

PROPLACE AI: INTELLIGENT CAREER & JOB MATCHING ASSISTANT

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Abstract- This project develops an AI-based career recommendation and job matching system using intelligent automation to streamline the recruitment and career guidance process. By integrating Natural Language Processing (NLP) and Machine Learning techniques, the system analyzes user resumes and matches them with relevant job opportunities, reducing manual effort and improving decision accuracy. Built on modern web technologies and Python-based frameworks, the platform automates resume screening, skill extraction, and personalized job recommendations along with real-time feedback. Results indicate that the system significantly reduces candidate filtering time compared to traditional manual methods. The system provides a seamless, intelligent, and user-friendly solution suitable for job seekers, educational institutions, and recruitment platforms.

Key Words: Artificial Intelligence, Career Recommendation, Job Matching, Resume Analysis, Intelligent Automation, Natural Language Processing (NLP), Machine Learning, FastAPI, PostgreSQL.

1. INTRODUCTION

Career guidance and recruitment processes have evolved into complex operations in the modern digital era, requiring the analysis of large volumes of candidate data, job requirements, and dynamic industry trends. Despite the availability of online job portals, the primary challenge remains the inefficiency of manual resume screening and generic job recommendations. Current systems often rely on keyword-based filtering and require users to navigate through numerous listings, which is time-consuming and often leads to mismatched opportunities. As the job market becomes increasingly competitive and data-driven, there is a growing need for intelligent systems capable of understanding user profiles and delivering accurate, personalized career recommendations to improve decision-making efficiency.

The emergence of Artificial Intelligence (AI) and Machine Learning technologies provides a viable solution to these challenges. By incorporating AI-driven algorithms and Natural Language Processing (NLP), the system can automatically analyze resumes, extract relevant skills, and match candidates with suitable job roles. Intelligent systems can now handle repetitive recruitment tasks—such as resume screening, job filtering, and skill assessment—without human intervention. This enables job seekers to receive more precise recommendations while allowing recruiters to focus on strategic hiring decisions rather than manual filtering processes.

This research focuses on developing a cohesive platform that bridges the gap between candidate profiles and job opportunities using a centralized database managed by an AI engine. By utilizing intelligent automation and NLP techniques, the system can identify skill gaps, recommend relevant job roles, and enhance overall employability. In this paper, through the integration of Python-based frameworks and modern web technologies, we aim to improve existing recruitment methodologies. Our focus is on creating a smart, efficient, and scalable ecosystem where AI acts as an intelligent assistant for career development and job matching across various domains.

2. SCOPE

The primary objective of this phase is to distinguish and select appropriate scientific methodologies and architectural techniques applicable to the design of an AI-driven event management system. The employed techniques encompass real-time voice processing, natural language understanding, automated scheduling algorithms, and cloud-based data synchronization. The aim is to exploit successful research approaches in human-computer interaction to improve the efficiency of task execution within the application environment. These chosen methodologies enable the seamle

development of core functionalities, including voice-activated report generation, interactive scheduling interfaces, attendee management, and automated notification services. The pursuit of an effective and purposeful solution includes the utilization of research techniques that are technically grounded, user-centric, and in compliance with modern data privacy and automation standards.

3. OBJECTIVE

The main aim of this project is to construct the AI-based career recommendation and job matching system through an intelligent application with features for improved user experience and automated decision-making. The key objectives of the project include:

- [1] Resume Analysis and Parsing: Users can upload their resumes, which will be analyzed using NLP techniques to extract relevant information such as skills, education, and experience for further processing.
- [2] Personalized Job Recommendation: The system will recommend suitable job opportunities to users based on their profile, skills, and preferences using machine learning algorithms.
- [3] Skill Gap Analysis: The platform will identify missing or required skills for desired job roles and provide suggestions to improve user employability.
- [4] User Profile Management: To ensure a personalized experience, a user profile system will be implemented where users can manage their data, preferences, and career interests.
- [5] Role-Based Access Control: Implement role-based access for different users such as job seekers, recruiters, and administrators to ensure secure and efficient system interaction.
- [6] Intelligent Recommendation Engine: Employ machine learning and NLP models to analyze user data and generate accurate job matching and career guidance suggestions.
- [7] Real-Time Data Interaction: Utilize database systems such as PostgreSQL to ensure efficient data storage, retrieval, and real-time interaction within the platform.
- [8] Job Filtering and Search Optimization: Provide advanced filtering and search capabilities to help users find relevant job opportunities quickly and efficiently.
- [9] Automated Notifications and Updates: Use integrated notification services to provide users with updates on job applications, recommendations, and system activities in real time.

4. LITERATURE REVIEW

- [1] The scientific and engineering community is increasingly exploring the integration of Artificial Intelligence (AI) and intelligent automation in recruitment and career guidance systems, resulting in a growing body of research focused on improving user interaction, decision-making accuracy, and job matching efficiency. Studies by various researchers highlight how AI-driven recommendation systems enhance user engagement by providing personalized and data-driven career suggestions. Additionally, research on digital platforms emphasizes the importance of adaptive interfaces and intelligent systems in transforming traditional recruitment practices.
- [2] Optimization of recruitment processes through data-driven analysis has been widely studied. Researchers have demonstrated that automated resume screening and candidate evaluation significantly improve efficiency and reduce manual workload. Machine learning-based systems are capable of analyzing large datasets to identify patterns in hiring trends, thereby enabling more accurate and scalable recruitment solutions. Studies also highlight the role of real-time data processing in enhancing decision-making within career guidance platforms.
- [3] Several studies have focused on user behavior and motivation in digital career platforms. Research indicates that personalized recommendations, feedback mechanisms, and interactive interfaces play a crucial role in improving user engagement and satisfaction. Furthermore, studies on employment trends suggest that aligning user skills with industry demands is essential for effective job matching and long-term career development.
- [4] The literature also includes advancements in deep learning techniques for resume classification and job recommendation. Hybrid models combining Natural Language Processing (NLP) and machine learning algorithms have shown significant improvements in extracting meaningful insights from unstructured resume data. These approaches enhance the accuracy of skill identification, job matching, and candidate profiling.
- [5] The integration of cloud computing and data management technologies has further strengthened modern recruitment systems. Research highlights how cloud-based platforms enable scalable storage, real-time processing, and seamless access to job-related data. Additionally, studies emphasize the importance of secure

data handling and privacy in managing sensitive user information within career platforms.

- [6] Recent advancements in NLP and machine learning have enabled automated extraction and classification of resume content. Researchers have demonstrated that intelligent systems can effectively analyze textual data, identify relevant skills, and categorize candidates based on job requirements. These developments underline the importance of automation in improving recruitment workflows and reducing human bias.
- [7] The growing adoption of intelligent recommendation systems has led to the development of smart career guidance platforms. Studies suggest that AI-driven systems can provide personalized job suggestions, predict career paths, and assist users in identifying skill gaps. Such systems contribute to improved employability and better alignment between candidates and job opportunities.
- [8] Research on decision-making processes in digital environments highlights the role of AI in assisting users with complex choices. Intelligent systems can analyze multiple factors, including user preferences, experience, and industry trends, to provide optimized recommendations. These capabilities enhance the effectiveness of job matching systems and improve user satisfaction.
- [9] Deep learning-based models, such as Convolutional Neural Networks (CNN) and other advanced architectures, have been applied to classification and prediction tasks in recruitment systems. These models demonstrate high accuracy in analyzing structured and unstructured data, making them suitable for large-scale job recommendation platforms.
- [10] Furthermore, studies on user behavior and system interaction emphasize the importance of adaptive and intelligent interfaces in career platforms. AI systems that learn from user interactions can continuously improve recommendation accuracy and system performance over time.
- [11] Recent research also highlights the role of predictive analytics in recruitment systems. By analyzing historical data and user behavior, AI systems can forecast job trends and recommend future career opportunities. This enables users to make informed decisions and stay competitive in the job market.
- [12] Collectively, these studies provide valuable insights into the application of AI, machine learning, and data-driven technologies in recruitment and career guidance systems. Building upon these advancements, this project aims to develop an intelligent AI-based career recommendation and job matching system that enhances efficiency, accuracy, and user experience while promoting data-driven decision-making in modern recruitment environments.

5. PROPOSED METHODOLOGY

To construct an effective AI-based career recommendation and job matching system, the proposed algorithm supports the workflow by analyzing user resumes and job data using advanced Natural Language Processing (NLP) and machine learning techniques. The algorithm employs a deep learning-based approach for high accuracy in extracting user skills, experience, and preferences while classifying job requirements. The system first captures user inputs in the form of resumes or profile data through the application interface. These inputs undergo a preprocessing phase using NLP techniques and intelligent modules to extract relevant features such as skills, qualifications, and domain expertise.

The employed machine learning models, adapted from established frameworks in intelligent recommendation systems, are utilized to match candidate profiles with suitable job opportunities. The system integrates a recommendation engine that compares user data with job descriptions stored in the database and generates personalized suggestions.

Additionally, classification techniques are applied to categorize jobs and user profiles into predefined domains, improving the accuracy and relevance of recommendations. The integrated search and filtering mechanism allows users to explore job opportunities efficiently and track application status in real time.

Furthermore, the platform includes a skill analysis module that identifies gaps between user capabilities and job requirements, providing recommendations for improvement. A dedicated interface is implemented to guide users with career-related insights and resources. The system also manages user profiles and recruiter data, enabling role-based interaction and personalized experiences. This proposed methodology, combining intelligent automation and data-driven techniques, is designed to be a scalable and user-friendly solution that enhances recruitment efficiency and supports informed career decision-making within the application ecosystem.

6. METHODOLOGY

Iterative Waterfall Model: The project follows an extended waterfall model, combining the structured approach of the traditional waterfall with the flexibility of an iterative framework. This approach enables a phased development process while allowing continuous improvements based on user feedback and system performance.

Requirements Gathering (Initial Phase): * The first step is to collect and document the entire set of project requirements accurately.

1. Requirements Gathering (Initial Phase):

- The first step involves collecting and documenting all project requirements in detail.
- Key elements include identifying core features such as resume analysis, job recommendation, skill gap detection, user profile management, and role-based access control.

2. System Design (Initial Phase):

- The team develops an initial system architecture outlining data flow and system components.
- This phase includes selecting appropriate technologies such as FastAPI for backend development, PostgreSQL for database management, and machine learning models for recommendation systems.

3. Implementation (Iterative Phase):

- The implementation begins with core modules such as resume parsing and job recommendation.
- A functional prototype is developed, focusing initially on specific components.
- Modules are iteratively improved through testing and real-world data evaluation to enhance accuracy and system performance.

4. Testing (Iterative Phase):

- Rigorous testing is conducted for each module of the system.
- Testing focuses on resume parsing accuracy, recommendation precision, database operations, and user interface functionality.
- Identified issues are resolved through iterative refinements to ensure system reliability and performance.

5. Integration (Iterative Phase):

- Different system components are integrated into a unified platform.
- Data flow between modules is tested to ensure seamless interaction and a consistent user experience.

6. User Feedback (Iterative Phase):

- Feedback is collected through testing phases and user interaction.
- The system is refined based on user suggestions to improve usability, recommendation accuracy, and overall functionality.

7. Documentation (Ongoing):

- Comprehensive documentation is maintained throughout the development lifecycle.
- This includes system architecture, API documentation, and user manuals.

8. Deployment (Final Phase):

- The final version of the system is deployed for real-world usage.
- Final validation ensures all modules—including resume analysis, job recommendation, and user management—function correctly.

9. Maintenance and Updates (Post-Deployment):

- Continuous monitoring is performed after deployment.
- Updates, bug fixes, and feature enhancements are implemented based on user feedback and system performance.

TECHNOLOGIES USED

1. **Natural Language Processing (NLP) and Machine Learning:** This project utilizes NLP techniques and machine learning algorithms to analyze resumes, extract relevant skills, and generate accurate job recommendations.

2. **Python-Based Frameworks (FastAPI):** The backend is developed using FastAPI, providing high performance, scalability, and efficient API handling for intelligent automation processes.

3. **Database Management (PostgreSQL):** PostgreSQL is used for structured data storage, ensuring efficient data retrieval, management, and real-time interaction within the system.

4. **Frontend Technologies (React):** The user interface is developed using React to provide an interactive, responsive, and user-friendly experience for job seekers and recruiters.

5. **Recommendation System Algorithms:** Machine learning-based recommendation techniques are implemented to

match user profiles with suitable job opportunities and improve decision-making accuracy.

Such technologies enable the AI-based career recommendation system to address challenges in traditional recruitment processes by providing intelligent automation, personalized recommendations, and efficient data-driven solutions, thereby enhancing overall system performance and user experience.

7. SYSTEM REQUIREMENT

For Developers:

- **Hardware Platform:**
 - **Processor:** Core i3 or Higher
 - **RAM:** 4GB or above
 - **GPU:** Optional (for machine learning model training)
 - **Hard Disk:** 100 GB or above
- **Software Platform:**
 - **Development Environment:** Python IDEs (e.g., PyCharm) or VS Code
 - **Backend Framework:** FastAPI
 - **Frontend Framework:** React
 - **Database:** PostgreSQL
 - **Operating System:** Windows 10 or above / Linux / macOS

For Users:

- **Hardware Platform:**
 - **Processor:** Snapdragon 450 equivalent or above
 - **RAM:** 2GB or above
 - **ROM:** 16GB or above
- **Software Platform:**
 - **Web Browser:** Chrome, Firefox, or Edge (latest version)
 - **Operating System:** Android 11.0 or above / Windows / iOS

8. SYSTEM DESIGN

8.1 E-R Diagram

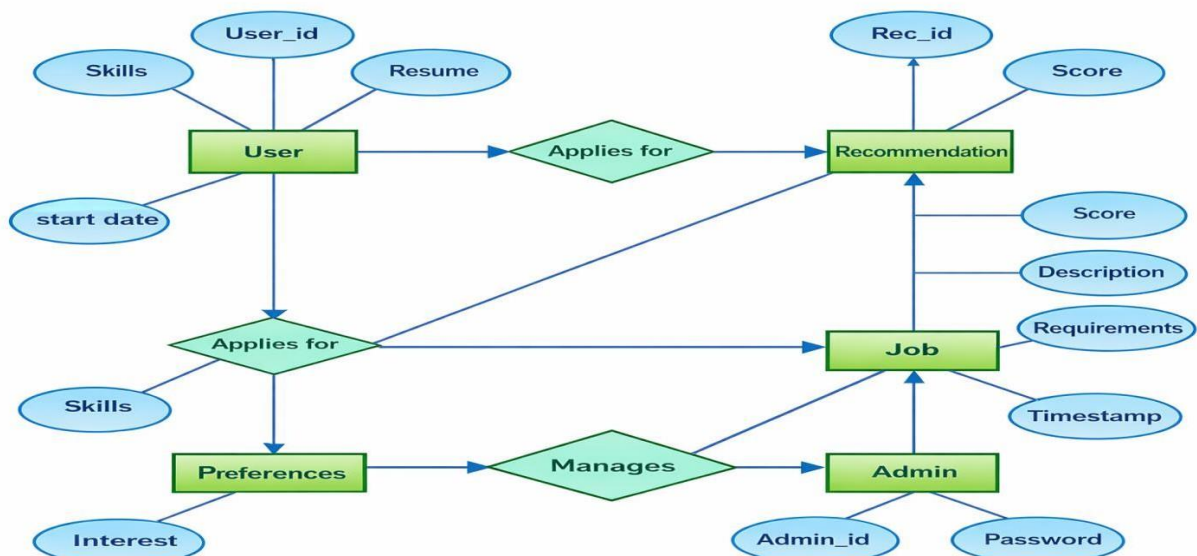


Figure 1 E-R Diagram

8.2 Use Case Diagram

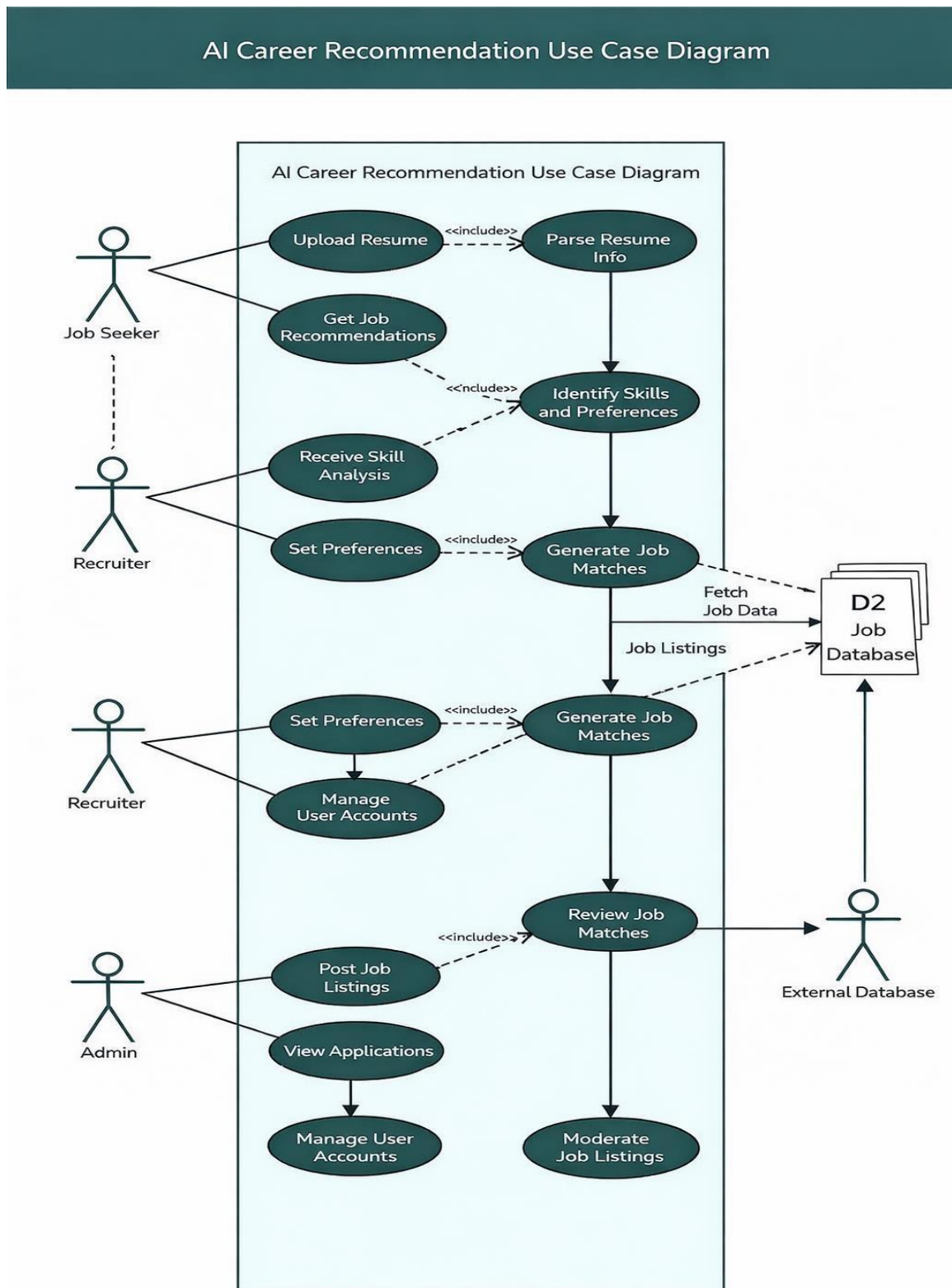


Figure 2 Use Case Diagram

8.3 Data Flow Diagram

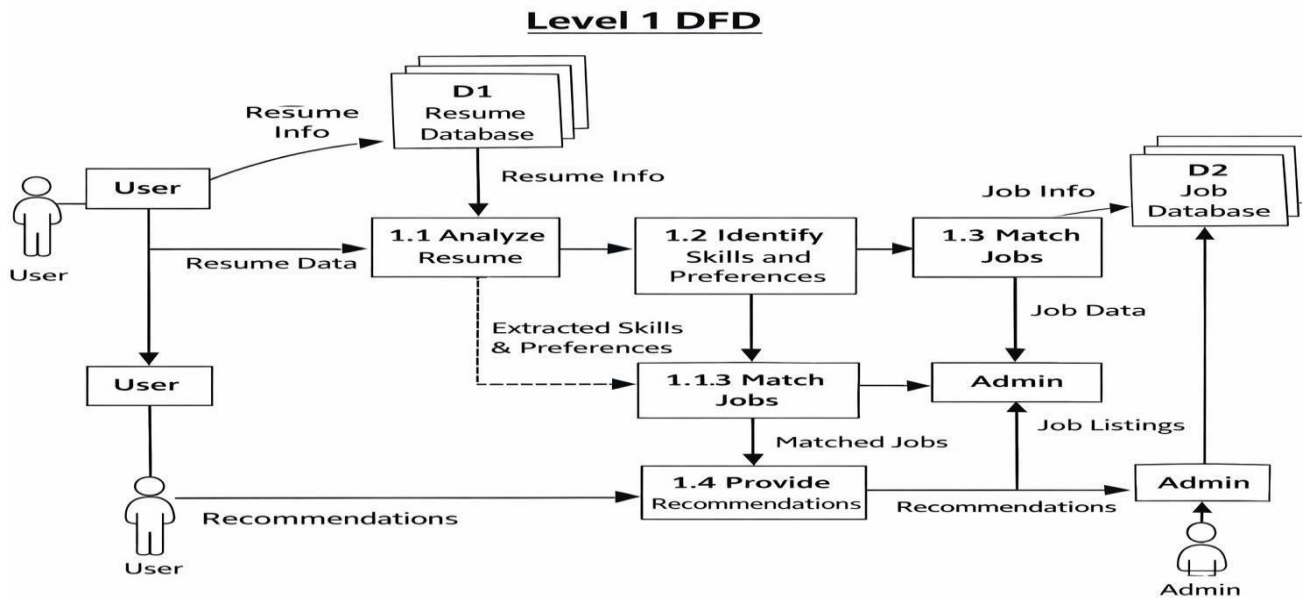


Figure 3 DFD 1 level

9. IMPLEMENTATION:

9.1 Getting Started Screen:

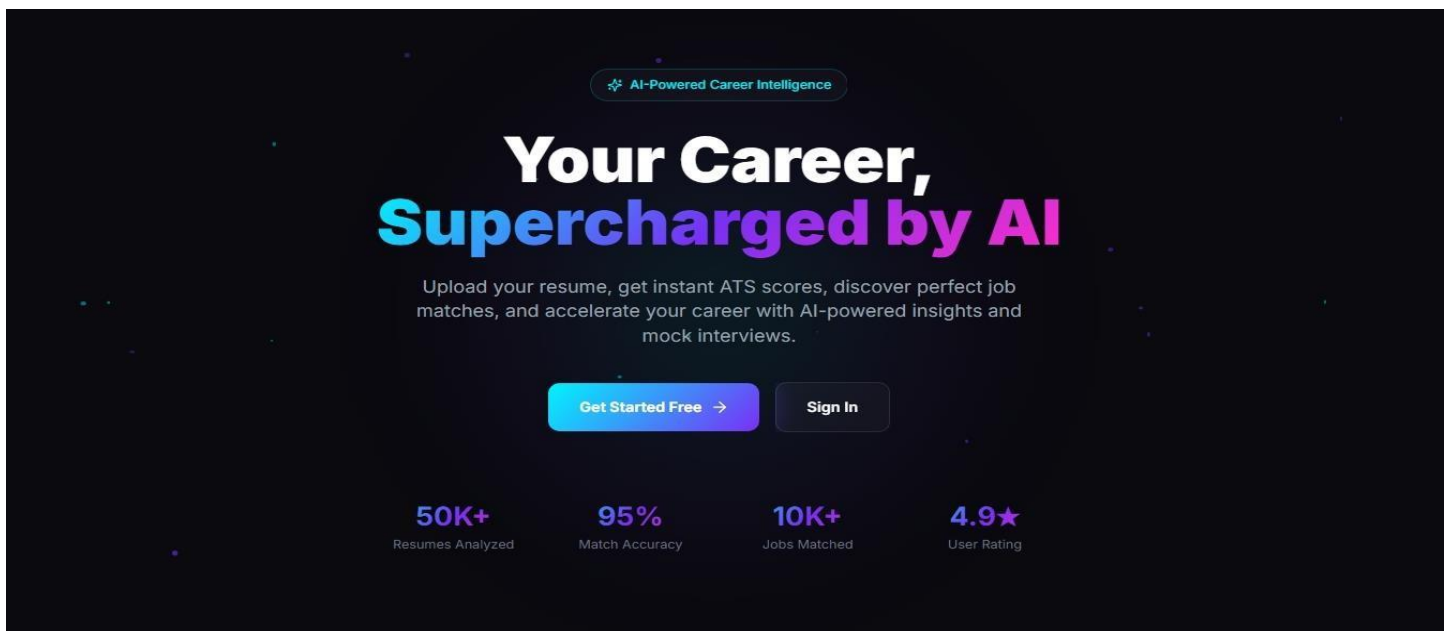


Fig 9.1 Getting Started Screen

9.2 User Signup Screen:

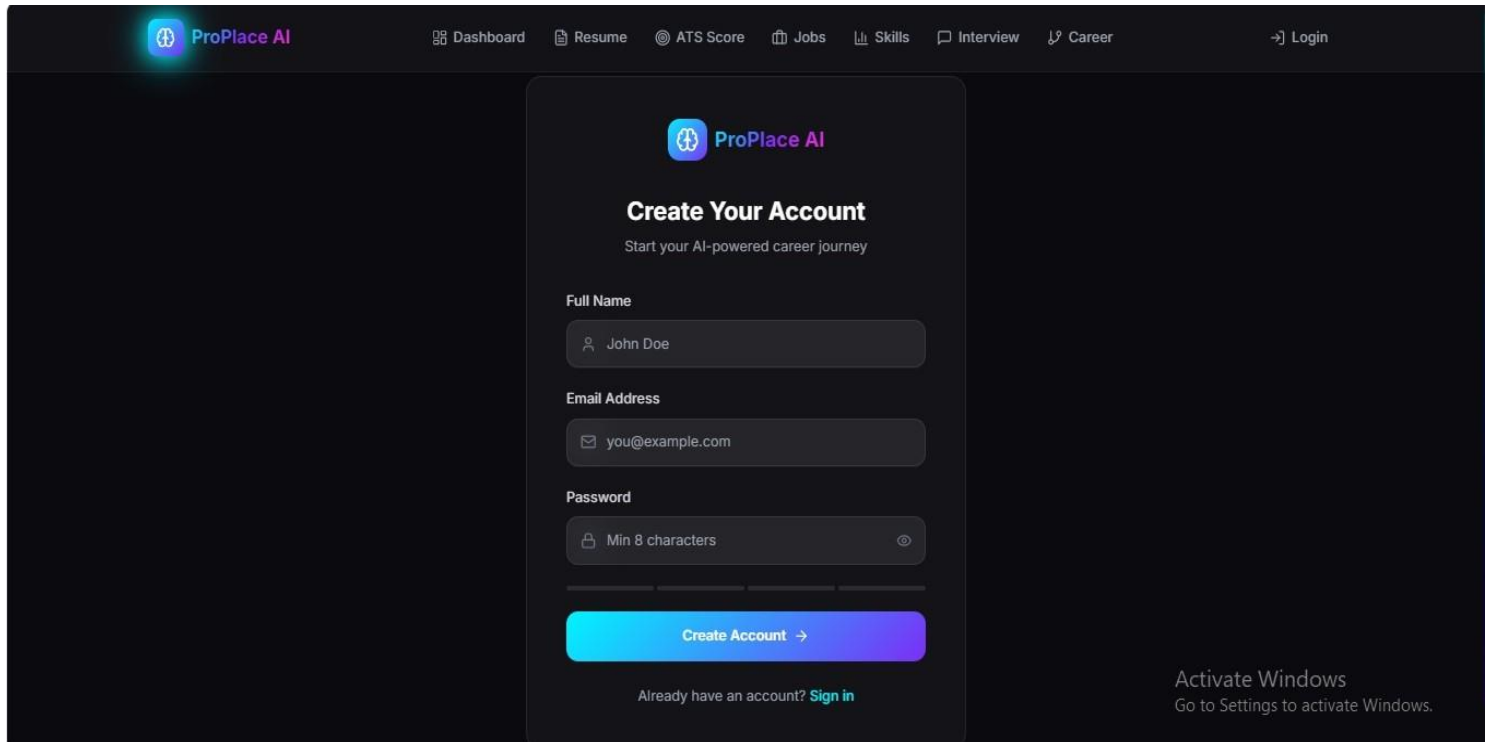


Fig 9.2 User Signup Screen

9.3 User Dashboard:

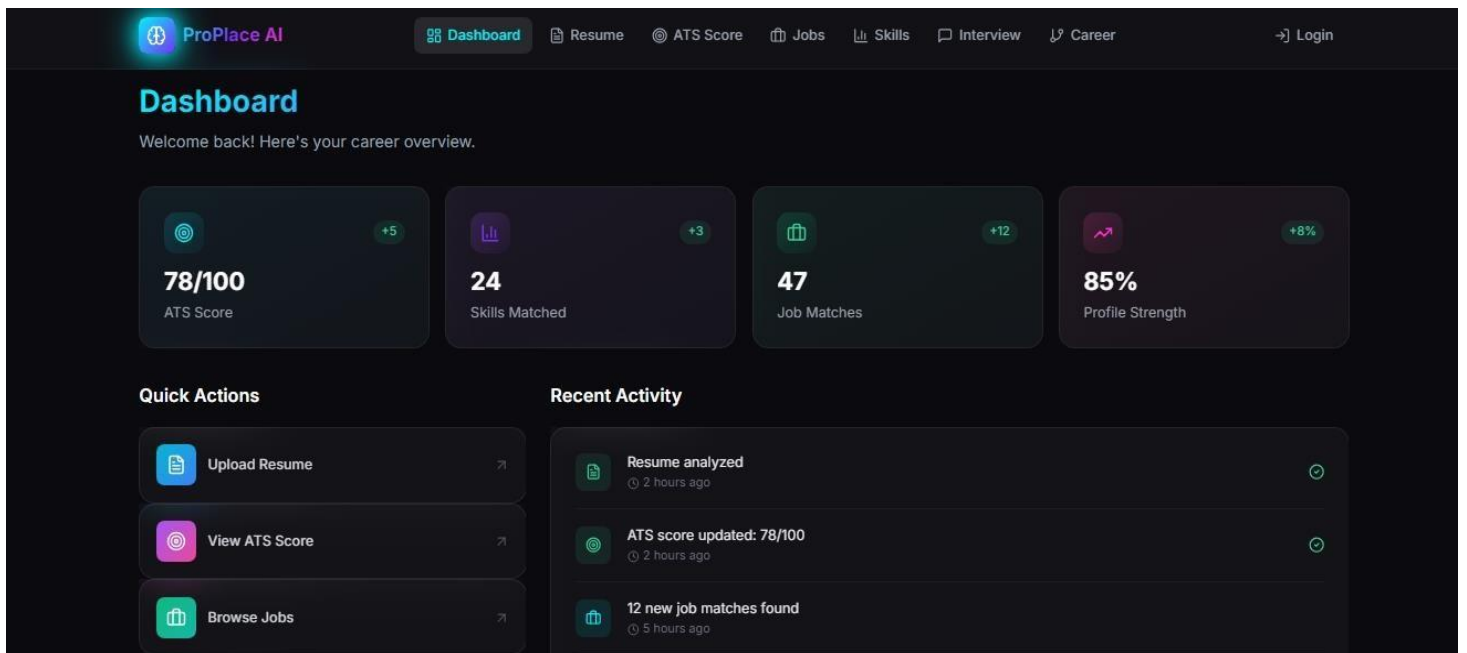


Fig 9.3 User Dashboard

9.4 Resume Upload:

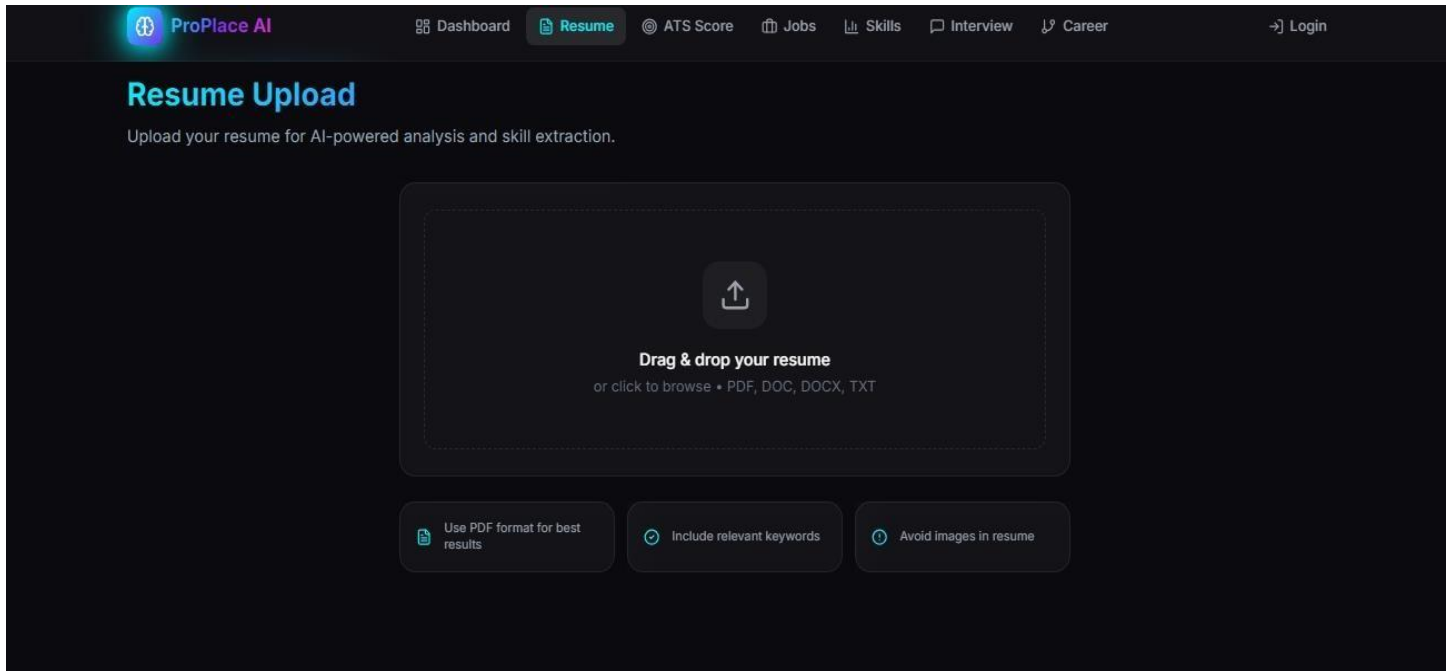


Fig 9.4 Resume Upload:

9.5 ATS Score Analysis Page:



Fig 9.5 ATS Score Analysis Page:

9.6 Job Recommendation Page :

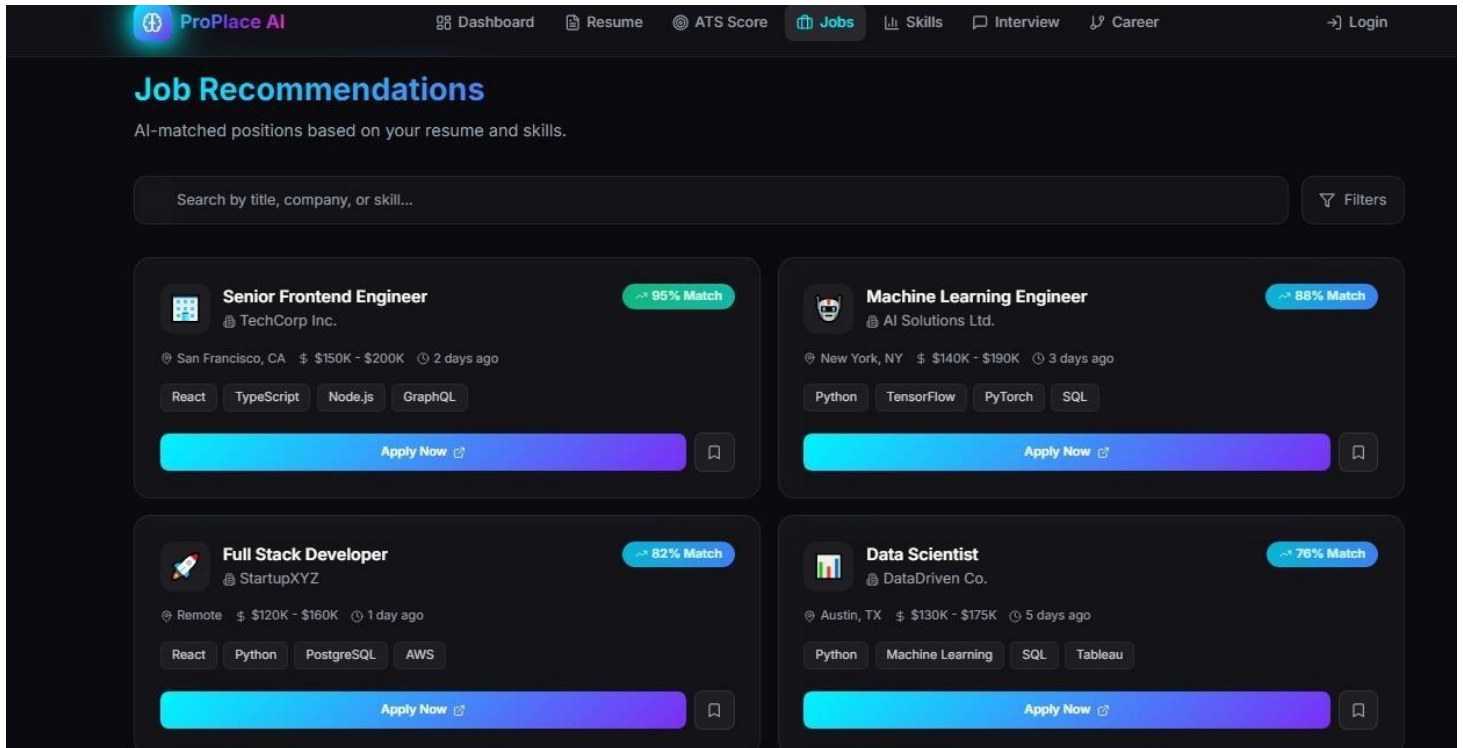


Fig 9.6 Job Recommendation Page

9.7 Skill Gap Analysis:

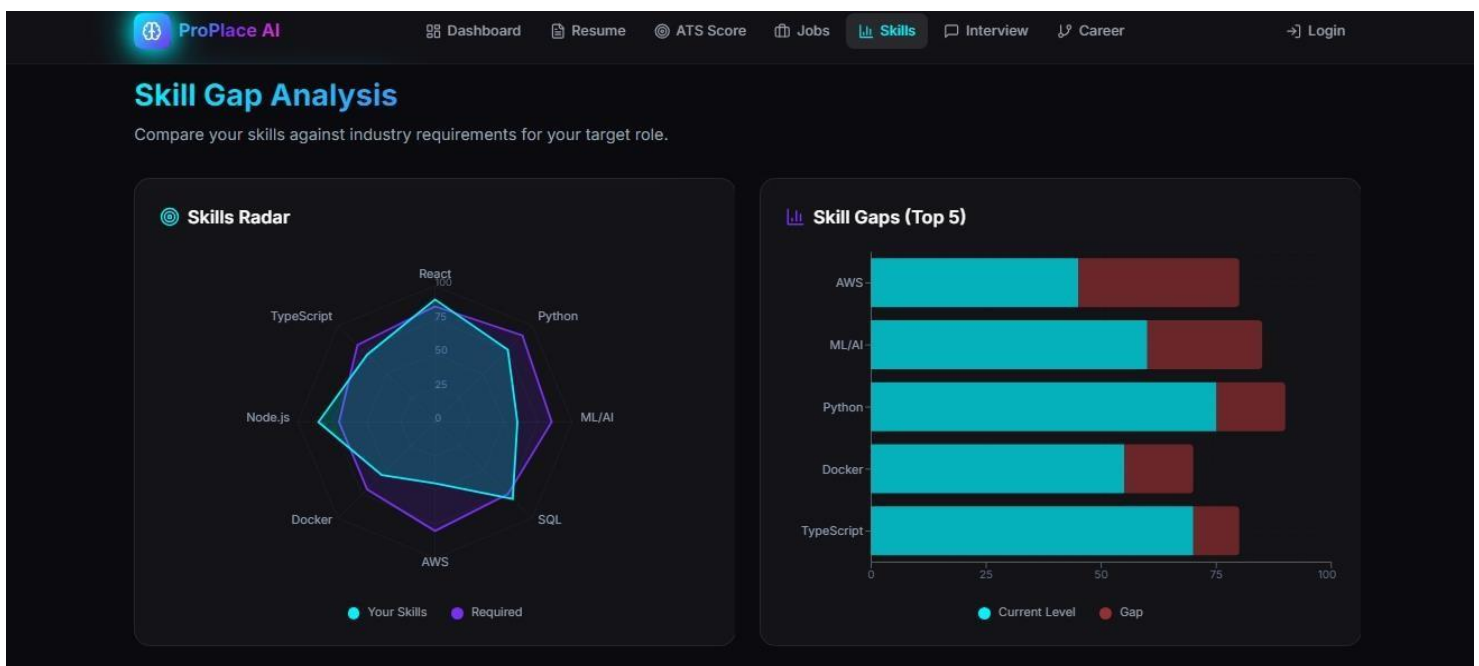


Fig 9.7 Skill Gap Analysis:

9.8 AI Mock Interview Page:

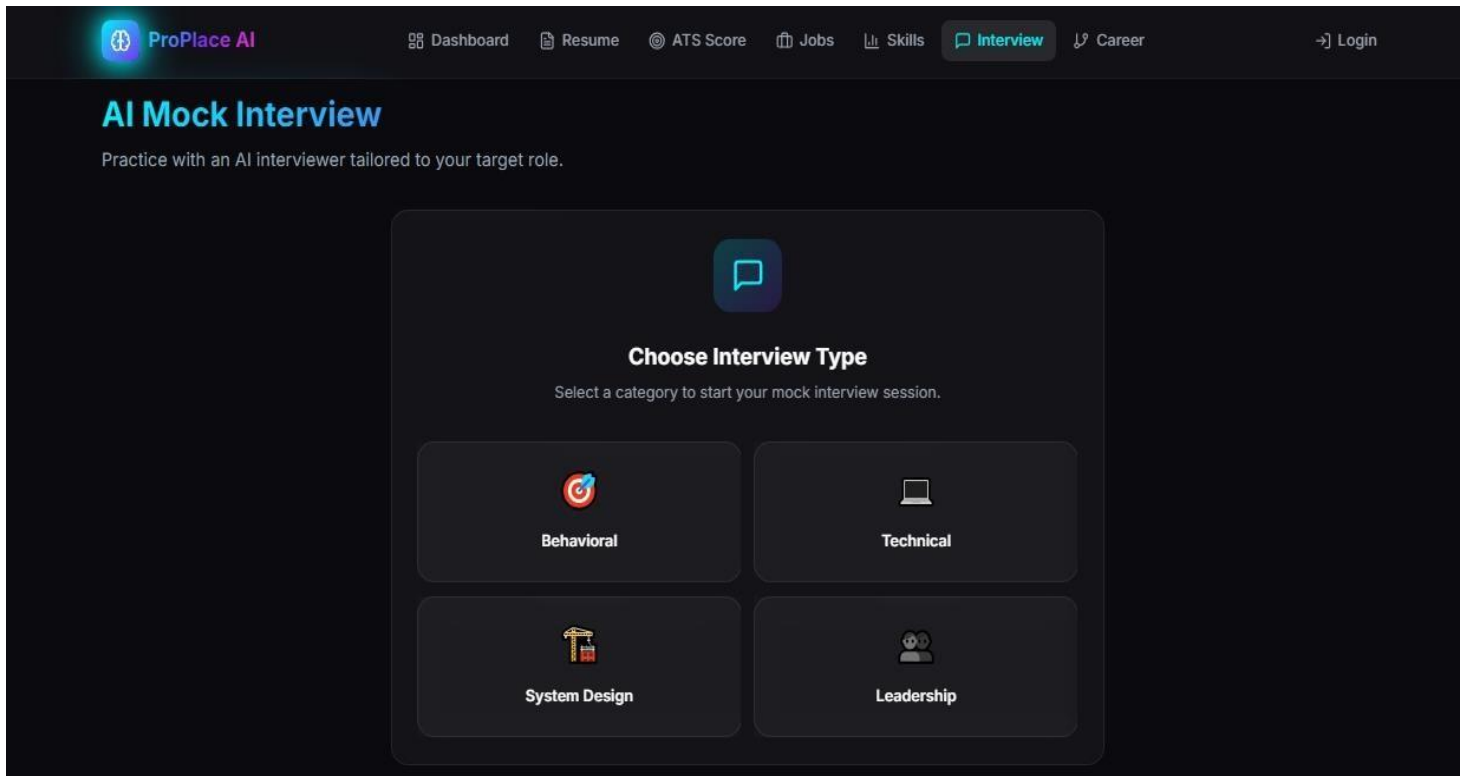


Fig 9.8 AI Mock Interview:

9.9 Career Path Visualization:

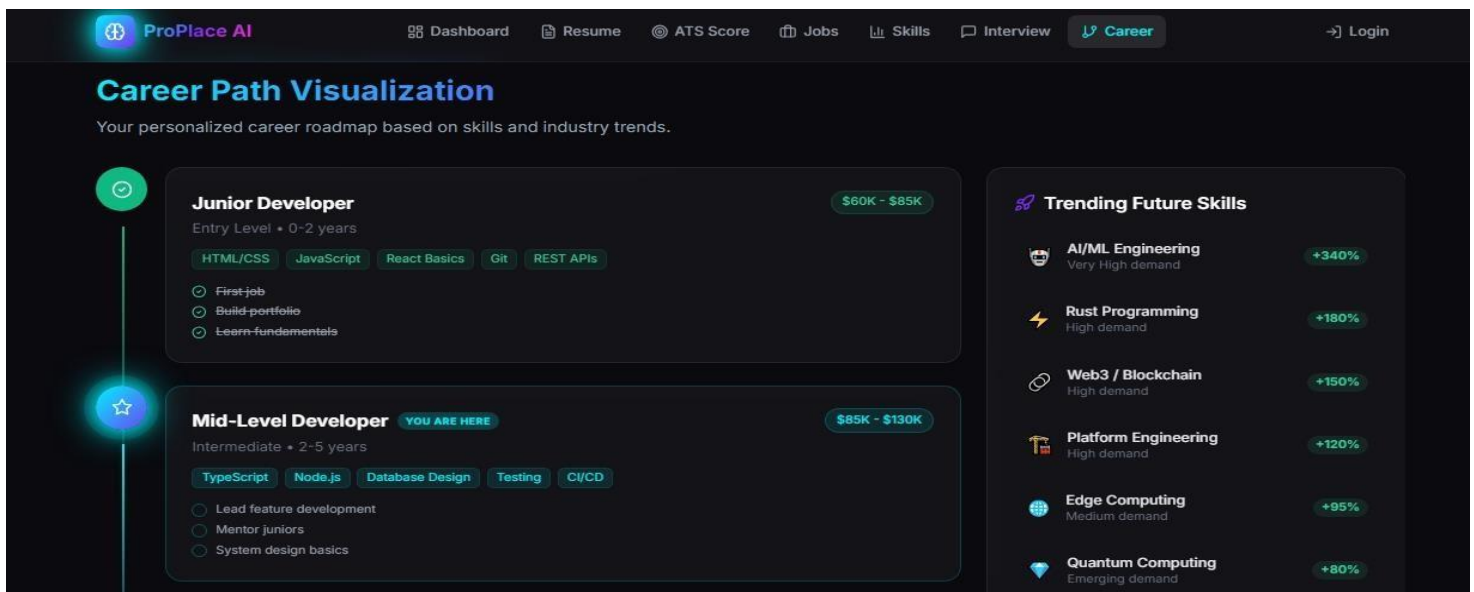


Fig 9.9 Career Path Visualization:

10. SYSTEM FLOW

The application flow begins with an authentication mechanism where users are required to log in or register into the system. Upon successful authentication, the user is redirected to the Home Screen; otherwise, they remain on the login page to ensure secure access. The Home Screen acts as a central dashboard, providing access to key features such as Resume Upload, Job Recommendations, Skill Analysis, Job Search, and Profile Management.

These sections enable users to interact with the system efficiently:

Resume Management: Users can upload and manage their resumes, which are analyzed by the system to extract relevant skills, qualifications, and experience.

Job Recommendations: The system provides personalized job suggestions based on the user’s profile, skills, and preferences using AI-driven algorithms.

Skill Analysis: Users can view identified skill gaps and receive suggestions for improvement to enhance their employability.

Job Search and Filtering: The platform allows users to search and filter job opportunities based on criteria such as role, location, and required skills.

Application Tracking: Users can monitor the status of their job applications and track progress in real time.

Personalization: A dedicated Profile section enables users to update personal details, preferences, and career interests for improved recommendation accuracy.

This structured workflow ensures smooth navigation, efficient data processing, and intelligent decision support, making the system highly user-friendly and effective in delivering accurate career recommendations and job matching services.

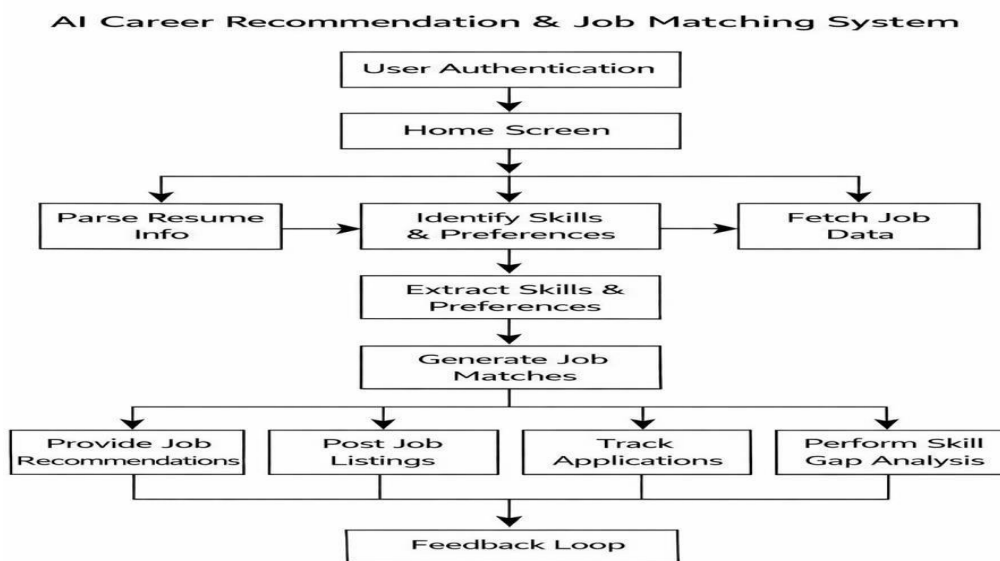


Figure 10 System Flow Diagram:

11. RESULT:

The research presents the successful development of an AI-based career recommendation and job matching system using Python-based frameworks and modern web technologies. The system utilizes advanced Natural Language Processing (NLP) and machine learning models to improve the accuracy of resume analysis, skill extraction, and job recommendation. By leveraging intelligent algorithms, the platform enhances the efficiency of candidate-job matching and reduces manual effort in the recruitment process.

The implementation ensures a responsive and user-friendly interface through cross-platform development tools, enabling seamless interaction for users across different devices. The integration of a structured database system allows efficient storage and retrieval of user profiles, job listings, and recommendation data in real time. Additionally, the system provides

personalized job suggestions, skill gap analysis, and application tracking features, which significantly improve user engagement and decision-making. This solution demonstrates how advanced AI technologies can streamline recruitment workflows, improve accuracy in job matching, and provide a scalable and efficient platform for career guidance. The system highlights the potential of intelligent automation in transforming traditional hiring processes into a more data-driven and user-centric approach.

12. CONCLUSION:

Eventually, the AI-based career recommendation and job matching system is developed as a comprehensive solution that integrates profile analysis, job recommendation, and continuous feedback mechanisms. Unlike traditional recruitment methods, the system incorporates several innovative features, including automated resume parsing, intelligent job matching, skill gap analysis, and personalized user profiling, enabling individuals to efficiently identify suitable career opportunities. The algorithm leverages insights and data from established research to enhance accuracy in recommendation and decision-making using machine learning models and intelligent automation techniques.

Such a framework aligns with the advancement of modern recruitment technologies, as highlighted in previous studies emphasizing the importance of AI and data-driven approaches in analyzing complex datasets. The system effectively addresses the challenges of inefficient job matching and manual screening processes by providing an automated and scalable solution. This approach aims to improve the precision and reliability of career recommendations while promoting a more structured and intelligent recruitment process. As a robust and adaptive system, it demonstrates the practical effectiveness of AI in solving real-world employment challenges and sets the foundation for future enhancements in smart career guidance and recruitment automation, contributing toward long-term digital transformation and efficiency.

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