

AI Career Coach: A Full-Stack Intelligent Web Application for Personalized Career Development in the AI Domain

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Abstract

— The modern AI job market presents significant challenges for both aspiring and experienced professionals — from identifying relevant skills and understanding emerging industry trends to preparing for technical interviews and crafting impactful application materials. Traditional career coaching methods and existing online platforms, while helpful in certain respects, lack the integration, personalization, and AI-driven intelligence required to effectively guide individuals through the complex AI career landscape. This paper presents the AI Career Coach, a comprehensive, full-stack intelligent web application designed to empower individuals at every stage of their AI career journey — from beginners entering the field to seasoned professionals seeking advancement. The platform is built upon a modern technology stack comprising Next.js for a performant server-rendered frontend and backend, Neon DB as a serverless PostgreSQL database, Prisma as a type-safe ORM for streamlined data management, Tailwind CSS and Shadcn UI for a consistent and accessible user interface, and Inngest for reliable scheduled background task processing. At its intelligence core, the platform integrates Google's Gemini AI API to deliver dynamic and personalized career guidance. Key functionalities include a personalized onboarding and profile management module, an AI-generated industry insights engine, an AI-powered mock interview generator with performance analytics, an AI-assisted resume builder with Markdown generation and PDF export, and a contextual cover letter generator. The system architecture follows a modular and iterative Agile development approach, emphasizing scalability, developer productivity, and seamless AI integration. Testing encompassed functional validation, performance evaluation of API endpoints, and security hardening through input validation, CSRF protection, and HTTPS enforcement. The platform demonstrates how modern full-stack development paradigms can be effectively combined

with large language model APIs to create practical, high-impact AI-driven applications.

Keywords — AI Career Coach, Full-Stack Web Application, Gemini AI API, Next.js, Neon DB, Mock Interview Generator, AI Resume Builder, Career Development, Personalization, Natural Language Processing, Inngest, NextAuth.js

I.. INTRODUCTION

The modern landscape of career development is undergoing a significant transformation, driven by rapid technological advancements and the increasing demand for specialized skills, particularly in the burgeoning field of Artificial Intelligence (AI). Navigating this complex ecosystem can be daunting for individuals seeking to enter or advance within the AI domain [1]. Aspiring AI professionals frequently face challenges in identifying relevant skills, understanding industry trends, preparing for technical interviews, crafting compelling resumes, and ultimately securing fulfilling career opportunities.

Traditional career coaching systems rely primarily on human counsellors, printed resume templates, and offline mock interview sessions. While valuable, these methods are limited in availability, personalization, scalability, and real-time relevance [2]. The rise of digital platforms such as LinkedIn Career Coach, Resume.io, ChatGPT, Interview Cake, and Coursera Career Academy has partially addressed these limitations by digitizing certain aspects of career development. However, these tools remain siloed, providing fragmented support without a unified, AI-powered experience tailored to the rapidly evolving demands of the AI industry [3].

Recognizing these gaps, the development of a comprehensive, intelligent, and integrated career coaching platform becomes not just beneficial but essential. This paper details the development and architecture of the AI

Career Coach, a sophisticated web application that leverages Next.js, Neon DB, Prisma, Inngest, Tailwind CSS, Shadcn UI, NextAuth.js, and Google's Gemini AI API to deliver a modular and personalized career development platform [4]. The system is designed to provide personalized guidance, practical tools, and up-to-date information to users at various stages of their AI career journey.

The remainder of this paper is organized as follows: Section II discusses the challenges in existing career systems. Section III explains the proposed system architecture and modules. Section IV describes the methodology and technologies used. Section V discusses system design and implementation. Section VI presents results and discussion. Section VII outlines future enhancement possibilities. Section VIII concludes the paper.

II.. CHALLENGES IN EXISTING SYSTEMS

A comprehensive analysis of traditional and existing online career platforms reveals several critical limitations that create opportunities for improvement. These challenges form the primary motivation for the proposed AI Career Coach system.

A. Lack of Personalization

Most career development platforms provide generic advice, static resume templates, and one-size-fits-all interview question banks without considering the user's specific skills, experience level, target role, or areas of interest. This lack of personalization significantly reduces the effectiveness of the guidance provided, especially for individuals targeting specialized fields such as Artificial Intelligence, Machine Learning, and Natural Language Processing [5]. Generic tools fail to account for the rapidly evolving nature of the AI domain, where skill requirements change frequently.

B. Absence of an Integrated Platform

Existing career development tools are fragmented across multiple platforms. Resume builders, interview preparation tools, industry insights portals, and cover letter generators operate as separate services, requiring users to maintain data across different platforms and switch between tools constantly [6]. This fragmentation creates friction in the career development process and leads to an inconsistent and inefficient user experience. There is a clear need for a

single unified platform that integrates all essential career development functionalities.

C. Limited AI Integration

While platforms such as ChatGPT and LinkedIn have begun integrating AI capabilities, most career tools do not fully leverage large language model APIs for personalized resume generation, dynamic interview question creation, or real-time industry insights tailored to individual user profiles. Static question banks do not adapt to changing industry trends or the user's specific profile and target role, making interview preparation less effective [7]. Resume builders relying on fixed templates fail to provide AI-driven content optimization suggestions.

D. Absence of Real-Time Industry Insights

The AI industry evolves at an exceptionally rapid pace. New technologies, frameworks, and skill requirements emerge frequently. Most existing platforms rely on manually curated articles or static content that quickly becomes outdated [8]. Users require a system capable of automatically delivering current, AI-generated insights into emerging technologies, in-demand skills, market trends, and salary benchmarks without requiring manual search or platform updates.

E. Poor Performance Tracking and Analytics

Existing mock interview platforms often provide limited or no analytics on user performance across sessions. Without detailed performance tracking — such as accuracy scores, question completion rates, improvement trends, and identification of weak areas — users cannot effectively direct their preparation efforts or measure their progress over time. This absence of feedback-driven learning reduces the overall effectiveness of interview preparation tools [9].

F. Security and Data Privacy Concerns

Many online career platforms store sensitive user information including resumes, career goals, personal details, and employment history, making them potential targets for data breaches. Inadequate authentication mechanisms, lack of proper encryption, and insufficient input validation expose user data to unauthorized access. A robust career development platform must incorporate strong security measures to protect user information and maintain user trust [10].

III.. PROPOSED SYSTEM

The AI Career Coach is designed as a smart, centralized, and intelligent career development platform that overcomes the limitations of existing systems. It integrates real-time AI-generated industry insights, dynamic mock interview generation, AI-assisted resume and cover letter creation, performance analytics, and secure user authentication into a single full-stack web application.

A. System Overview

The platform follows a modular full-stack architecture where the Next.js frontend and backend, Neon DB serverless PostgreSQL database, Prisma ORM, Inngest job scheduler, and Gemini AI API work together seamlessly. The frontend communicates with the backend through Next.js API Routes, which handle user data, AI interactions, and scheduled background tasks. The architecture is designed for scalability, developer productivity, and smooth AI integration.

B. Personalized Onboarding and Profile Management

New users are guided through a comprehensive onboarding process where they provide information about their current skills (technical and soft), educational background, work experience, specific areas of interest within AI (such as NLP, Computer Vision, or Deep Learning), their career goals, and their overall experience level. This profile becomes the foundation for all personalized features across the platform, with data stored securely in Neon DB via Prisma. Users can update their profiles at any time to ensure recommendations remain relevant.

C. AI-Generated Industry Insights Module

The platform leverages the Gemini AI API combined with Inngest's scheduled cron jobs to regularly fetch and deliver the latest trends, emerging technologies, in-demand skills, and salary benchmarks in the AI field. These insights are automatically generated and stored in Neon DB for display on the user dashboard. This keeps users consistently informed about the rapidly evolving AI industry without requiring manual search, providing a significant competitive advantage in career planning [11].

D. AI-Powered Mock Interview Module

The mock interview generator creates realistic, role-specific technical interview questions based on the user's profile, including their skills, experience level, and target role. Questions cover key areas such as algorithms, machine learning concepts, deep learning architectures, and domain-specific knowledge. An interactive UI allows

users to practice answering questions in a simulated interview environment. After each session, performance statistics — including questions attempted, accuracy scores, and a performance trend chart — help users identify weaknesses and focus their preparation efforts effectively.

E. AI-Assisted Resume Builder

The resume builder guides users through a structured form to input their educational details, work history, projects, skills, and achievements. The Gemini AI API is then used to generate AI-optimized resume content, suggest action verbs and keywords relevant to AI roles, help quantify achievements, and ensure professional grammar and tone. The resume is generated in Markdown format for easy editing and flexibility, and users can export their professionally formatted resume as a PDF document ready for submission to potential employers.

F. AI-Powered Cover Letter Generator

Users can input the details of a specific job application — including job title, company name, and key requirements — and the platform uses the Gemini AI API to generate a personalized, compelling cover letter based on the user's profile and the target job. Users can review and customize the generated letter before finalizing it. This feature significantly reduces the time required to craft high-quality, targeted application materials.

G. Secure Authentication and Authorization

Secure user authentication is implemented via NextAuth.js, supporting both credential-based registration and login with secure session management through database-backed sessions in Neon DB. Role-based access control ensures users can only access their own data and protected routes. Security measures include bcrypt password hashing, CSRF protection, input validation, secure API key management through environment variables, and HTTPS enforcement during deployment.

IV.. METHODOLOGY

The development of the AI Career Coach follows an Agile software development methodology for continuous improvement and iterative testing. The system is divided into smaller modules — user authentication, profile management, resume building, mock interview generation, industry insights delivery, and cover letter generation — each developed, tested, and integrated independently. The Agile approach supports faster testing cycles, flexibility in

handling changing requirements, and continuous feedback during the implementation process [12].

A. Requirements Analysis

The requirement analysis phase involved studying the major limitations of traditional career coaching methods and existing online platforms to identify the functional and non-functional requirements of the AI Career Coach. Functional requirements include user authentication, profile management, AI-powered resume building, dynamic mock interview generation, real-time industry insights delivery, cover letter generation, and PDF export. Non-functional requirements include system performance, scalability, security, usability, reliability, and availability.

B. Frontend Development

The frontend is built using Next.js, a React framework that enables server-side rendering (SSR) and static site generation (SSG) for fast initial page loads and improved SEO. Shadcn UI provides accessible, pre-built components styled with Tailwind CSS, enabling rapid and consistent UI development. The component-based architecture of React promotes reusability and maintainability. Custom React hooks are developed for data fetching and common functionalities. The interface is designed to be responsive, intuitive, and user-friendly across desktop and mobile devices.

C. Backend Development

Next.js API Routes serve as the backend, handling user authentication, database operations, and communication with external services such as the Gemini AI API and Inngest. Prisma ORM provides a type-safe database client, automated migrations, and an intuitive data modelling schema for Neon DB. Neon DB, a serverless PostgreSQL database, offers automatic scaling, instant rollbacks, and PostgreSQL compatibility without the complexities of traditional database management [4].

D. AI Integration

The Gemini AI API serves as the central AI engine powering the platform's intelligent features. It is integrated to generate AI industry insights, create mock interview questions, optimize resume content, and produce personalized cover letters. Prompts are carefully engineered to produce relevant, high-quality outputs tailored to individual user profiles. API keys are stored securely as environment variables to prevent exposure on

the client-side. The API is accessed through the official Google AI client library installed in the Next.js project.

E. Background Task Processing with Inngest

Inngest is used for managing and executing background tasks and scheduled cron jobs. The platform uses Inngest to periodically trigger the AI industry insights generation pipeline — fetching the latest industry data from the Gemini AI API, processing the output, and storing updated insights in Neon DB for display on user dashboards. This asynchronous processing ensures that time-consuming AI tasks do not impact real-time user experience [11].

F. System Testing

Testing encompasses functional validation of each feature module, performance evaluation of API endpoints and page load times, and security testing for input validation, authentication, and data protection. Unit testing validates individual components, integration testing verifies module interactions, and end-to-end testing simulates complete user workflows from signup through profile creation to feature usage. Postman is used for API endpoint testing and validation during development.

V.. SYSTEM DESIGN AND IMPLEMENTATION

A. System Architecture

The overall architecture of the AI Career Coach consists of a Next.js frontend and backend, Neon DB database layer, Gemini AI API, and Inngest job scheduler working in coordination. The frontend renders pages using SSR for improved performance. API routes located in the Next.js pages/api directory handle server-side business logic, database queries through Prisma, and communication with external AI services. The modular design ensures that new features can be added without disrupting the existing system structure.

B. Data Flow — DFD Level 0

At the system level (DFD Level 0), the user interacts with the AI Career Coach system by providing profile data, resume details, and job-related inputs. The system sends structured prompts to the Gemini AI API and receives generated content such as industry insights, interview questions, resume suggestions, and cover letters. Inngest acts as the external job scheduler, triggering the system periodically to refresh industry insight data without user intervention.

C. Data Flow — DFD Level 1

At the subsystem level (DFD Level 1), the system is divided into six process modules: (1) User Authentication — handles registration, login, and session management via NextAuth.js; (2) Profile Management — stores and retrieves user profile data in Neon DB; (3) Resume Building — collects user input, sends prompts to Gemini AI, generates Markdown output, and supports PDF export; (4) Mock Interview — generates role-specific questions via Gemini AI, records user sessions, and computes performance analytics; (5) Industry Insights — triggered by Inngest cron jobs, fetches and stores AI-generated insights in Neon DB; (6) Cover Letter Generation — accepts job details, generates personalized letters via Gemini AI, and allows user customization.

D. Database Schema Design

The Neon DB database is organized into six primary schemas managed through Prisma. The User schema stores unique identifiers, name, email, encrypted password, and timestamps. The Profile schema stores userId (foreign key), bio, skills array, experience, education, target industry and sub-industry, and career goals. The Resume schema stores userId, Markdown content, and PDF export URL. The Interview schema stores userId, generated questions array, user answers array, and performance score. The IndustryInsights schema stores industry name, AI-generated content, and the next scheduled update timestamp. The CoverLetter schema stores userId, job title, company name, and letter content.

E. Key Feature Implementation Details

The resume building workflow operates as follows: the user inputs educational and professional details through a structured form, the backend constructs a detailed prompt incorporating the user's profile and input data, the prompt is sent to the Gemini AI API, the API response is parsed and formatted into Markdown, the Markdown is stored in Neon DB, rendered in the UI using React Markdown, and exported to PDF using a server-side PDF library. The mock interview workflow generates role-specific questions by constructing prompts that include the user's profile, target role, and selected focus areas, then sending these to the Gemini AI API. Performance data is stored after each session and aggregated to produce accuracy trends and statistics displayed on the user dashboard.

F. Authentication Implementation

NextAuth.js is configured with a Credentials provider for email and password authentication and integrated with the Prisma adapter for database-backed session management. Upon successful login, a secure JSON Web Token (JWT) is issued and stored in an HTTP-only cookie. Session data including user ID, name, and email is accessible on both the frontend through the useSession hook and on the backend through the getSession function. All protected API routes verify the session before processing requests, ensuring unauthorized access is prevented. Password hashing uses bcrypt before storing credentials in Neon DB.

VI.. RESULTS AND DISCUSSION

A. Functional Testing Results

All core modules of the AI Career Coach were tested across multiple user scenarios using both manual and automated testing techniques. The system successfully validated 14 test cases covering all major functionalities. Table I summarizes the test cases, expected outputs, and results. All test cases passed, confirming that the system meets its functional requirements across authentication, profile management, AI content generation, interview preparation, performance tracking, and PDF export functionalities.

TC ID	Module	Test Input
TC01	Signup	Valid user name, email, password
TC02	Signup	Existing registered email address
TC03	Login	Valid registered credentials
TC04	Login	Invalid / wrong password entered
TC05	Profile	Complete profile data submitted
TC06	Resume	User profile + resume details
TC07	Resume	Required fields left empty
TC08	Interview	Target role selected by user
TC09	Interview	Session completed by user
TC10	Insights	Inngest cron job triggered

TC ID	Module	Test Input	Feature	Existing Systems
TC11	Cover Letter	Job title and company provided	Platform Availability letter generated	Multiple fragmented tools
TC12	Cover Letter	Job title field left empty	Personalization Validation error message shown	Generic advice and templates
TC13	PDF Export	Saved resume content present	Resume Building Interview Resume PDF downloaded successfully	Static templates only
TC14	Logout	Authenticated user clicks logout	Industry Insights Session cleared, redirected	Fixed static question banks

Table I. Functional Test Cases and Results

B. Performance Analysis

The platform demonstrated stable frontend performance using Next.js SSR, with page load times remaining responsive during continuous user interactions. Gemini AI API responses were handled asynchronously through Next.js API Routes to avoid blocking user-facing interactions. Neon DB's serverless architecture provided fast storage and retrieval of user data, resume content, interview records, and performance statistics. API endpoints maintained stable response times during concurrent user testing. Inngest background jobs executed reliably on schedule without impacting the real-time user experience, confirming the effectiveness of the asynchronous processing architecture.

C. Security Testing and Enhancements

Security measures implemented and validated during testing include: NextAuth.js session management with HTTP-only JWT cookies; bcrypt password hashing before database storage; secure API key management through environment variables; input validation and sanitization on both frontend and backend to prevent injection attacks; CSRF protection via NextAuth.js built-in mechanisms; HTTPS enforcement during Vercel cloud deployment; and rate limiting on sensitive API endpoints to prevent abuse. These measures collectively protect user data and prevent common web vulnerabilities including SQL injection, cross-site scripting (XSS), and cross-site request forgery (CSRF) [13].

D. Comparison with Existing Systems

Table II presents a detailed comparison between existing career development systems and the proposed AI Career Coach across key features and capabilities.

Performance Tracking	Limited or entirely absent
Cover Letter	Manual or basic template-based
Authentication	Basic credential login only
Scalability	Limited, often server-dependent
AI Integration	Minimal or surface-level

Table II. Comparison of Existing Systems and Proposed AI Career Coach

E. System Performance Summary

The overall performance of the AI Career Coach platform was analysed based on tracking responsiveness, API response time, database communication speed, and operational reliability. The system successfully processed all user interactions across the authentication, profile management, resume generation, mock interview, industry insights, and cover letter modules without data loss or system crashes. The use of Next.js SSR improved initial page load performance, while Neon DB's serverless architecture ensured efficient data handling under varied load conditions. The Gemini AI API consistently produced high-quality, relevant content across all AI-powered features, confirming the effectiveness of the prompt engineering strategy employed during development.

VII.. FUTURE ENHANCEMENTS

The AI Career Coach platform establishes a strong foundation for future growth and enhancement. Several promising directions for expansion exist that can further improve system intelligence, user engagement, and platform reach.

A. AI-Powered Interview Response Feedback

Future iterations can integrate the Gemini AI API further to evaluate user responses during mock interview sessions, providing detailed feedback on technical accuracy, clarity of explanation, and overall communication effectiveness. This would transform the mock interview module from a self-assessment tool into an AI-driven coaching system capable of adaptive difficulty adjustment based on user performance.

B. Personalized Learning Roadmaps

Based on user profiles and identified skill gaps from performance analytics, the platform can recommend curated learning resources including online courses, research papers, documentation, and hands-on projects. These recommendations would be organized into structured, personalized learning roadmaps that guide users step-by-step towards their career goals within the AI domain.

C. AI-Driven Job Matching and Application Assistance

Expanding the platform to include a job board with AI-powered matching capabilities would allow the system to recommend relevant AI job openings based on user profiles and career goals. The Gemini AI API can further assist users in tailoring their resumes and cover letters to match specific job descriptions, improving application success rates [14].

D. Skill Assessment and Gap Analysis

Implementing skill assessment features through quizzes, coding challenges, and practical exercises would allow the system to objectively evaluate users' current AI competencies. The results would be used to generate personalized gap analysis reports and direct users towards specific learning resources and practice materials.

E. Networking and Community Features

Adding functionality to connect users with AI mentors, industry peers, and professionals through the platform would enhance the career development experience. Community features such as discussion forums, Q&A sections, and peer-reviewed project sharing would foster collaborative learning within the AI career community.

F. Mobile Application Development

Developing native mobile applications for Android and iOS platforms would provide users with convenient access to all platform features on the go. Push notifications can be implemented for instant delivery of industry insights

updates, interview reminders, and application tracking alerts, further improving user engagement and platform accessibility.

G. Gamification and Engagement

Incorporating gamification elements such as points, badges, streak tracking, leaderboards, and progress milestones would enhance user motivation and platform engagement. Gamified career development pathways can encourage consistent daily practice of interview preparation and skill development activities.

VIII. CONCLUSION

The AI Career Coach represents a significant and practical step towards leveraging modern full-stack web development technologies and the transformative power of large language model APIs to address the evolving needs of individuals navigating the complex AI career landscape. By integrating Next.js, Neon DB, Tailwind CSS, Prisma, Inngest, Shadcn UI, NextAuth.js, and Google's Gemini AI API into a cohesive, modular platform, the system provides a comprehensive suite of intelligent features designed to empower users at every stage of their professional journey.

The successful implementation of personalized onboarding, AI-driven industry insights, dynamic mock interview preparation, AI-assisted resume and cover letter generation, performance analytics, and secure user authentication demonstrates the technical viability and practical value of combining modern full-stack paradigms with AI-powered personalization. The system's modular architecture ensures scalability, maintainability, and the ability to integrate future enhancements without disrupting existing functionality.

Functional testing confirmed that all 14 test cases across all feature modules passed successfully. Performance analysis validated the efficiency of the Neon DB serverless architecture, Next.js SSR rendering, and asynchronous Inngest background processing. Security testing confirmed the robustness of the NextAuth.js authentication system, input validation mechanisms, and data protection measures.

Overall, the AI Career Coach provides a reliable, intelligent, and user-friendly solution for modern AI career development, with significant future scope for AI-powered interview feedback, personalized learning roadmaps, job matching, skill gap analysis, mobile application

development, and gamification. The platform stands as a compelling example of how artificial intelligence and modern web technologies can be combined to create meaningful, high-impact applications that address real-world challenges in career development.

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