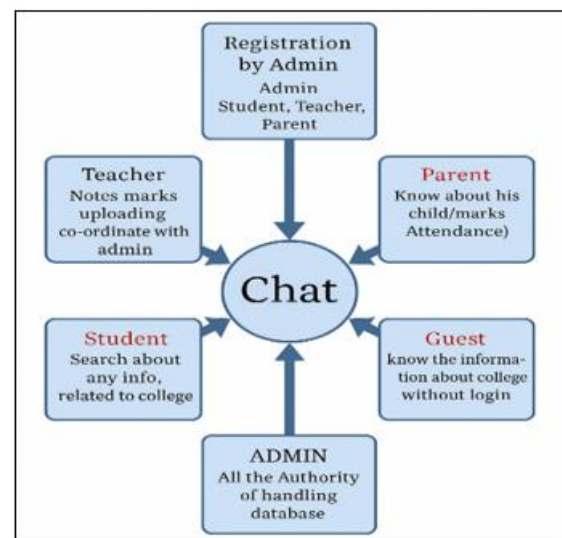


Figure 1: Chat system functional overview

2. Literature Survey

The "College Inquiry Chat Bot" project was proposed by Prof. Girish Wadhwa [1] in March–April 2017. This system utilizes artificial intelligence algorithms to evaluate user queries and comprehend user messages. Students need to select a department category before posing their questions, allowing the chatbot to retrieve accurate information. The project focuses on designing an algorithm to find responses to user-submitted questions and establishing a web interface connected to a backend database for storing requests, responses, keywords, logs, and feedback messages. Bayu Setiaji [2] published "Chatbot Using Knowledge in Database" in 2016.

In this work, the chatbot aims to simulate human-machine interaction by recognizing text inputs and making decisions based on a built-in knowledge database. Sentence similarity calculations are performed by breaking down sentences into characters, and the system matches inputs using structured queries (SQL) on the database. Entity-relationship diagrams were designed to model the chatbot's knowledge base, resulting in 11 entities and their relationships. The first chatbot to implement a pattern-matching algorithm was Eliza,

developed by Joseph Weizenbaum [3] in 1964.

Eliza used a set of pattern-matching rules to simulate conversation. Later, the rule-based chatbot ALICE, built using Artificial Intelligence Markup Language (AIML), expanded this approach by offering more than 40,000 categories of pattern-response pairs. Md. Shahriar Satu and Shamim-Al-Mamun [4] evaluated chatbot applications using AIML, highlighting its portability, simplicity, and effectiveness in conversational systems. Thomas N. T. Amrita Vishwa [5] developed an AIML and Latent Semantic Analysis (LSA)-based chatbot for customer support in e-commerce platforms. Their work demonstrated that enhancing chatbot models with additional semantic analysis can significantly improve the accuracy and relevance of responses.

Rushabh Jain and Burhanuddin Lokhandwala [6] explored the integration of chatbot into Android applications. They proposed a methodology for building conversational agents on mobile platforms to enhance user accessibility and portability. Traian Rebedea and Emanuela Haller [7] discussed the creation of a chatbot representing a historical figure, as presented in an IEEE conference in July 2013. Their work focused on extracting personality traits and important life events from web documents to build an agent that can interact with users in educational contexts, particularly in Computer-Supported Collaborative Learning (CSCL) environments.

Finally, Maja Pantic, Robbert Jan Grootjans, and Reinier Zwitserloot [8], in their paper "Teaching Introductory Artificial Intelligence Using a Basic Agent Framework," presented in IEEE Transactions on Education (Vol. 48, No. 3, August 2005), introduced a simple Java-based agent framework designed for educational purposes. They aimed to provide first-year computer science students with a user-friendly platform to learn fundamental concepts of artificial intelligence through hands-on experimentation.

In the development of chatbot systems, solving the underlying problem statements often involves addressing satisfiability issues. These issues can be analyzed using principles from Modern Algebra and computational complexity theory, specifically through the classification of problems into P, NP, and NP-Complete categories [1], [2]. Polynomial time problems, such as finding the maximum element in an array or verifying whether a string is a palindrome, are solvable efficiently with algorithms having complexities like $O(n)$, $O(n^2)$, or $O(n^3)$ [3]. These problems fall within the P class and are considered computationally viable for real-time chatbot systems.

However, certain challenges, such as the Traveling Salesman Problem (TSP) and the Subset Sum Problem, belong to the NP-Complete class [4]. These problems do not currently have known deterministic polynomial-time solutions. For example, determining whether a subset of numbers sums to zero (Subset Sum) is an NP problem, where verifying a solution is quick, but finding the solution is computationally intensive [5]. Although a deterministic polynomial solution is not guaranteed, once a solution is found, it can be validated in polynomial time. This understanding is crucial when

designing chatbot backends that must handle large datasets, complex user queries, or dynamic decision-making processes [6].

The existing approach for developing chatbot systems typically includes using cloud-based solutions like Microsoft Azure Bot Service, LUIS (Language Understanding Intelligent Service), QnA Maker, and Microsoft Cognitive Services Text Analytics [7]. These platforms provide natural language processing, intent recognition, and question-answering capabilities, significantly reducing the development overhead [8]. However, many current chatbot systems are heavily script-driven and lack the ability to handle unexpected user inputs or emotional nuances in conversation [9].

The College Inquiry Chatbot system builds upon these existing technologies while addressing key shortcomings. By integrating sentiment analysis and active learning, the proposed chatbot can better understand user emotions, adjust its responses dynamically, and continuously learn from new user interactions [10]. This ensures that the system can provide more empathetic, context-aware, and flexible support for users, significantly enhancing the overall user experience compared to traditional rigid chatbots [11].

3. Proposed Work

The proposed system is a comprehensive web- and mobile-based academic management and assistance platform that integrates administrative tools with intelligent student support features. The architecture comprises two primary panels—Administrator Panel and Student Panel—each designed with tailored functionalities to streamline academic processes and enhance learner engagement.

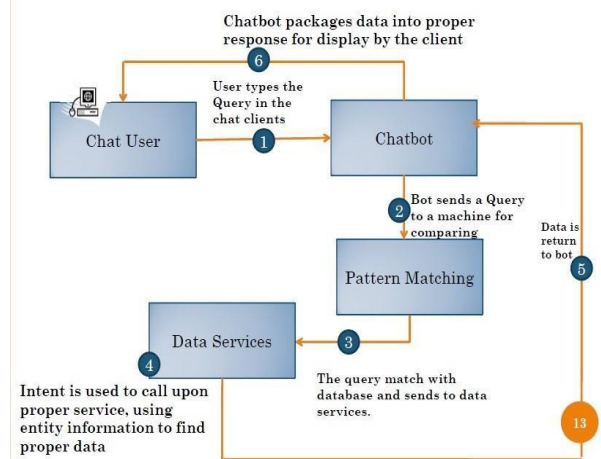


Figure 2: System Architecture

3.1 Administrator Panel

The Administrator Panel offers a secure and efficient interface for managing academic data and student records:

- Scholar Registration:** A secure student registration system allows administrators to enroll scholars into the platform. Upon registration, a unique password is auto-generated and sent to the scholar's registered email address, ensuring authorized access and confidentiality of login credentials.

- **Course and Subject Management:** Administrators can add, update, or delete courses and subjects based on the semester structure. The system ensures that any modifications are instantly reflected, allowing dynamic and real-time curriculum management.
- **Semester Schedule Upload:** Semester timetables are uploaded in JPEG format and made accessible through the student mobile application. Students can view, zoom in, and download these schedules, providing convenience and accessibility.
- **Academic Document Management:** Essential academic resources such as lecture notes, internal test papers, and reports are uploaded in PDF format. These documents are categorized based on course and semester, allowing structured and easy access to academic content.

3.2 Student Panel

The Student Panel is designed to provide secure access and intelligent academic support:

- **Secure Login:** Students log in using credentials received via email. Secure session handling ensures data protection throughout the user session.
- **Exam Solution Viewing:** Integration with Google Docs enables students to view past exam solutions categorized by course and semester, assisting in effective preparation for upcoming assessments.
- **Weekly Grade Tracking:** The system visualizes student performance using interactive charts. Line charts illustrate individual performance trends compared to class averages and highest scores, while pie charts display grade distribution, offering comprehensive insight into academic progress.
- **Hyperlink and Voice-Based Access:** The system provides hyperlinks to university resources such as event details, photo galleries, and department-specific announcements. A built-in chatbot equipped with text-to-speech (TTS) functionality reads out solutions to user queries, enhancing accessibility for diverse learners.

3.3 Special Features

The platform includes an AI-powered Chabot that significantly extends its capabilities:

- **Pattern Matching Algorithm:** The Chabot uses natural language processing (NLP) techniques and pattern-matching algorithms to understand and respond to user queries effectively.
- **Sentiment Analysis and Active Learning:** The Chabot incorporates sentiment analysis to identify the emotional tone of student queries and adapt its responses accordingly. An active learning framework allows continuous improvement through feedback and newly encountered queries.

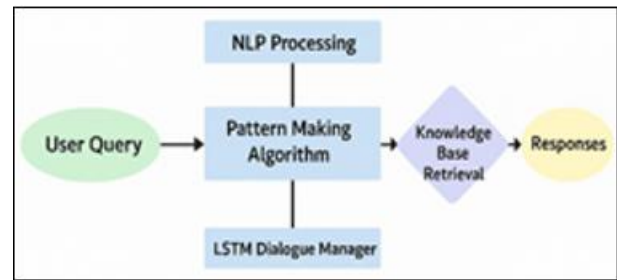


Figure 3: Chabot Workflow Diagram

- **Efficient NP-Problem Handling:** To handle complex computational tasks like intent classification and response generation from large datasets (analogous to NP-hard problems), the system leverages optimized polynomial-time algorithms to ensure rapid response times while minimizing server load. This paperwork aims to provide a unified academic platform that not only supports administrative efficiency but also promotes student engagement through intelligent, responsive, and accessible design principles. By integrating AI-driven features with practical academic workflows, the system addresses key challenges in digital education environments.

4. Results and Discussion

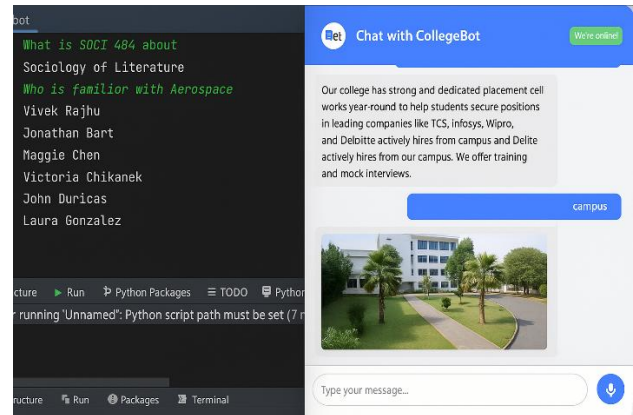
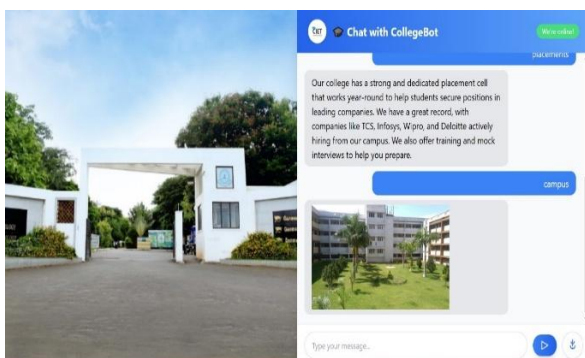
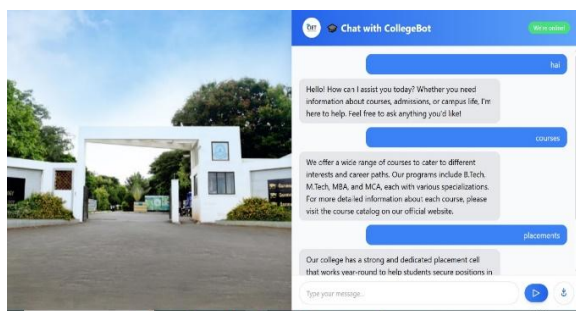
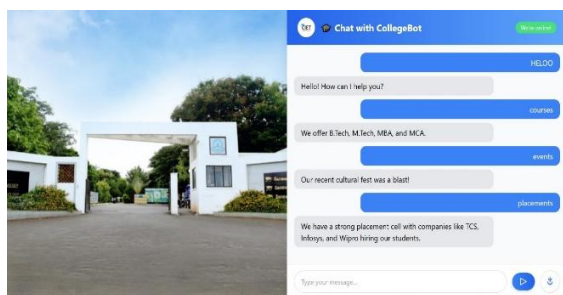
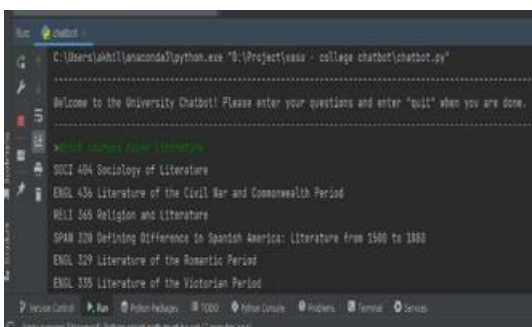
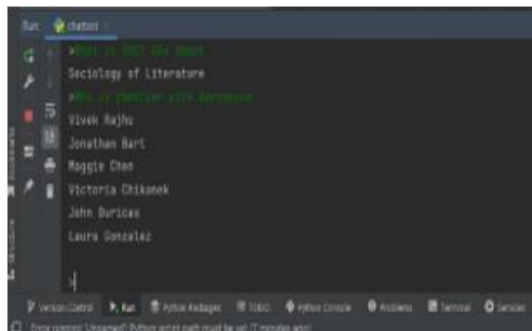
In traditional college enquiry systems, students typically had to visit the college physically, call the administration office, or browse through complicated websites to find information related to admissions, courses, fees, placements, and events. In some cases, basic Chabot's existed, but they lacked secure access, were limited to fixed responses, and often failed to handle user queries efficiently. Most existing chatbot did not integrate login security, had slow response times, and provided static information without personalization, making the overall user experience less engaging and sometimes frustrating.

The proposed system successfully integrates a College Chatbot (CollegeBot) with a secure login page. The developed College Enquiry Chatbot System ("CollegeBot") improves upon existing solutions by integrating a secure login page that allows only authorized users to interact with the bot. After successful login, users can instantly ask queries regarding admissions, programs, events, placements, and campus life. The chatbot uses a knowledgeable database and NLP techniques to fetch relevant and dynamic responses based on keywords.

It offers quick replies related to top recruiters like TCS, Infosys, and Wipro and provides information about available courses and recent events. Additionally, the system features a clean, user-friendly interface with attractive colors and icons, fast loading speeds, and error-free functioning, resulting in an enhanced and more satisfying user experience.

After logging in, users can interact with CollegeBot for quick access to campus-related information chatbot responds to keywords like courses, events, and placements, providing dynamic replies such as available programs, recent campus events, and placement opportunities with top companies like TCS, Infosys, and Wipro. The bot intelligently fetches and

displays predefined answers related to user queries, enhancing user experience through instant support. The system uses a clean and user-friendly interface with bright colors, icons, and attractive layout, making it intuitive even for first-time users.



5. Conclusion

The CollegeBot system provides an efficient solution for enhancing communication between the institution and users. By integrating a Chabot with a secure login page, the system ensures that the information is delivered quickly, reliably, and securely. The Chabot reduces the workload on administrative staff and improves the user experience by providing immediate answers to frequently asked questions. Overall, the developed system is effective in creating an interactive and accessible communication platform for colleges. The fastest-growing technology in history is artificial intelligence. Utilizing a database that is both artificially intelligent and knowledgeable. We can transform virtual aid and pattern matching. With the use of a virtual assistant and an artificially intelligent database, this technique builds an Android-based Chabot. We can develop a Chabot that answers to user enquiries and can distinguish between human and computer speech.

6. Advantages and Future Work

- **24/7 Availability:** The Chabot provides information at any time without needing human support.
- **User Authentication:** Secure login ensures that only authorized individuals interact with the system.
- **Time-Saving:** Students get immediate answers without searching through websites or contacting college staff.
- **Scalability:** Easily extendable with more intents (questions and answers) like hostel info, faculty details, scholarship opportunities, etc.
- **User-Friendly Interface:** Simple and modern UI that's easy to use for students, parents, and visitors.
- **Increased Engagement:** The personalized experience encourages more interaction with college service.
- **Google Assistant / Alexa Integration:** Expand the Chabot's capabilities to work with smart assistants.
- **Admin Dashboard:** Add a backend where admins can easily update Chabot responses without touching the code.
- **Analytics Module:** Track user queries to understand what information users seek most and improve services accordingly.
- **Multilingual Support:** Enable the Chabot to communicate in regional languages like Tamil, Hindi, and Telugu.
- **Student-Specific Responses:** Customize responses based on the user's course or year once logged in.

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