



Ai-Assisted HR Job Posting and Candidate Evaluation System Using Natural Language Understanding

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Abstract

In recent years, recruitment processes have become increasingly complex due to the large volume of job applications. To improve hiring efficiency and accuracy, researchers have proposed the use of Artificial Intelligence and Natural Language Processing for automated resume screening. However, traditional systems face challenges such as manual effort, time consumption, and inaccurate candidate-job matching. To address these limitations, we propose an intelligent HR Job Posting System that enhances recruitment using AI-driven techniques. Specifically, we first model the recruitment workflow including resume submission, job description management, and candidate evaluation. We then design a system that integrates web technologies, NLP, and machine learning algorithms to automate the screening process. The proposed system leverages resume parsing to extract key details such as skills, education, and experience, while job descriptions are analyzed to identify required competencies. It uses advanced techniques like TF-IDF and BERT along with cosine similarity to compute matching scores between resumes and job descriptions. Additionally, an AI assistant is incorporated to provide smart recommendations and interactive support. We evaluated the system using real-time datasets, and the results demonstrate improved accuracy and efficiency in candidate selection. The system is developed using Python, Flask, MongoDB, and modern web technologies to ensure scalability and performance.

Introduction

The project titled “AI-Based HR Job Posting and Resume Screening System” focuses on addressing key challenges in modern recruitment processes such as time consumption, inefficiency, and inaccurate candidate selection. In recent years, organizations receive a large number of job applications, making manual screening difficult and error-prone. To overcome these challenges, this project leverages Artificial Intelligence and Natural Language Processing to build an intelligent system that automates resume screening and candidate ranking. The platform ensures efficient matching between resumes and job descriptions by analyzing skills, qualifications, and experience..

The proposed system integrates web technologies with machine learning models to achieve both efficiency and scalability. While the backend processes and analyzes large volumes of data, the system uses NLP techniques like TF-IDF and BERT to generate meaningful insights and similarity scores. It also incorporates resume parsing to extract structured information and an AI assistant to provide smart recommendations and interactive support.

Developed using Python, Flask, and

MongoDB, the platform is designed to be scalable, user-friendly, and secure, enabling seamless interaction between applicants and recruiters. By improving accuracy, reducing manual effort, and speeding up the hiring process, this system enhances recruitment efficiency and decision-making.

Background

Recruitment is an essential process in every organization, as selecting the right candidate directly impacts productivity and growth. However, the hiring process has become increasingly complex due to the large number of applications received for each job posting. Recruiters often spend a significant amount of time reviewing resumes manually, which can lead to delays and inconsistencies in candidate selection.

Traditional recruitment systems rely heavily on manual screening and basic keyword matching, which may not accurately reflect a candidate's skills and suitability for a role. These systems often fail to capture the contextual meaning of information in resumes and job descriptions, resulting in poor matching and missed opportunities.

Additionally, the lack of automation and intelligent analysis makes it difficult to efficiently manage and evaluate large datasets

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of resumes. This highlights the need for an advanced system that can automate the screening process, improve accuracy, and provide better insights for decision-making.

Problem Statement

The recruitment process involves multiple stages such as job posting, resume collection, screening, and candidate selection. Managing these stages using traditional methods often leads to challenges such as high time consumption, manual effort, and inconsistent evaluation of candidates. It becomes difficult for recruiters to efficiently analyze a large number of resumes and identify the most suitable candidates.

Another major problem is the lack of accurate matching between resumes and job descriptions due to limited analysis techniques. Traditional systems primarily depend on keyword-based filtering, which may overlook relevant candidates or include unsuitable ones. This results in reduced hiring efficiency and increased chances of poor recruitment decisions.

Furthermore, the absence of intelligent automation and real-time insights makes it challenging to provide a seamless and effective recruitment experience. There is a need for a smart system that can automate screening, improve matching accuracy, and support recruiters in making better hiring decisions.

Literature Survey

The increasing number of job applications and the growing complexity of recruitment processes have created significant challenges in efficiently identifying suitable candidates. Traditional recruitment systems often rely on manual screening and basic keyword matching, which can lead to inefficiencies, bias, and inaccurate candidate selection. To address these issues, recent research has focused on integrating Artificial Intelligence (AI) and Natural Language Processing (NLP) into recruitment systems. These technologies enable automated resume analysis, semantic understanding of job descriptions, and intelligent candidate ranking, thereby improving hiring accuracy and reducing manual effort.

Several studies highlight the importance of AI-driven techniques in enhancing recruitment efficiency. Liang et al. (2023) proposed a multi-task learning-based resume parsing method that extracts structured information such as education, skills, and experience from unstructured resumes. Their work demonstrated improved accuracy in data extraction and enabled effective preprocessing for AI-based evaluation. Similarly, Mohanty et al. (2023) developed an NLP-based resume parsing prototype that automates the initial screening process, significantly reducing manual workload while improving the consistency and reliability of candidate evaluation.

Another significant contribution comes from Liu et al. (2022), who introduced a joint deep learning embedding model for representing both job descriptions and candidate resumes. This approach enables semantic matching based on contextual similarity rather than simple keyword overlap, resulting in more precise candidate-job alignment. In addition, Chou and Yu (2020) presented an AI-based system that combines natural language understanding with similarity ranking techniques to recommend suitable job roles, thereby optimizing recruitment workflows and enhancing decision-making. Furthermore, Mujtaba and Mahapatra (2024) discussed the challenges of fairness and bias in AI-driven recruitment systems, emphasizing the need for transparent, explainable, and ethical AI models to ensure trustworthy hiring processes.

Proposed System

The proposed system covers the major recruitment processes, that is: 1) job posting; 2) resume submission; 3) resume screening; and 4) candidate ranking. From the beginning of the recruitment process, each applicant is assigned a unique digital profile (i.e., candidate ID) to uniquely identify a candidate. The candidate ID represents verified user information and is essential for maintaining consistency and tracking throughout the recruitment lifecycle.

The involved entities will interact with the system at each stage to verify and process data before proceeding to the next step. Applicants upload resumes, which are parsed to extract structured information, while recruiters manage job descriptions and review candidate matches. The system continuously analyzes and compares data using NLP techniques to ensure accurate matching. Once a mismatch or issue is identified, recruiters can review detailed insights and take appropriate decisions efficiently.

Technically, there exist two key challenges in the proposed system. The first challenge is how to ensure accurate and meaningful matching between resumes and job descriptions using NLP techniques. The second challenge is how to efficiently process large volumes of data while maintaining system performance and scalability.

Modules Used

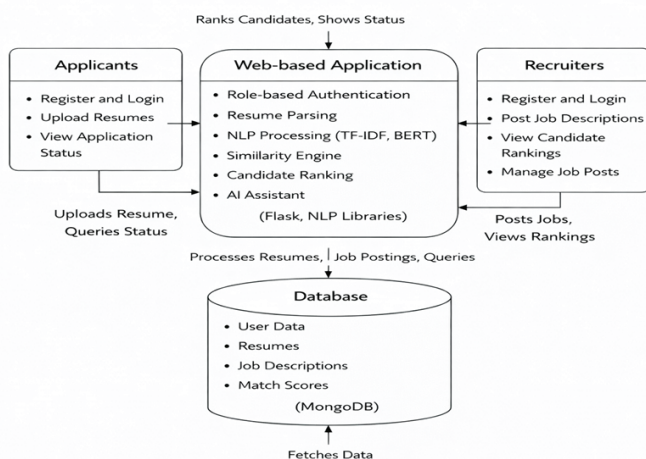
- **User Authentication Module:** This module handles user registration, login, and secure session management. It supports role-based access control for applicants and recruiters, ensuring that each user can access only their respective dashboards and functionalities.
- **Resume Upload Module:** This module allows applicants to upload resumes in various formats such as PDF or DOCX. It processes the uploaded files and stores them securely for further analysis and evaluation within the system.
- **Resume Parsing Module:** This module extracts key information such as contact details, education, skills, and experience from unstructured resumes using NLP techniques like spaCy and NLTK, converting them into structured data for processing.
- **Job Description Module:** This module enables recruiters to create, upload, and manage job descriptions. It processes job requirements and extracts relevant features to facilitate accurate matching with candidate resumes.
- **NLP Matching Module:** This module applies TF-IDF, BERT, and cosine similarity techniques to compare resumes with job descriptions. It generates a matching score and identifies matched and missing skills for better evaluation.
- **Result & Dashboard Module:** This module displays candidate rankings, matching scores, and detailed insights through an interactive dashboard. It helps recruiters make informed decisions and allows applicants to view their performance and recommendations.

Advantages of proposed system

- **Automated Resume Screening:** Uses AI and NLP techniques to automatically analyze resumes, reducing manual effort and saving time.
- **Accurate Candidate Matching:** Utilizes TF-IDF, BERT, and cosine similarity to provide precise matching between resumes and job descriptions.

- **Improved Recruitment Efficiency:** Speeds up the hiring process by quickly identifying the most suitable candidates.
- **Smart Data Extraction:** Resume parsing extracts key details such as skills, education, and experience from unstructured data.
- **Personalized Recommendations:** Provides intelligent job suggestions to applicants based on their profiles and skills.
- **Handling Large Data Volumes:** Efficiently processes and manages a large number of resumes and job postings.
- **Reduced Human Bias:** AI-driven evaluation minimizes manual bias and ensures fair candidate selection.
- **Real-Time Analysis:** Provides instant match scores and insights for better decision-making.
- **Enhanced User Experience:** Interactive interface and AI assistant improve usability for both applicants and recruiters.
- **Scalability and Flexibility:** The system can be easily scaled to handle growing recruitment demands.
- **Better Decision Making:** Detailed insights on matched and missing skills help recruiters select the best candidates.

System Architecture



Results

The results of the proposed project demonstrate that the intelligent HR Job Posting System effectively improves recruitment efficiency, accuracy, and decision-making. By utilizing Artificial Intelligence and Natural Language Processing techniques, the system ensures that resume and job description data are analyzed in a structured and meaningful way, significantly reducing manual effort and errors in candidate selection. The integration of resume parsing enables automatic extraction of key details such as skills, education, and experience, improving data processing efficiency. Advanced algorithms such as TF-IDF, BERT, and cosine similarity ensure accurate matching between candidates and job roles. The system also provides real-time match scores and insights, helping recruiters make better hiring decisions. Experimental evaluation shows that the system achieves faster processing of large volumes of resumes, improved matching accuracy, and efficient candidate ranking. Overall, the results confirm that the proposed system provides a scalable, reliable, and intelligent solution for modern recruitment and hiring processes.

Conclusion

Ensuring vaccine safety is critical. To improve the safety of vaccine circulation, we proposed an improved block chain based system to make the vaccine circulation process traceable and verifiable. The improved system alleviates the storage pressure of the block chain. We also implemented and verified the proposed scheme. The experimental results showed promising performance and potentiality. We also discussed the limitation of the proposed scheme and possible further improvement. We hope that the proposed scheme provides new insights for ensuring vaccine safety. In the future, one important work is to fine-tune the proposed system to achieve better performance by incorporating different entities' interests. Another important work is to conduct incentive mechanism research that could encourage the stakeholders along the vaccine supply chain to migrate existing systems to a block chain-based one.

Future Scope

- **Integration with Advanced AI Models:** Future versions of the system can integrate advanced AI models such as deep learning and transformer-based architectures to further improve resume analysis, candidate ranking, and job recommendations.
- **Real-Time Analytics and Dashboard Enhancements:** The system can be enhanced with real-time analytics dashboards to provide recruiters with deeper insights into candidate performance, hiring trends, and recruitment metrics.
- **Mobile Application Development:** A mobile version of the platform can be developed for applicants and recruiters to access job postings, upload resumes, and track application status conveniently using smartphones.
- **Bias Detection and Fairness Mechanisms:** The system can incorporate AI-based bias detection techniques to ensure fair and unbiased candidate evaluation, improving transparency and trust in the recruitment process.

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