PYTHON PROJECT

EVALUATION - 1 REPORT

ON

Automatic Resume Screening using Lemmatization, LLMs and Personality Data from Social Media

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ABSTRACT

Hiring the right candidate efficiently is a major challenge for organizations today. Traditional resume screening methods are slow and often influenced by human bias. With advancements in Artificial Intelligence (AI) and Natural Language Processing (NLP), automated resume screening has become more popular. However, current techniques still struggle with accuracy and fairness.

This research explores different resume screening techniques that use NLP and Machine Learning (ML). We evaluate several studies to identify gaps in precision, recall, and overall performance. Our proposed system improves resume parsing by using advanced NLP methods to make the process faster and more reliable.

By refining resume classification, our system helps ensure fair and efficient candidate selection. The study concludes that when AI-driven resume screening is properly optimized, it can make the hiring process significantly more effective while reducing bias.

INTRODUCTION

The hiring process has always been complex, with recruiters spending hours manually screening resumes. This traditional method is slow, inefficient, and prone to human bias. As a result, many researchers have explored AI-driven approaches to automate resume screening and improve efficiency [1]. Natural Language Processing (NLP) and Machine Learning (ML) are now widely used to extract useful information from resumes and rank candidates based on relevance [2].

However, despite advancements, AI-based resume screening systems still face challenges such as misclassification, bias, and handling unstructured resume formats [3]. Some models rely on keyword matching, while others use deep learning techniques such as Large Language Models (LLMs) [4]. The performance of these methods varies, leading to inconsistencies in results.

This paper is structured as follows: Section 2 covers the literature review, discussing previous research and identifying key challenges. Section 3 analyzes different screening techniques based on performance metrics. Section 4 introduces our proposed system, and Section 5 presents the conclusion, discussing how our approach improves upon existing methods.

LITERATURE SURVEY

Several studies have explored AI-driven resume screening techniques. Below are some key contributions:

1. NLP-Based Resume Screening

   ○ Sarika Pabalkar (2024) developed an NLP-powered resume analyzer to extract key details for efficient screening [4].
   ○ Vishaline AR (2024) introduced a machine learning-based ranking system to prioritize resumes based on job relevance [5].

2. Machine Learning Approaches

   ○ Nida Akram (2023) designed an ML-based automation system for resume classification, improving accuracy in candidate selection [6].
   ○ Esmail Salakar (2023) used Large Language Models for better resume screening and classification accuracy [7].

3. Hybrid Approaches

   ○ Tumula Mani Harsha (2022) combined NLP with deep learning to enhance resume parsing accuracy [8].
   ○ Ki-Young Shin (2017) incorporated social network analysis into resume verification to improve credibility [9].

From these studies, it's clear that AI-driven resume screening offers several advantages, but challenges such as fairness, accuracy, and adaptability still need improvement. These studies form the basis for our analysis in the next section.

ANALYSIS

To compare existing resume screening methods, we analyze their performance using the following key factors:

- Accuracy: How well the system correctly classifies resumes.
- Precision: The proportion of true positives among selected resumes.
- Recall: The system's ability to retrieve relevant resumes.
- F1 Score: A balance between precision and recall.
- Robustness: How well the system handles different resume formats.

The following graphs visually represent the performance of different approaches:
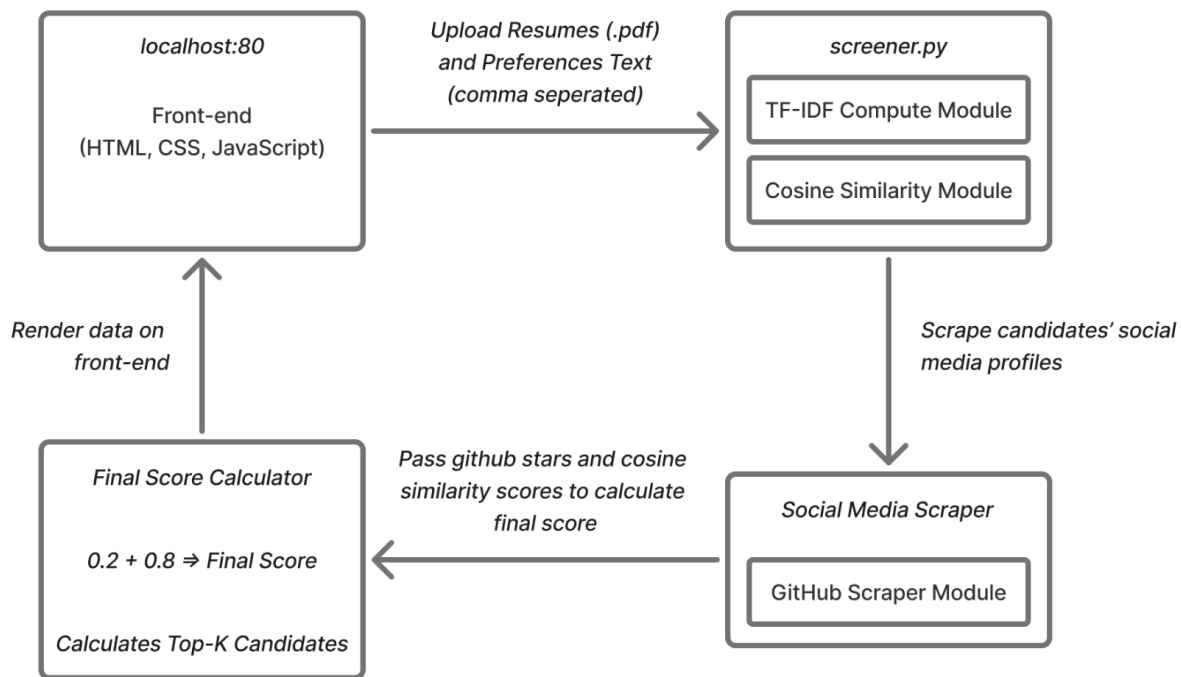
Accuracy
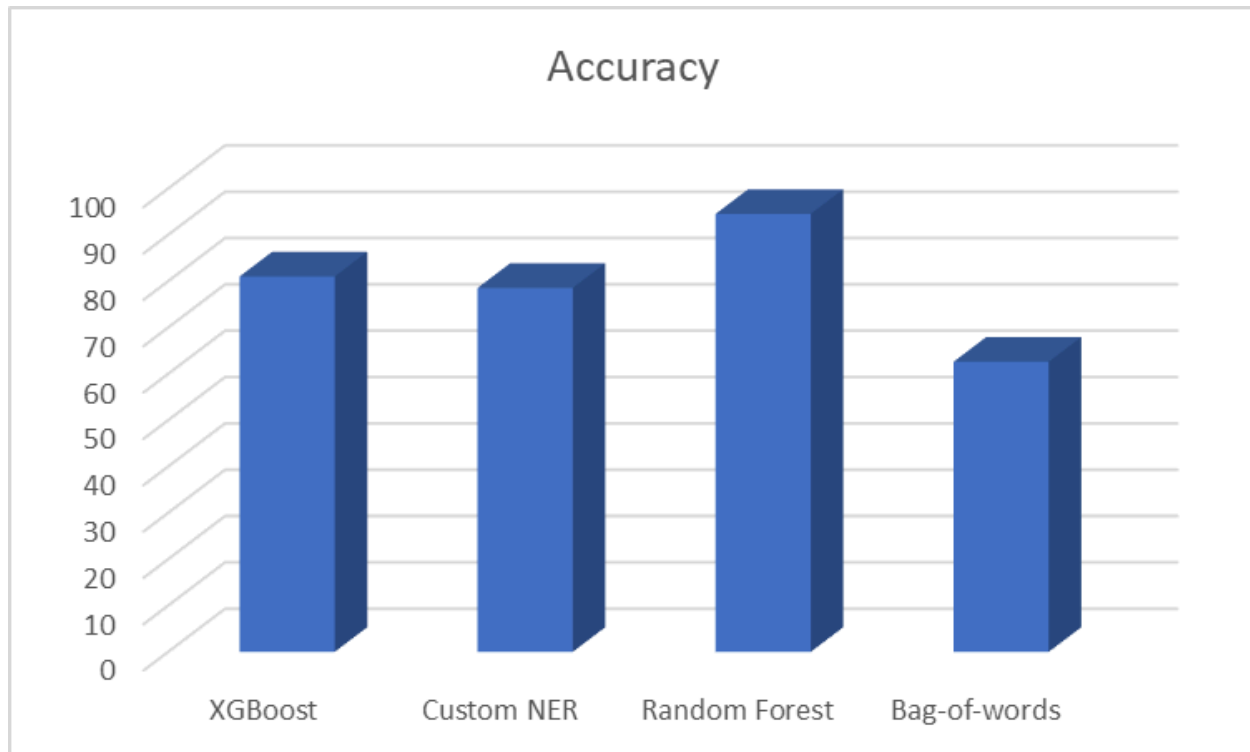
Our findings suggest that deep learning models, especially those using LLMs, achieve higher precision and recall but require significant computational resources. On the other hand, traditional NLP models perform well for structured resumes but struggle with unstructured data.

PROPOSED SYSTEM

To address the challenges identified, we propose a Hybrid Resume Screening System that combines NLP with Large Language Models for better accuracy and fairness. The system consists of the following key components:

- Resume Preprocessing Module: Extracts structured information from unstructured resumes.
- Feature Extraction Module: Identifies key skills and experience using deep learning.
- Ranking & Filtering Module: Uses machine learning algorithms to rank resumes based on job descriptions.
- Bias Mitigation Module: Reduces hiring bias by eliminating reliance on specific keywords.

Our approach aims to improve precision while ensuring fair candidate selection.

CONCLUSION

AI-powered resume screening has the potential to make recruitment faster and more efficient. However, existing methods still face challenges related to accuracy, fairness, and adaptability. Our proposed hybrid system addresses these gaps by integrating NLP with advanced machine learning techniques, leading to better candidate evaluation. Future improvements could focus on refining bias detection and making the system more adaptable to different industries.

REFERENCES

[1]   Sarika Pabalkar, "Resume analyzer using natural language processing (NLP)"
[2]   Spandana Anilkumar Kamkar, "Resume parser and job description matcher"
[3]   Vazzula Manish, "Optimizing resume parsing processes by leveraging large language models"
[4]   Mithul Chander B, "Talent acquisition process using NLP and machine learning"
[5]   Vishaline AR, "An ML-based resume screening and ranking system"
[6]   S Ambareesh, "Resume shortlisting using NLP"
[7]   Nida Akram, "Automation of resume classification using machine learning algorithm"
[8]   Heenakauskar Pendhari, "Resume screening using machine learning"
[9]   Esmail Salakar, "Resume screening using large language models"
[10]   B Nisha, "HR tech analyst: automated resume parsing and ranking system through natural language processing"
[11]   Merve Elmas Erdem, "Automatic resume screening using content matching"
[12]   B. Surendiran, "Resume classification using ML techniques"
[13]   B. Lalitha, "Application screening system using NLP"

[14]   Muskan Sharma, "Resume classification using elite bag-of-words approach"

[15]   S Bharadwaj, "Resume screening using NLP and LSTM"

[16]   Tumula Mani Harsha, "Automated resume screener using natural language processing (NLP)"

[17]   M. Alamelu, "Resume validation and filtration using natural language processing"

[18]   Anushka Sharma, "Intelligent recruitment system using NLP"

[19]   Rohini Nimbekar, "Automated resume evaluation system using NLP"

[20]   Ki-Young Shin, "A job application's resume verification method using a social network analysis using facebook like as linkedin for recruiting"