International journal of basic and applied research
www.pragatipublication.com
ISSN 2249-3352 (P) 2278-0505 (E)
Cosmos Impact Factor-5.86

AI-Powered Resume Screening and Ranking System

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***Abstract*—The increasing number of job applications in mod-ern recruitment processes has made manual resume screening inefficient, time-consuming, and prone to bias. To address these challenges, this paper proposes an AI-powered resume screening and ranking system that leverages Natural Language Process-ing (NLP) techniques for automated candidate evaluation. The system utilizes a Sentence-BERT (SBERT) model to generate semantic embeddings of resumes and job descriptions, enabling meaningful comparison beyond traditional keyword-based meth-ods. Resumes in PDF and DOCX formats are processed through a text extraction pipeline, followed by similarity computation using cosine similarity to rank candidates based on relevance.**

Additionally, the system incorporates a skill matching module that identifies matching and missing skills, improving the inter-pretability of results and assisting recruiters in decision-making. The system is implemented using a web-based architecture with a React frontend and a Node.js backend, ensuring efficient processing and user-friendly interaction. The proposed approach demonstrates improved accuracy and consistency in identifying relevant candidates, making it a scalable solution for modern recruitment systems.

I. INTRODUCTION

The rapid growth of online job portals and digital recruit-ment platforms has significantly increased the volume of appli-cations received by organizations. As a result, manual resume screening has become a challenging task, requiring substantial time and effort while being susceptible to human bias and inconsistency. Traditional approaches, such as keyword-based filtering, often fail to capture the contextual meaning of can-didate profiles, leading to inaccurate shortlisting of applicants. Recent advancements in Artificial Intelligence (AI) and Natural Language Processing (NLP) have provided new op-portunities to automate and improve recruitment systems. By enabling machines to understand and analyze human language, NLP techniques allow for more accurate evaluation of re-sumes based on semantic meaning rather than exact keyword matches. This has led to the development of intelligent sys-tems capable of performing automated resume screening and ranking.

In this paper, an AI-powered resume screening and ranking system is proposed, which utilizes Sentence-BERT (SBERT) to generate semantic embeddings of resumes and job descrip-tions. These embeddings capture the contextual meaning of text and are compared using cosine similarity to determine the relevance of each candidate. The system processes resumes in multiple formats, extracts meaningful textual information, and ranks candidates based on similarity scores.

To enhance system interpretability, a skill matching module is integrated to identify matching and missing skills between resumes and job descriptions. This provides additional insights into candidate suitability and supports better decision-making. The system is implemented using a web-based architecture, ensuring efficient processing and scalability.

Overall, the proposed system offers an effective and in-telligent solution for automating resume screening, reducing manual effort, and improving the accuracy and consistency of candidate selection.

II. RELATED WORK

Automated resume screening has evolved significantly with advancements in Artificial Intelligence (AI) and Natural Language Processing (NLP). Traditional methods rely on keyword-based filtering, which often fails to capture the con-textual meaning of candidate profiles and leads to inaccurate results.

Early approaches used techniques such as TF-IDF and vector space models to improve matching by considering word importance. However, these methods lacked semantic under-standing. Later, machine learning models were introduced to classify resumes, but they required large labeled datasets and struggled with complex text relationships.

The development of transformer-based models, particularly BERT, enabled better contextual understanding of language. However, due to computational limitations, Sentence-BERT (SBERT) was introduced as an efficient alternative for seman-tic

similarity tasks. SBERT generates sentence embeddings that can be compared using cosine similarity, making it suitable for resume matching applications.

Recent systems utilize SBERT to rank resumes based on semantic relevance. Some approaches also incorporate skill extraction techniques, but many focus on either similarity or skill analysis independently. The proposed system combines semantic similarity with skill matching to improve both accu-racy and interpretability.

Overall, modern recruitment systems are shifting from keyword-based methods to AI-driven semantic approaches, enabling more efficient and accurate candidate evaluation.

III. SYSTEM ARCHITECTURE

A. Frontend Layer

The frontend is responsible for user interaction and is im-plemented using a web-based interface. It allows the recruiter to upload resumes and enter the job description. The frontend sends the input data to the backend through HTTP requests and displays the ranked results.

B. Backend Processing Layer

The backend handles all core operations of the system. It receives data from the frontend, manages file uploads, and coordinates different modules. It ensures smooth data flow between text extraction, model processing, and result generation.

C. Text Extraction Module

This module extracts textual content from resumes in PDF and DOCX formats. It converts unstructured documents into raw text that can be processed further. This step ensures that relevant information from resumes is accurately captured.

D. AI Analysis Module

The AI module uses the SBERT model to generate em-beddings for both job descriptions and resumes. These em-beddings represent the semantic meaning of the text. Cosine similarity is then used to measure the relevance between resumes and job requirements.

E. Ranking and Output Module

The system ranks resumes based on similarity scores in descending order. It also identifies matched and missing skills to improve interpretability. The final results are sent to the frontend and displayed to the user.

IV. IMPLEMENTATION

A. Frontend Development

The frontend of the system is developed using React with Vite as the build tool. It provides a user-friendly interface where the recruiter can upload multiple resumes and enter the job description. The interface ensures smooth interaction and sends the input data to the backend using HTTP requests. Tailwind CSS is used for styling to create a clean and responsive design.

B. Backend Development

The backend is implemented using Node.js and Express.js, which handle server-side operations. It receives requests from the frontend, processes uploaded files, and manages the flow of data through different modules. The backend exposes an API endpoint for resume analysis and returns the processed results to the frontend.

C. File Handling and Text Extraction

The system supports resumes in PDF and DOCX formats. File uploads are handled using Multer with memory storage. Text extraction is performed using specialized libraries that convert documents into raw text. This ensures that relevant content from resumes is captured for further processing.

D. Embedding Generation using SBERT

The extracted text is processed using a pre-trained SBERT model to generate semantic embeddings. These embeddings represent the contextual meaning of both resumes and job descriptions in a numerical format. This step enables the system to understand text beyond simple keyword matching.

E. Similarity Computation and Ranking

Cosine similarity is used to compare embeddings of resumes with the job description. A similarity score is calculated for each resume, indicating its relevance. The resumes are then sorted in descending order based on these scores to produce a ranked list of candidates.

F. Skill Matching and Result Display

The system includes a skill matching module that identifies matching and missing skills between resumes and the job description. This enhances interpretability by providing addi-tional insights. The final ranked results, along with similarity scores and skill details, are displayed to the user through the frontend interface.

V. RESULTS AND DISCUSSION

A. Functional Results

The system was tested with multiple resumes and job de-scriptions. It successfully processed PDF and DOCX files, ex-tracted text, and generated embeddings using SBERT. Cosine similarity was used to calculate relevance scores, and resumes were ranked accordingly. The system effectively identified relevant candidates and handled multiple inputs without errors.

B. System Comparison

The proposed system was compared with traditional keyword-based methods used in resume screening. Traditional systems rely on exact keyword matching, which may lead to inaccurate results due to differences in wording, synonyms, or missing keywords. This often results in relevant candidates being overlooked.

In contrast, the proposed system uses semantic similarity through SBERT, enabling it to understand the contextual meaning of resumes and job descriptions. This improves the accuracy of candidate selection by identifying relevant profiles even when different terms are used. Additionally, the inclusion of a skill matching module enhances the evaluation by highlighting matched and missing skills, providing clearer insights into candidate suitability. Overall, the system offers improved accuracy, better decision-making, and more reliable results compared to traditional approaches.

TABLE I: Comparison of Existing and Proposed System

System Type	Description
Existing System	Uses keyword-based matching, lacks context understand-ing, and provides basic filtering with limited accuracy.
Proposed System	Uses SBERT-based semantic similarity, understands con-text, ranks resumes accurately, and provides skill match-ing insights.

C. Interface Results

The interface is simple, clean, and user-friendly, making it easy for users to interact with the system without any confusion. Users can quickly upload multiple resumes and enter job descriptions through well-organized input sections. Clear buttons and labels guide the user through each step of the process.

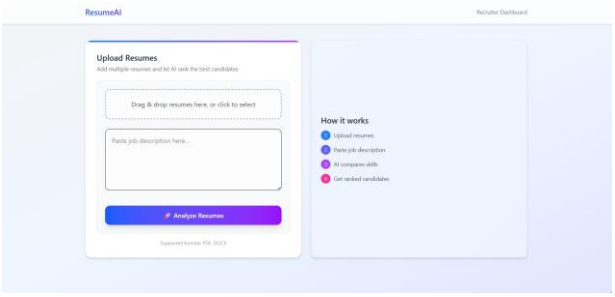

Fig. 1: Upload Interface - Selecting Resumes and Entering Job Description

Once the data is submitted, the system processes the infor-mation efficiently and displays the results in a structured and easy-to-understand format. The ranked resumes are presented along with matching scores, extracted skills, and relevant details, allowing recruiters to quickly identify the most suitable candidates. The layout ensures that all important information is visible at a glance.

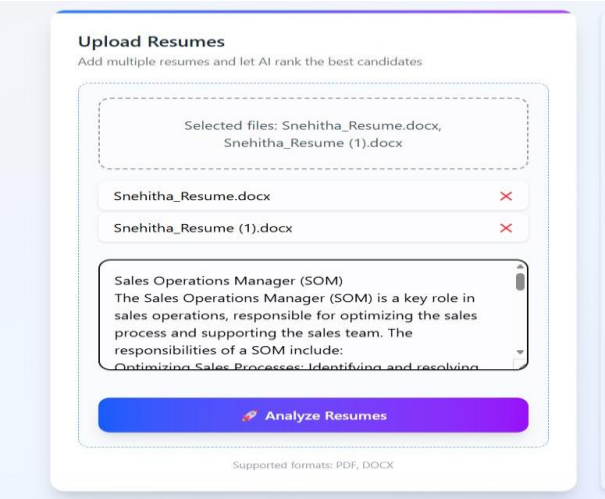

Fig. 2: Uploading Documents and Job Description

The system also provides fast response times, which im-proves user experience and makes it practical for real-world applications.

Overall, the interface design focuses on simplicity, clarity, and efficiency, ensuring that even first-time users can operate the system smoothly.

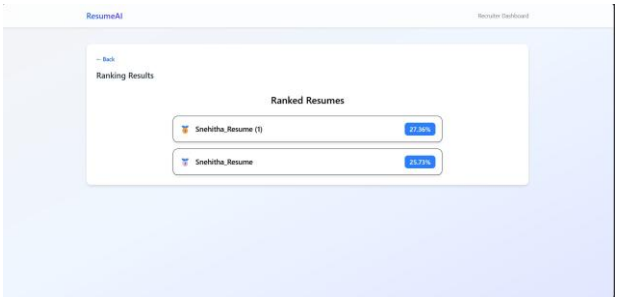

Fig. 3: Ranked Results Display with Similarity Scores

D. Discussion

The results show that SBERT-based semantic analysis im-proves resume screening accuracy. The skill matching feature adds interpretability by explaining results. However, perfor-mance depends on the model and does not include structured data extraction. Overall, the system provides an efficient and scalable solution.

VI. Conclusion

The developed AI-powered resume screening and ranking system provides an effective solution to the limitations of tra-

ditional recruitment methods. By automating resume analysis, the system reduces manual effort, minimizes errors, and speeds up the hiring process. It enables recruiters to focus more on decision-making rather than time-consuming screening tasks. The integration of Natural Language Processing and ma-chine learning techniques allows the system to understand the context of resumes and job descriptions, resulting in more accurate matching and ranking of candidates. The use of semantic similarity models further enhances the system's ability to identify relevant skills and qualifications beyond simple keyword matching.

Additionally, the system promotes fairness and consistency in recruitment by applying uniform evaluation criteria to all applicants. The structured output, including ranking scores and skill insights, provides transparency and helps recruiters make informed decisions.

The user-friendly interface and quick response time make the system suitable for real-time applications. It can be easily adopted by organizations of different sizes, from small startups to large enterprises. Overall, this project demonstrates the practical implementation of AI in solving real-world problems and highlights its potential in transforming the recruitment industry.

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