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Intelligent Applicant Resume Scoring and Job Fit Prediction System

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ABSTRACT: Recruiters today receive hundreds of resumes for every job opening, making manual screening inefficient, subjective, and time-consuming. Traditional Applicant Tracking Systems (ATS) rely only on simple keyword matching, which often fails to identify the true suitability of candidates. This project proposes an Intelligent Applicant Resume Scoring and Job Fit Prediction System using Machine Learning (ML) and Natural Language Processing (NLP) to automate the resume evaluation process. The system extracts skills, experience, education, and other key elements from resumes, analyzes job descriptions, and calculates a Resume Fit Score to determine how well a candidate matches a job. The model classifies candidates into categories such as Excellent, Good, Average, or Poor fit. This system significantly reduces recruitment time, minimizes bias, increases hiring accuracy, and enables HR teams to make data-driven decisions. It offers an efficient, intelligent, and scalable solution for modern recruitment challenges.

KEYWORDS: Resume Screening, Job Fit Prediction, Machine Learning, Natural Language Processing (NLP), Applicant Tracking System (ATS), Resume Parsing, Skill Extraction, Candidate Ranking, Recruitment Automation, Text Mining, Predictive Analytics, HR Analytics

I. INTRODUCTION

Recruitment is a crucial function in organizations, yet the initial screening of resumes is one of the most time-intensive processes. A job posting can attract hundreds or thousands of applicants, and manually evaluating resumes often leads to delays, inconsistencies, and biased decisions. With advancements in Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP), resume screening can now be automated intelligently. The Intelligent Applicant Resume Scoring and Job Fit Prediction System automatically parses resumes, extracts meaningful information, analyzes job requirements, and predicts how suitable a candidate is for a specific role.

II. LITERATURE SURVAY

Research on résumé analysis and recruitment automation has attracted growing attention in recent years due to the increasing volume of job applications and the need for efficient, fair, and scalable hiring processes. The existing literature can be broadly categorized into two major research directions: (1) résumé information extraction systems and (2) job recommendation and candidate–job matching systems. Each direction addresses specific challenges in recruitment automation but also exhibits notable limitations..

A. Résumé Information Extraction Systems Résumé information extraction systems primarily focus on converting unstructured résumé documents into structured data that can be processed by automated systems. These approaches commonly employ Natural Language Processing (NLP) techniques, including tokenization, part-of-speech tagging, and Named Entity Recognition (NER), to identify key entities such as skills, educational background, work experience, and personal information.. Several studies have demonstrated the effectiveness of tools such as PyResParser, spaCy, and Stanford NLP in extracting structured résumé content from text-based documents. These tools typically rely on predefined skill dictionaries, pattern matching, and statistical language models. While they achieve satisfactory extraction accuracy, their functionality is largely limited to information retrieval. Most existing systems do not assess

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the quality, completeness, or professional structure of résumés, which is a critical factor in recruitment decision-making. Moreover, résumé extraction systems often struggle with inconsistencies in résumé formats, variations in terminology, and domain-specific skill representation. Although some studies attempt to address these challenges through customized ontologies or domain-specific vocabularies, such solutions require extensive manual effort and are difficult to generalize across different job domains and industries

B. Job Recommendation and Candidate–Job Matching Job recommendation systems aim to match candidates with suitable job opportunities based on their skills, experience, and qualifications. Traditional approaches in this area frequently rely on similarity-based techniques such as Term Frequency–Inverse Document Frequency (TF-IDF), Cosine Similarity, and Jaccard Similarity to compute the textual similarity between résumés and job descriptions. These methods are computationally efficient and relatively easy to implement, making them popular in early recruitment systems. However, similarity-based approaches suffer from several limitations. They often depend heavily on exact keyword overlap and fail to capture semantic relationships between skills and job requirements. As a result, candidates with relevant but differently phrased skills may receive low matching scores. Additionally, these systems typically provide only a matching score without offering explanations or actionable feedback, limiting their usefulness for job seekers seeking career guidance. Recent research has explored the use of deep learning models, particularly transformer-based architectures such as BERT, to improve semantic understanding in résumé–job matching. These models have demonstrated higher accuracy in capturing contextual relationships between skills and job requirements. Nevertheless, their high computational cost, dependence on large labeled datasets, and lack of interpretability pose significant challenges for real-world HR applications, where transparency and trust are essential

C. Skill Gap Analysis and Explainability A limited number of studies have addressed the concept of skill gap analysis, which focuses on identifying missing competencies that prevent candidates from qualifying for specific job roles. Existing approaches often integrate skill gap analysis implicitly within recommendation models, without explicitly highlighting missing skills or providing clear improvement paths. Consequently, candidates receive limited guidance on how to enhance their employability. Explainability has also emerged as a critical concern in intelligent recruitment systems. Black-box models, although accurate, raise ethical and legal concerns related to bias, fairness, and accountability. Several researchers have emphasized the need for interpretable and rule-based approaches that allow HR professionals and candidates to understand the rationale behind system decisions.

D. Research Gap and Contribution Despite the progress achieved in résumé parsing and job recommendation, there remains a clear research gap in developing integrated systems that combine résumé quality evaluation, explicit skill gap detection, and interpretable recommendation mechanisms. Most existing solutions address these components in isolation or overlook one or more of them entirely. Unlike previous work, the proposed system integrates NLP-based résumé information extraction with rule-based résumé quality assessment and explicit skill gap analysis. By employing transparent decision rules rather than black-box models, the system provides explainable job and training recommendations that address both technical limitations and practical Human Resource management requirements.

III. THEORETICAL BACKGROUND

3.1 PROBLEM IDENTIFICATION

- In the existing recruitment environment, organizations largely depend on manual resume screening and traditional keyword-based applicant tracking systems. Manual screening requires HR personnel to read through each resume, compare it with job requirements, and decide whether the candidate should be shortlisted. This process is slow and inconsistent, especially when the number of applicants is high. Human evaluators are prone to fatigue, oversight, and personal biases, resulting in candidates being unfairly overlooked or inaccurately evaluated.

3.2 PROBLEM SOLVING

- The proposed Intelligent Applicant Resume Scoring and Job Fit Prediction System provides a smarter, automated solution by using Machine Learning and Natural Language Processing to evaluate resumes. Instead of relying on keyword presence alone, the system understands the deeper context of both resumes and job descriptions. It extracts skills, experience, education, and other key attributes from the applicant's resume and compares them with the requirements mentioned in the job description. Machine learning models analyze the extracted features and generate a

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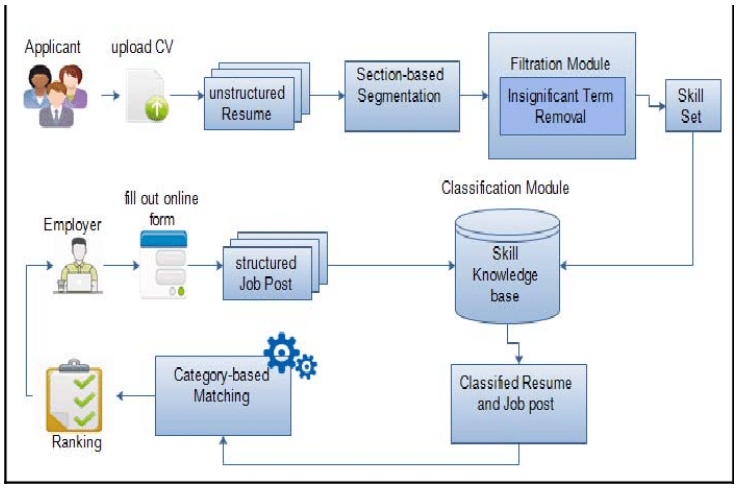
resume score that reflects how well the applicant matches the job requirements. The system also predicts the overall suitability of the candidate by classifying them into different fit categories.

3.3 SYSTEM ARCHITECTURE



IV. SYSTEM IMPLEMETATION

4.1. MODULE:

- User / HR Module
- Applicant Module
- Resume Parsing Module
- Job Description Analysis Module
- Feature Extraction Module
- ML Scoring & Prediction Module
- Result Visualization & Ranking Module
- Admin Module

4.2 MODULE DESCRIPTION:

1. User / HR Module

- HR Login
- Create job postings
- Upload job descriptions
- View candidate rankings
- Shortlist or reject candidates

2. Applicant Module

- Applicant registration/login
- Upload resume
- Apply for job
- View personal score (optional)

3. Resume Parsing Module

Uses NLP to extract:

- Name, Email, Phone
- Skills & Technologies
- Experience duration
- Education details
- Certifications

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4. Job Description Analysis Module
Breaks down the JD into:
- Required skills
- Preferred skills
- Required experience
- Tools & technologies
- Role responsibilities

5. Feature Extraction Module
- Converts resumes & JDs into vector representations
- Uses TF-IDF, BOW, Word Embeddings
- Computes similarity metrics
- Calculates skill match %, experience match score, etc.

6. ML Scoring & Prediction Module
ML models used:
- Random Forest
- Logistic Regression
- Gradient Boosting
- SVM

Outputs:
- **Resume Score (0–100)**
- **Fit Category** (Excellent / Good / Average / Poor)

7. Result Visualization & Ranking Module
HR can view:
- All applicants
- Score-based ranking
- Filters by score/experience/skills
- Export shortlisted candidates

8. Admin Module
- Manage users
- Update scoring model
- Monitor system performance

V. CONCLUSION

The **Intelligent Applicant Resume Scoring and Job Fit Prediction System** successfully automates the resume screening process using ML and NLP. It extracts relevant information from resumes, analyzes job descriptions, and predicts candidate-job fit efficiently. This reduces HR workload, eliminates human biases, and speeds up the hiring process. The system provides accurate, consistent, and data-driven shortlisting decisions, making it a highly beneficial solution for modern recruitment challenges.

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