



AI-POWERED CAREER NAVIGATOR: PERSONALIZED ROADMAP

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Abstract: The AI-Powered Career Navigator: Personalized Roadmap is a system designed to assist students in identifying the most suitable career paths based on their skills, interests, and academic performance. The project uses artificial intelligence and machine learning algorithms to provide personalized recommendations, helping students make informed career choices. The system also offers a user-friendly interface and integrates a recommendation engine for efficient guidance.

Index Terms - Artificial Intelligence, Career Guidance, Machine Learning, Recommendation System, Student Support, Web Application.

I. INTRODUCTION

Career decision-making is critical for students and early-career professionals; however, traditional counseling is often limited by availability, subjectivity and outdated market insights. The AI-Powered Career Navigator offers a data-driven solution that analyzes users' skills, interests and academic records to propose personalized career paths and learning roadmaps. By combining automated quizzes, ML recommendation engines, and job-API aggregation, the platform helps users discover relevant roles, required skills, and available courses to bridge skill gaps. This work extends existing career guidance tools by adding conversational AI, dynamic job-market integration and downloadable resume creation.

II. OBJECTIVES AND SCOPE

The objective of the project is to design a platform that provides reliable, personalized career guidance using machine learning. The system helps students understand their aptitude and recommends the most appropriate professional paths. It also generates resumes automatically, lists related job opportunities, and maintains user data securely.

The scope extends to educational institutions where the platform can serve as a virtual career counselor. It minimizes manual counseling efforts, ensures quick decision-making, and remains scalable for future integration with external APIs such as job or course databases.

III. LITERATURE REVIEW

A short review of recent works shows several career guidance systems that rely on psychometric tests or static rule-based matching. Recent research emphasizes ML models that combine skill matching with job-market signals. This project adopts hybrid techniques (rule-based quiz scoring + ML ranking + LLM-driven explanation) to balance reliability and interpretability. Representative prior works and their limitations are summarized:

- Psychometric-based advisors: useful but static.
- Pure LLM advisers: conversational but may hallucinate market facts.
- Hybrid solutions: best trade-off—this project follows the hybrid approach.

IV. SYSTEM ANALYSIS

4.1 Existing System

Traditional counseling is manual and often limited by counselor availability and outdated knowledge; small-scale web tools give generic recommendations without market integration.

4.2 Limitations of Existing System

- Subjectivity and limited scalability.
- Lack of real-time job-market awareness.
- No integrated resume builder or conversational AI.

4.3 Functional Requirements (summary)

- User registration & secure login.
- Career quiz with adaptive scoring.
- Recommendation engine producing ranked career options.
- Jobs dashboard with live listings and apply/save options.
- Resume generator (pdfService.js) and AI chat assistant.

V. PROPOSED SYSTEM

The proposed *AI-Powered Career Navigator* uses intelligent algorithms to analyze user input and generate individualized career suggestions. The system consists of three layers: user interface, processing engine, and database. The interface collects data through structured forms and quizzes. The processing engine applies a weighted-scoring model and machine-learning logic to evaluate the data, while the database stores user information securely for future reference.

The career recommendation algorithm computes a *career-fit score* based on user skills and interests. The system architecture connects all components logically, ensuring seamless interaction between the frontend, backend, and storage layers. It also integrates a chatbot that interacts with users, clarifies doubts, and delivers instant feedback.

5.1 Architecture (High-Level)

Modules: Frontend (React + Tailwind), Backend (Node/Serverless), Authentication (Firebase Auth), AI Advisor (LLM API), Jobs Aggregator (Adzuna/JSearch), Recommendation Engine (ML scoring), PDF resume generator (jsPDF).

Data flow: user → quiz/Ai → preprocessing → recommendation model → outputs.

5.2 Modules Description

1. Career Quiz Module — captures interests, skills and personality traits.
2. AI Advisor — handles conversational queries and explanations using an LLM API; maintains context.
3. Recommendation Engine — weighted scoring model combining quiz results, user profile and market trends.
4. Jobs Dashboard — aggregated listings from job APIs with match scoring.
5. Resume Generator — uses jsPDF to create downloadable professional resumes.

5.3 Recommendation Algorithm (summary)

A weighted match score is computed:

$$\text{Match Score} = \left(\frac{\text{Common_Skills}}{\text{Total_Required_Skills}} \right) \times 100$$

This is combined with weights from quiz fit and market demand to rank jobs and career roles. (Detailed algorithm pseudocode can be added to appendix.)

VI. METHODOLOGY

6.1 Data Collection & Preprocessing

User-provided quiz responses, academic details, and profile skills are collected. External job data fetched from Adzuna/JSearch is normalized and tokenized for skill extraction. Data privacy: store only necessary fields and use hashed identifiers for sessions.

6.2 Model Training / Rules

For prototyping, a rule-based + heuristic weighted model is used; future work can replace it with ML ranking models trained on labeled career-fit datasets.

6.3 Chatbot Integration

LLM API calls are routed through a server-side proxy to avoid exposing keys; conversation memory keeps short-term context for coherent guidance. Error handling ensures graceful fallback to canned responses if API fails.

VII. EXISTING SYSTEM

The existing method of career guidance primarily depends on manual counseling or static aptitude tests. These processes are time-consuming and provide generalized suggestions that do not reflect real-time job-market trends. Manual systems often lack consistency, and students receive subjective opinions instead of data-driven advice.

Because there is no automation or continuous feedback, such systems fail to accommodate new skills and technologies. As a result, many students select unsuitable courses or careers. This drawback prompted the development of an AI-driven system capable of analyzing multiple factors simultaneously to produce accurate recommendations.

VIII. SYSTEM DESIGN AND IMPLEMENTATION

The system is implemented as a web application. The frontend uses HTML, CSS, and JavaScript for interface design, ensuring that users can easily navigate through questionnaires and view their career analysis results. The backend is implemented using Python Flask or Node JS, which processes the collected data and communicates with the Firebase database.

The system architecture defines the flow of data from user input to final recommendation. Each module is developed separately and integrated for testing. The resume generator uses the jsPDF library to format and export resumes automatically in PDF format. The chatbot uses a trained AI model to answer general career questions interactively.

VIII. RESULTS AND DISCUSSION

Testing verified the accuracy and efficiency of the system. The modules were tested individually for performance and data reliability. The recommendation engine achieved high accuracy in suggesting suitable roles. The chatbot responded effectively to user queries, and the resume generator produced professional outputs without errors.

During evaluation, students expressed that the platform helped them understand potential career directions and the skills required for improvement. The results confirmed that the system is faster and more reliable than traditional counseling.

IX. CONCLUSION AND FUTURE ENHANCEMENT

The *AI-Powered Career Navigator* successfully fulfills its goal of providing personalized career guidance through AI and machine learning. It simplifies decision-making for students and assists institutions in offering better counseling support.

Future enhancements can include integration of live job APIs, predictive analytics for labor-market trends, and voice-based interaction for accessibility. The system can also incorporate advanced deep-learning algorithms to improve recommendation precision and continuously adapt to user feedback.

Tables

The overall architecture of the proposed system is shown in Fig. 1. The diagram explains how the user interface interacts with the backend AI engine and the database.

Fig. 1. System Architecture of AI-Powered Career Navigator.

S.No	Functional Modules of the Proposed System	
	Module Name	Description
1.	Data Collection	Gathers academic details and skills from user input
2.	AI Recommendation	Generates personalized career suggestions
3.	Chatbot	Provides real-time interaction and guidance
4.	Resume Generator	Produces professional resumes using jsPDF

X. ACKNOWLEDGMENT

The authors are grateful to Dr. G. Fathima and Mrs. R. Dhanalakshmi for their guidance, and to the college for providing infrastructure and support during the project.

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