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ElevateX: An AI-Powered Career Guidance Platform

Saif Chaudhary, Faizan Bari, Arbab Ansari, Fahim Shaikh, Prof. Anuja Kamat
Dept. of Electronics & CS Engineering
Rizvi College of Engineering Mumbai, India

Abstract- The rapid evolution of technology and the expanding digital economy have created significant complexity in career decision-making for students and fresh graduates. Traditional career counselling approaches are static, generalized, and fail to account for individual skill profiles, evolving industry demands, and personalized learning trajectories. This paper presents ElevateX, an AI-powered career guidance platform that leverages large language models (LLMs) and natural language processing (NLP) to deliver personalized career recommendations, skill gap analysis, dynamic learning roadmaps, project suggestions, resume insights, and mock interview simulations. ElevateX engages users through an intelligent questionnaire that assesses their skills, interests, and aspirations, and subsequently generates actionable guidance tailored to their profile. Experimental evaluations demonstrate high user satisfaction, improved career clarity, and measurable gains in skill awareness among participants. The platform addresses a critical gap in accessible, personalized, and data-driven career counselling for the student community.

Keywords- Career guidance, artificial intelligence, large language models, natural language processing, skill gap analysis, learning roadmap, resume analysis, mock interview, personalized recommendation.

I. INTRODUCTION

The accelerating pace of technological change has fundamentally transformed the professional landscape, making informed career decision-making more challenging than ever before. Students and early-career professionals frequently struggle to identify suitable career paths, understand the skills required for their desired roles, and navigate the overwhelming volume of available learning resources. According to recent surveys, a significant majority of graduates report feeling underprepared for the transition from academia to the professional world [1].

Conventional career counselling relies heavily on human advisors whose guidance is often constrained by limited availability, subjective biases, and lack of real-time industry data. Online platforms such as LinkedIn and Coursera offer career-related tools, but these remain largely disconnected, requiring users to manually synthesize information from multiple sources. The absence of a unified, intelligent, and personalized career guidance system represents a critical gap that this work seeks to address.

ElevateX is a web-based AI-powered career guidance platform designed to provide end-to-end career planning support. The platform interacts with users through a structured questionnaire to assess their current skill sets, interests, and career aspirations. Based on this assessment, it employs large language models to generate tailored career path recommendations, perform skill gap analysis, produce step-by-step learning roadmaps, suggest relevant projects and resources, provide resume feedback, and conduct mock interviews. This paper describes the design, architecture, implementation, and evaluation of ElevateX.

II. LITERATURE SURVEY

Several research efforts have explored the application of machine learning and AI in career guidance and recommendation systems. Xu et al. [2] proposed a deep learning-based job recommendation system using user profiles and job postings, achieving improved precision in matching candidates to roles. However, their system did not address skill gap analysis or learning pathway generation.

Qin et al. [3] introduced a neural network model for person-job fit analysis that evaluated the semantic alignment between resume content and job descriptions. While effective for matching, the approach was limited to existing resume data and did not provide guidance for skill development. Similarly, Roy et al. [4] developed a rule-based expert system for career counselling in educational institutions, which suffered from scalability limitations and inability to adapt to dynamic industry trends.

The emergence of large language models such as GPT-4 and Claude has opened new possibilities for conversational AI applications in education and career development. Bommarito and Katz [5] demonstrated the capability of LLMs to perform professional-level assessments, while Brown et al. [6] showed the effectiveness of prompt-based learning for diverse downstream tasks. Recent work by Liu et al. [7] explored LLM-based tutoring systems with personalized feedback, providing a foundation for the intelligent guidance features in ElevateX.

Despite these advances, no existing system integrates career path recommendation, skill gap analysis, learning roadmap generation, project suggestions, resume analysis, and mock interview preparation within a single cohesive platform. ElevateX addresses this gap by combining multiple AI-driven functionalities into a unified, user-centric career guidance ecosystem.

III. PROPOSED SYSTEM

ElevateX is proposed as an integrated AI-powered platform that guides users through every stage of career planning. The system is designed around a conversational AI core that personalizes all outputs based on a user's assessed profile. The key modules of ElevateX are described below.

A. Career Path Recommendation

Upon re gistration, users complete a dynamic questionnaire covering their educational background, technical and soft skills, hobbies, work preferences, and long-term goals. The AI engine processes these inputs using prompt-engineered LLM queries to generate ranked career path recommendations with justifications, ensuring transparency and user trust.

B. Skill Gap Analysis

For each recommended career path, the system compares the user's current skill profile against industry-standard skill requirements sourced from curated job postings and role descriptions. The resulting skill gap report highlights specific competencies that require development, categorized by priority and estimated acquisition difficulty.

C. Learning Roadmap Generation

Based on the identified skill gaps, ElevateX generates a structured, time-bound learning roadmap. The roadmap organizes skills into sequential milestones with recommended courses, certifications, and practice materials from platforms such as Coursera, edX, YouTube, and official documentation sources.

D. Project and Resource Suggestions

To reinforce theoretical learning with practical experience, the system recommends hands-on projects aligned with the user's target career and current skill level. Each project suggestion is accompanied by implementation guidance, relevant GitHub repositories, and technology stack recommendations.

E. Resume Insights

Users may upload their resume in PDF or DOCX format. The platform extracts and analyzes the content using NLP techniques to evaluate structure, keyword optimization, quantification of achievements, and alignment with target job descriptions. Actionable improvement suggestions are presented in a structured report.

F. Mock Interview Simulation

ElevateX includes an AI-driven mock interview module that generates role-specific technical and behavioural interview questions. Users submit their responses, and the system provides detailed feedback on answer quality, communication clarity, and areas for improvement, simulating a realistic interview preparation environment.

IV. SYSTEM ARCHITECTURE

The architecture of ElevateX follows a three-tier client-server model comprising a frontend presentation layer, a backend application layer, and an AI services layer. This separation of concerns ensures modularity, scalability, and maintainability.

A. Frontend Layer

The frontend is developed using React.js, providing a responsive and interactive single-page application (SPA). The user interface encompasses the onboarding questionnaire, dashboard, career recommendation display, roadmap visualizer, resume uploader, and mock interview interface. TailwindCSS is used for consistent and accessible design.

B. Backend Layer

The backend is implemented using Node.js with the Express framework, exposing RESTful APIs consumed by the frontend. It handles user authentication via JSON Web Tokens (JWT), session management, business logic, and orchestration of AI service calls. A MongoDB database is used for persistent storage of user profiles, assessments, and generated content.

C. AI Services Layer

The AI services layer integrates with the Anthropic Claude API as the primary LLM provider. Carefully engineered system and user prompts govern the behaviour of the model across all modules. Resume parsing utilizes PDF extraction libraries combined with NLP preprocessing. A vector-based skill-matching component maps user skills against a curated knowledge base of industry role requirements.

TABLE I. ELEVATE■ SYSTEM ARCHITECTURE OVERVIEW

Layer	Technology	Function
Frontend	React.js, TailwindCSS	User interface, questionnaire, dashboard
Backend	Node.js, Express, MongoDB	API routing, auth, data persistence
AI Services	Claude API, NLP libraries	LLM inference, resume parsing, matching
Deployment	Vercel / AWS EC2	Hosting, scalability, CI/CD

V. METHODOLOGY

The development of ElevateX followed an iterative agile methodology with five principal phases: requirements analysis, system design, AI prompt engineering, full-stack implementation, and evaluation.

A. Requirements Analysis

A survey was administered to 120 undergraduate and postgraduate students to identify pain points in career planning. The findings revealed that 78% of respondents lacked a clear understanding of their skill gaps, and 85% expressed a need for personalized learning guidance. These insights directly informed the feature set of ElevateX.

B. Prompt Engineering

Effective LLM integration required systematic prompt engineering. Each platform module was assigned a distinct system prompt that constrained the model's role, output format, and tone. Few-shot examples were incorporated into prompts for modules requiring structured outputs such as skill gap tables and roadmap milestones. Iterative prompt refinement was conducted through empirical testing with diverse user profiles.

C. Skill Knowledge Base

A curated knowledge base of skill requirements for fifty common technology career paths was assembled by aggregating job descriptions from major job portals. Skills were normalized and categorized into technical, analytical, and interpersonal domains. This knowledge base serves as the reference for skill gap computation.

D. Evaluation Methodology

The platform was evaluated through a combination of user studies and automated quality metrics. Thirty student volunteers used ElevateX over a two-week period and completed pre- and post-usage surveys assessing career clarity, satisfaction, and perceived usefulness. Resume analysis quality was evaluated against expert human reviewer assessments using precision, recall, and F1 score metrics.

VI. IMPLEMENTATION

ElevateX was implemented as a full-stack web application. The frontend SPA communicates with the backend via authenticated REST API endpoints. On the backend, incoming user assessment data is serialized and transmitted to the Claude API with module-specific prompts. Responses are post-processed, structured into JSON objects, and returned to the frontend for rendering.

The onboarding questionnaire comprises fifteen adaptive questions spanning technical skills, soft skills, academic background, preferred work environment, and career interests. Question flow is dynamically adjusted based on prior responses to maintain relevance and reduce cognitive load on the user.

Resume analysis is triggered upon file upload. The system extracts text content using a PDF parsing library, segments the content into predefined resume sections, and submits structured prompts requesting section-by-section feedback. The mock interview module maintains conversational state across multiple question-response turns, enabling context-aware follow-up questions and progressive feedback accumulation.

User data including profiles, assessment results, and generated content are persisted in MongoDB collections. JWT-based authentication ensures secure access to individual user dashboards. The application is containerized using Docker and deployed on a cloud instance, ensuring availability and horizontal scalability.

VII. RESULTS AND DISCUSSION

The evaluation of ElevateX yielded encouraging results across all assessed dimensions. Results from the user study and automated evaluations are summarized in Table II.

TABLE II. EVALUATION RESULTS SUMMARY

Evaluation Metric	Score / Value	Method
Career Clarity Improvement	72% of users reported improvement	Pre/Post Survey
User Satisfaction (CSAT)	4.3 / 5.0 average rating	Post-use Survey
Resume Analysis F1 Score	0.81	Expert Comparison
Skill Gap Accuracy	84.6%	Knowledge Base Validation
Roadmap Relevance	88% found roadmap useful	User Feedback
Mock Interview Helpfulness	79% reported confidence gain	Post-use Survey

The career clarity improvement metric, measured via pre- and post-usage surveys, showed that 72% of participants reported a clearer understanding of their target career path following interaction with ElevateX. The platform's user satisfaction score of 4.3 out of 5.0 reflects strong acceptance of the conversational guidance approach.

Resume analysis achieved an F1 score of 0.81 when compared against expert human reviewer assessments, demonstrating near-expert quality in automated resume feedback. Skill gap analysis accuracy of 84.6% was validated against the curated knowledge base, with most errors occurring for niche or emerging roles where knowledge base coverage was limited.
Qualitative feedback highlighted the mock interview module and personalized roadmap as the most valued features. Users particularly appreciated the actionable specificity of the recommendations, contrasting favorably with the generic advice offered by conventional platforms. Areas identified for improvement include richer multi-language support and integration with real-time job market data feeds.

VIII. CONCLUSION

This paper presented ElevateX, a comprehensive AI-powered career guidance platform that integrates career path recommendation, skill gap analysis, personalized learning roadmaps, project suggestions, resume insights, and mock interview simulation within a unified web-based system. By leveraging large language models and structured prompt engineering, ElevateX delivers personalized, actionable, and contextually relevant career guidance at scale.

Evaluation with thirty student participants demonstrated measurable improvements in career clarity, strong user satisfaction, and competitive performance in automated resume analysis. The platform addresses a significant gap in the landscape of digital career counselling tools and presents a viable, scalable alternative to traditional advisory services.

Future Scope
Several directions for future development have been identified based on user feedback and system evaluation. Integration of real-time labor market data through job portal APIs would enable the platform to reflect current hiring trends and in-demand skills dynamically. Incorporating collaborative filtering based on anonymized peer profiles could further enhance the personalization of recommendations.

Future iterations will explore fine-tuning domain-specific language models on career counselling corpora to improve response precision and reduce reliance on general-purpose LLMs. Expansion of the mock interview module to include speech-based interaction with vocal feedback analysis represents another high-impact enhancement. Mobile application development and multi-language support are planned to broaden accessibility across diverse user demographics.

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