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Intelligent Campusgenie Chatbot Using Deep Learning

¹ *Murugeswari*, ² *Ezhumalai M*, ³ *Karthikeyan S*, ⁴ *Kingslin A*, ⁵ *Bharath Kumar S*

Assistant Professor^[1], UG Student^[2,3,4,5]

^{1 2 3 4 5} Department of Artificial Intelligence And Data Science, Dhanalakshmi Srinivasan Engineering College Perambalur, Tamil Nadu, India

Eswariram13@gmail.com¹, ezhumalaimurugan234@gmail.com², karthi230723@gmail.com³, kingslin29102003@gmail.com⁴

bharathpoongodi804@gmail.com⁵

ABSTRACT:

In recent years, the integration of artificial intelligence (AI) in educational institutions has significantly transformed the way students and faculty interact with administrative systems. This research paper proposes the development of an AI-based College Chatbot System utilizing Recurrent Neural Networks (RNNs) for intelligent and context-aware communication. The chatbot is designed to serve multiple user roles—students, faculty, and administrators—by providing tailored access to modules such as Authentication and Role-Based Access Control, Student and Staff Details Management, Attendance Monitoring, Notifications and Alerts, and an AI-powered Career Guidance System. The backend of the system is developed using Python, Flask, and MySQL, while the chatbot employs TensorFlow-based RNNs for generating human-like, dynamic responses. The model interprets user queries and responds appropriately by analyzing not just the input query but also contextual data such as academic history and predefined institutional rules. NLP techniques, combined with fuzzy string matching, ensure that even imprecise or typo-prone queries are accurately resolved and directed to relevant modules. The system architecture demonstrates high scalability and accuracy in managing academic information and responding to natural language queries. This approach enhances student engagement, reduces the administrative workload, and fosters a more connected and interactive campus environment. The findings from this implementation indicate that deep learning models, especially RNNs, hold significant potential in developing responsive and intelligent educational support systems.

Keywords: College Chatbot, Recurrent Neural Network (RNN), Natural Language Processing (NLP), Flask, MySQL, Student Management, Career Guidance, AI in Education.

INTRODUCTION:

The integration of artificial intelligence (AI) and machine learning (ML) into education has opened up new avenues for enhancing administrative efficiency and student engagement. One of the most promising applications of AI in the academic domain is the development of intelligent chatbot systems capable of automating responses, managing academic records, and assisting students and faculty with real-time information retrieval. Traditional student support systems are often overwhelmed with repetitive queries, delays, and human errors, making it difficult to provide timely and consistent support. This project addresses these challenges by introducing an AI-powered **College Chatbot System** built using **Recurrent Neural Networks (RNNs)**, a type of deep learning architecture particularly suited for sequential data and natural language processing (NLP). The chatbot system is designed to cater to three major user roles—**students, faculty, and administrators**—each with role-specific access and functionality. The chatbot not only responds to general queries but also performs advanced tasks such as displaying attendance records, accessing academic information, managing staff and student details, sending alerts and notifications, and offering AI-based career recommendations. The RNN model enables the system to understand and respond to complex, context-aware natural language queries, providing a user-friendly and dynamic interface. Developed using **Python, Flask, and MySQL**, the system is modular and extensible, allowing for future upgrades and scalability. Furthermore, the integration of **NLP techniques** and **fuzzy string matching** ensures robustness in interpreting user input, even in the presence of spelling mistakes or informal language. By automating a significant portion of college administrative functions and enhancing interaction through intelligent conversation, this project aims to revolutionize student services and support infrastructure in educational institutions.

EXISTING SYSTEM:

In many educational institutions, student interaction with college systems such as attendance tracking, academic information retrieval, and career counseling is typically handled through static web portals, manual administrative processes, or help desks. These systems are often non-interactive and require users to browse through multiple web pages or physically visit administrative offices to access even the simplest information. Common activities like checking attendance, exam schedules, or receiving announcements are either posted manually or communicated via notices and emails, which can lead to delays and missed updates. The traditional systems are also highly compartmentalized. For instance, attendance data may be maintained in spreadsheets, academic records in separate databases, and notifications via emails or SMS services. This fragmentation makes it difficult for users to get a unified and consistent experience. Furthermore, these systems generally do not support any form of natural language input. Students

and staff have to adapt to the rigid structure of dropdown menus, predefined forms, and static queries, which limits accessibility and usability. Career guidance in these systems is typically offered through annual seminars, workshops, or one-on-one sessions with counselors. These methods, while helpful, are not personalized or readily available to all students. They also do not leverage data such as student interests or academic performance to provide tailored advice. Additionally, many of the existing solutions are not optimized for mobile usage, lack real-time interactivity, and are resource-intensive to maintain, especially in institutions with growing student populations.

DRAWBACKS:

- Lack of integration between different functional modules
- No natural language processing (NLP) based interaction
- No AI-based recommendations for career planning
- Lack of real-time notifications and alerts
- Poor user experience for both students and faculty

PROPOSED SYSTEM :

The Campusgenie proposes a centralized, intelligent, and fully integrated platform that overcomes the limitations of the existing systems. Key features of the proposed system include Users can interact naturally through a chat interface. Handles general queries (college information, staff information, attendance details) as well as dynamic queries (personal attendance, grades). Different dashboards and functionalities based on the user role (Student, Faculty, Admin). Students can check academic progress and attendance. Faculty can manage attendance and student records. Admin can manage users, notifications, and global settings. Faculty can mark attendance through the system. Students can view their own attendance in real-time. Automated alerts and notifications to students and faculty for important updates. Real-time message delivery through the chatbot interface. Personalized career suggestions based on academic records, interests, and current industry trends. AI models (like GPT-style recommendations) are used to provide guidance on courses, certifications, and career paths.

ADVANTAGES :

- Unified platform for all users
 - Real-time database interaction
 - Improved communication and transparency
 - Smart recommendations for students
1. Reduced workload for administrative staff
 2. Enhanced user engagement and satisfaction

SYSTEM ARCHITECTURE:

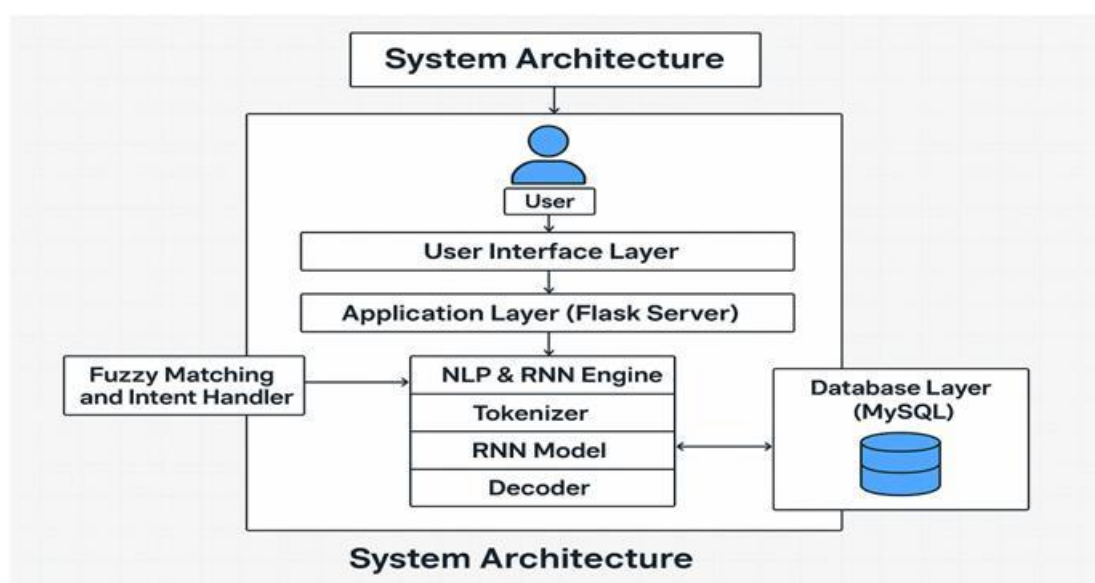


Fig 1. System Architecture

LIST OF MODULES :

- Authentication and User Management Module
- Student Details Management Module
- Staff Details Management Module
- College Information Module
- Attendance Management Module
- Notifications and Alerts Module
- Career Guidance Module
- Chatbot Interface

MODULE DESCRIPTION :***1. Authentication and User Management Module***

This module manages the entry point of the system by ensuring secure login and registration functionalities. It enables students, faculty, and administrators to sign up and access their respective dashboards based on their roles. Key features include User registration with role selection (Student, Faculty, Admin), Login with password encryption for security, Role-based access control: ensuring users see only permitted modules, Forgot password and reset password functionalities, Session management to maintain secure user sessions.

2. Student Details Management Module

This module allows management of all student-related information in the database. Admins can add, edit, and delete student profiles, while students can view their academic details. Key features include Student personal information management (Name, Roll Number, Department, Year, etc.), Academic record viewing (Grades, Subjects enrolled), Attendance history viewing, Option to update limited personal information (like phone number, email) by students themselves. Importance: Maintaining updated student data helps automate processes like report generation, attendance tracking, and personalized career advice

3. Staff Details Management Module

The Staff Management Module stores and manages the faculty details necessary for academic activities. Faculty profile management (Name, Employee ID, Department, Subjects taught), Assignment of subjects and classes to faculty. Faculty dashboard access to manage student attendance and notifications. Faculty can update their teaching schedules. Importance: This module simplifies managing a large number of faculty members and their responsibilities in a college environment.

4. College Information Module

This module acts as an information board for the college. It provides general information about the college, upcoming events, important notices, and exam schedules. Display of latest news and updates. Timetables and academic calendars. Holiday announcements and circulars. Event reminders and registration links. Importance: Students and staff can stay informed about important academic and non-academic events without manual notifications.

5. Attendance Management Module

Attendance tracking is a crucial aspect of any academic institution. This module allows faculty to mark and update student attendance and allows students to view their own records. Faculty login to mark daily attendance. Update/correct attendance records. Students can view their monthly or subject-wise attendance reports. Admins can generate complete attendance summaries. Importance: Accurate attendance tracking improves academic discipline and transparency.

6. Notifications and Alerts Module

This module is responsible for delivering important communications and alerts to different users based on their roles. Admins/Faculty can send notices to students. Scheduled and real-time notifications. Notification categories (Academic, Administrative, Emergency). Alert history for future reference. Importance: Timely communication of updates and emergencies ensures the smooth functioning of the institution.

7. Career Guidance Module

The Career Guidance Module integrates AI to help students make informed career decisions based on their academic performance and interests. Personalized career recommendations using AI (trained on student performance and market trends). Suggestions for higher education,

certifications, and job roles. Linking with external resources like online courses and job portals. Chatbot-based queries like "Suggest me a career" or "Which certification should I do?". Importance: This empowers students to choose appropriate career paths based on real data and future trends rather than guesswork.

8. Chatbot Interface

The Chatbot Module is the centerpiece of the project, providing an intelligent conversational interface for users to interact with the system naturally. Understands natural language questions. NLP (Natural Language Processing) and fuzzy matching to detect user intent. Answers questions like "Show my attendance," "Go to dashboard," or "Update my profile". Smart redirection to appropriate modules/pages automatically. Handles minor spelling mistakes and synonyms to improve usability. Importance: A conversational AI makes the system user-friendly, modern, and accessible even to non-technical users.

RESULT:

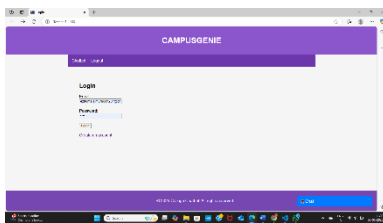


Fig.2

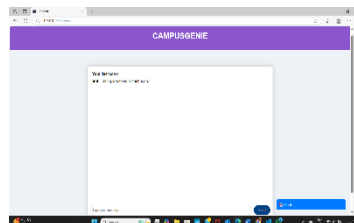


Fig.3

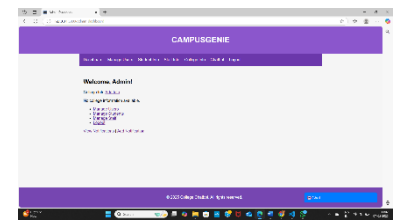


Fig.4

CONCLUSION:

This project successfully demonstrates the implementation of a college chatbot system powered by Recurrent Neural Networks (RNN) for smart academic support. By integrating natural language processing, role-based access, and database connectivity, the chatbot enhances student, faculty, and admin interactions. It automates routine tasks like attendance checking, staff queries, and academic updates. The RNN model enables contextual and dynamic responses to user queries. The system reduces administrative load while improving accessibility and engagement. Fuzzy matching improves flexibility in input handling. Future enhancements may include voice input and multilingual support.

FUTURE ENHANCEMENT:

Multilingual Support: Integrate language translation APIs so the chatbot can interact in multiple regional and international languages, making it accessible to a wider audience. **Voice-Based Interaction:** Enable voice input and output using speech recognition and text-to-speech technologies, allowing users to talk to the chatbot naturally. **Context-Aware Conversations:** Improve the RNN model to remember conversation history and context, enabling more intelligent and continuous dialogues. **Integration with External APIs:** Connect the chatbot with third-party APIs for real-time updates on job alerts, exam schedules, and online learning resources. **Mobile App Deployment:** Extend the project to Android/iOS platforms for better accessibility, enabling students and staff to interact from anywhere. **Emotion Detection:** Incorporate sentiment analysis to detect student emotions and provide mental health support or redirect critical cases to counselors. **Adaptive Learning Recommendations:** Personalize career guidance and academic recommendations further using adaptive learning algorithms based on student behavior and performance trends.

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