AI-Powered Next-Gen Job Recommendation System Using NLP and Machine Learning

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Abstract

The AI-Powered Job Recommendation System uses NLP and Machine Learning to deliver personalized job recommendations and efficient candidate matching. Built with the Agile SDLC model, it ensures scalability, user feedback integration, and real-time job data processing, streamlining recruitment for employers and job seekers.

Introduction

- Job matching is inefficient due to **keyword-based systems.**
- This project builds an **AI-driven** job platform for smarter matching.
- Uses **NLP**, **ML**, and **BERT** for context-aware recommendations.
- Developed with **Python**, **PHP**, and **MySQL**.
- Hosted on **local/shared servers**, not cloud-based.
- **Improves recruitment** for both seekers and employers.

Problem Domain

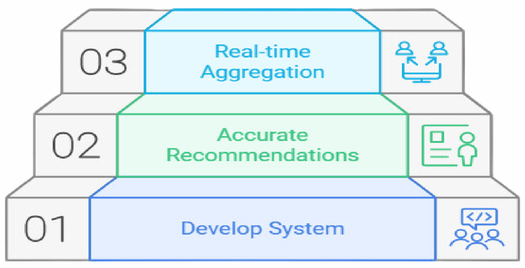
- Inefficiency in Job Matching: Keyword-based systems often provide irrelevant results [1].
- Challenges in Niche Skills: Limited contextual understanding overlooks specialized skills [2].
- Need for Context-Aware Solutions: Lack of intelligent algorithms misses opportunities for users [3].

Motivation

- Traditional platforms fail to match jobs effectively due to keyword-based limitations.
- The growing demand for specialized roles requires smarter, context-aware systems.
- AI-based solutions can streamline recruitment, save time, and enhance the user experience for both job seekers and employers.

Objective

- Develop an AI-powered job recommendation system using Natural Language Processing (NLP) and Machine Learning .
- Provide accurate, context-aware job recommendations tailored to user profiles and preferences.
- Enable real-time job data aggregation and scalable functionality for both job seekers and employers.



Literature Review

Table 1: Summary of Key Findings from Relevant Literature

Author	Contribution	Limitation
Sharma et al [1]	Accurate, customized job recommendations using web scraping, NLP, and BERT embeddings.	Dependency on data quality, potential biases, and limited real-time adaptability
Goyal et al [2]	Combines social media profiling, resumes, and ML to suggest employability scores and emotional intelligence.	Limited data privacy, reliance on API availability, and potential bias in social media analysis.
Behrouz H et al [3]	Automates resume shortlisting using BERT, reducing workload and improving decision-making efficiency.	Relies on historical data quality, lacks interpretability, and may inherit biases from training data.
Patanwadia et al [4]	Enhances recruitment with NLP, dynamic profiles, video interview emotion analysis, and Job Fit Scores.	Emotion analysis accuracy, reliance on video quality, and limited adaptability to diverse industries.
Anju et al [5]	Identifies challenges and potential AI-based solutions for employee-job profile matching using Delphi methodology.	Subjective expert opinions, limited sample size, and focus on feasibility rather than implementation results

System Workflow Overview

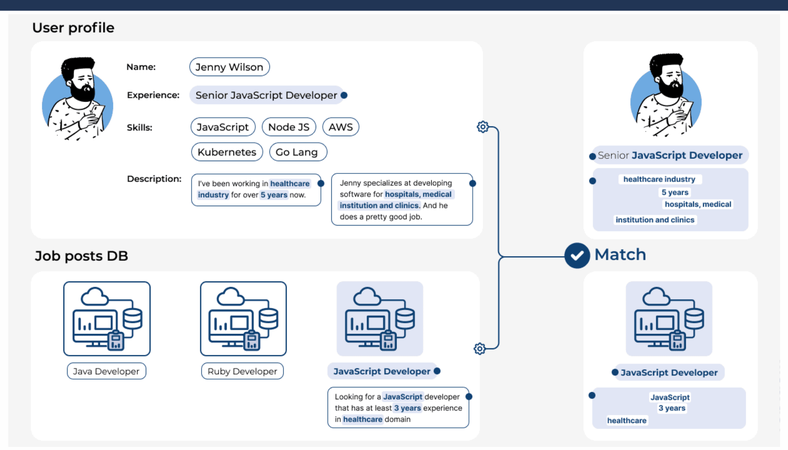


Figure 1: System Workflow Overview of NGJRS

Software Requirements Specification

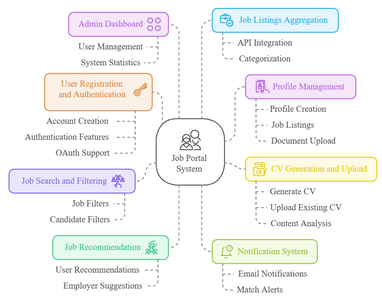


Figure 2: Functional Requirement of NGJRS

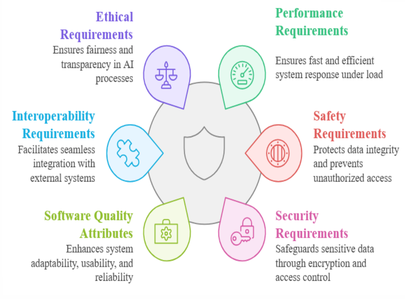


Figure 3: Non-Functional Requirement of NGJRS

SDLC

Table 2: Comparative Analysis of SDLC Models

Mark	Criteria	Waterfall	V-Shape	Iterative	Spiral	Agile	Prototype
10	Flexibility for Changes	No	No	Yes	Yes	**Yes**	Yes
8	Risk Management	No	No	No	Yes	No	No
7	Time to Market	No	No	Yes	No	**Yes**	Yes
9	User Feedback Integration	No	No	Yes	Yes	**Yes**	Yes
9	Complexity of Development	No	Yes	Yes	Yes	**Yes**	Yes
10	Quality Assurance	Yes	Yes	Yes	Yes	**Yes**	No
10	Scalability	No	Yes	Yes	Yes	**Yes**	No
9	Performance	No	Yes	Yes	Yes	**Yes**	No
10	Security and Dependability	No	Yes	No	No	**Yes**	No
7	Time-Consuming	Yes	Yes	No	Yes	No	No
9	Adaptability to New Technologies	No	No	Yes	Yes	**Yes**	Yes
10	Integration with Machine Learning	No	No	Yes	Yes	**Yes**	No
10	User-Centric Design	No	No	Yes	Yes	**Yes**	Yes
Total	**Overall**	20	57	93	101	**103**	81

Data Flow Diagram

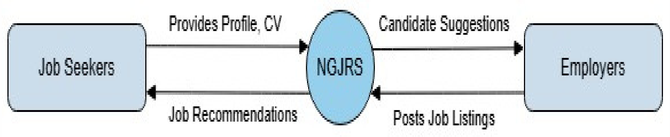


Figure 4: DFD Level 0 Diagram of NGJRS

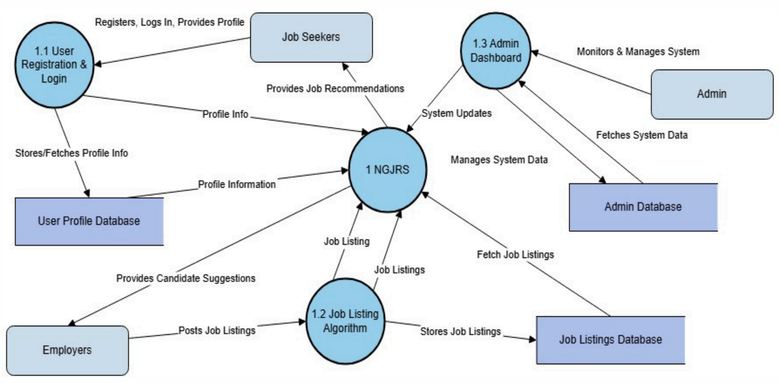


Figure 5: DFD Level 1 Diagram of NGJRS

Use Case Diagram

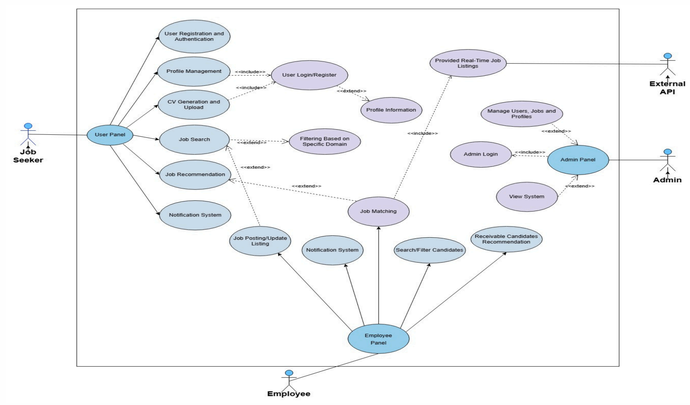


Figure 6 : Use Case of NGJRS

Sequential & Comunicational

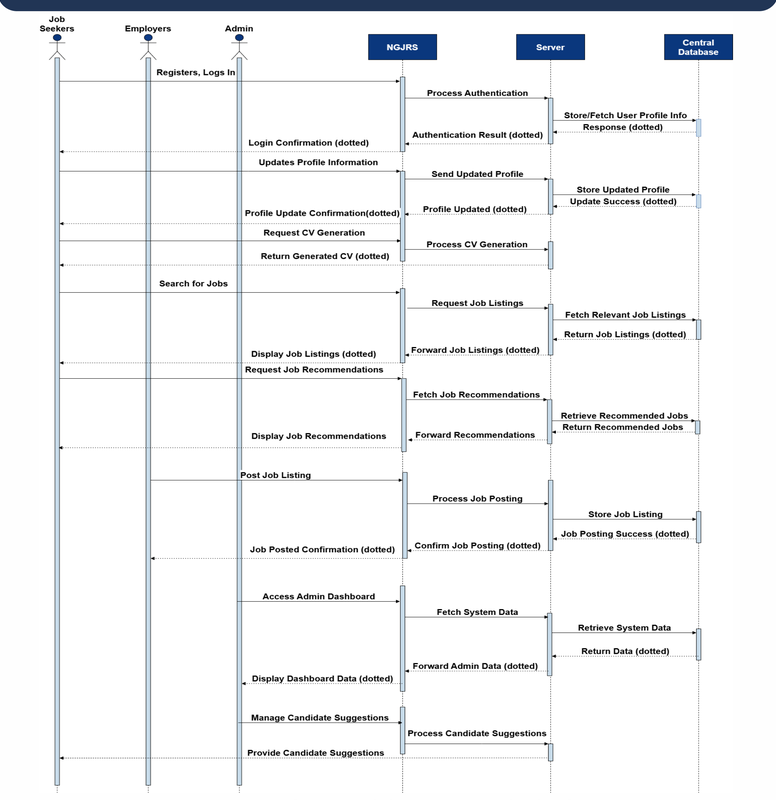


Figure 7 : Sequential & Comunicational of NGJRS

Class Diagram

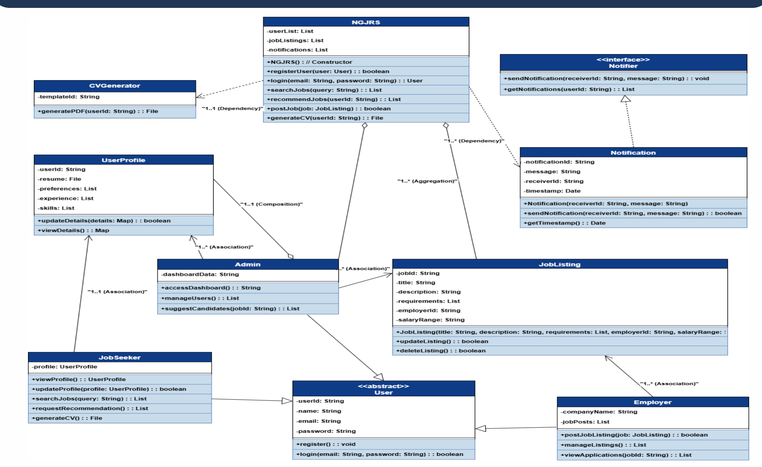


Figure 8: Class Diagram of NGJRS

Social Impact

- Empowering Job Seekers: Provides personalized job recommendations, helping individuals find roles that match their skills and aspirations.
- Enhancing Recruitment Efficiency: Reduces hiring time and effort for employers, ensuring the right candidates are matched to the right roles.
- Promoting Fair Opportunities: Utilizes unbiased AI algorithms to ensure equitable access to job opportunities for all candidates.
- Adapting to Modern Workforce Needs: Addresses the growing demand for specialized roles and context-aware solutions in a dynamic job market.

Conclusion

The AI-Powered Job Recommendation System leverages advanced NLP and Machine Learning techniques to revolutionize the recruitment process. By addressing the limitations of traditional job-matching platforms, it provides accurate, personalized recommendations, and context-aware solutions for both job seekers and employers. Developed using the Agile SDLC model, the system ensures flexibility, scalability, and continuous improvement, making it adaptable to evolving user needs and technologies. This innovative approach streamlines job matching, saves time, and fosters a more efficient and equitable recruitment ecosystem.

Reference

[1]. S. Panchasara, R. K. Gupta and A. Sharma, "AI Based Job Recommedation System using BERT," 2023 7th International Conference On Computing

[2]. V. S. Pendyala, N. Atrey, T. Aggarwal and S. Goyal, "Enhanced Algorithmic Job Matching based on a Comprehensive Candidate Profile using NLP and Machine Learning," 2022

[3]. E. Abdollahnejad, M. Kalman and B. H. Far, "A Deep Learning BERT-Based Approach to Person-Job Fit in Talent Recruitment," 2021

[4]. S. Jogi, S. Warang, H. N. Bhor, D. Solanki and H. Patanwadia, "NLP Unleashed: Transforming Employment Landscapes with Dynamic Recruitment Platforms," 2024

[5]. Pradhan, Anju (2024). Employee – Job profile matching challenges: AI/ML-based recommender systems solutions for knowledge workers