

Resume Screening System Using Machine Learning

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Abstract— In today's highly competitive job market, organizations often receive a vast number of applications for a single position, making manual resume screening inefficient, time-consuming, and susceptible to human error and unconscious bias. Recruiters often struggle with fatigue, inconsistent evaluations, and lack of standardized assessment methods, which can delay hiring and result in overlooked qualified candidates. To address these challenges, this paper presents an AI-powered resume parsing and screening system that leverages Natural Language Processing (NLP) and Machine Learning (ML) to automate and enhance candidate evaluation. The system extracts structured data such as skills, education, work experience, and certifications from unstructured resumes while removing bias-related attributes to promote fairness. It employs semantic analysis for contextual understanding and ML-based similarity scoring to match resumes with job descriptions, enabling accurate candidate ranking. The solution features a dual-dashboard architecture, including an HR dashboard for job management, candidate ranking, analytics, and automated communication, and an employee dashboard that provides resume feedback, optimization, and interview preparation support. Experimental results demonstrate improved efficiency, consistency, and reduced recruiter workload, highlighting the system's effectiveness in modern recruitment processes.

Keywords— Applicant Tracking System, Artificial Intelligence, Machine Learning, Named Entity Recognition, Natural Language Processing, Recruitment Automation, Resume Screening, Support Vector Machine.

I. INTRODUCTION

In modern recruitment, organizations receive a large number of resumes for each job opening, making manual screening a time-consuming and inefficient process [1]. Recruiters often struggle to manage high application volumes, which increases hiring time and operational costs. Human-driven resume evaluation is frequently affected by fatigue, inconsistency, and subjective judgment. Additionally, unconscious bias related to candidate names, educational institutions, resume formatting, or personal background may unintentionally influence hiring decisions, leading to unfair outcomes. Traditional resume screening methods also lack standardization and scalability, limiting their effectiveness in high-volume hiring scenarios such as mass recruitment drives and campus placements.

To overcome these challenges, the proposed **AI-Powered Resume Parsing and Screening System** automates resume evaluation using Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML) techniques. The system extracts relevant information such as skills, educational qualifications, and work experience from unstructured resumes using NLP-based parsing methods. Advanced language models, semantic similarity analysis, and contextual matching techniques are employed to improve resume understanding beyond simple keyword filtering.

Machine Learning algorithms compute relevance scores to rank candidates according to their suitability for the job role. Support Vector Machine (SVM)-based classification models further enhance screening accuracy by categorizing resumes based on job requirements [2], while similarity-based techniques such as cosine similarity enable effective comparison between resumes and job descriptions.

Furthermore, the system extends beyond automated screening by integrating role-based dashboards to support end-to-end recruitment workflows. The HR dashboard enables job posting, resume ranking, analytics visualization, and automated communication with candidates through email notifications. The employee dashboard enhances candidate experience by providing resume analysis, AI-based improvement suggestions, optimized resume generation, and personalized interview question preparation.

II. LITERATURE REVIEW

The literature reviewed indicates that traditional recruitment systems predominantly rely on manual resume screening and basic keyword-based filtering techniques [1]. Such conventional approaches are highly inefficient, time-consuming, and

heavily dependent on human judgment, often leading to inconsistent candidate evaluation and subjective decision-making [2].

Several studies have explored the application of Natural Language Processing (NLP) techniques to improve resume analysis [4]. Advanced NLP techniques enable systems to understand semantic and contextual meaning rather than relying solely on surface-level keyword matching, significantly enhancing candidate profiling accuracy [5]. Named Entity Recognition (NER) techniques have been widely adopted to extract structured information such as skills, educational qualifications, work experience, and certifications from unstructured resumes [6].

Machine Learning (ML) techniques play a crucial role in automated resume ranking and candidate shortlisting [7]. Similarity-based models and intelligent ranking algorithms compute relevance scores by comparing extracted resume features with job descriptions [8]. Support Vector Machine (SVM)-based classifiers have demonstrated improved accuracy in identifying suitable candidates across different job domains [9].

Recent research has also focused on developing integrated web-based recruitment platforms that combine resume parsing, ranking mechanisms, and recruiter dashboards within a single system [10], [11]. However, the literature also identifies persistent challenges, including algorithmic bias, limited system transparency, and insufficient feedback mechanisms for candidates [12].

TABLE 1
COMPARISON OF EXISTING AI-BASED HIRING PLATFORMS

Sr. No.	Launch Date	Website Name	Features, Drawbacks, and Proposed System Advantage
1	Jun-16	HireVue	Features: AI-based video interviews, candidate assessments, recruitment analytics. Drawbacks: High enterprise pricing, limited resume screening, no detailed resume feedback. Proposed Advantage: Bulk resume screening (up to 100 resumes), real-time LLM analysis, candidate ranking, resume improvement suggestions.
2	Aug-18	Rezi	Features: ATS-optimized resume creation, keyword-based feedback. Drawbacks: Job seeker only, no recruiter tools, no fraud detection. Proposed Advantage: Recruiter-focused capabilities, job-based screening, automated ranking, interview question generation.
3	Jan-22	PyjamaHR	Features: ATS with AI-driven candidate shortlisting, interview management. Drawbacks: Limited resume feedback, no salary prediction. Proposed Advantage: Dynamic job-based screening, resume analysis, improvement suggestions, AI-powered Q&A.
4	Mar-19	Vervoe	Features: AI-powered skill assessments, pre-employment testing. Drawbacks: No resume analysis, no job-fit scoring, no resume feedback. Proposed Advantage: Resume screening, job-match scores, resume analysis and feedback, unified HR and employee dashboards.

III. METHODOLOGY

The proposed AI-Powered Resume Parsing and Screening platform follows a dual-dashboard architecture supporting both recruiter-side screening and candidate-side assistance functionalities. The system leverages NLP and ML techniques to automate resume evaluation, enabling efficient application handling, unbiased candidate assessment, and accurate job-fit ranking.

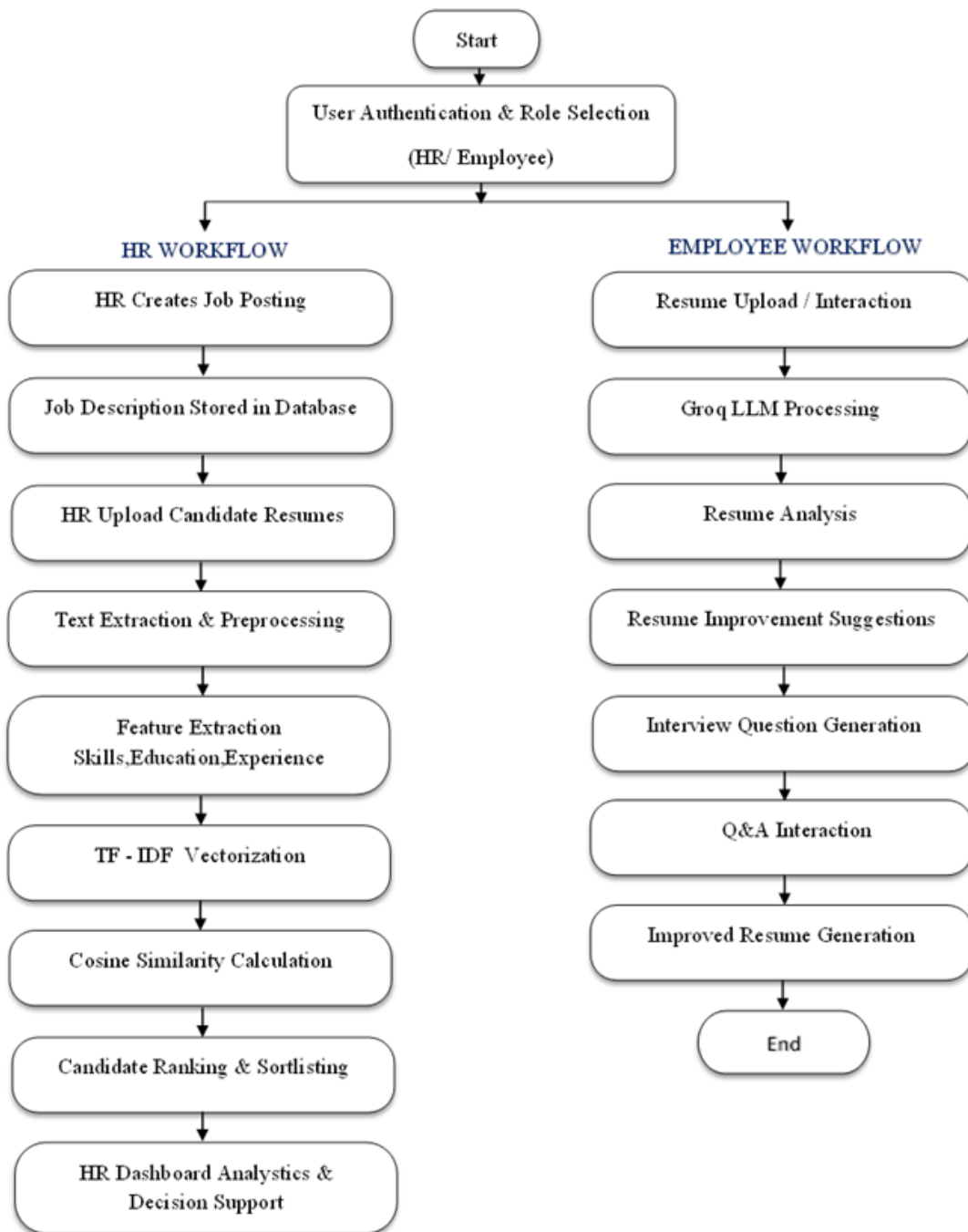


Figure 1: Flowchart of the Proposed AI-Powered Resume Parsing and Screening System

3.1 User Authentication and Role Selection

Users first log into the platform using a secure login system. After logging in, they choose their role as either HR or Employee. Based on the selected role, the system directs users to their respective dashboards.

3.2 HR Dashboard Workflow

3.2.1 Job Creation: HR users create job postings by entering job titles, descriptions, required skills, and qualifications. These job details are stored in the system database and act as reference criteria for evaluating candidate resumes.

3.2.2 Resume Upload: HR users upload candidate resumes in formats such as PDF or DOCX for analysis and evaluation.

3.2.3 Text Processing and Feature Extraction: The system extracts textual content from resumes and processes it to identify key professional attributes such as skills, education, and experience.

3.2.4 AI-Based Screening: Cosine similarity is used to measure the relevance between candidate resumes and job descriptions. After converting textual content into TF-IDF feature vectors, similarity is computed using:

$$\text{Similarity}(R, J) = \frac{R \cdot J}{\|R\| \times \|J\|}$$

where R denotes the resume feature vector, J denotes the job description feature vector, and the double bars denote vector magnitude.

3.2.5 Candidate Ranking: Based on calculated similarity scores, candidates are automatically ranked according to job-fit suitability.

3.2.6 Dashboard Visualization: The HR dashboard displays ranked candidates along with evaluation scores and insights for informed hiring decisions.

3.3 Employee Dashboard Workflow

3.3.1 Resume Upload: Candidates upload their resumes to access AI-assisted features.

3.3.2 Resume Analysis: The system evaluates the resume to identify professional attributes and assess content quality.

3.3.3 Feedback Generation: Based on analysis results, the system provides suggestions highlighting improvement areas and missing skills.

3.3.4 Interview Question Generation: The platform generates role-related interview questions to assist candidates in preparation.

3.3.5 Question-Answer Interaction: Candidates can interact with the system to obtain guidance related to resumes and interview preparation.

3.3.6 Improved Resume Generation: The system produces an improved version of the resume incorporating suggested enhancements.

IV. RESULTS AND DISCUSSION

The AI-Powered Resume Parsing and Screening System was implemented and evaluated to demonstrate its functionality and effectiveness in automating recruitment processes.

4.1 User Interface

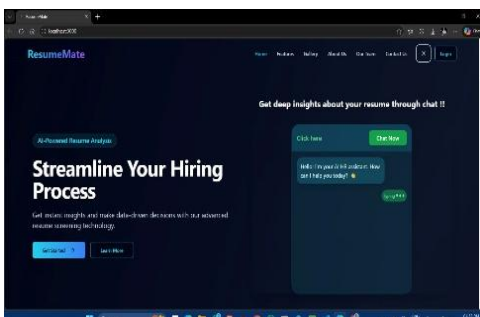


Figure 2: Home Page Interface

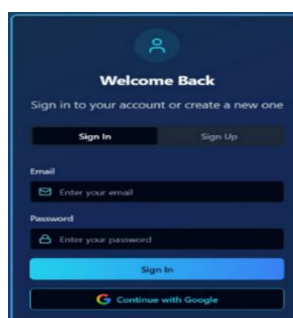


Figure 3: Sign Up / Login Interface



Figure 4: Role Selection Screen

The Home Page (Fig. 2) introduces the AI-powered resume analysis platform and highlights core features. Fig. 3 shows the Sign Up/Login Interface, providing secure user authentication. After successful authentication, users are redirected to the Welcome Screen (Fig. 4), where they select their role as HR or Employee, enforcing Role-Based Access Control (RBAC).

4.2 HR Dashboard

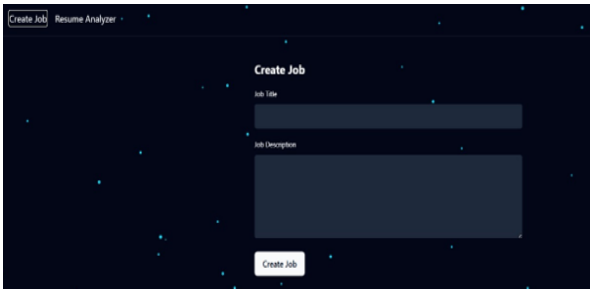


Figure 5: HR Dashboard Job Creation Interface

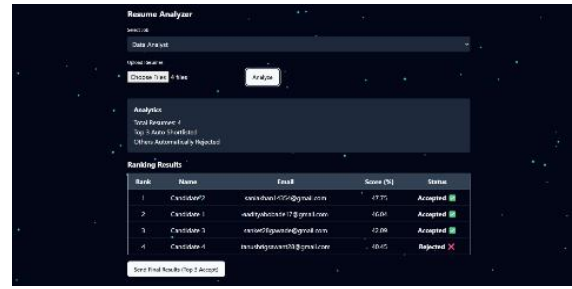


Figure 6: HR Resume Analyzer and Candidate Ranking

The HR dashboard (Figs. 5–6) provides all recruitment-related functionalities. HR users can create job postings, upload multiple resumes, and start the analysis process. The system processes resumes, calculates job-match scores, and displays analytics such as total resumes, shortlisted candidates, and rejected applicants along with ranked results.

4.3 Employee Dashboard

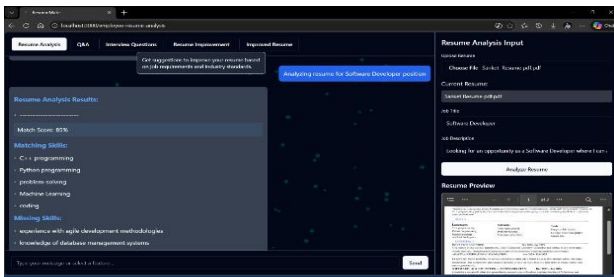


Figure 7: Resume Analysis Interface

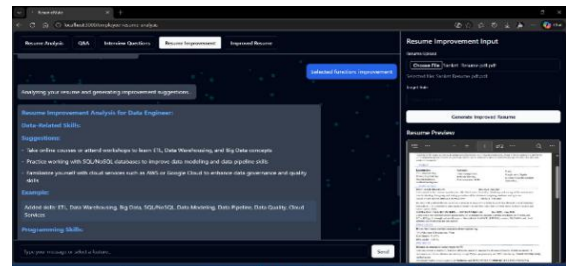


Figure 8: Resume Improvement Interface

The employee dashboard (Figs. 7–8) allows candidates to check and improve their resumes. Users upload their resume, enter a job title and description, and start the analysis. The system displays a job-match score along with matching and missing skills. The resume improvement section provides suggestions, example skill additions, and improvement guidance, generating an optimized version of the resume.

4.4 Discussion

The experimental results demonstrate that the proposed system:

- Reduces manual effort in resume screening
- Provides consistent, data-driven hiring decisions
- Supports candidates with resume improvement and interview preparation
- Enables scalable recruitment through automated ranking

V. CONCLUSION

This paper presented the design and implementation of an AI-Powered Resume Parsing and Screening Platform developed to automate and improve the recruitment process. By using Natural Language Processing (NLP) and Machine Learning (ML) techniques in a dual-dashboard system, the platform supports both HR users for resume screening and candidates for resume assistance.

Key Contributions:

1. Automated resume analysis and job-match evaluation using cosine similarity with TF-IDF vectors

2. Candidate ranking for efficient shortlisting
3. Dual-dashboard architecture (HR and Employee) for role-specific functionalities
4. Resume improvement suggestions and interview question generation for candidates
5. Role-Based Access Control (RBAC) for secure, role-specific access

Future Work:

- Integration of advanced NLP models (BERT, GPT) for improved semantic understanding
- Explainable AI (XAI) for transparent candidate ranking decisions
- Fairness-aware screening to reduce demographic bias
- Mobile application deployment
- Integration with job portals for direct application processing

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