

AI Career Coach

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Abstract—The rapid expansion of career opportunities in the digital era has made it increasingly difficult for students and job seekers to identify suitable career paths, prepare professional resumes, and develop job-relevant skills. Traditional career guidance methods are often limited, time consuming, and inconsistent due to the availability of multiple information sources and the lack of personalized mentorship. To address this challenge, the AI Career Coach project proposes an intelligent, automated guidance system that utilizes Artificial Intelligence to assist users in making informed career decisions.

This system analyses the user's academic background, skills, interests, and professional preferences to recommend suitable job roles, required skill development paths, and resume improvement suggestions. The platform provides interactive guidance and curated learning resources to help users bridge the skill gap effectively. By leveraging AI-based recommendation techniques, natural language processing, and structured evaluation parameters, this offers personalized and data-driven career counselling accessible at any time.

I. INTRODUCTION

Career planning plays a crucial role in shaping an individual's professional future. With an ever-growing number of job roles, skill requirements, and rapidly evolving industry standards, students and job seekers often struggle to identify suitable career paths and make informed decisions. Career guidance is typically provided through counsellors, mentors, or various online platforms. However, traditional counselling methods are time-consuming, inconsistent, and not always readily accessible. This gap highlights the need for a scalable, intelligent, and user-centric solution that can offer personalized and reliable career guidance. The AI Career Coach Web Application is developed to

provide automated and customized career recommendations based on a user's educational background, technical skills, interests, and professional preferences. The system assists users by generating suitable career suggestions, learning pathways, and resume improvement recommendations. By integrating career counselling knowledge with machine learning-based recommendation systems, the platform acts as a virtual career guidance assistant that can support career-related decision-making at any time.

The web-based nature of the system ensures ease of accessibility, platform independence, and user-friendly interaction environment. Through structured analysis and intelligent data processing, this project aims to simplify the career selection process and support individuals in aligning their capabilities with relevant career opportunities.

1.1 Details of Project Work

The AI Career Coach Web Application focuses on providing automated, personalized career coaching services to users. The platform collects user inputs such as academic qualifications, technical/non-technical skills, work experience (if any), and career interests. Based on these inputs, the system processes data and generates customized recommendations for job roles and skill development. It further suggests relevant courses, certifications, and improvement areas to help users enhance their employability. The project also includes a user-friendly interface developed for smooth task navigation and interaction.

1.1.1 Objectives

The key objectives of the project are:

- To analyse user academic and skill profiles for generating personalized career recommendations.

- To assist users in identifying job roles aligned with their interests and abilities.
- To provide structured guidance for improving professional skills and employability.
- To reduce dependency on human career counsellors by offering an AI-driven automated solution.
- To create a scalable and accessible platform usable by students, graduates, and professionals.

1.1.2 Scope of the Project

The scope of the AI Career Coach Web Application includes:

- Providing personalized career suggestions.
- Recommending relevant courses, certifications, and training material.
- Offering resume analysis and improvement suggestions.

II. LITERATURE SURVEY

Recent advancements in artificial intelligence (AI) have significantly transformed career guidance and recommendation systems by enabling more personalized and adaptive solutions. Systems like AI Coach provide real-time feedback, dynamic interview preparation, and resume optimization, addressing the limitations of traditional methods [1]. Similarly, deep learning-based recommendation systems have improved personalization using advanced techniques such as neural networks, though challenges like data sparsity and cold-start problems remain [2]. Furthermore, real-time recommendation approaches outperform batch systems by incorporating recent user interactions, leading to better engagement and more relevant job suggestions [3].

In rapidly evolving job markets, AI-driven frameworks focus on analysing resumes to recommend suitable career paths and re-education strategies, helping individuals adapt to changing skill demands [4]. The emergence of Agentic AI further strengthens this domain by enabling autonomous, goal-driven systems capable of adaptive decision-making in complex environments [5]. Additionally, scalable multilingual document processing frameworks support handling unstructured data like resumes, improving system efficiency and accessibility [6]. At the same time, trust and transparency are addressed through explainability

models such as TrustME, which enhance user confidence and system adoption [7].

Moreover, AI chatbot-based platforms and NLP-driven conversational models provide interactive, user-centered career guidance while emphasizing emotional intelligence and adaptability to market trends [8][9]. Alongside this, AI-STEM frameworks highlight the importance of AI literacy and interdisciplinary learning in preparing individuals for future careers [10].

2.1 Proposed System

The proposed AI Career Coach Web Application is designed to offer personalized career guidance through an interactive web-based platform. It collects user data such as educational background, academic performance, technical and soft skills, interests, and desired job sectors. The system then processes this information to determine potential career roles and learning paths. The central recommendation engine uses Collaborative Filtering, which compares similar user profiles to identify common career trajectories and suggests career options that align with the user's skills and interests. The system also suggests relevant online courses, certifica

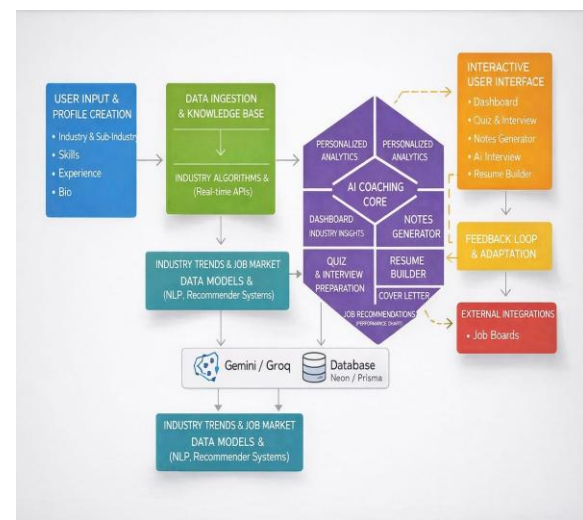


Figure 1: Proposed System Diagram

tions, and skill-building materials to help users progress in their chosen career path. Additionally, it provides resume structuring support to improve job readiness. The platform ensures:

- Accessibility: Available from any device with a browser.

- Consistency: Same guidance quality for all users.
- Scalability: Can support large numbers of users simultaneously.
- Personalization: Recommendations tailored to user specific profiles.

Thus, the proposed system acts as a virtual mentor that assists in structured and informed career planning.

III. SOFTWARE REQUIREMENT SPECIFICATION (SRS)

3.1 Overall Description

The AI Career Coach Web Application is a browser-based system developed to provide personalized career recommendations, skill development pathways, and resume enhancement guidance. The system collects user information, analyses skill attributes, and matches them with relevant career roles using a collaborative filtering recommendation approach. The platform also suggests learning resources and training programs for skill improvement. The system is built using a modern and scalable full-stack web development architecture to ensure performance, responsiveness, and secure user access.

3.1.1 Product Perspective

The system is designed as a standalone web application accessible through any modern browser. It follows a client-server architecture where the front-end interface interacts with the back-end services via secure APIs. The application integrates external services such as authentication, vector processing, and AI-response generation. The system leverages:

- React 19+ Next.js 15 for the frontend to ensure dynamic UI rendering and optimized routing.
- Tailwind CSS and Shaden UI for responsive and consistent user interface styling.
- Prisma ORM to manage structured database operations efficiently.
- NeonDB as the primary relational database.
- Clerk Authentication for secure user login, identity management, and access control.
- Inngest for background task automation and workflow execution.
- Gemini API to process AI-driven feedback and personalized recommendations.

3.1.2 User Characteristics

The target users of this system include:

- Students seeking clarity on possible career opportunities.
- Fresh graduates preparing for job placement or higher education.

IV. SYSTEM DESIGN

4.1 Architectural Design

4.1.1 Overview

The AI Career Coach is implemented as a modern web application using a client-server architecture with serverless edge functions for API handling. The architecture separates concerns into presentation (frontend), application logic (serverless APIs and background workers), data persistence (NeonDB via Prisma), authentication (Clerk), background workflows (Inngest), and AI services (Gemini API). The system is deployed on Vercel for global edge delivery and low latency.

4.1.2 Logical Components

1. User Layer

The User Layer represents the entry point of the system where users interact with the platform. Users perform actions such as login, registration, and profile creation. During profile creation, users provide key information including skills, experience, goals, and interests.

2. Application Layer (Frontend) The Application Layer provides the user interface and overall user experience. It is responsible for displaying features such as:

- Dashboard
- Quiz & Interview modules
- AI Interview system
- Resume Builder
- Notes Generator
- Job Recommendations

3. Backend Layer

The Backend Layer handles all core system operations and acts as the brain of the application logic (excluding AI reasoning). It includes:

- API handling (Next.js API routes)
- Authentication (Clerk)
- Business logic execution

- Interview scoring system
- Performance tracking
- Session management

4. AI Layer

The AI Layer is responsible for intelligence and personalization in the system. It uses AI models (such as Gemini or Groq) along with NLP techniques to:

- Generate interview questions
- Analyze user responses
- Provide feedback and improvement suggestions
- Generate resume content and notes
- Recommend skills and career paths

5. Database Layer

The Database Layer stores and manages all persistent data in the system. It includes:

- User profiles

- Quiz and interview scores
- Session history
- Generated content (resume, notes)
- Performance analytics

6. External Integration

This component connects the system with external job platforms to provide real-world job recommendations. The recommendations are based on:

- User profile
- Skills
- Interview performance

7. Continuous Learning & Improvement

The system includes a feedback loop where user interactions and performance data are continuously analysed. Based on this:

- Recommendations are updated

- Difficulty level adjusts
- Suggestions become more personalized
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8. Technology Stack

The system is built using:

- Frontend: React, Tailwind CSS
- Backend: Next.js API routes
- Authentication: Clerk
- AI Models: Gemini, Groq
- Database: NeonDB • ORM: Prisma

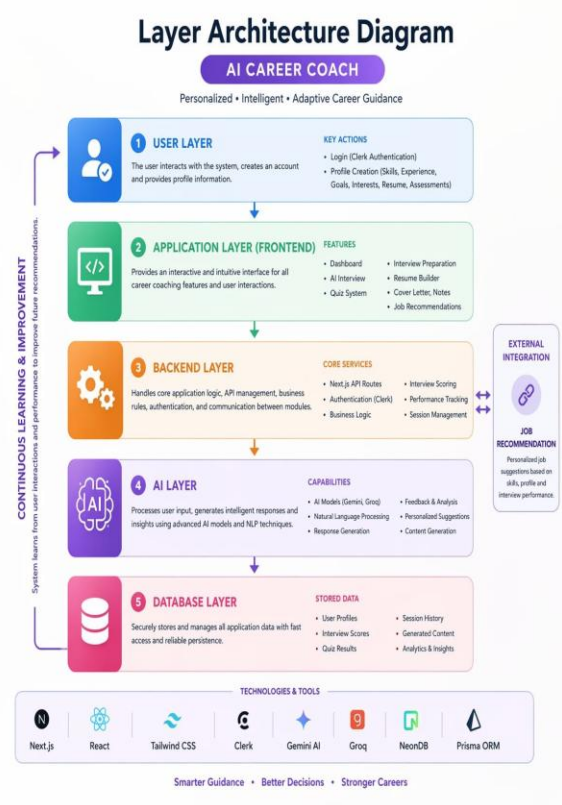


Figure 2: System Architecture

5 Algorithms

5.1 Large Language Model (LLM) Algorithm

The system uses Large Language Models (LLMs) such as Gemini or Groq-based models to generate interview questions, evaluate answers, and provide feedback. LLMs are deep learning models trained on massive text datasets using the Transformer architecture. They work by predicting the next word in a sequence based on context, allowing them to generate human-like responses. The LLM processes input prompts (user answer + instructions) and generates structured outputs in JSON format. This enables the system to extract meaningful data such as score, feedback, and improvement tips. Since LLMs are probabilistic, prompt design plays a critical role in controlling output quality and structure.

Working Steps (LLM Algorithm):

- o Input user data (industry, skills, answer)
- o Construct structured prompt.

- o Send prompt to LLM API
- o LLM processes using Transformer model
- o Generate response (text output)
- o Convert output into JSON format
- o Validate and extract required fields
- o Return structured result to UI

5.2 Natural Language Processing (NLP) Algorithm

NLP techniques are used to process and understand user input (spoken or typed answers). The system applies NLP for tasks such as text cleaning, keyword extraction, and semantic understanding before sending data to the LLM. NLP also plays a role in fallback logic, where basic rule-based evaluation is applied if AI fails.

Working Steps (NLP Algorithm):

- Input user answer (voice/text) • Convert speech → text (Speech Recognition)
- Preprocess text:
- Remove noise
- Normalize text
- Tokenize sentence
- Extract keywords and intent
- Send processed input to LLM

6 Pseudocode: Hybrid Recommendation System

BEGIN

INPUT user_id

// Step 1: Fetch user data user ← get User From DB
(user_id) skills ← user.skills industry ← user.industry
scores ← get User Scores(user_id)

// Step 2: AI-based recommendations

R_ai ← generate AI Insights(industry)

// Step 3: Collaborative Filtering users ← get All Users

() FOR each u IN users DO

similarity[u] ← cosine Similarity (user.skills, u.skills)

END FOR

Top Users ← select TopK(similarity) R_cf ← extract Skills(topUsers)

// Step 4: Rule-based scoring

S_avg ← average(scores)

IF S_avg < 50 THEN

level ← "Beginner"

ELSE IF S_avg < 80 THEN

level ← "Intermediate"

ELSE level ← "Advanced" END IF

// Step 5: Combine results

R ← merge (R_ai.recommended Skills, R_cf)

R ← remove Duplicates(R)

// Step 6: Return output

RETURN {recommendations: R, level: level} END

Explanation: The pseudocode represents a hybrid recommendation approach where user data is processed using AI based generation, collaborative filtering, and rule-based scoring to produce personalized recommendations.

7 Snapshots

This section presents the user interfaces of the core features within the AI Career Coach Web Application.

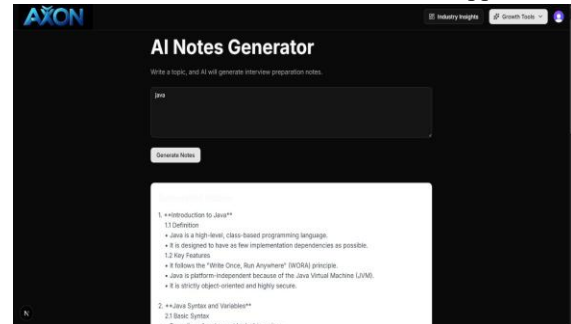


Figure 3: The AI Notes Generator interface allowing users to dynamically generate topic-specific interview notes and study materials.

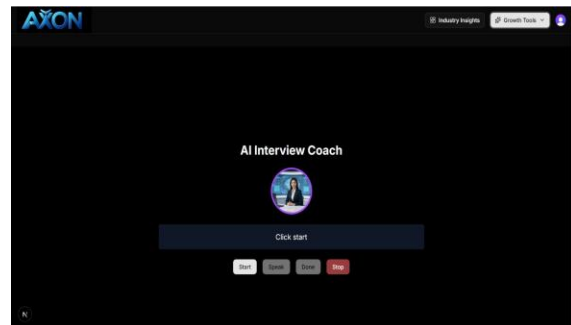


Figure 5: The AI Interview Coach interface providing users with an interactive environment for practicing mock interviews.

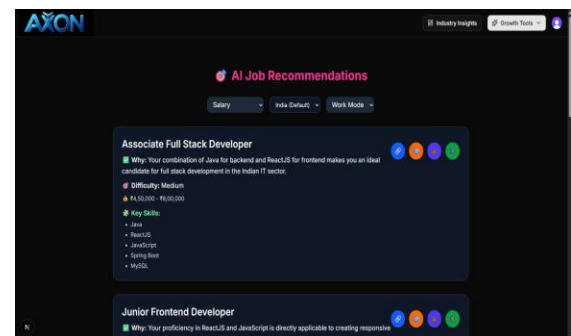


Figure 4: The AI Job Recommendations dashboard displaying tailored job roles, expected salary ranges, required key skills, and a matching rationale.

V. CONCLUSION

The AI Career Coach Web Application successfully demonstrates a scalable, automated approach to career guidance, utilizing collaborative filtering and AI-based reasoning to provide personalized recommendations. The system analyses user skills, educational background, and interests to suggest relevant job roles, learning pathways, and resume improvement strategies. The integration of Gemini API enhances the system's ability to generate meaningful insights, while Clerk ensures secure and reliable authentication. The use of NeonDB with Prisma ORM allows efficient and structured data storage, and Inngest enables automated background processing for continuous recommendation updates. The project meets its objectives by providing users with a reliable, accessible, and user-friendly platform that reduces dependency on traditional human career counselling. The webbased architecture ensures easy availability, usability, and scalability. Future enhancements can include integration of real-time job opportunities, dynamic labor market data, and AI-driven interview practice modules. Overall, the system lays a strong foundation for intelligent career planning assistance and has strong potential for practical deployment and further development.

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