

AI-Enabled Academic and Career Planning System

Mrs.E.Aksha Pricilda Reena¹, Mr.J.A.Surya Prasath², Mr.S.Sham³

¹ Assistant Professor/Information Technology & Kongunadu College of Engineering and Technology

² Information Technology & Kongunadu College of Engineering and Technology

³ Information Technology & Kongunadu College of Engineering and Technology

Abstract - The rapid growth of higher education institutions and diverse career options has made academic and career planning increasingly challenging for students. This project, titled AI-Enabled Academic and Career Planning System, aims to provide an intelligent platform that simplifies the process of college selection and career guidance. The system integrates comprehensive information about colleges to enable students to make well-informed choices. A core feature is the AI-driven quiz and recommendation module that analyzes students' interests, strengths, and skills to suggest suitable courses and potential career paths. The platform is built using a modern and scalable technology stack: the frontend utilizes HTML, CSS, and JavaScript, specifically leveraging React.js for a dynamic and responsive UI; the backend is powered by Node.js; data storage is managed by MongoDB; and the AI recommendation engine is implemented in Python, leveraging libraries such as scikit-learn and TensorFlow for machine learning functionalities. Hosting and deployment are managed via Firebase, ensuring robust performance and broad accessibility. By combining detailed institutional data with personalized AI-driven guidance, this system effectively bridges the gap between students' aspirations and academic opportunities, empowering them to take confident steps toward their future.

Key Words: *AI-Enabled, Career Planning, Academic Guidance, Recommendation System, Machine Learning, Web Platform, College Selection, Node.js, MongoDB, React.js, TensorFlow.*

1. INTRODUCTION

The transition from school to higher education is a critical junction in a student's life, often complicated by the sheer volume of available institutions and diverse career fields. Traditional methods of research, such as relying on manual searches, word-of-mouth, or visiting multiple, often inconsistent, websites, lead to significant confusion, wasted time, and misaligned career choices. Furthermore, existing educational portals frequently lack updated and accurate details about crucial factors like fees, placement records, and campus infrastructure, and they generally do not offer personalized guidance based on a student's individual profile.

The AI-Enabled Academic and Career Planning System was developed to serve as a one-stop solution for post-school academic and career planning. The primary goal is to centralize essential information and integrate intelligent guidance to simplify the decision-making process.

The main objectives of this project are:

1. To provide students with a centralized platform for searching colleges with detailed information on infrastructure, fees, placements, departments, and amenities.
2. To integrate an AI-based quiz that suggests suitable career paths or courses based on individual aptitude and interests.
3. To enable students to directly connect with colleges for queries and admission processes.
4. To reduce the time, confusion, and effort involved in manual college and career research.

2. RELATED WORK

The foundation of this project is built upon addressing the limitations found in existing systems and research in the domain of educational technology. The manual search approach often results in inconsistent and outdated data, lacks integrated communication channels, and fails to offer the personalized, AI-based decision support that modern students require.

Summary of Literature Review:

Existing studies strongly emphasize the need for intelligent systems that can provide personalized, dynamic, and adaptable academic and career recommendations. The reviewed literature highlights the effectiveness of various AI approaches, such as hybrid recommendation models, in offering more accurate and personalized guidance compared to conventional methods.

S.N O	Title and Authors	Technology Used	Key Findings	Limitations
1	A Machine Learning-Based Framework for Personalized Academic Path Recommendation (Wang, H., 2020)	Machine learning models	Provides dynamic, personalized recommendations based on student performance and interests.	Requires a large dataset and may raise privacy concerns. Recommendations may lack the nuance of human interaction.
2	Development of a Smart Career Guidance System using a Hybrid Recommendation Model (Chen, L., et al., 2019)	Hybrid recommendation model (collaborative filtering and content-based)	Employs a hybrid approach for more accurate recommendations and incorporates user feedback.	Suffers from an initial "cold-start" problem for new users with limited data.
3	Intelligent Tutoring System for Career Counseling: An AI-Enabled Approach (Gupta, S., & Singh, V., 2021)	Conversational AI agent (chatbot)	Integrates a chatbot for interactive, immediate career advice and can handle a large volume of queries.	Advice quality is limited by its pre-trained knowledge base, and conversational flow can feel robotic.
4	Predictive Analytics for Student Dropout... (Li, J., et al., 2018)	Predictive analytics	Helps identify at-risk students early for proactive intervention.	Focuses on a negative outcome rather than comprehensive planning, and predictions may cause stress.
5	The Role of Natural Language Processing in Analyzing Student Career Narratives	Natural Language Processing (NLP)	Uses NLP to analyze open-ended responses for a deeper understanding of student motivations.	Interpreting qualitative data is complex and prone to errors; struggles with non-

(Smith, B., & Jones, A., 2022)			standard language.
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Table -1: Literature Review

A key finding is the critical need for data security and privacy due to the sensitive nature of student data (performance, interests, etc.). Our proposed system specifically addresses the lack of a centralized platform that seamlessly integrates career guidance (via the AI Quiz) with actionable institutional information (via the College Finder) and direct communication channels.

3. PROPOSED SYSTEM ARCHITECTURE AND METHODOLOGY

The proposed system is a user-centric, web-based platform designed to be a comprehensive two-part application: a College Finder and an AI-powered Quiz.

System Architecture:

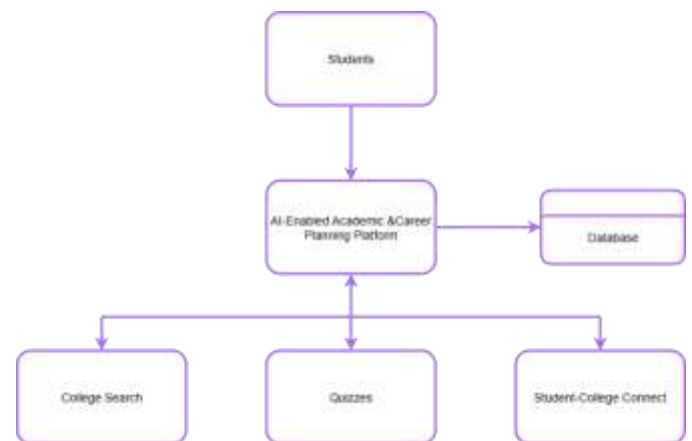


Fig -1: Architecture Diagram

The system employs a standard tiered architecture. Students interact with the AI-Enabled Academic & Career Planning Platform, which connects to a central Database (MongoDB) for data storage. The platform's core functionalities are segregated into:

- **College Search:** For exploring institutions and information.
- **Quizzes:** For personality and aptitude assessment to feed the AI.
- **Student-College Connect:** For integrated communication.

Core Features:

3.1 College Finder Module:

This feature provides detailed information for each institution, including a breakdown of its infrastructure, departments, available amenities, fee structures, and placement statistics. The system incorporates robust search and filtering capabilities, allowing users to refine results based on multiple criteria:

- **Location** (City, state, or region).
- **Course/Major** (Specific fields of study).
- **Fees** (A customizable range of costs).
- **Facilities** (Campus amenities).
- **Placements** (College's job placement track record).

3.2 AI-Powered Quiz and Recommendations Module:

This is the intelligent backbone of the system. It uses a dynamic, interactive quiz to capture a student's interests, aptitudes, and skills.

- **AI Engine:** The engine analyzes the user responses using a machine learning model.
- **Personalization:** It generates personalized recommendations for suitable career paths and academic_streams.
- **Seamless Connection:** These recommendations are directly linked to relevant colleges and courses available within the College Finder, ensuring that guidance is immediately actionable.

3.3 Integrated Communication:

The platform includes a dedicated Student-College Communication Hub to facilitate direct contact. Students can send messages or submit queries directly to the colleges listed on the platform, centralizing the process of obtaining information about admissions or courses and removing the need for external communication channels.

4. IMPLEMENTATION DETAILS

4.1 Technology Stack:

The platform is implemented using a modern, full-stack approach:

- **Frontend:** HTML, CSS, JavaScript, utilizing React.js for a dynamic and responsive UI. The provided code snippet demonstrates a React

component for student login.

- **Backend:** Node.js.
- **Database:** MongoDB (a NoSQL database) for efficient management of college and user data, including collections for colleges, studentprofiles, and quizquestions.
- **AI/ML:** Python for the recommendation engine, leveraging libraries like scikit-learn and TensorFlow.

4.2 Algorithm Used:

4.2.1 College Finder Logic

The search and filtering functionality relies on sophisticated algorithms to deliver precise and ranked results.

- **Search and Sorting Algorithms:** Standard algorithms are used for quickly matching colleges to user-defined criteria, with sorting used to rank results by factors like placement rate or fees.
- **Weighted Scoring Model:** This is essential for personalized college ranking. It allows the system to assign higher importance (weight) to criteria that a specific student values most (e.g., placing a higher weight on placement rates than on location), thus providing highly personalized results.
- **Geospatial Algorithms:** Used for location-based search to calculate distances accurately and find colleges within a specified geographic radius.

4.2.2 AI Quiz Engine

The core of the personalized guidance is the machine learning model within the AI Quiz Engine. It processes a student's interests, aptitudes, and skills derived from quiz responses.

- **Machine Learning Model:** The model, built with libraries such as scikit-learn and potentially TensorFlow, is trained to classify or predict the most suitable academic and career paths based on the input profile.

Module	Purpose	Key Implementation Details
Student Dashboard	User registration, login, profile management , and access to all tools.	Secure authentication (JWT in Node.js), hashed password storage, simple front-end forms with validation.
Institutional Management	Enables college admins to securely update their institution's data.	Secure login, Role-based Access Control, forms for editing details and uploading data (infrastructure, fees, placements).
AI Recommendation System	Administers the quiz and generates personalized recommendations.	Uses a machine learning model to analyze quiz data and link results to college/course options.
System Oversight	Platform monitoring and user/data management .	Admin module responsible for verifying college-submitted data to ensure accuracy.

Table -2: Module Info

5. RESULTS AND DISCUSSIONS

The implemented system successfully provides a multi-role web platform for academic and career planning, addressing the issues of inconsistency, lack of personalization, and centralization present in existing systems.

5.1 Role Selection Interface:



Fig -2: Login Page

The initial screen of the application presents the Role Selection Interface, serving as the gateway to the entire platform. This page's primary function is to direct users to the appropriate dashboard based on their access level. It ensures distinct user experiences and functionalities for each stakeholder.

The interface allows the user to select one of three predefined roles:

- **Student:** This role is for users who intend to search for colleges, save their preferences, and receive the personalized recommendations generated by the AI-driven system. The action button directs them to LOGIN_AS_STUDENT.
- **College:** This role is for representatives of academic institutions. Users here can manage their college profile, view student applications, and establish direct communication with students. The action button directs them to LOGIN_AS_COLLEGE.
- **Admin:** This role is reserved for system administrators who oversee the entire platform. Admins are responsible for managing all user accounts (students and colleges) and monitoring overall system activities. The action button directs them to LOGIN_AS_ADMIN.

The page also includes a "Don't have an account? Sign up here" link, which directs new users to the registration process for account creation. This multi-role segregation is fundamental to the system's architecture, enabling secure and specialized interaction based on user privileges.

5.2 Student Dashboard:

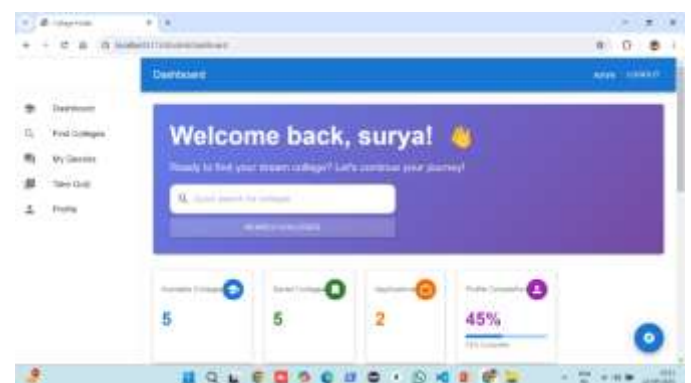


Fig -3: Dashboard

The Student Dashboard is a personalized homepage designed to provide a comprehensive overview of the student's progress and key information related to their college search journey.

Key Features and Functionality

- **Personalized Welcome:** The page displays a welcoming message, such as "Welcome back, surya!", ensuring a tailored user experience.
- **Navigation Sidebar:** A prominent sidebar provides quick access to core platform functionalities, including:
 - Dashboard.
 - Find Colleges.
 - My Queries.
 - Take Quiz.
 - Profile.
- **Quick Search:** A central search box is featured for students to initiate a quick search for colleges.
- **Progress and Status Metrics:** The main part of the dashboard features four key metrics to give the user a quick update on their progress:
 - **Available Colleges:** Indicates the total number of colleges available on the platform.
 - **Saved Colleges:** Shows the count of colleges the student has saved.
 - **Applications:** Tracks the number of applications the student has submitted.
 - **Profile Completion:** Displays the percentage of the student's profile that has been completed.
- **User Logout:** A "LOGOUT" button is available in the top right corner, allowing the user to securely end their session.

This centralized view empowers the student by presenting essential information and next steps clearly, supporting the platform's objective of simplifying academic and career planning.

5.3 College Discovery and Filtering Interface:

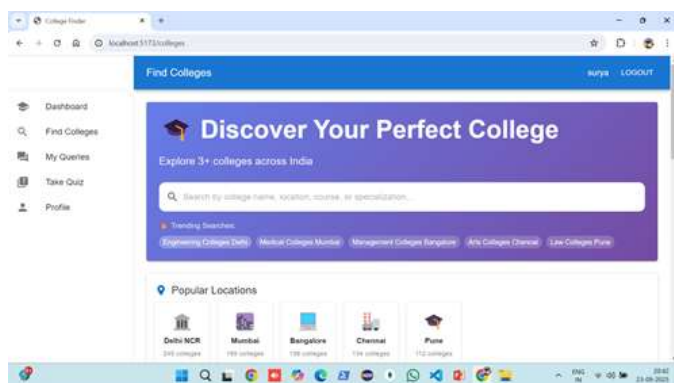


Fig -4: College Search

The "Find Colleges" section is a central component of the College Finder platform, designed to help students efficiently discover and search for suitable universities across India. This interface serves as the primary search hub, facilitating both targeted and exploratory college searches.

Key Features and Functionality

- **Prominent Search Bar:** A dedicated search bar allows users to input queries based on college name, location, specific course, or specialization.
- **Trending Searches:** A list of popular search queries (e.g., *Engineering Colleges Delhi*, *Medical Colleges Mumbai*) is prominently displayed to help users explore common interests and quickly begin their search.
- **Popular Locations:** The interface highlights key cities and regions where colleges are located, providing an overview of institutional density in major hubs.
 - Each location is listed with the total number of available colleges in that region (e.g., Delhi NCR: 245 colleges, Mumbai: 189 colleges).

This structure provides various entry points for the student, enabling them to narrow down college choices based on location, course, or industry trend, thus fulfilling the objective of providing robust college discovery and filtering capabilities.

5.4 AI Quiz Results and Career Recommendations:

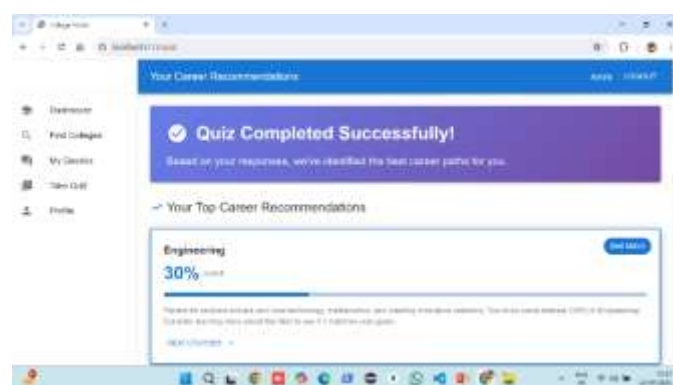


Fig -5: AI Quiz

This interface displays the results generated by the AI Recommendation System after the student completes the dynamic, interactive quiz designed to assess their interests, aptitudes, and skills. This module represents the core personalization feature of the platform.

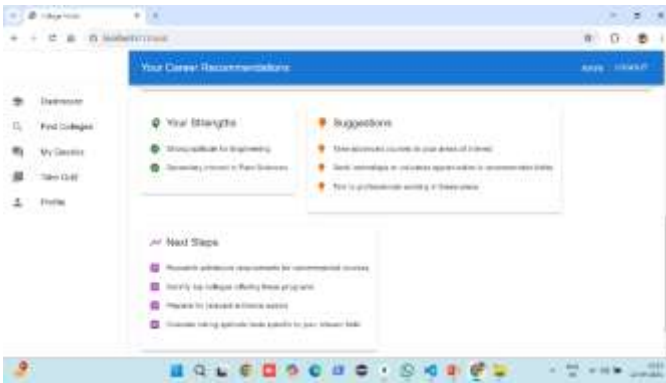


Fig -6: AI Quiz Recommendations

Key Features of the Recommendations Screen

- **Quiz Completion Confirmation:** A prominent banner confirms the successful completion of the assessment, stating: "Quiz Completed Successfully! Based on your responses, we've identified the best career paths for you".
- **Top Career Recommendations:** The system provides a prioritized recommendation based on the AI engine's analysis of the quiz responses.
 - **Best Match Identification:** The recommended path is clearly labeled as the "Best Match" (e.g., Engineering).
 - **Match Percentage:** A quantitative score indicates the student's alignment with the suggested field (e.g., 30% match), giving the recommendation a data-driven basis.
 - **Field Description:** A brief, informative description of the recommended career path is included, explaining what the field entails and why the student showed interest in it (e.g., "Perfect for problem-solvers who love technology, mathematics, and creating innovative solutions...").
 - **Actionable Link:** The "VIEW COURSES" link provides a seamless connection between the career guidance and actionable academic choices by leading the student directly to relevant colleges and courses available on the platform.

Ultimately, this interface effectively bridges the gap between student aspirations and academic opportunities through personalized, data-driven career guidance.

6. CONCLUSIONS

The AI-Enabled Academic and Career Planning System is a transformative platform designed to empower students in navigating their educational and professional futures. By leveraging artificial intelligence, it moves beyond traditional, static college search tools to offer a dynamic and personalized experience. The system's core strength lies in the integration of three vital components: the AI Quiz Module for data-driven course and career recommendations, a robust Search & Filter Module for precise college exploration, and the Communication Module for direct, centralized contact with college authorities. This system significantly reduces the confusion and effort involved in manual research, serving as a highly accessible and efficient one-stop solution for academic planning.

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BIOGRAPHIES

	<p>E. Aksha Pricilda Reena is working as an Assistant Professor at Kongunadu College of Engineering and Technology, with six months of teaching experience. She pursued her Bachelor of Technology – Information Technology at JJ College of Engineering and Technology in 2012. Subsequently, She pursued her Master of Engineering with a Specialization in VLSI Design at Asan Memorial College of Engineering and Technology in 2014.</p>
	<p>J. A. Surya Prasath is currently pursuing his Bachelor of Technology in Information Technology at Kongunadu College of Engineering and Technology, where he is in his pre-final year of study. He completed his schooling in the year 2023.</p>
	<p>S. Sham is currently pursuing his Bachelor of Technology in Information Technology at Kongunadu College of Engineering and Technology, where he is in his pre-final year of study. He completed his schooling in the year 2023.</p>