PCE IT ASSISTANT APPLICATION (An Educational RAG App)

Dr. Nikita Hatwar, Miss. Anushri Mule, Miss. Aditi Sawarkar, Miss. Astha Fulzele,

Mr. Ayush Randive, Mr. Prasanna Gajbhiye

Faculty of Information Technology, Priyadarshini College of Engineering, Nagpur 440019, India

Information Technology, Priyadarshini College of Engineering, Nagpur440019, India

Abstract: The widespread adoption of digital technologies in educational institutions has significantly increased students' reliance on online portals, enterprise resource planning platforms, and placement management systems. This growing dependence has created a need for smarter and more accessible technical support services. Conventional IT helpdesks and manual placement communication methods frequently face issues such as slow response times, restricted availability, and inconsistent information dissemination. To overcome these limitations, this study presents an AI-driven College IT Assistant Application that leverages Retrieval-Augmented Generation (RAG) along with mobile and cloud technologies to deliver automated, context-sensitive support for students. The proposed solution integrates a secure Android application authenticated through ERP credentials with an intelligent chatbot designed to address technical issues related to institutional software, portal access, network connectivity, and system configuration. Furthermore, the application includes a customized Training and Placement module that provides department-specific placement notifications, company insights, and interview preparation materials. A FastAPI-powered backend architecture facilitates scalable interaction among the mobile client, institutional databases, and AI components. Experimental findings indicate that the system enhances response speed, improves accessibility to critical information, and minimizes reliance on traditional manual support processes. Overall, the research demonstrates the potential of hybrid AI and API-driven architectures in building scalable, secure, and student-focused digital support environments for contemporary academic institutions.

Keywords: Artificial Intelligence, Retrieval-Augmented Generation (RAG), Educational Chatbot ,College IT Assistant ,Android Application Development ,FastAPI ,ERP Authentication ,Training and Placement System ,Natural Language Processing (NLP) ,Student Support Automation

I.INTRODUCTION:

The growing integration of digital technologies within higher education has significantly changed the delivery of academic, administrative, and technical services to students. Educational institutions increasingly depend on Enterprise Resource Planning (ERP) solutions, learning management systems, institutional web portals, and digital placement platforms to manage everyday academic and operational activities. Although these systems improve convenience and efficiency, students often face technical issues such as authentication errors, software installation and configuration problems, network connectivity concerns, and challenges in using institutional digital platforms. Traditional support mechanisms, including manual IT desks and email-based assistance, frequently struggle to provide immediate solutions, resulting in delayed issue resolution, decreased productivity, and lower student satisfaction.

Beyond technical assistance, students also need regular access to placement-related resources, including recruitment announcements, aptitude preparation materials, interview guidance, and company-specific updates. In many institutions, such information is disseminated through disconnected communication channels such as emails, notice boards, and messaging groups, which can lead to inconsistent updates and limited accessibility.

To address these concerns, Artificial Intelligence (AI)-enabled support systems have become increasingly relevant in academic settings. Retrieval-Augmented Generation (RAG), in particular, has emerged as an effective approach because it combines information retrieval techniques with natural language generation to produce accurate, context-sensitive, and knowledge-based responses. In contrast to conventional rule-based chatbot systems, RAG-powered assistants can retrieve relevant institutional information dynamically and generate responses customized to specific student queries.

This study introduces the development of an AI-powered College IT Assistant Application that combines a RAG-based chatbot with an integrated Training and Placement module to provide centralized student support through a secure Android application. The system employs ERP-based authentication to ensure secure user access, FastAPI

to manage scalable backend communication, and Jetpack Compose to support modern Android user interface design. By unifying technical support and placement services within a single intelligent platform, the proposed solution seeks to improve support responsiveness, increase student engagement, and modernize institutional service delivery.

Overall, the research demonstrates the practical applicability of hybrid AI–API architectures in creating scalable, dependable, and student-oriented support platforms for future-ready educational institutions.

II.PROBLEM STATEMENT:

More schools now use digital tools, so learners lean heavily on ERP setups, web-based learning sites, one-stop career booking apps - each handles different school chores. Even with progress, glitches pop up: login failures crop, setup hiccups arise unexpectedly, connection drops strike without warning, navigating platforms feels unclear at times. Current fixes? Desk agents by hand, ticketing via message boxes - they drag response speed, function narrow windows, apply uneven solutions across cases, slowing down scholar output, disrupting daily routines. What stays unchanged is how much friction remains in routine tasks.

While job alerts, tips for interviews, plus details about companies pop up across different platforms, they rarely land in one spot. Because these bits show up scattered - on email, groups, notices - it takes extra effort to keep track. Missing key updates becomes likely when nothing ties them together. Too much disorganized info can overwhelm rather than help.

One step at a time, today's learning tools tend to handle tech help or job updates on their own, never blending both into one smart, tailored experience. Hidden behind that gap, plenty of platforms miss strong login controls and real-time guidance that adjusts by itself.

One way to handle these issues? Build a unified digital space that offers instant tech help, safety-checked, along with custom career advice - all running smoothly on one expandable setup. This new college IT helper app runs on artificial intelligence, bringing together live data retrieval, access control tied to school systems, plus tailored information sharing, all inside a phone-friendly hub meant to grow with demand.

III.OBJECTIVES:

The main aim of this research is to design and implement an intelligent College IT Assistant Application that offers automated technical support and customized placement assistance to students through a secure mobile-based platform.

1) To build an AI-driven chatbot utilizing Retrieval-Augmented Generation (RAG) to deliver precise and context-sensitive responses to student IT-related queries.
2) To provide instant technical support for common institutional challenges, including ERP access issues, software setup, network-related problems, and guidance for navigating institutional platforms.
3) To develop a personalized Training and Placement module capable of delivering placement notifications, company information, and interview preparation resources based on students' academic branch and year.
4) To incorporate secure ERP-based authentication mechanisms to ensure authorized system access and safeguard student and institutional information.
5) To establish a scalable backend infrastructure using FastAPI to enable seamless interaction between the mobile application, AI modules, and institutional databases.
6) To design and develop an intuitive Android application with a modern and responsive user interface that enhances accessibility and user engagement.
7) To minimize reliance on manual support services by automating repetitive IT support and placement-related assistance tasks.
8) To improve the effectiveness of institutional support systems through intelligent automation, centralized information management, and continuous 24/7 service availability.

IV.LITERATURE REVIEW :

Sr. No.	Author / Year	Title / System	Methodology / Technology Used	Key Findings	Limitations

1	Alabbas & Alomar (2024)	AI-Powered Student Helpdesk Chatbot	NLP-based chatbot framework for technical student support	Improved accessibility and automated query handling	Limited domain-specific personalization
2	Baviskar (2024)	EduAssist Chatbot	Rule-based chatbot for student admission queries	Reduced manual admission inquiry workload	Restricted to predefined responses
3	Bhardwaj (2021)	College Enquiry Chatbot	Automated academic query system using chatbot logic	Enhanced student engagement with quick responses	Low contextual understanding
4	Bommireddy et al. (2024)	VardhaGenie	AI-integrated student support platform	Demonstrated AI usefulness in educational assistance	Focused only on general support
5	Chandrasekar et al. (2024)	LLM-based Organizational Navigation	Large Language Model for institutional navigation	Improved resource discovery using AI	Did not integrate placement/IT modules
6	Ganesh Kumar et al. (2025)	StudentEase	AI-powered student assistance chatbot	Real-time query resolution and support	Lacked secure ERP integration
7	Kothawade (2025)	AI Powered Student Assistant Chatbot	NLP + AI chatbot for academic support	Improved automated response generation	Generic responses in domain-specific cases
8	Patil & Dhiman (2025)	College Information Portal AI Chatbot	Centralized AI information portal	Simplified access to academic information	No placement personalization
9	Thamilselvan et al. (2024)	Llama 2 Powered College Chatbot	LLM-based chatbot for website support	Improved conversational support quality	High computational requirements

10	Torres-Cruz et al. (2023)	Bilingual Academic Advice Chatbot	Multilingual NLP chatbot	Enhanced accessibility for diverse students	Limited institutional customization

V.PROPOSED SYSTEM:

A smart college helper arrives by phone, built on Android with safety first. Instead of juggling apps, students tap one place for tech help plus career prep tasks. Inside lives a chatbot that pulls live data before answering - no canned replies. It learns what you need, when you need it, mixing training steps with job search tools. Login works through existing school records so nothing extra to remember. Everything runs behind the scenes but adapts fast if more users join. Help shows up quick because answers come from current databases, not guesswork. This isn't just another portal - it thinks while it serves.

Logging into the app happens through school ERP details, so just approved students get entry. After signing in, they talk with a smart chat helper that answers tech questions about ERP problems, setting up programs, fixing internet hiccups, or how to use college systems. This assistant works by pulling facts from an organized school database first - then crafting replies that fit the situation well.

Besides handling IT help, the platform has a special section for training and job placements. This part sends alerts about opportunities tailored to each learner. Company profiles appear alongside resources for interviews. Past interview queries are included too. Filtering shifts automatically depending on which course and level the student is in. That way, what shows up fits better. Engagement grows when information feels more personal.

Out back, FastAPI handles logins, chatbot messages, job placement details, while linking the front end to artificial intelligence tools through APIs. Android Studio shapes the app's look, where Jetpack Compose builds screens that adapt smoothly, feel current, stay easy to navigate.

A single smart setup could handle campus help tasks automatically. This approach cuts down busywork for staff while making student services easier to reach. Instead of juggling separate tools, everything works together smoothly. Fewer delays happen when requests come in. Support becomes faster because systems respond without waiting. Reliability goes up since errors drop with less human handling. Efficiency improves across departments over time. Scalability means it keeps working well even as demand grow

VI.METHODOLOGY:

The College IT Assistant Application is implemented using a hybrid AI–API framework that combines a Retrieval-Augmented Generation (RAG) chatbot, secure authentication protocols, and a customized Training and Placement assistance module within an Android application. The research methodology for developing the proposed system is structured into the following stages:

1. Requirement Analysis

The initial stage focuses on identifying the major issues students encounter while seeking technical assistance and accessing placement-related information. This analysis is conducted through observation of institutional processes, collection of student feedback, and examination of frequently reported technical and placement concerns. Based on these findings, the functional and non-functional specifications of the system are established.

2. Knowledge Base Construction

Relevant institutional resources—including IT support documents, ERP operation manuals, troubleshooting guides, placement announcements, company information, and commonly asked interview questions—are gathered and organized into a structured knowledge repository. The collected data is cleaned, classified, and indexed to enable efficient retrieval during chatbot interactions.

3. Development of the RAG-Based Chatbot

A Retrieval-Augmented Generation model is designed to facilitate intelligent query handling. Upon receiving a user query, the system identifies and retrieves the most contextually relevant documents from the institutional knowledge repository through semantic similarity matching. These retrieved documents are then provided to the language generation model, which generates an accurate and contextually appropriate response. This retrieval-generation approach enhances factual consistency and minimizes hallucinated responses.

4. Personalized Training and Placement Module

A specialized module is implemented to provide customized placement-related content based on students' branch and academic year. The system filters and presents placement notifications, company profiles, and interview preparation resources according to the authenticated student's academic information, ensuring relevant and personalized content delivery.

5. Secure Authentication Integration

To maintain secure access control, ERP-based authentication is incorporated into the platform for validating student credentials. Password encryption techniques and secure API communication protocols are employed to safeguard user data and preserve confidentiality.

6. Android Frontend Development

The mobile frontend is developed using Android Studio with Jetpack Compose to create a modern and responsive user interface. The application design emphasizes intuitive navigation, smooth interaction, and compatibility across multiple Android devices.

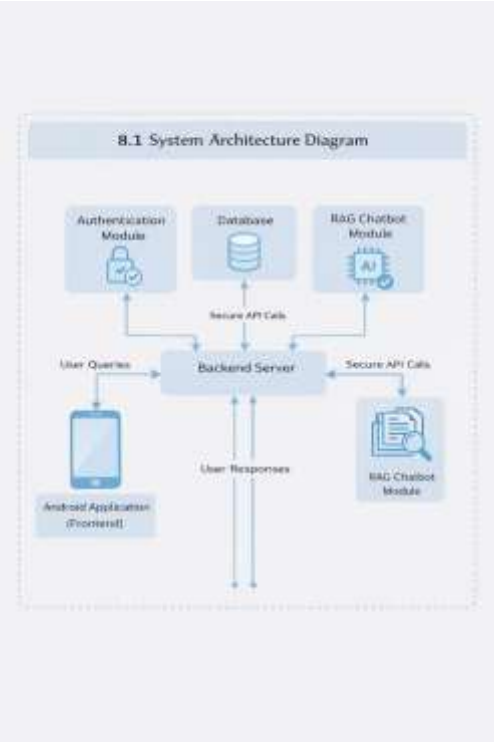
7. Backend API Implementation

A FastAPI-based backend server is developed to manage authentication, chatbot processing, placement information handling, and communication between frontend components and AI services. RESTful API endpoints are implemented to ensure efficient, scalable, and maintainable data exchange.

8. System Testing and Evaluation

The final system undergoes comprehensive functional, integration, and usability testing to validate overall performance. Evaluation metrics such as response latency, retrieval precision, user satisfaction, and operational reliability are measured to determine the effectiveness of the proposed solution.

VII. DIAGRAM & FLOW:



VIII.IMPLEMENTATION AND RESULTS:

The College IT Assistant Application was successfully implemented and tested for automated IT and placement support. The system performed effectively across authentication, AI-based query handling, and personalized placement modules.

ERP-based authentication ensured secure access by validating student credentials. The RAG chatbot accurately responded to technical queries by retrieving relevant information from the institutional knowledge base. The placement module delivered personalized notifications, company details, and interview resources based on student profiles.

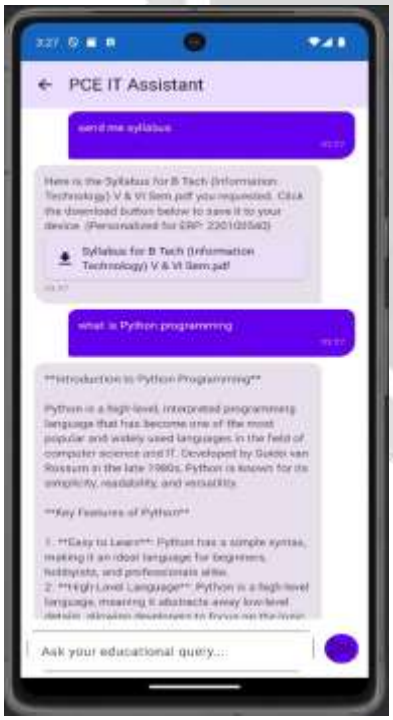
Evaluation showed reduced response time compared to manual support systems, along with improved accessibility and student satisfaction. These results confirm that the proposed hybrid AI–API architecture provides a scalable and efficient solution for intelligent campus support.

A. Student Login

B. Home page

C. Student Registration

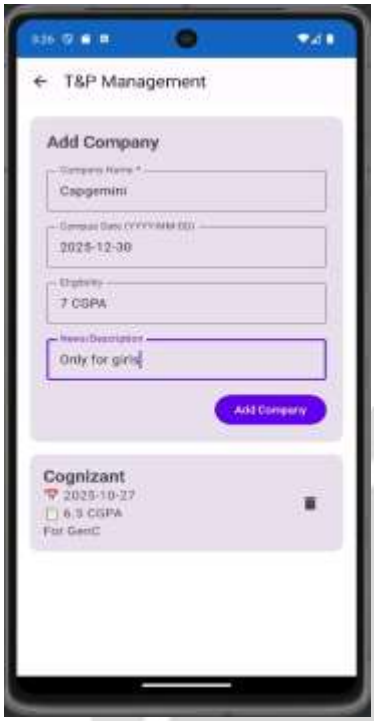
D. Assistant



E. Manage User

F. Admin Dashboard

G. T &P Management



H. T &P Updates

IX.CONCLUSION:

This study presents the design and implementation of an intelligent College IT Assistant Application aimed at enhancing the delivery of technical and placement-related support services for students in academic institutions. The proposed platform integrates a Retrieval-Augmented Generation (RAG) based chatbot with a customized Training and Placement module to create a centralized environment for addressing technical concerns and providing relevant career-related information. Secure ERP-based authentication is incorporated to protect institutional data and ensure authorized user access, while the combination of an Android frontend and FastAPI backend enables efficient, scalable, and user-friendly system operation.

Performance analysis of the developed system demonstrates a considerable reduction in support response time when compared with traditional manual assistance processes. The platform also improves the consistency, availability, and reliability of institutional support services by offering real-time automated assistance. Additionally, the personalized placement component enhances student engagement through branch-specific and year-specific placement updates, thereby streamlining communication and minimizing unnecessary information exposure.

The findings confirm that integrating artificial intelligence with API-driven backend services can significantly enhance digital campus support infrastructures. The proposed framework illustrates a practical and scalable approach for educational institutions seeking to modernize student support services through intelligent automation and secure mobile technologies.

X.REFERENCES:

1) A. Alabbas and K. Alomar, “Tayseer: A Novel AI-Powered Arabic Chatbot Framework for Technical and Vocational Student Helpdesk Services and Enhancing Student Interactions,” Applied Sciences, vol. 14, no. 6, 2024.

2) J. Swacha and M. Gracel, “Retrieval-Augmented Generation (RAG) Chatbots for Education: A Survey of Applications,” Applied Sciences, vol. 15, no. 8, 2025. DOI: 10.3390/app15084234.

3) M. Labib Husain, Y. Wibisono, and A. Anisyah, "Development of an Academic Services Chatbot Based on Retrieval-Augmented Generation (RAG)," Brilliance: Research of Artificial Intelligence, vol. 5, no. 2, 2025. DOI: 10.47709/brilliance.

4) L. Labadze, M. Grigolia, and L. Machaidze, "Role of AI Chatbots in Education: Systematic Literature Review," International Journal of Educational Technology in Higher Education, vol. 20, no. 56, 2023.

5) N. P. Nisanth et al., "RAG-Based AI Chatbot for Student and Institutional Assistance," International Journal for Research in Applied Science and Engineering Technology (IJRASET), 2025. DOI: 10.22214/ijraset.2025.73970.

6) M. Thway et al., "Harnessing GenAI for Higher Education: A Study of a Retrieval Augmented Generation Chatbot's Impact on Learning," Journal of Chemical Education, vol. 102, no. 9, pp. 3849–3857, 2025. DOI: 10.1021/acs.jchemed.5c00113.

7) H. Thamilselvan et al., "Designing a Llama 2-Powered Chatbot for Enhanced College Website Support," in Proceedings of International Conference on Computing Communication and Networking Technologies, 2024.

8) F. Torres-Cruz et al., "Bilingual Chatbot Powered by Artificial Intelligence for Academic Advice," in Global Conference on Technologies and Information Communications, 2023.

9) J. He and C. Xin, "Developing an AI Powered Chatbot to Support the Administration of Middle and High School Cybersecurity Camps," Journal of Cybersecurity Education, Research and Practice, 2021.

10) R. Patil and K. L. Dhiman, "College Information Portal AI Chatbot," International Scientific Journal of Engineering and Management, 2025.