iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** I **Month of publication:** January 2026

DOI: https://doi.org/10.22214/ijraset.2026.76741

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue I Jan 2026- Available at www.ijraset.com

A Review on IT Assistant Application (An Educational RAG App)

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Abstract: ***The increasing reliance of college students on digital systems has created a need for immediate IT support and easy access to career and placement-related information. Conventional support mechanisms often struggle to provide quick technical assistance or placement guidance, particularly beyond regular working hours, resulting in delays and reduced efficiency. To overcome these limitations, the College IT Assistant App has been designed as a smart Android-based platform that combines secure user authentication with an AI-powered Retrieval-Augmented Generation (RAG) chatbot and a dedicated Training & Placement (T&P) module. The application enables students to receive real-time IT assistance, customized placement notifications, and access to previously asked interview questions categorized by academic branch and year. This paper surveys existing AI-driven educational support and placement solutions, highlighting how the integration of RAG models with Android and FastAPI frameworks improves information retrieval accuracy and enhances overall user experience. Additionally, the study discusses the advantages of a modular system architecture, ERP-based secure authentication, and the adoption of Jetpack Compose for modern user interface development. The findings indicate that combining hybrid AI–API architectures with personalized data analytics can greatly enhance the accessibility, dependability, and scalability of IT and placement support systems in higher education.***

Keywords: IT support; Retrieval-Augmented Generation (RAG); Android application development; FastAPI; ERP authentication; AI chatbot; Training & Placement; educational technology

I. INTRODUCTION

In today's academic landscape, information technology (IT) has become an essential component in facilitating teaching, learning, and administrative processes within higher education institutions. Despite this reliance, students often face technical challenges such as authentication failures, software setup issues, and network connectivity problems, which can hinder academic progress and reduce efficiency. In the absence of a centralized, intelligent, and readily available IT support system, students are frequently dependent on manual help desks or delayed email-based assistance. Additionally, as educational institutions continue to adopt digital platforms, there is an increasing demand for integrated solutions that address not only technical concerns but also academic and career-oriented needs in a secure and accessible environment.

To mitigate these issues, the College IT Assistant App has been designed as an intelligent mobile-based platform aimed at streamlining IT support and improving access to institutional information for college students. The application incorporates two primary components: an AI-driven Retrieval-Augmented Generation (RAG) chatbot for resolving IT-related queries and a Training & Placement (T&P) module that delivers curated resources such as company details, previously asked interview questions, and placement notifications tailored to students' academic branch and year. This combined framework enables the automation of technical assistance while simultaneously enhancing student readiness for placement opportunities.

Existing research on educational chatbots and digital support systems largely concentrates on simple question–answer mechanisms or rule-based response models. However, these approaches often fall short when handling complex, context-sensitive, or continuously evolving information. In contrast, RAG-based systems integrate information retrieval with natural language generation to produce more accurate, relevant, and personalized responses. When deployed alongside Android's Model–View–ViewModel (MVVM) architecture and a FastAPI-powered backend, the system achieves improved scalability, modular design, and reliable performance, even in environments with constrained network resources.

Data security and user privacy are also critical considerations in academic applications. Conventional authentication methods frequently lack robust encryption and centralized verification, increasing the risk of data exposure.

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The College IT Assistant App addresses these concerns through ERP-based authentication combined with bcrypt password hashing, ensuring that access to academic and placement-related content is restricted to authenticated users only.

This paper examines the design principles, system architecture, and practical significance of the College IT Assistant App as a comprehensive digital solution for modern academic ecosystems. It emphasizes the integration of AI-enabled RAG models, secure backend services, and contemporary Android user interface development using Jetpack Compose. Additionally, the study assesses the application's effectiveness in bridging the gap between institutional IT services and student career development initiatives.

II. OBJECTTIVES

The primary objective of this project is to develop an intelligent College IT Assistant application that provides real-time IT support and placement-related information to students through an AI-powered chatbot. The system aims to overcome the limitations of traditional support mechanisms by offering instant, accurate, and personalized responses at any time. By integrating Retrieval-Augmented Generation (RAG) with a secure Android-based platform and FastAPI backend, the application ensures reliable information retrieval, efficient query handling, and enhanced user experience. The project focuses on delivering a scalable, secure, and user-friendly solution that supports students' academic, technical, and career development needs within a single digital platform.

Main Points and Importance of Our Research

1) *AI-powered IT assistance using RAG:*

We developed an intelligent chatbot that uses Retrieval-Augmented Generation to provide accurate and context-aware answers to students' IT-related queries. By combining document retrieval with generative AI, the system delivers reliable solutions instead of generic responses.

2) *Integrated Training & Placement information system:*

The application offers personalized placement updates, company details, and previously asked interview questions based on students' branch and academic year. This reduces dependency on manual communication and improves access to career-related information.

3) *Secure ERP-based authentication:*

We implemented secure authentication using ERP credentials to ensure authorized access and protect sensitive student data. This enhances system reliability and aligns with institutional security standards.

4) *Scalable backend architecture with FastAPI:*

A robust FastAPI-based backend manages chatbot requests, placement data, and user interactions efficiently. This architecture ensures fast response times, smooth API communication, and scalability for future expansion.

5) *Modern Android UI with Jetpack Compose:*

The application adopts Jetpack Compose for building a clean, responsive, and modern user interface. This improves usability, reduces UI complexity, and enhances the overall user experience on Android devices.

6) *Real-time availability and improved accessibility:*

By providing 24/7 IT and placement support, the system eliminates delays caused by limited working hours. Students can instantly access help, improving efficiency and satisfaction.

7) *Promoting intelligent campus support systems:*

This project demonstrates how hybrid AI–API architectures and personalized data analytics can transform traditional college support services into smart, adaptive, and student-centric digital platforms. The research highlights the practical use of artificial intelligence in improving accessibility, accuracy, and reliability of academic support systems.

III. LITERATURE REVIEW

Recent advancements in artificial intelligence (AI), natural language processing (NLP), and mobile application development have significantly transformed the way educational institutions deliver technical support and placement-related services. Traditional college IT helpdesks and placement cells often rely on manual processes, limited availability, and fragmented communication systems. Existing literature highlights a growing shift toward intelligent, automated platforms that improve accessibility, responsiveness, and personalization in campus support systems.

A. AI-Based Educational Support Systems

Studies indicate that AI-driven chatbots are increasingly used in educational environments to handle student queries related to academics, administration, and technical issues. NLP-based models enable these systems to understand user intent and generate relevant responses, reducing dependency on human intervention. Research shows that AI-powered assistants enhance response time, ensure consistency of information, and improve overall student satisfaction by offering round-the-clock support.

B. Retrieval-Augmented Generation (RAG) in Information Systems

Recent research emphasizes the effectiveness of Retrieval-Augmented Generation models in improving the accuracy and reliability of AI responses. Unlike standalone generative models, RAG systems combine document retrieval with language generation, ensuring that responses are grounded in verified data sources. This approach has been shown to reduce hallucinations and increase trustworthiness, making it suitable for academic and institutional support applications.

C. AI Chatbots for IT Assistance

Literature on IT support automation highlights the role of AI chatbots in resolving common technical issues such as login problems, software errors, and system usage guidance. By leveraging predefined knowledge bases and contextual understanding, these systems can provide instant solutions and escalate complex issues when required. Such implementations significantly reduce response delays and operational workload for IT departments.

D. Digital Training and Placement Support Systems

Research on placement management platforms reveals that centralized digital systems improve communication between students and placement cells. AI-based systems enable personalized notifications, company-specific information delivery, and access to historical interview questions. These features help students prepare more effectively for recruitment processes while ensuring timely dissemination of placement-related updates.

E. Secure Authentication and Data Privacy

Several studies stress the importance of secure authentication mechanisms in educational applications. ERP-based authentication models are widely recommended to ensure authorized access and protect sensitive student information. Secure login systems not only enhance data privacy but also increase institutional trust in AI-enabled platforms.

F. Mobile Application Development for Education

Android-based applications have become a preferred medium for delivering educational services due to their accessibility and ease of use. Research highlights the adoption of modern UI frameworks such as Jetpack Compose for building responsive and maintainable interfaces. Combined with scalable backend frameworks like FastAPI, mobile applications can efficiently manage real-time data exchange and AI interactions.

G. Hybrid AI–API Architectures

Recent literature supports the use of hybrid architectures that integrate AI models with RESTful APIs to build scalable and flexible systems. Such architectures allow seamless communication between mobile clients, backend services, and AI components, ensuring high performance and adaptability. Studies conclude that hybrid AI–API designs are well-suited for intelligent campus support platforms that require reliability, scalability, and personalization.

IV. METHODOLOGY

A. System Design and Intelligent Support Modelling

The proposed College IT Assistant system is built around two core components: an institutional knowledge base and an AI-driven support and placement assistance model. Well-structured and semantically rich institutional data is essential for effectively applying artificial intelligence in academic support environments. In this project, IT support documents, ERP-related guidelines, placement records, and frequently asked queries were carefully analyzed and organized to form a reliable knowledge base. These resources include structured text data, placement notifications, company details, and previously asked interview questions.

This institutional knowledge forms the foundation of the system, enabling accurate query resolution, identification of user intent, and personalized information delivery. By mapping student queries to relevant knowledge sources, the system can provide precise IT solutions and placement guidance based on a student's academic branch, year, and profile.

B. AI-Based Chatbot and Retrieval-Augmented Generation

The second key aspect of the methodology is the implementation of an AI-powered chatbot using a Retrieval-Augmented Generation (RAG) approach. Instead of relying solely on generative responses, the system first retrieves relevant information from the institutional knowledge base and then generates context-aware answers. This method improves response accuracy and reduces misinformation by grounding chatbot outputs in verified data.

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Student queries remain abstract until relevant documents or data entries are retrieved dynamically. Once the appropriate context is identified, the chatbot generates a clear and concise response tailored to the user's needs. This dynamic interaction ensures that the system adapts to different types of IT and placement-related queries in real time.

C. Personalized Training and Placement Support

The Training and Placement module is designed to deliver customized information to students. Placement updates, company-specific details, and interview questions are dynamically filtered based on academic branch and year. This personalization ensures that students receive relevant and timely information aligned with their career goals.

D. System Architecture and Implementation

The application follows a modular architecture comprising an Android frontend developed using Jetpack Compose and a scalable backend implemented with FastAPI. Secure ERP-based authentication is used to validate users and protect sensitive data. RESTful APIs enable smooth communication between the mobile application, backend services, and AI components, ensuring reliable and efficient system performance.

This methodology demonstrates how a hybrid AI–API architecture combined with structured institutional knowledge can deliver an intelligent, secure, and adaptable college-level IT and placement support platform.

V. RESULT

After completing an interaction with the College IT Assistant application, the system processes the user's requests and generates appropriate responses in real time. The results are presented through a clear and user-friendly interface, displaying accurate IT solutions or relevant placement information based on the user's query. For placement-related features, students can view personalized updates, company details, and previously asked interview questions filtered by branch and academic year. The system also maintains a record of user interactions, allowing students to revisit past queries and responses. Based on usage patterns, the application can provide relevant suggestions and improved guidance for future queries. Overall, the results demonstrate that the system delivers timely, reliable, and personalized support, enhancing the effectiveness and accessibility of IT assistance and placement services within the college environment.

VI. CONCLUSIONS

The development of the AI-enabled College IT Assistant application represents a meaningful advancement in digital campus support systems. By integrating an intelligent chatbot with Retrieval-Augmented Generation, secure authentication, and a scalable backend architecture, the system transforms how students access IT assistance and placement-related information. The use of modern Android technologies and API-driven communication ensures fast, accurate, and user-friendly interactions. The application successfully delivers real-time technical support, personalized placement updates, and structured access to interview preparation resources, reducing delays and improving overall efficiency. As the platform evolves, it can be extended with advanced analytics, deeper personalization, and expanded institutional datasets. This project demonstrates the practical potential of AI-driven solutions in creating reliable, adaptable, and student-centric support systems for higher education

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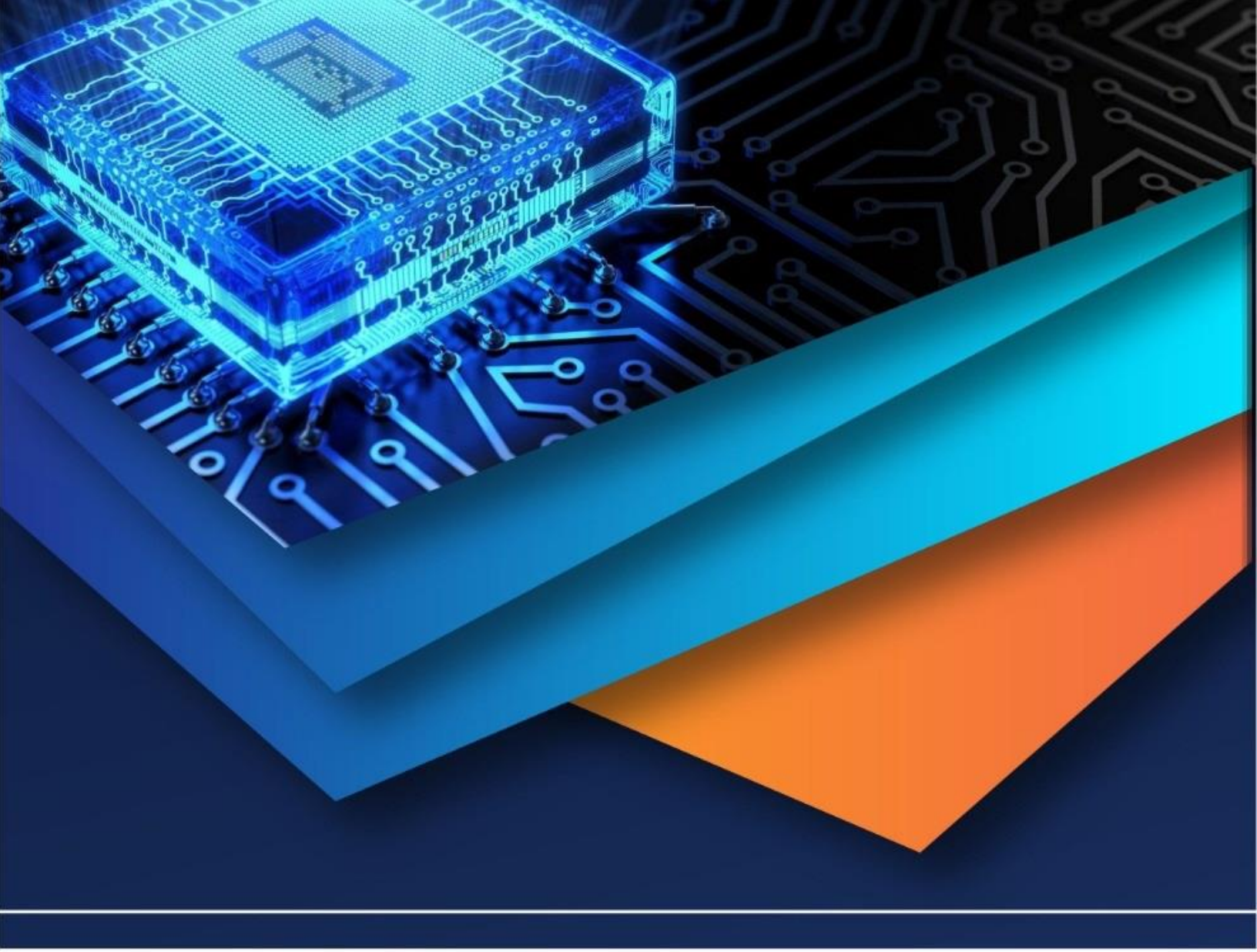
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