

# A Survey on SkillSense: AI Career Analyzer App

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## ABSTRACT

*In today's employment landscape, a clear gap exists between the theoretical knowledge gained in academic institutions and the practical skills expected by industry. Many graduates have limited exposure to real-world problem-solving, industry tools, and applied technical experience, which affects their employability. To address this challenge, this paper introduces SkillSense, an Artificial Intelligence-driven career analysis application designed to evaluate individual profiles and provide meaningful insights for professional growth.*

*The proposed system is developed using a modern web architecture that combines a React + Vite frontend for smooth and responsive user interaction with a Django-based backend for managing data processing and application logic. SkillSense makes use of the Gemini API to perform advanced Natural Language Processing (NLP) on unstructured resume data. It extracts, organizes, and interprets important details such as academic background, technical skills, and project experience, and converts them into a structured format suitable for further analysis.*

*The application then performs a detailed skill gap analysis by comparing the extracted user data with current industry requirements. Based on this evaluation, SkillSense generates personalized and context-aware recommendations to help users improve their technical abilities and overall career readiness. These suggestions include structured learning paths, strategies for skill improvement, and project-based tasks that encourage hands-on experience.*

*In addition, the system focuses on scalability, modular design, and ease of use, ensuring efficient data processing and smooth user interaction. By combining AI-based semantic analysis with a full-stack web framework, SkillSense offers an effective and automated solution to reduce the gap between academic learning and industry needs. This approach not only helps individuals make informed career decisions but also supports the development of a more skilled and industry-ready workforce.*

**Keyword:** — Artificial Intelligence (AI), Natural Language Processing (NLP), Career Analysis, Skill Gap Detection, Gemini API, React, Django, Resume Parsing, Personalized Learning Systems.

## 1. INTRODUCTION

The rapid growth of Artificial Intelligence (AI) and Natural Language Processing (NLP) has brought noticeable changes to recruitment processes and career development practices across different industries. In recent years, researchers have explored the use of NLP techniques such as TF-IDF, Word2Vec, and BERT-based embeddings along with Machine Learning (ML) models to automate tasks like resume screening, job role prediction, and candidate evaluation. These approaches have helped reduce manual effort, improve accuracy in decision making, and make the process of matching candidates with job roles more efficient, supporting scalable and intelligent recruitment systems.

However, despite these advancements, many existing resume analysis platforms still depend on keyword-based or rule-based methods that lack deeper contextual understanding. For instance, traditional systems may not recognize that “Python-based data visualization” and “dashboard development using Matplotlib” refer to

closely related skills. In addition, most current systems are designed mainly for recruiters, focusing on filtering candidates rather than helping individuals identify and improve their own skill gaps. As a result, users often receive limited guidance on how to strengthen their profiles or align their skills with changing industry requirements.

At the same time, the rise of AI-based learning platforms has encouraged a shift toward continuous learning and skill development. The concept of Industry 4.0 highlights the importance of automation, digital transformation, and lifelong learning to ensure adaptability in the workforce. Previous studies, such as Efficient Resume-Based Re-Education, have shown how semantic similarity and clustering techniques can be used to generate personalized learning recommendations. Similarly, systems like CareerNet, Job2Vec, and Skill2Vec use structured relationships between skills, job roles, and educational backgrounds to support career progression analysis.

Although these systems are effective in identifying skill gaps, they often do not focus enough on practical, project based learning, which is essential for real-world application. Moreover, many of them rely on limited or domain-specific datasets, which reduces their flexibility across different career paths. As a result, while such systems can detect missing skills, they often fail to provide clear, actionable, and context-aware suggestions that help users effectively overcome those gaps.

To overcome these limitations, the proposed SkillSense framework introduces an AI-based career analysis system that uses the capabilities of the Gemini API for improved semantic understanding and intelligent content generation. The system combines a React + Vite frontend with a Django backend to create a scalable, efficient, and user-friendly architecture. By analyzing unstructured resume data, SkillSense extracts important information such as academic background, technical skills, and project experience, and compares it with current industry expectations.

A major contribution of this framework is its ability to generate personalized, project-oriented recommendations along with adaptive learning paths. By combining semantic analysis with structured output generation, the system provides clear and actionable feedback tailored to individual users. This approach not only helps in improving technical skills but also encourages practical learning aligned with industry needs.

In summary, SkillSense is designed to reduce the gap between academic knowledge and real-world industry requirements. Through intelligent analysis, personalized guidance, and scalable web technologies, the system helps users enhance their employability and adapt to evolving professional demands. In this way, it contributes to building a more skilled and future-ready workforce.

## 2. LITERATURE SURVEY

The field of AI-based career analytics, resume evaluation, and adaptive learning systems has developed rapidly in recent years. Researchers have explored various Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP) techniques for tasks such as skill assessment, candidate–job matching, and automated career recommendation. This section reviews key contributions in this area and explains how the proposed SkillSense framework improves upon existing methods through better semantic understanding, explainability, and a focus on project-based learning.

### 2.1 AI-Based Resume Screening Systems

Abhishek *et al.* [1] presented an intelligent resume screening system that combines NLP and ML techniques to improve candidate–job matching. Their approach used TF–IDF along with transformer-based embeddings to achieve accurate mapping between resumes and job descriptions. Although the system reduced manual effort in screening, its primary objective was candidate filtering, offering limited support for user feedback or skill improvement. In comparison, the proposed SkillSense framework goes beyond filtering by incorporating semantic analysis, grouping related skills, and generating personalized recommendations to help users enhance their competencies and employability.

### 2.2 Adaptive Learning and Career Re-Education Models

Lee *et al.* [2] introduced a hybrid AI-based model aimed at reducing the gap between industry demands and individual skill sets. Their system used BERT-based embeddings and clustering methods to generate personalized learning paths aligned with job market trends. While the model effectively supported adaptive learning, it lacked

practical guidance in the form of project-based recommendations. The SkillSense system addresses this limitation by suggesting actionable and project-oriented tasks, such as building domain-specific applications, enabling users to gain hands-on experience along with theoretical understanding.

### 2.3 Generative AI in Educational Engagement

Lin *et al.* [3] studied the role of Large Language Models (LLMs) in improving student engagement and critical thinking. Their work showed that structured prompting techniques can enhance analytical reasoning and learning outcomes. However, they also pointed out issues related to bias and lack of interpretability in AI-generated responses. To handle these concerns, SkillSense applies structured prompting strategies and uses the Gemini API to produce consistent, context aware, and interpretable outputs, improving the reliability of generated recommendations.

### 2.4 Ethical Governance in AI Recruitment

Gupta *et al.* [4] explored ethical challenges in AI-based recruitment systems, focusing on bias, transparency, and accountability. Their study highlighted the importance of adopting Explainable AI (XAI) techniques to ensure fairness in automated decisions. In line with these findings, the SkillSense framework incorporates explainable components in its analysis process, allowing users to understand the reasoning behind generated insights and recommendations, which helps build trust in the system.

### 2.5 Skill Development for Industry 4.0 Education

Silva *et al.* [5] examined how Industry 4.0 technologies such as automation, data analytics, and AI are influencing modern education systems. Their work proposed competency based learning models that align academic content with industry requirements. While effective within specific domains, the approach showed limited flexibility across different career paths. The SkillSense framework improves this by supporting multi-domain skill mapping and offering adaptable recommendations suitable for a wide range of professions.

### 2.6 Sustainable and Ethical AI Practices in Higher Education

Sharma *et al.* [6] emphasized the need for integrating ethical and sustainable practices into AI-driven educational systems. Their findings suggested that responsible AI usage enhances user trust and institutional credibility. However, their approach faced challenges related to scalability and modular system design. The proposed SkillSense system addresses these issues by adopting a scalable architecture and incorporating ethical design principles, ensuring transparency, flexibility, and responsible use of AI technologies.

### 2.7 Ontology-Driven Skill Mapping

Patil *et al.* [7] developed an ontology-based system that used knowledge graphs to represent relationships between academic subjects and job roles. This method improved the understanding of skill dependencies but faced limitations in handling cross-domain applications due to restricted datasets. The SkillSense framework overcomes these challenges by applying advanced semantic analysis and dynamic data interpretation, allowing better flexibility, contextual understanding, and scalability across multiple domains and industries.

## 3. PROPOSED METHODOLOGY

The SkillSense framework is designed as a multi-stage analytical system that converts unstructured resume data into structured, interpretable, and actionable career insights. The system combines Natural Language Processing (NLP) techniques with the capabilities of the Gemini API to perform semantic analysis, skill extraction, and intelligent recommendation generation. The overall methodology is divided into three main stages: *Data Acquisition*, *AI-Based Analysis*, and *Result Generation and Visualization*.

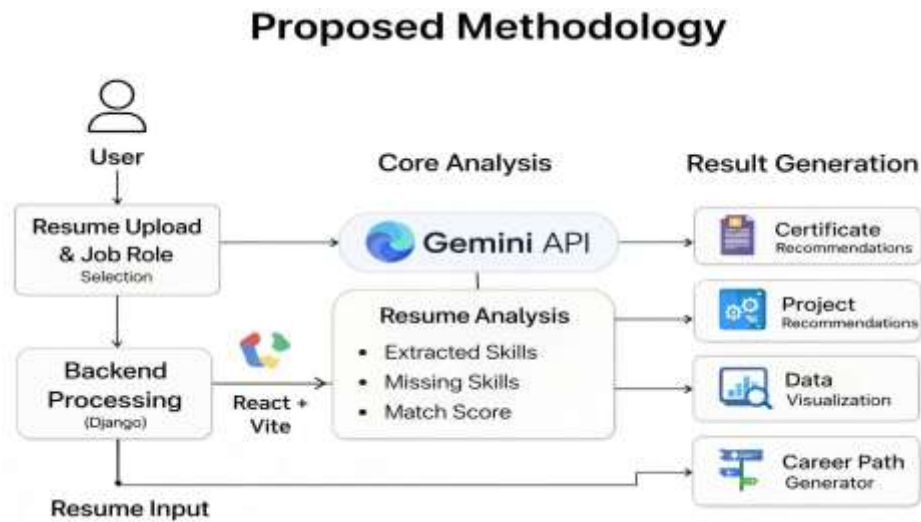


Fig. 1. Proposed Methodology of SkillSense Framework

### 3.1 Data Acquisition and Resume Processing

1) *Resume Upload and Job Role Selection:* The process begins when the user uploads their resume in PDF or DOCX format through a responsive web interface developed using React + Vite. The interface is designed to provide smooth interaction and efficient file handling. In addition, the user selects a target job role from predefined options or enters a desired role manually, which acts as a reference for further analysis.

2) *Backend Processing:* After the resume is submitted, it is sent to the backend server developed using Django. The backend manages file processing, text extraction, and preparation of the input data for AI-based analysis. The extracted resume content is cleaned and structured to ensure it is suitable for the next stages of the processing pipeline.

### 3.2 Core Analytical Framework Using Gemini API

1) *AI-Based Resume Analysis:* The processed resume data, along with the selected job role, is provided as input to the Gemini API. The API performs semantic analysis to extract important details such as technical skills, educational qualifications, and project experience. Unlike traditional keyword based approaches, the Gemini model understands contextual meaning and identifies relationships between different skills.

2) *Skill Extraction and Matching:* The system produces a structured output that includes:

- Extracted skills from the resume
- Missing or required skills for the selected job role
- A calculated match score representing how well the user profile aligns with the target role

This analysis helps users clearly understand their current position and identify areas that need improvement.

### 3.3 Result Generation and User Interaction

3) *Interactive Output Interface:* After completing the analysis, the results are displayed on the frontend interface in a structured and user-friendly manner. The system provides detailed insights along with interactive options that allow users to explore additional recommendations.

4) *Recommendation Modules:* To improve usability and provide practical guidance, the system includes four dedicated modules accessible through interactive buttons:

- **Certificate Recommendations:** Suggests relevant certifications and courses to address identified skill gaps.
- **Project Recommendations:** Provides hands-on project ideas aligned with the selected job role to encourage practical learning.
- **Data Visualization:** Displays analytical insights such as skill distribution and match scores using graphical representations for better understanding.

- Career Path Generator: Creates a structured career roadmap outlining the steps required to achieve the desired role.

5) *System Workflow and Integration*: The integration of React + Vite for the frontend, Django for backend processing, and the Gemini API for intelligent analysis ensures that the system remains scalable, efficient, and responsive. The modular architecture allows smooth communication between components, enabling real-time processing and result generation.

Overall, the SkillSense methodology offers a clear and efficient approach to resume evaluation and career guidance. By combining AI-driven analysis with interactive features, the system provides personalized, actionable, and easy-to-understand insights that support continuous skill development and career growth.

#### 4. SYSTEM ARCHITECTURE

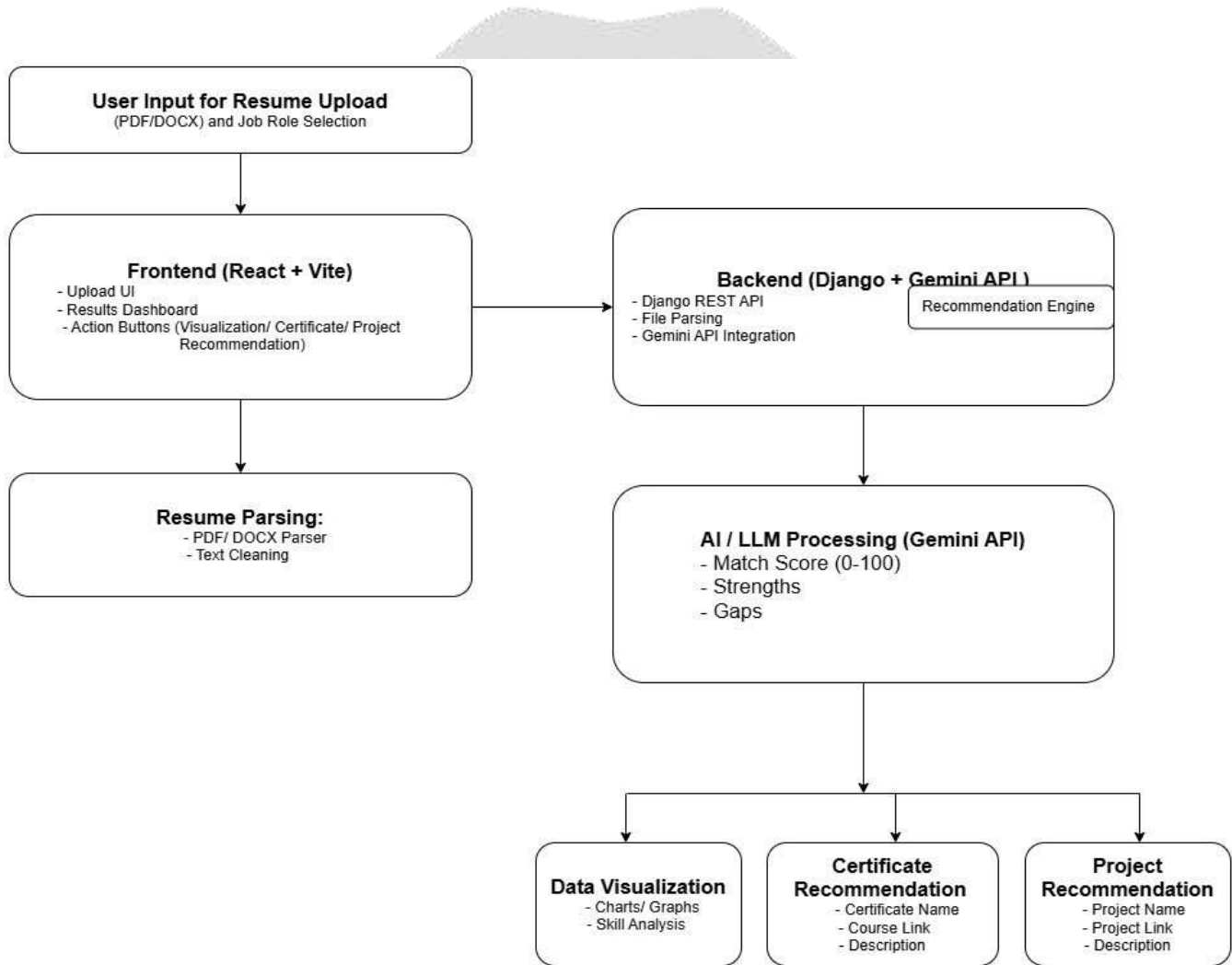


Fig. 2. System Architecture of Resume Analysis and Recommendation System

**System Architecture:** The system architecture represents the overall workflow of the resume analysis and recommendation system. It starts with user input, where a resume is uploaded and a job role is selected. The frontend, developed using React and Vite, provides an interface for uploading files, displaying results, and interacting with different features.

The backend, implemented using Django and REST APIs, manages file processing and integrates with the Gemini API. The resume is parsed and cleaned to extract meaningful text information. This processed data is then analyzed by the AI/LLM module, which generates a match score, identifies strengths, and detects skill gaps.

Based on this analysis, the system generates multiple outputs, including data visualizations for skill insights, certificate recommendations to enhance knowledge, and project suggestions to improve practical experience. These outputs help users understand their current profile and guide them toward better career opportunities.

### 5.WORKFLOW DIAGRAM

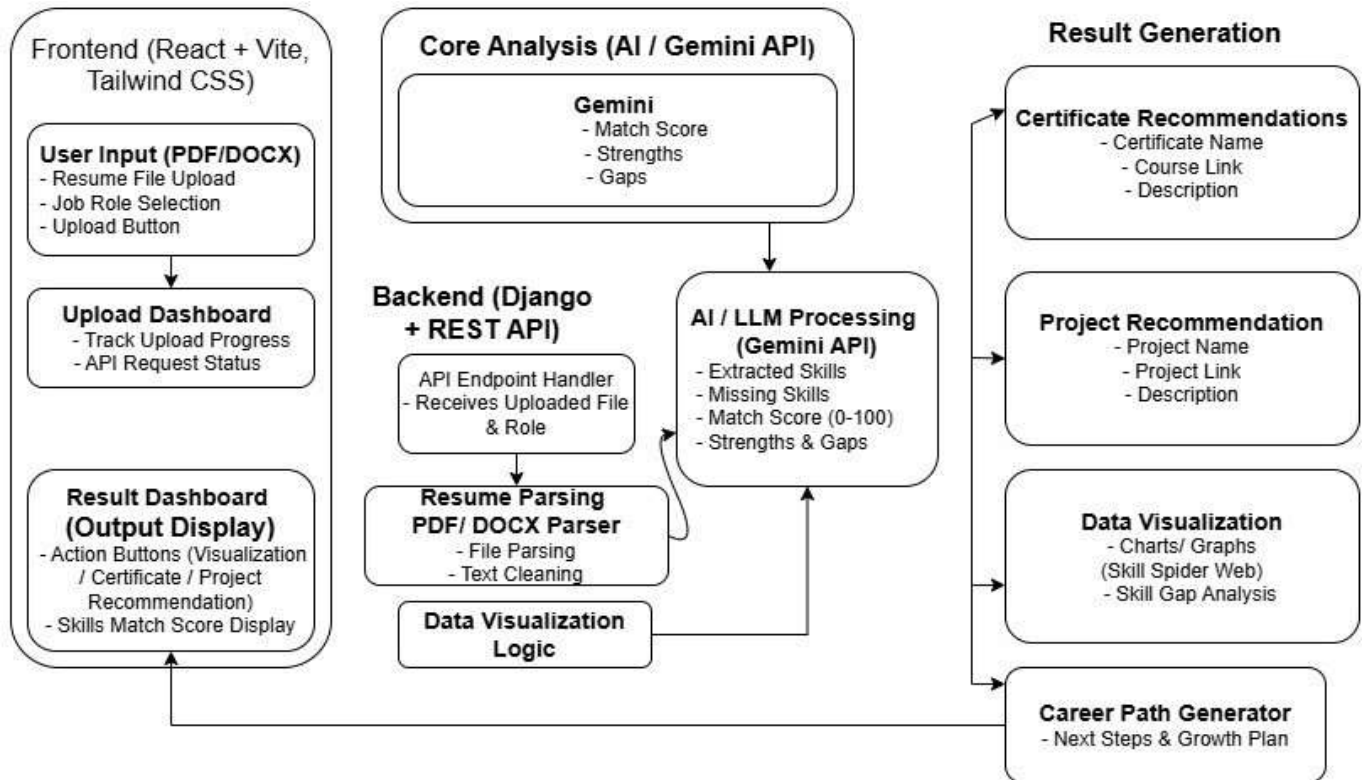


Fig. 3. Workflow of Resume Analysis System

Workflow Description: This workflow diagram illustrates a system that analyzes a user’s resume and provides personalized recommendations. The frontend enables users to upload resumes and select job roles. The backend, developed using Django and REST APIs, processes the uploaded files by parsing and cleaning the data. The core analysis is carried out using the Gemini API, which evaluates skills, identifies gaps, and generates a match score. Based on this analysis, the system produces outputs such as certificate suggestions, project recommendations, data visualizations, and a career growth plan. Finally, all results are displayed on a dashboard for the user.

### 6.EXPECTED RESULTS

#### 6.1User Interface Screens

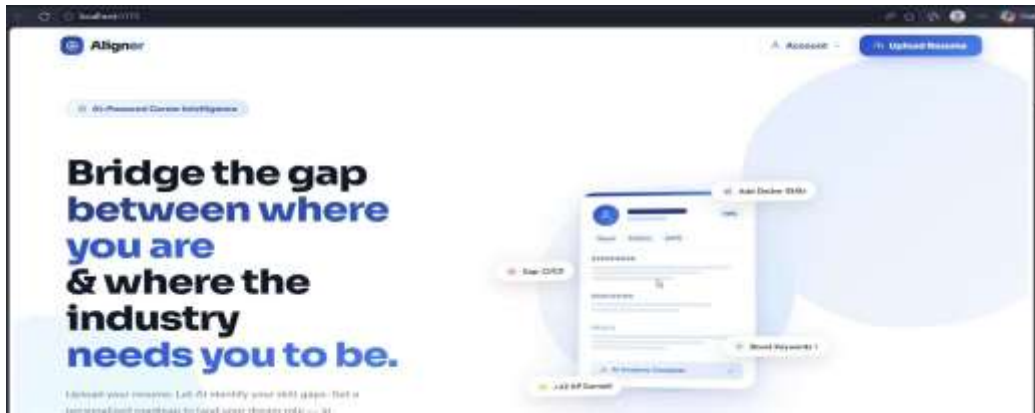


Fig. 4. User Interface for Resume Upload and Job Role Selection

Fig. 4 shows the initial interface where users upload their resume and select a target job role. The design ensures a simple and intuitive workflow.

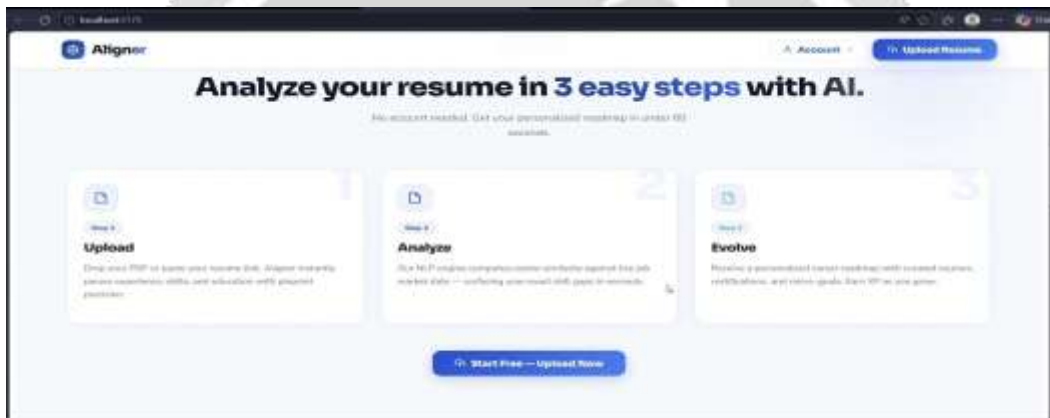


Fig. 5. AI Analysis Interface Displaying Match Score and Skill Insights

Fig. 5 illustrates the analysis page where the system displays match score, strengths, and identified skill gaps.

## 6.2 System Output Visualization



Fig. 6. Resume Upload and Job Role Selection Interface

Fig. 6 shows the user interface where the candidate uploads a resume and selects a target job role. The system provides a simple and structured workflow to initiate the analysis process.



Fig. 7. AI-Based Resume Analysis with Match Score and Skill Gap Results

Fig. 7 illustrates the AI-generated results, including career summary, match score, strengths, and identified skill gaps. These outputs help users understand their current standing and identify areas for improvement.

### 6.3 Data Visualization and Skill Analysis Dashboard



Fig. 8. Skill Intelligence Dashboard with Match Score and Skill Metrics

Fig. 8 presents the Skill Intelligence Dashboard, displaying key metrics such as match score, skills present, skills missing, and coverage rate. It also provides graphical insights into market readiness and overall skill distribution.



Fig. 9. Detailed Skill Analysis with Radar Chart and Proficiency Scores

Fig. 9 illustrates a detailed analysis of user skills using radar charts and proficiency scores. It highlights strong areas and identifies weaker skills, enabling users to focus on specific areas for improvement.

### 6.4 Personalized Career Path Generation



Fig. 10. AI-Generated Personalized Career Path

Fig. 10 illustrates the personalized career path generated by the system based on the user’s profile and selected job role. It provides a structured overview of the steps required to achieve the target position.

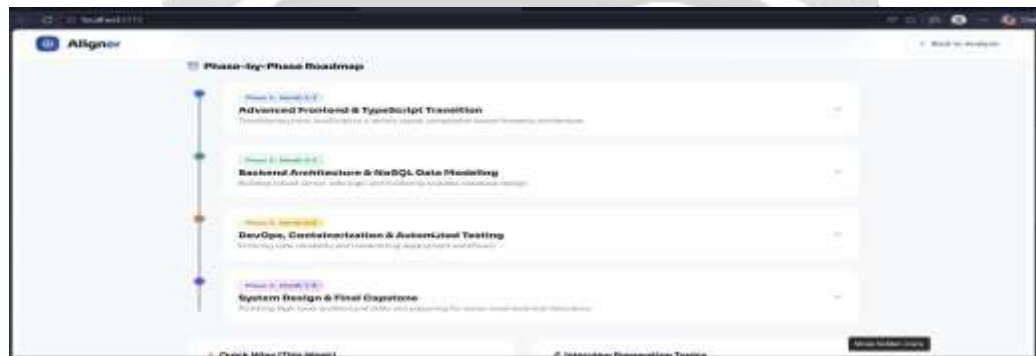


Fig. 11. Phase-wise Career Roadmap for Skill Development

Fig. 11 presents a phase-by-phase roadmap outlining learning stages and skill progression. This helps users follow a clear and systematic path for achieving career goals.

### 6.5 Recommendation Modules

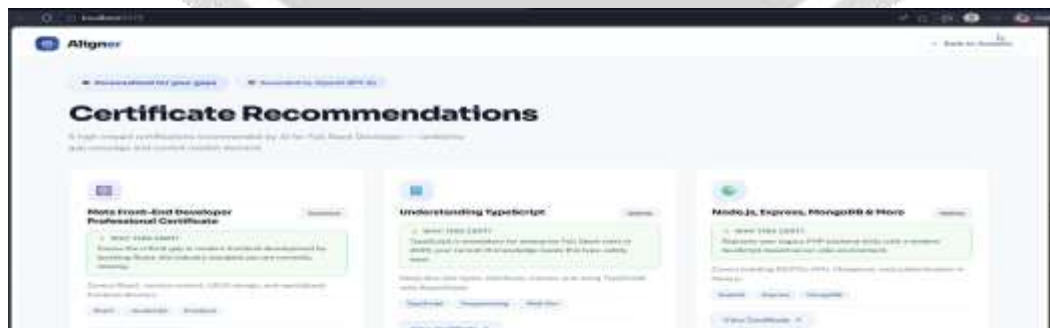


Fig. 12. AI-Based Certificate Recommendations for Skill Enhancement

Fig. 12 shows the certificate recommendation module, where the system suggests relevant courses and certifications based on identified skill gaps. These recommendations help users improve their technical knowledge and industry readiness.

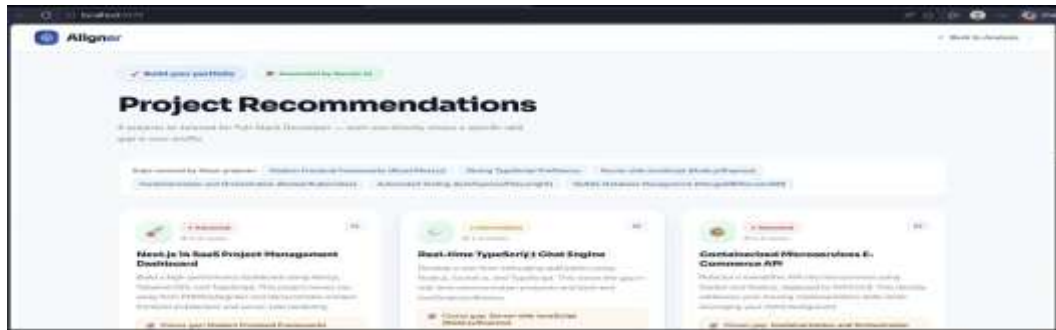


Fig. 13. Project-Based Recommendations for Practical Skill Development

Fig. 13 illustrates the project recommendation module, which provides hands-on project ideas aligned with the selected job role. These projects enable users to gain practical experience and strengthen their portfolio.

## 6. CONCLUSION

The proposed SkillSense framework offers an intelligent, AI-based solution to address the growing gap between academic learning and industry skill requirements. By using advanced Natural Language Processing (NLP) techniques along with the Gemini API, the system efficiently analyzes unstructured resume data, extracts relevant information, and identifies key skill gaps. It also provides a match score that indicates how well a candidate's profile aligns with the selected job role.

The integration of a React + Vite frontend with a Django based backend ensures a responsive, scalable, and efficient platform for real-time analysis and user interaction. In addition to basic resume evaluation, SkillSense includes multiple interactive modules such as certificate recommendations, project suggestions, data visualization, and career path generation. These features help users gain practical insights and take meaningful steps toward improving their employability.

Furthermore, the system focuses on clarity and usability by presenting structured and easy-to-understand outputs, allowing users to identify their strengths and areas that need improvement. The use of AI-based semantic analysis provides more accurate and context-aware results compared to traditional keyword-based methods.

In summary, SkillSense contributes to the development of AI-based career analysis systems by combining automation, personalized guidance, and modern web technologies. The framework supports continuous learning and skill development, helping individuals adapt to changing industry demands and build relevant professional competencies.

## 7. ACKNOWLEDGMENT

The authors express their sincere gratitude to the Department of Computer Engineering, Dhole Patil College of Engineering, Pune (affiliated with Savitribai Phule Pune University) for their continuous academic support, infrastructure, and guidance throughout this research. Special appreciation is also extended to Prof. Ganesh Kendre for her invaluable mentorship, constructive feedback, and encouragement, which greatly contributed to the refinement of this work.

The authors also thank the faculty members, research coordinators, and peers for their insightful discussions, cooperation, and technical assistance during the development of the SkillSense framework. Their contributions were instrumental in achieving the objectives of this study.

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