

NextGen Career Planning Platform with Data-Driven Insights

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Abstract - The evolving job market, driven by technological advancements, requires dynamic and data-driven career guidance solutions. This research proposes the design and development of an AI-powered career guidance platform that offers personalized career recommendations, skill gap analysis, and real-time job market insights. The platform caters to students, professionals, and career changers by analyzing data from diverse career clusters, including emerging fields (AI, Quantum Computing, Blockchain), sector-specific roles, freelance opportunities, and higher education pathways. AI algorithms and predictive models provide tailored suggestions based on user profiles, geographical job trends, and salary comparisons. An AI-powered chatbot enhances the platform by offering virtual career counseling, while interactive career path visualizations make the interface engaging and intuitive. Unique features such as a job readiness score and cross-domain career insights distinguish this platform from existing solutions. Built using HTML, CSS, and JavaScript for the frontend, with Python and Django for the backend, this platform aims to redefine career guidance, making it more accessible, informed, and effective.

Key Words: Career Guidance, Artificial Intelligence, Skill Gap Analysis, Real-Time Job Market, Predictive Analytics, Web-Based Platform

1. INTRODUCTION

Navigating today's rapidly evolving job market is increasingly complex, with students and early-career professionals overwhelmed by emerging fields such as Data Science, Machine Learning, and Blockchain Development. Mid-career professionals and career switchers also face challenges in identifying the skills needed to stay competitive.

Despite the availability of online resources, career-related information remains fragmented across educational platforms, job portals, and forums, making it difficult for users to make informed decisions.

The "NextGen Career Planning Platform Using Data-Driven Insights" addresses these challenges by consolidating these resources into a unified application. The platform offers personalized career recommendations, skill gap analysis, and real-time job market insights. An AI-powered chatbot enhances user experience by providing context-aware career guidance. Built with Django, the platform empowers users to make informed career decisions and explore relevant opportunities effectively.

2. LITERATURE REVIEW

Traditional career guidance platforms offer static information and generalized recommendations, often failing to keep pace with evolving job market demands. Recent research highlights the growing effectiveness of AI-powered systems in delivering personalized career advice by analyzing user preferences, skill profiles, and emerging industry trends. AI-driven platforms leverage machine learning (ML) and Natural Language Processing (NLP) to offer real-time insights into job opportunities, skill gaps, and career trajectories.

2.1 AI-Powered Career Counselling Systems

AI-based career counseling systems enhance decision-making accuracy by dynamically matching users with suitable career paths. These platforms utilize ML models and NLP techniques to assess user inputs, provide tailored career suggestions, and analyze real-time job market data.

However, most existing systems lack the capability to address cross-domain career insights sector-specific recommendations, limiting their effectiveness in an increasingly interdisciplinary job market.

2.2 Real-Time Skill Gap Analysis and Career Prediction

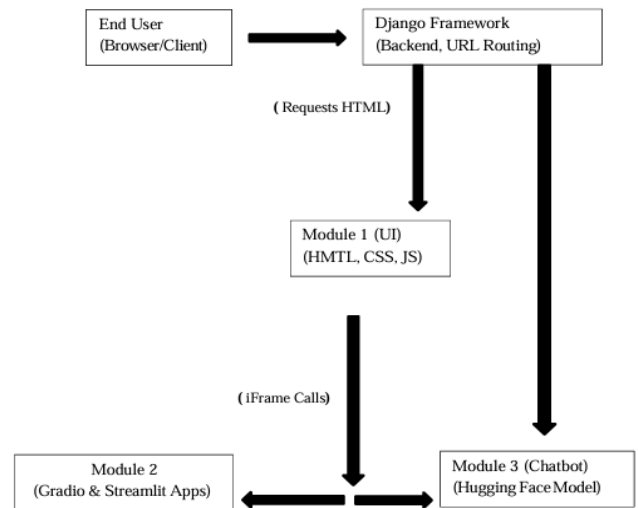
- **Skill Comparison and Analysis:** Compares user competencies with industry standards, identifies areas for improvement, and recommends necessary skill enhancements.
- **Training and Certification Suggestions:** Recommends relevant training programs and certifications, suggesting skill improvement pathways aligned with emerging industry trends.
- **Career Forecasting:** Uses predictive models to analyze job market trends and forecasts future career opportunities by aligning user skill sets with industry demands.
- **Limitations of Existing Platforms:** Highlights the lack of region-specific job demand analysis and absence of salary trends and insights into emerging skill requirements.
- **Addressing Gaps:** Incorporates real-time analytics to provide personalized career forecasting and enhances decision-making by integrating regionally relevant career insights.

2.3 System Architecture and Modular Design

Cross-domain career insights explore interdisciplinary career opportunities aligned with evolving industry trends. These insights empower users to consider career transitions and pivot between fields based on transferable skills. By analyzing career trajectories and emerging job trends, AI models predict alternative career paths that align with users' evolving aspirations. This feature enhances decision-making by broadening career possibilities beyond traditional sector boundaries.

- A modular architecture ensures that core functionalities such as UI, skill gap analysis, job recommendations, and chatbot interactions operate independently while maintaining seamless communication.
- Django orchestrates the backend processes, rendering templates and managing user sessions. The platform integrates Gradio and Streamlit for interactive modules, hosted on Hugging Face Spaces, allowing real-time skill gap analysis and career recommendations.
- The chatbot leverages NLP models hosted on Hugging Face, ensuring responsive and context-aware interactions. This modular design enhances scalability, facilitates easy updates, and ensures

optimal performance even with increasing user demands.



2.3 System Architecture

3. Module 1: User Interface

3.1 Design Goals:

The User Interface (UI) serves as the primary interaction point for users, presenting diverse career options and key platform features in an intuitive and visually engaging manner. Developed using HTML, CSS, and JavaScript, the interface ensures seamless navigation through carousels, search bars, and interactive elements. The design focuses on enhancing usability and user satisfaction by providing easy access to personalized career recommendations and real-time insights.

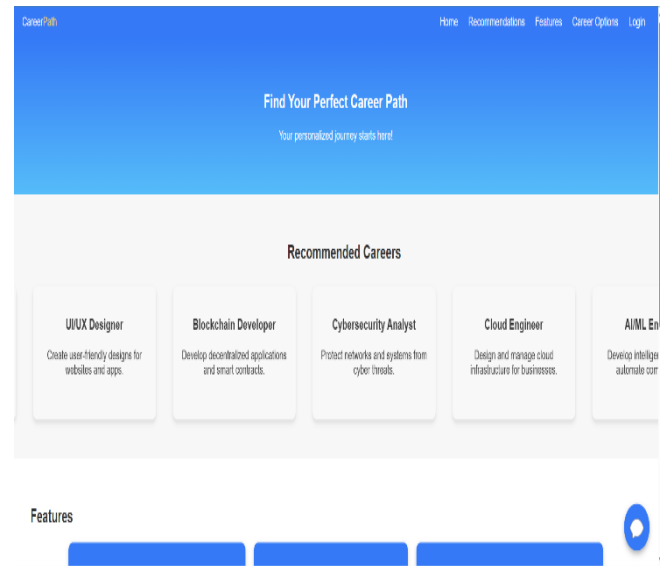
- **Intuitive Navigation:** The UI incorporates clear headings such as "Home," "Recommendations," and "Features," enabling users to explore the platform effortlessly.
- **Visual Appeal:** A dynamic carousel highlights recommended careers using minimal animations to maintain a modern and engaging appearance.
- **Responsiveness:** The design adapts to various screen sizes, including desktops, tablets, and mobile devices, ensuring a consistent user experience across platforms.
- **Seamless Embedding:** iFrames are used to integrate external applications, allowing smooth access to additional tools and features within the platform.

3.2 Sections and Features

The interface is organized into three primary sections, each offering distinct functionality to enhance user engagement and decision-making:

- Section 1: Recommended Career Options**
 A dynamic carousel showcases popular careers such as Data Scientist, UI/UX Designer, and other trending professions. The carousel scrolls horizontally, encouraging users to explore a variety of career options.
- Section 2: Features of the Application**
 This section outlines key functionalities, including Skill Gap Analysis and Job Recommendation. Each feature is interactively revealed through a toggle or click action, dynamically loading the relevant iFrame for real-time analysis and insights.
- Section 3: Real-Time Career Options**
 Another carousel links to specialized pages for domains such as Engineering, Medicine, and Law. Each page provides a brief description, required skillset, and prevailing market trends, presented either as textual data or visual content. A double-click on a sub-field “card” reveals deeper insights through a pop-up or collapsible section, enhancing user understanding.
- Login / Sign Up System:** User authentication is embedded in the navigation bar, allowing seamless login and account creation. Upon successful login, the system displays the user’s name and provides a “Logout” link for easy account management.

- JavaScript:** JavaScript functions dynamically toggle iFrame visibility for Skill Gap Analysis and Job Recommendation features, enhancing interactivity. A floating chatbot button triggers a hidden <div> containing the iFrame, enabling real-time conversational assistance through AI-powered guidance.



3.3.1 Home Page

3.3 Implementation Details

The platform’s user interface leverages a combination of HTML, CSS, and JavaScript to ensure a smooth and interactive user experience.

- HTML:** The career.html file employs semantic HTML5 elements such as <section>, <div>, and <nav> to organize content effectively, ensuring better readability, maintainability, and accessibility. The structured approach enhances content hierarchy, allowing users to navigate the platform with ease.
- CSS:** Custom styles, including classes such as .carousel-container and .career-card, ensure a visually appealing interface with smooth transitions. Media queries (@media rules) adapt the layout for smaller screens, enhancing the user experience across various devices.

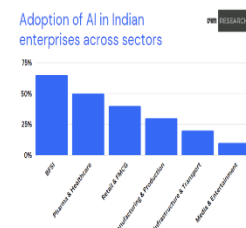
AI in Robotics

AI in Robotics integrates artificial intelligence with robotic systems, enabling automation, self-learning, and adaptive decision-making. Robots powered by AI can perform tasks in manufacturing, healthcare, and even space exploration. This field combines computer vision, motion planning, and reinforcement learning to enhance robot intelligence.

Required Skills

- Computer Vision for Object Detection
- ROS (Robot Operating System)
- Path Planning & Motion Control
- Reinforcement Learning in Robotics
- AI-driven Decision-Making
- Embedded Systems for Robotics

Industry Demand & Job Trends



3.3.2 Sub Page

4. Module -2: Data Driven Insights

Module-2 of the NextGen Career Planning Platform focuses on delivering key data-driven insights to help users assess their career readiness and explore job opportunities. This module includes two major features: Career Gap Analysis and Job Recommendation. These features empower users to identify skill gaps for specific job roles and receive personalized job recommendations based on their preferences. Both features are deployed on Hugging Face Spaces and integrated seamlessly into the main Django application via iframed mini-apps. This

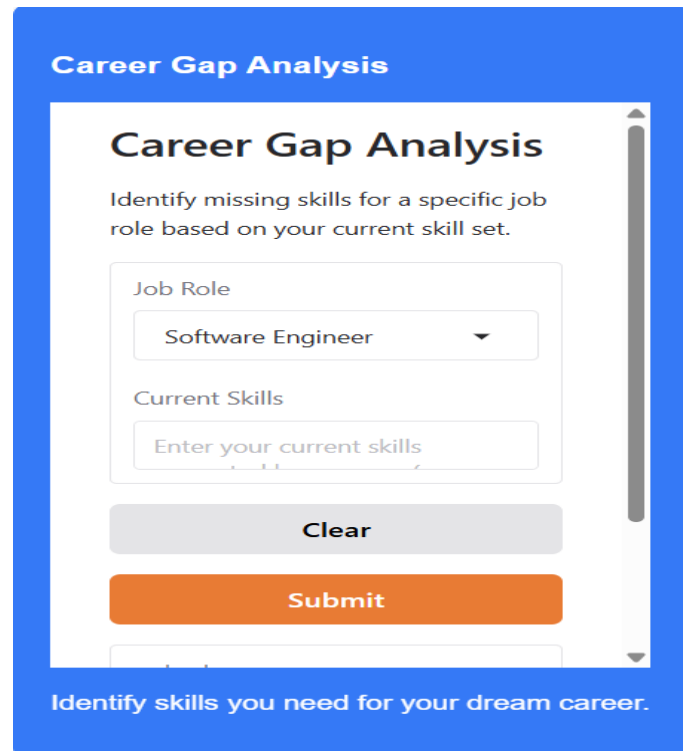
modular design ensures that users can access advanced data-driven features without leaving the main platform, offering an intuitive and interactive experience.

4.1 Career Gap Analysis

The Career Gap Analysis feature is designed to help users identify the missing skills required for specific job roles. The process begins with the loading of a CSV file containing predefined job roles and their associated skills required. This dataset, such as `Job_Roles_and_Skills.csv`, lists roles like "Data Scientist" with their respective skills such as Python, SQL, and Machine Learning. The system compares these required skills with the user's self-reported skill set, which is inputted as a comma-separated list. If the user's skills do not match the required skills, the platform flags those as "missing."

The workflow for this feature is straightforward. The system preprocesses the dataset by splitting the "Skills Required" column into individual skills using Python, which allows for easy comparison against user inputs. In the optional step, a `CountVectorizer` can be used to vectorize the skills for more advanced analysis, but a simple skill comparison method is effective for the basic gap analysis. If a user's selected job role has missing skills, the platform lists those skills, helping the user focus on areas for improvement. If no missing skills are found, the user is informed that they are fully qualified for the role.

The Career Gap Analysis is implemented using Gradio to create an interactive interface. Users select a job role from a dropdown and input their skills, triggering the analysis. Once the analysis is performed, the results are displayed to the user. This tool is deployed as a Gradio app on Hugging Face Spaces, and the resulting application is embedded in the main platform using an `iframe`. This seamless integration enables users to perform gap analysis directly within the platform without navigating to external websites. The deployment of this feature ensures that users can continuously evaluate their career readiness in real-time.



4.1 Career Gap Analysis

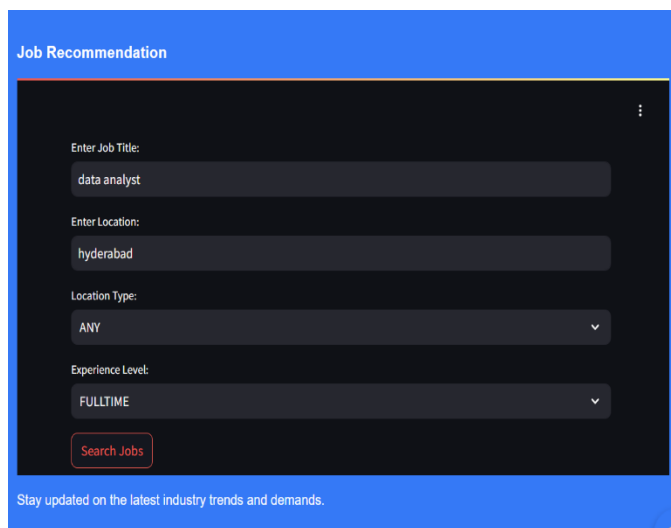
4.2 Job Recommendation

The Job Recommendation feature enables users to explore real-time job opportunities tailored to their inputs. When users provide a job title, location, location type (remote or on-site), and experience level, the platform queries external job listing APIs to fetch relevant job postings. This feature uses the `jsearch.p.rapidapi.com` API to retrieve up-to-date job listings. The integration ensures that users receive personalized job recommendations that match their criteria, saving time and effort in manual job searching.

The technical flow of the job recommendation feature begins when the user enters their job search criteria, including the title, location, and experience level. The platform uses Streamlit for the front-end interface, allowing users to enter the required parameters through text fields and buttons. The function `get_job_openings()` sends these inputs as a query to the RapidAPI job search endpoint, which returns job listings in the form of a JSON response. Each job posting includes details such as job title, company name, location, job type, and application link, which are then displayed on the platform. Error handling ensures that the user is informed if no results are found or if the API call fails.

Like the Career Gap Analysis, the Job Recommendation feature is deployed using Streamlit and hosted on Hugging Face Spaces. The job listings and their

details are embedded in the main platform’s career.html page through an iframe. This allows users to access job data directly within the platform, ensuring a seamless experience. As the job recommendations are pulled in real-time from external APIs, the platform ensures that the information is up-to-date. The job recommendation feature also integrates a dynamic user interface, allowing users to interact with the job data through a simple and effective interface. By embedding this feature via iframe, the platform keeps the user engaged within the same environment without navigating away from the main site.



4.2 Job Recommendation

5. Module-3: Interactive Chatbot

The Interactive Chatbot module is designed to enhance the user experience by providing real-time, context-aware guidance to users. This feature is an essential addition to the NextGen Career Planning Platform, offering personalized career advice, answering career-related queries, and assisting users with navigation. The chatbot utilizes a state-of-the-art language model hosted on Hugging Face, ensuring high-quality interactions while being lightweight enough for efficient deployment. By embedding the chatbot within the platform, users can receive instant feedback, making career planning more accessible and user-friendly.

5.1 Chatbot Importance

- The Interactive Chatbot plays a pivotal role in enhancing user engagement on the platform. By leveraging an advanced language model with 7 billion parameters, the chatbot is capable of understanding and generating natural language responses in real-time. This is essential for providing career guidance, offering personalized suggestions, and helping users navigate through the platform.

- Unlike traditional search engines or static content, the chatbot enables conversational interaction, allowing users to ask specific questions and receive immediate, contextually relevant answers. Whether it's clarifying skill requirements for a career or suggesting potential job roles, the chatbot serves as a friendly assistant that bridges the gap between complex data and user comprehension.
- This functionality is particularly beneficial for job seekers, students, and professionals looking to make informed career decisions based on tailored advice.

5.2 Implementation Of Chatbot

- The implementation of the Interactive Chatbot leverages the HuggingFaceH4/zephyr-7b-beta model, a 7-billion parameter language model chosen for its efficient balance between performance and resource consumption.
- This model is capable of maintaining coherent, context-aware conversations, making it an ideal fit for interactive tasks such as career guidance. The chatbot’s conversation logic is designed to maintain an ongoing exchange with users by appending their messages and the model’s responses to a messages list.
- At the core of the implementation, the Gradio library is used to create an interactive chat interface that is both user-friendly and responsive. The conversation begins with a “system message” that defines the chatbot’s role, such as, “You are a friendly assistant to help with career guidance.”
- The user’s inputs are dynamically appended to the conversation, and the assistant’s responses are generated through a streaming approach with Gradio’s stream=True option, ensuring that tokens are displayed in real-time as they are generated by the model.

5.3 : Chatbot Integration

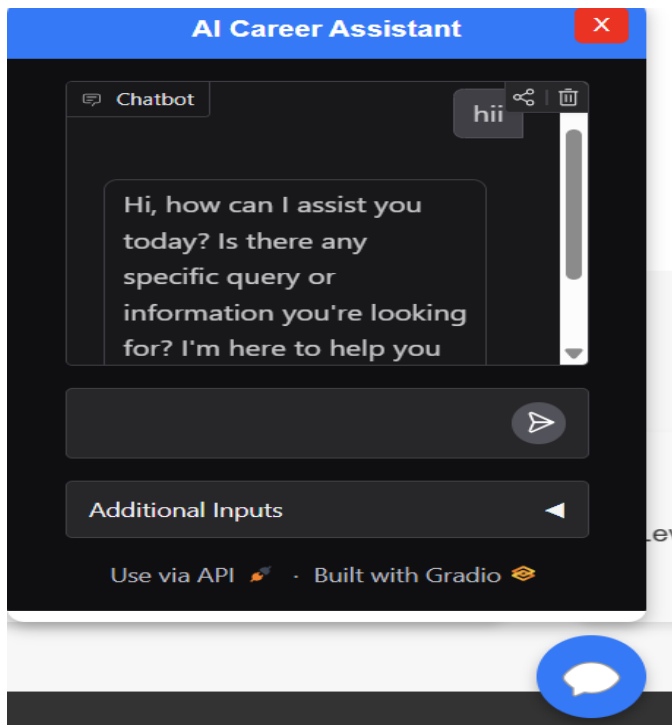
To seamlessly integrate the Interactive Chatbot into the NextGen Career Planning Platform, we deploy the chatbot as a Gradio app on Hugging Face Spaces. This deployment is simple, as Gradio automatically handles the user interface while Hugging Face takes care of the model hosting.

The app.py file contains the necessary code to manage the chatbot’s functionality, while requirements.txt lists dependencies such as gradio and huggingface_hub.

Once deployed, the app is accessible through a shareable URL, such as <https://username-career-guidance-chatbot.hf.space>, allowing users to access the chatbot directly from the platform.

For integration with the main Django application, a floating button is added to the career.html page. When clicked, this button toggles the visibility of a div containing an iframe that loads the Hugging Face Space URL.

This setup ensures that the chatbot is accessible from any page within the platform without disrupting the user interface or workflow. By embedding the chatbot as an iframe, users can interact with it without leaving the current page, ensuring a seamless, uninterrupted experience.



5.3 Chatbot Application

6. Module Interaction & Sample Test Cases

6.1 Modules Interaction

In the NextGen Career Planning Platform, the interaction between various modules is designed to provide a seamless and cohesive user experience. The platform is built on the Django framework, which follows a well-defined project structure ensuring scalability and maintainability.

The platform integrates multiple functionalities, including career exploration, job recommendations, career gap analysis, and an interactive chatbot. Each of these modules interacts efficiently through Django's views,

templates, and URL routing mechanisms, enabling smooth data flow between them. The career_app within Django handles the core logic of the platform, from user authentication to rendering dynamic career pages.

At the heart of this integration lies the career_app, which manages the interactions between models, views, and templates to provide dynamic content to users. The models.py file defines the structure of the application's data, while views.py processes HTTP requests, calling the appropriate model methods and rendering the templates.

The urls.py file ensures that each request is routed to the correct view for further processing. The modular approach ensures that each feature, such as the Career Gap Analysis and Job Recommendation, is encapsulated within its own submodules and can be easily modified or scaled independently. This system architecture provides a structured approach to development and enhances maintainability.

6.2 Linking All Modules

The platform follows a modular approach, integrating the features into the main Django framework to create a unified experience for the user. Each module is embedded into the platform using iFrames, ensuring that the user can seamlessly interact with external applications without leaving the main site.

Module 1 (User Interface) is directly integrated into the Django templates (HTML, CSS, and JavaScript) to present career recommendations, features, and real-time career options. This module provides a cohesive frontend experience that encourages user interaction.

Module 2 (Data-Driven Insights), which includes the Career Gap Analysis and Job Recommendation features, is embedded as two separate iFrames. The first iFrame is dedicated to the Gradio-based Career Gap Analysis, and the second iFrame displays the Streamlit-based Job Recommendation.

Both of these mini-applications are deployed on Hugging Face Spaces, which provides a cloud-based environment for hosting and executing machine learning models and interactive tools.

The Interactive Chatbot (Module 3) is similarly embedded via an iframe, allowing users to engage with the chatbot without disrupting their workflow. A floating button on the UI allows users to toggle the visibility of the chatbot interface, providing instant, real-time assistance for career-related queries.

This integration ensures that users can interact with the various functionalities—gap analysis, job recommendations, and the chatbot—without navigating

away from the platform. It creates a seamless, unified user experience by utilizing Django’s powerful backend capabilities while embedding external mini-apps to handle specific tasks.

6.3 Sample Test Cases

Testing is a crucial step in ensuring the platform functions as expected and provides a smooth user experience. Several test cases are designed to verify the functionality of the platform’s key features, including login authentication, career gap analysis, job recommendations, and chatbot interaction.

Test Case	Input	Expected Output	Result
TC1: Login	Username=valid, Password=valid	Redirect to home with user greeting	Pass/Fail
TC2: Gap Analysis	Job Role="Data Scientist", Skills="python, sql"	Show "missing skills: statistics, machine learning"	Pass/Fail
TC3: Job Recommendation	Job Title="Data Engineer", Loc="NY", Type="Remote"	A list of relevant job postings from the API	Pass/Fail
TC4: Chatbot	"Hello, can you suggest a tech career?"	Chatbot responds with suggestions (e.g., AI/ML, WebDev)	Pass/Fail
TC5: Logout	Click Logout	User session cleared, returns to login prompt	Pass/Fail

6.3 Sample Test Cases

- Test Case 1:** In this test, the platform verifies user authentication. When a user enters a valid username and password, they should be redirected to the home page with a personalized greeting. This test ensures that the authentication system works correctly and users can securely access their personalized features.
- Test Case 2:** This test checks the accuracy of the Career Gap Analysis feature. For example, if a user selects the Data Scientist job role and enters "Python, SQL" as their current skills, the platform should highlight missing skills like Statistics and Machine Learning. This ensures the system accurately identifies skill gaps based on predefined job role requirements.
- Test Case 3:** The Job Recommendation feature is tested by entering job parameters such as job title, location, and experience level (e.g., "Data Engineer", "NY", "Remote"). The platform should fetch live job data from RapidAPI and display a list of relevant job postings. This test ensures that the platform correctly queries external APIs and displays accurate job listings.
- Test Case 4:** The chatbot functionality is tested by querying it with simple questions such as "Can you suggest a tech career?". The chatbot should

respond with relevant career suggestions like AI/ML or Web Development. This verifies that the chatbot responds appropriately and provides useful information to users.

- Test Case 5:** This test ensures that when a user clicks the Logout button, their session is cleared, and they are redirected to the login page. It confirms the security and session management capabilities of the platform, ensuring that users can securely log out without issues.

These test cases verify that the core features of the platform are working as expected and provide a seamless experience for users. Through unit testing, integration testing, and user acceptance testing, the platform ensures that all components interact correctly and deliver the intended functionality.

7. Conclusion

The NextGen Career Planning Platform represents a comprehensive solution for modern career guidance, combining cutting-edge technology with real-time data and personalized insights. By integrating key features such as career gap analysis, job recommendations, and an interactive chatbot, the platform empowers users with tools to make informed career decisions. The platform’s ability to provide tailored career suggestions, identify skills gaps, and connect users to real-time job opportunities addresses critical challenges faced by job seekers and students in today’s competitive job market.

The integration of powerful frameworks like Django, Streamlit, and Gradio, alongside Hugging Face for AI-driven interactions, has enabled the creation of an efficient, scalable, and user-friendly platform. The modular approach used in the development ensures ease of maintenance and future scalability, allowing for continuous enhancement of features and the addition of new functionalities. Furthermore, the use of external APIs and real-time data retrieval ensures that users have access to up-to-date information about job opportunities, while the AI-powered chatbot offers instant, personalized guidance, making the platform not only interactive but also a reliable resource for career exploration.

In conclusion, the NextGen Career Planning Platform addresses the evolving needs of individuals navigating their career paths, offering a data-driven, interactive, and personalized experience. The project showcases how integrating machine learning, natural language processing, and real-time job data can transform career planning into a more efficient and dynamic process. Moving forward, there is immense potential to enhance the platform with predictive analytics, advanced machine learning models, and broader industry integration, further

helping users navigate their career journeys with greater precision and confidence.

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