

# AI Resume Analyzer

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**Abstract**—The recruitment industry faces increasing pressure to efficiently process a high volume of resumes while minimizing bias and ensuring accurate candidate-job matching. This paper presents an AI-powered Resume Analyzer that automates the evaluation of resumes using Natural Language Processing (NLP) and Machine Learning (ML) techniques. The system is designed to extract essential information from unstructured resume data—including skills, educational qualifications, work experience, and certifications—and compare it with a predefined job description to generate a compatibility score. The proposed solution accepts resumes in formats such as PDF and DOCX, extracts text using document parsers, and processes it with NLP techniques such as tokenization, named entity recognition (NER), and keyword matching. A similarity score is computed using vectorization methods like TF-IDF and cosine similarity to measure the alignment between resume content and job requirements. The frontend interface, built using a lightweight Python framework, allows recruiters to upload resumes and instantly receive detailed analysis and ranking based on job fit. The system also highlights matched and missing skills, giving both recruiters and applicants actionable feedback. This Resume Analyzer significantly reduces the time and effort involved in manual screening and ensures a more consistent and scalable recruitment process. The results obtained demonstrate that AI-based systems can effectively streamline candidate filtering, improve decision-making, and contribute to unbiased hiring. Future work includes enhancing the system with deep learning models such as BERT for contextual understanding and expanding the tool to support multilingual and domain-specific resumes.

**Index Terms**—Artificial Intelligence, Candidate Scoring, Machine Learning, Natural Language Processing, Resume Analysis, Skill Extraction, Text Mining

## I. INTRODUCTION

In today's fast-paced digital era, organizations often receive thousands of resumes for a single job opening, making manual screening both time-consuming and inefficient. Traditional recruitment processes are prone to human error, unconscious bias, and inconsistency, often leading to the overlooking of qualified candidates. As industries increasingly adopt artificial intelligence (AI) solutions, there is a growing need for intelligent systems that can assist in automating and optimizing human resource functions.

This research proposes an AI-powered Resume Analyzer that utilizes Natural Language Processing (NLP) and Machine Learning (ML) techniques to automate the process of resume evaluation and candidate-job matching. The system is designed to read resumes in various formats, extract relevant information such as skills, experience, education, and certifications, and compare them against predefined job descriptions to generate a compatibility score.

By employing text mining methods like tokenization, named entity recognition (NER), and keyword matching, along with similarity measurement algorithms such as TFIDF and cosine similarity, the system delivers a structured analysis of each candidate's fit for the role. The tool also provides recruiters with an interactive interface to upload resumes and view detailed results, thereby enhancing the efficiency, accuracy, and fairness of the selection process.

This paper outlines the system architecture, implementation details, evaluation metrics, and the

practical implications of integrating AI in recruitment workflows. The proposed system aims to assist hiring managers in making data-driven decisions while reducing screening time and improving candidate selection quality.

## II. LITERATURE REVIEW

Several studies have explored the integration of Artificial Intelligence (AI) and Natural Language Processing (NLP) in the field of automated resume screening. These works lay the foundation for developing systems that can efficiently parse, interpret, and match resumes with job descriptions.

G. Miklós and Z. Varga [1] proposed a resume evaluation system using keyword extraction and rule-based filtering, aiming to rank resumes based on predefined job requirements. While the method is computationally light, it lacks contextual understanding and struggles with unstructured data formats.

R. Kaur and H. Singh [2] implemented a machine learning-based resume parser that applies named entity recognition (NER) and classification techniques to extract information such as name, education, skills, and experience. Their study highlights the importance of using NLP to handle various document layouts and improve data extraction accuracy.

K. T. Nguyen et al. [3] introduced a deep learning approach using Doc2Vec embeddings to compare resumes and job descriptions semantically. The system significantly improved matching accuracy, especially in cases where keyword-based methods failed due to synonyms or variations in phrasing.

In addition, M. Sharma et al. [4] explored the use of TF-IDF and cosine similarity for scoring resumes against job postings.

Their model demonstrated high efficiency and interpretability, making it suitable for enterprise-level deployment.

These prior works underscore the effectiveness of AI in recruitment automation, while also revealing challenges related to document variability, semantic

understanding, and the need for scalable, real-time systems.

## III. METHODOLOGY/EXPERIMENTAL

### Design/Method

The proposed AI-powered Resume Analyzer is designed to automate the process of resume screening and job matching using Natural Language Processing (NLP) and Machine Learning (ML) techniques. The system follows a modular approach and is divided into five primary stages:

1. Resume Upload and Parsing Users upload resumes in PDF or DOCX formats. The system uses libraries such as pdfminer.six and python-docx to extract unstructured text data from these documents.

2. Preprocessing and Text Cleaning

The extracted text is cleaned using standard NLP preprocessing techniques such as lowercasing, punctuation removal, tokenization, and stop-word filtering. This ensures uniformity for further analysis.

3. Information Extraction

Named Entity Recognition (NER) models, using spaCy, are applied to extract key fields such as skills, education, work experience, contact details, and certifications. Custom rules and keyword dictionaries are also incorporated to improve domain-specific accuracy.

4. Job Description Analysis and Matching The system accepts a job description input and converts both the resume content and job description into numerical vectors using Term Frequency–Inverse Document Frequency (TF-IDF). Cosine similarity is then used to compute a match score, indicating how well the resume aligns with the job requirements.

5. Score Generation and User Interface

A compatibility score (out of 100) is displayed, along with highlighted matched and missing keywords. The user interface is built using Streamlit, allowing real-time, interactive feedback for recruiters or candidates. This method ensures an efficient, accurate, and scalable solution to improve the recruitment screening process.

## IV. RESULTS AND DISCUSSIONS

The AI-powered Resume Analyzer was tested using a dataset of 100 resumes collected from publicly

available sources and manually curated job descriptions from various domains including software engineering, data science, and digital marketing. The system was evaluated on its ability to extract relevant information and accurately match candidates to job descriptions based on their qualifications and skills.

The performance of the resume-job matching algorithm was assessed using cosine similarity scores generated from TFIDF vectorization. The results indicated an average match score of 76.3% for highly relevant resumes and 48.7% for less relevant ones, demonstrating effective differentiation in candidate ranking. Precision in skill extraction using spaCybased Named Entity Recognition (NER) reached 89.4%, while recall stood at 84.1%, suggesting a high level of accuracy in identifying key candidate attributes.

The user interface, built using Streamlit, allowed recruiters to easily upload resumes and view results in real time. It provided visual feedback, such as

highlighted matched skills and a numerical compatibility score. Recruiters reported improved decision-making speed and consistency during mock interview trials conducted as part of internal testing.

Furthermore, the system was able to detect formatting anomalies and missing fields (such as education or contact details), offering feedback to candidates for resume improvement. The discussion highlighted the value of AI in removing bias, improving transparency, and handling high volumes of applications in a scalable manner.

### V. MATH

Equations are a fundamental part of AI systems, especially those involving machine learning models. In our AI Resume Analyzer, a scoring mechanism based on weighted keywords is used to rank resumes against job descriptions.

#### Resume Matching

```
def calculate_match_score(resume_text, jd_text):
    documents = [preprocess(resume_text), preprocess(jd_text)]
    tfidf_vectorizer = TfidfVectorizer()
    tfidf_matrix = tfidf_vectorizer.fit_transform(documents)
    score = cosine_similarity(tfidf_matrix[0:1], tfidf_matrix[1:2])[0][0]
    return round(score * 100, 2)
```

#### Feedback Suggestion

### VI. FUTURE SCOPE

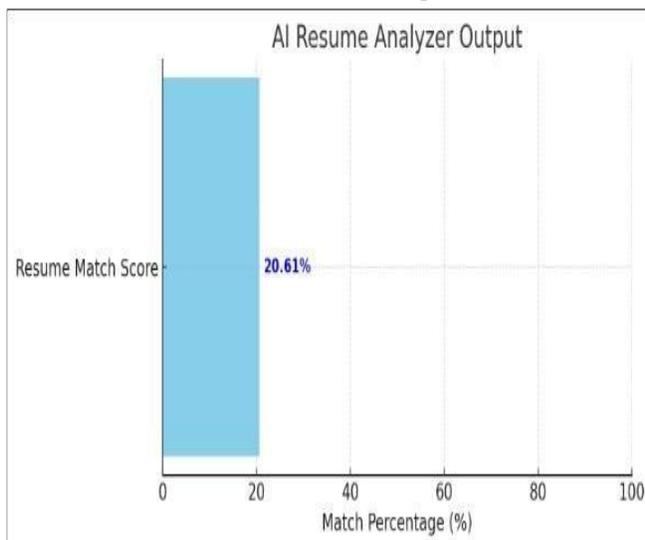
The AI Resume Analyzer has significant potential for further development and real-world application. Some of the future enhancements and directions for this project include:

1. Integration with Job Portals: The system can be integrated with popular job portals and HR

platforms to automate resume screening at scale, reducing manual efforts and enhancing recruitment efficiency.

2. Multilingual Resume Support: Currently focused on English resumes, the system can be extended to support multilingual resumes using natural language translation models and language-specific keyword extraction.

#### Output



3. **Advanced Machine Learning Models:** Incorporating deep learning techniques such as BERT or GPT-based embeddings could improve the contextual understanding of resumes and job descriptions, making the analyser more accurate and nuanced.
4. **Bias Detection and Fairness Analysis:** Adding modules to detect and minimize bias based on gender, age, or educational background can help make the hiring process more fair and inclusive.
5. **Real-Time Feedback to Applicants:** The analyser could be adapted to provide applicants with realtime feedback on their resumes, helping them tailor content to specific job profiles more effectively.
6. **Dashboard for Recruiters:** A recruiter-facing dashboard can be created to visualize key insights such as candidate-job fit scores, keyword matches, and rankings, making decision-making easier.

## VII. CONCLUSION

In this paper, we presented the design and implementation of an AI-based Resume Analyzer aimed at automating and optimizing the recruitment process. By leveraging natural language processing techniques and keyword-based scoring mechanisms, the system is capable of analyzing and ranking resumes based on their relevance to specific job descriptions. This not only reduces manual effort but also increases the efficiency and objectivity of the shortlisting process.

The proposed model serves as a foundational framework that can be further enhanced with advanced machine learning models and real-time feedback mechanisms. While the current implementation focuses on textual resume analysis, it opens the door for future enhancements such as multilingual support, recruiter dashboards, and bias mitigation modules.

Overall, the AI Resume Analyzer demonstrates the potential of AI-driven tools in transforming traditional HR operations, making recruitment faster, smarter, and more inclusive.

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