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Privacy- Resume Screening Application Using NLP
" Simplifying the Shortlisting Process "

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Abstract: *The rapid growth of online recruitment platforms has increased the number of job applications received by organizations. Manually reviewing resumes is often slow, labor-intensive, and may lead to biased hiring decisions. To address these challenges, this research presents a Resume Screening Application based on Natural Language Processing (NLP) and Machine Learning (ML). The proposed system automatically extracts important details from resumes and job descriptions, including technical skills, education, certifications, work experience, and soft skills.*

The application uses NLP techniques for text preprocessing and feature extraction, while machine learning algorithms such as Support Vector Classifier (SVC) and Random Forest are applied for resume classification and candidate-job matching. Semantic similarity methods are also used to compare resumes with job descriptions and identify the most suitable applicants for a particular role.

In addition, the system provides resume analysis and personalized feedback by identifying missing skills, skill gaps, and improvement areas. It supports multiple resume formats and helps reduce recruitment time, manual screening effort, and hiring bias while improving the overall accuracy and fairness of candidate selection. Experimental results demonstrate that the NLP-based screening approach can improve recruitment efficiency and support intelligent hiring decisions.

I. INTRODUCTION

In today's competitive employment environment, companies receive a large number of resumes for every job opening. Manually evaluating these resumes is time-consuming and may result in errors or unfair candidate selection. Traditional recruitment methods often depend heavily on human effort, which can slow down the hiring process and reduce efficiency. Therefore, organizations are increasingly adopting automated recruitment systems to improve accuracy and simplify candidate shortlisting.

The proposed Resume Screening Application uses Natural Language Processing (NLP) and Machine Learning (ML) techniques to automate resume analysis and candidate selection. NLP methods are used to extract important information from resumes, such as technical skills, educational qualifications, certifications, and work experience. Machine Learning algorithms including Support Vector Classifier (SVC) and Random Forest are applied for resume classification and job matching.

The system also uses semantic similarity techniques to compare resumes with job descriptions and identify the best candidates for specific roles. By automating the screening process, the application minimizes manual effort, reduces recruitment time, and decreases hiring bias. Additionally, it provides suggestions and feedback to candidates regarding missing skills and resume improvement. The main objective of this research is to develop a smart and scalable recruitment system that supports faster and data-driven hiring decisions.

II. LITERATURE REVIEW

Recent advancements in Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP) have significantly transformed recruitment and resume screening systems. Traditional recruitment methods mainly relied on keyword matching and manual resume evaluation, which often increased hiring time and recruitment costs while reducing matching accuracy between candidates and job

roles. Researchers have demonstrated that ML-based systems can improve hiring efficiency and reduce manual recruitment effort.

Several studies have focused on semantic resume matching using NLP techniques. Unlike keyword-based systems, semantic analysis helps in understanding the meaning and context of resumes and job descriptions, leading to better candidate recommendations. Techniques such as Named Entity Recognition (NER), TF-IDF, cosine similarity, and transformer-based models have been used to extract important information like skills, education, certifications, and work experience. These approaches improved resume classification accuracy and candidate ranking performance.

With the growth of online job portals, organizations now receive a large volume of applications, making manual screening difficult and time-consuming. To solve this issue, researchers introduced automated resume classification systems using algorithms such as Support Vector Machine (SVM), Naïve Bayes, Logistic Regression, and K-Nearest Neighbor (KNN). Hybrid models combining TF-IDF feature extraction with ML classifiers achieved promising results in resume filtering tasks. Some systems reported high accuracy rates while improving transparency and consistency in recruitment decisions.

Researchers have also highlighted the importance of AI-powered recruitment systems in reducing hiring bias and supporting fair candidate selection. Modern recruitment platforms can analyze candidate profiles intelligently and help organizations make better hiring decisions. Some studies further explored blockchain technology for secure verification of candidate credentials and maintaining data integrity. Overall, the integration of AI, NLP, ML, and semantic analysis has greatly improved resume screening efficiency and hiring accuracy.

III. METHOLOGY

The proposed Resume Screening Application is designed as an automated recruitment solution using NLP and ML techniques. The process begins with collecting resumes and job descriptions from online job portals, HR databases, and sample recruitment datasets. The system accepts resumes in multiple formats such as PDF, DOCX, and TXT.

In the preprocessing stage, the text data is cleaned by converting it into lowercase and removing punctuation marks, numbers, stop words, and special characters. Tokenization and lemmatization techniques are applied to divide the text into meaningful words and normalize them for analysis. NLP-based parsing methods are then used to extract important candidate information including name, contact details, education, certifications, skills, and work experience.

The extracted textual data is converted into numerical form using TF-IDF (Term Frequency–Inverse Document Frequency). Cosine similarity is then used to compare resumes with job descriptions and calculate compatibility scores for each candidate. Machine Learning algorithms such as K-Nearest Neighbor (KNN), Support Vector Classifier (SVC), and Random Forest Classifier are applied for resume classification and candidate ranking.

The system performance is evaluated using metrics such as accuracy, precision, recall, and F1-score. Additionally, the application provides personalized feedback, skill recommendations, certification suggestions, and resume improvement tips for candidates. This intelligent recruitment system helps reduce manual effort, improve screening accuracy, and simplify the overall hiring process.

IV. ARCHITECTURE

It starts with job applicants uploading their resumes, which are parsed and preprocessed to extract relevant information. The processed resumes are stored in a Resume Database. Simultaneously, job descriptions are stored in a Job Description Database, from which key skills and keywords are extracted. These keywords are used in the matching and scoring module to compare resumes against job requirements. The system calculates

match percentages, ranks candidates, and provides feedback. Finally, a shortlist is generated based on the ranking, and decisions are made to streamline and enhance the recruitment process.

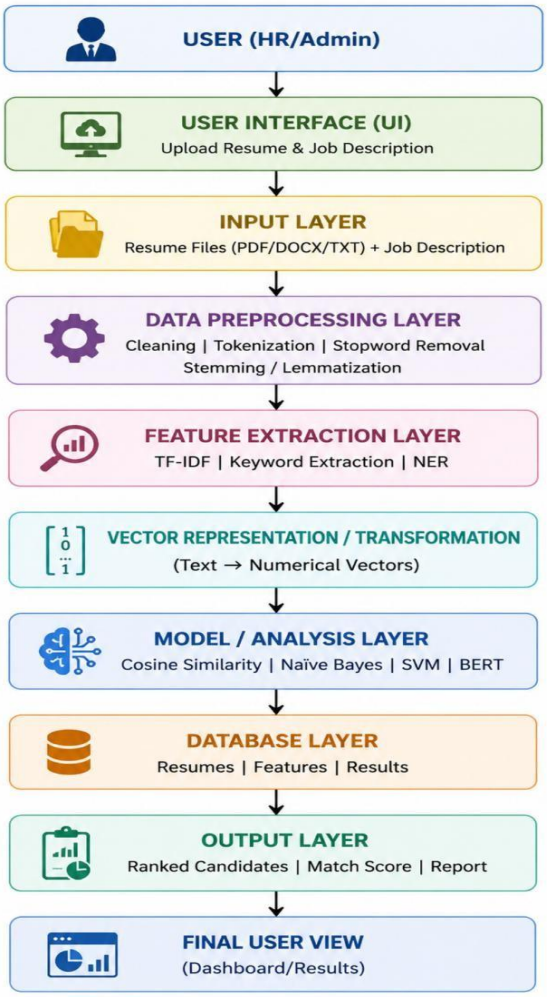

Fig I. : End-To-End Architecture System

The architecture diagram represents the complete workflow of the Resume Screening Application using Natural Language Processing (NLP) and Machine Learning (ML). The process begins when candidates upload resumes in PDF, DOCX, or TXT formats through the employee interface. The system then performs resume parsing to extract important details such as skills, education, certifications, and experience.

After preprocessing and cleaning the text data, TF-IDF vectorization converts textual information into numerical features, and cosine similarity is applied to compare resumes with job descriptions. Machine learning models such as Random Forest, SVM, and KNN classify and rank candidates based on compatibility scores. The system further provides resume scores, skill-gap analysis, recommendations, certifications, and career guidance.

All processed data is stored in a centralized database, while the admin interface allows authorized recruiters to securely access candidate information, monitor analytics dashboards, visualize recruitment statistics, and download reports for efficient and accurate hiring decisions.

V. RESULT & DISCUSSION

The proposed Resume Screening Application successfully automated the process of resume shortlisting and

candidate evaluation using NLP and ML techniques. The system effectively extracted important information from resumes in different file formats and identified candidate skills accurately.

TF-IDF vectorization and cosine similarity methods helped compare resumes with job descriptions and generate compatibility scores. Among the implemented machine learning algorithms, the Random Forest model achieved better accuracy and classification performance compared to SVM and KNN models.

The results indicate that the NLP-based approach improves the efficiency and accuracy of resume screening while reducing the manual workload of recruiters. The system also provided candidates with skill-gap analysis, resume improvement suggestions, and career recommendations. Furthermore, the admin dashboard enabled recruiters to monitor candidate rankings, analytics, and reports more efficiently. Overall, the proposed system proved effective in simplifying recruitment, reducing bias, and saving hiring time.

VI. RESUME ANALYSIS & SKILL ASSESMENT

Resume analysis is a process in modern recruitment. It helps evaluate candidate profiles efficiently using Natural Language Processing and Machine Learning techniques. The system extracts information from resumes. This includes education, technical skills, certifications, projects, work experience and contact details.

After cleaning the data, the system. Compares it with job descriptions. This helps identify if candidates are suitable for roles. The system uses techniques like TF-IDF vectorization and cosine similarity. These measure how relevant candidate qualifications are to job requirements. This helps recruiters quickly and accurately shortlist the applicants. Skill assessment is crucial in improving candidate evaluation. It identifies skill gaps. The system analyses existing candidate skills. Compares them with industry needs. It recommends skills, certifications and learning resources for career improvement.

Machine Learning algorithms classify resumes according to job categories. They rank candidates based on compatibility scores. This automated approach reduces effort and improves recruitment efficiency. It minimizes bias and provides data-driven insights, for better hiring decisions.
Resume analysis and skill assessment systems help both recruiters and job seekers. They create a faster and more reliable recruitment process.

The system successfully implements a structured workflow for resume evaluation. Users upload their resume documents and specify target job roles.

1) Matching Skills: Competencies already present in the candidate's profile
2) Missing Skills: Critical competencies required for the target role but absent from the candidate's resume (including HTML, CSS, JavaScript, React, Angular, Vue.js, Responsive Design, Web Accessibility, Version Control, Testing frameworks, and UI/UX principles)
3) Less Relevant Skills: Abilities possessed by the candi- date but less applicable to the target role (including C#, Go, AI, and iOS development).

VII. FUTURE SCOPE

The Resume Screening System has a future ahead with Artificial Intelligence, Machine Learning and Natural Language Processing getting better. These systems will do more than just match keywords. They will understand resumes and job descriptions in context to find the candidates. Some new features could be:

- Video resume analysis to see how candidates present themselves .
- Voice-based communication assessment to check how well they communicate
- Soft-skill evaluation to see if they have the right people skills

The system could also work with HR management platforms to automate tasks like:

- Scheduling interviews
- Tracking candidates
- Onboarding hires

To make sure hiring is fair the system can use bias reduction techniques and ethical AI models. These can help by removing information from resumes. In the future we might see:

- Support for different resume formats
- Analysis of resumes, in languages
- Predictive analytics to find skill gaps and hiring trends
- Industry- criteria to make recruitment decisions smarter

The Resume Screening System and Artificial Intelligence and Machine Learning and Natural Language Processing will be very important. The Automated Resume Screening System will use Artificial Intelligence and Machine Learning and Natural Language Processing.

VIII. CONCLUSION

The Resume Screening Application developed using Natural Language Processing and Machine Learning techniques provides an effective solution for modern recruitment challenges. The system automates resume analysis by extracting candidate details such as skills, education, certifications, and work experience, and comparing them with job requirements.

The application helps reduce manual screening effort, saves recruitment time, and improves fairness in candidate selection by minimizing human bias. It also supports candidates by providing recommendations related to missing skills, resume enhancement, and career development.

Overall, the proposed system acts as an intelligent recruitment tool that improves hiring accuracy, efficiency, and reliability. Future improvements such as advanced machine learning models, multilingual support, and deeper semantic analysis can further enhance the performance of the system and make it more suitable for real-world recruitment environments.

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