A Resume Screening Operation Powered by Ai That Utilizes BERT (Bi-Directional Encoder Representations from Transformers)

[1]Mr. G. Vihari, [2]Harshavardan Naidu, [3]Pavan Kumar Reddy Yeruva, [4]Vishnu Vardhan Pallela, [5]Rahul Pandrinki

[1]Assistant Professor, Department of Information Technology, Sir C. R. Reddy College of Engineering, Eluru

[2,3,4,5]Final Year Student, Department of Information Technology, Sir C. R. Reddy College of Engineering, Eluru

ABSTRACT

Shortlisting candidates from a massive list of resumes is an extremely huge challenge in the present-day recruitment landscape for organizations. Applicant Tracking Systems (ATS) that are based on the use of traditional keywords fail to complete a semantic extraction of the relationships between job descriptions and resumes so the results are often imprecise or bias. This paper presents an advanced Resume Screening system using Bidirectional Encoder Representations from Transformers (BERT), a current apex NLP model. Recruiters can input the job descriptions and upload candidate resumes (in PDF format) in this system. If using a Flask based backend and a React based frontend, a domain specific application is implemented which extracts text from resumes and compares it semantically with the job description using fine-tuned BERT model and returns a relevance score as a result i.e. how much the resume matches with the job description in terms of percentage. It provides an objective and accurate way to order candidates, reducing human effort and bringing in hiring efficiency. The system proposed shows good results in understanding contextual meaning to surpass standard ATS tools for matching resumes with job requirements.

Keywords:

Resume Screening, BERT, AI in Recruitment, Job Matching, Deep Learning, NLP

INTRODUCTION

Hiring the right people is a critical factor in organizational success since the candidate is recruited into an organization and the effect is on productiveness and business growth. But for a growing number of job openings with lots of applications, manually screening resumes is an arduous and inefficient process. Most Applicant Tracking Systems (ATS) typically use some form of keyword filtering and lack context, relevance, semantic meaning capability. Since, a lot of qualified candidates might get ditched, while other less qualified ones might be considered for job, and that makes the hiring process a waste of time and energy. To alleviate such problems, we developed an AI driven resume screening system driven by a fine-tuned BERT (Bidirectional Encoder Representations from Transformers) model. Our approach is different than a conventional ATS, in fact our approach takes the context and meaning of the resume, matching skills, experience and qualifications to the job description. The formatting of the resumes looks very discriminative which is bad, so the system classifies resumes into Suitable or Not Suitable categories offering a fair and accurate shortlisting process. Using Natural Language Processing (NLP), Deep Learning we are able to increase efficiency, reduce the recruiter workload, and only forward the most relevant candidates in the hiring process. Using this automated approach, recruitment accuracy is increased, and the hiring steps of organizations are streamlined.

LITERATURE SURVEY

[1] Applying BERT-Based NLP for Automated Resume Screening and Candidate Ranking Asmita Deshmukh, Anjali Raut (2024)

Then this study was to introduce an AI driven resume screening approach using Google BERT model. In the research, the dataset of resumes and job descriptions are analysed and we find that the NLP techniques significantly increase resume filtering accuracy over existing ATS systems. The proposed study points to the advantages of contextual understanding to the candidate ranking task.

[2] Machine Learning-Based Resume Shortlisting and Classification Einesh Naik, Dr. Nilesh B. Fal Dessai (2024)

In this paper, we propose a machine learning way to the automated resume classification. NLP and deep learning techniques are used to parse resumes and match them with job descriptions on the system. Taking the comparison a step further, different classification algorithms are compared and it was concluded that the transformer-based models perform better than the rule-based filtering.

[3] Automated Resume Screening Using Natural Language Processing (2023)

In this work, NLP in general and specifically Sentence-BERT and cosine similarity, are leveraged to create an impressive resume screening system. We show that deep learning-based models can achieve more accurate assessments of resume's relevance compared with traditional keyword matching techniques, and help in improving efficiency of candidate short list.

[4] Enhanced Resume Screening for Smart Hiring Using Sentence-BERT (2024)

Based on the above, we study if transformer-based models can be used for automated resume screening. In particular, it demonstrates that BERT and its variants can greatly improve the performance of understanding the contextual meaning of job descriptions and candidate experience through recruitment.

[5] A Machine Learning Approach for Automation of Resume Recommendation System (2019)

In this paper, however, we describe a machine learning based resume recommendation system to select the candidates according to the suitability of them for a job. Research results suggest that the performance of shortlisting candidate using deep learning techniques were better than traditional rule based ATS systems.

[6] Design and Development of Machine Learning-Based Resume Ranking System (2021)

The study then introduces a resume ranking system that considers various aspects of the candidates, including education, experience and skills, among others. Problems of standardizing resumes and how research is planned to be automated with a ranking system that minimizes the recruitment process.

[7] End-to-End Resume Parsing and Candidate Matching Using BERT (2019)

This research builds a resume parsing system for exactly the same, where a resume candidate is matched with a job in the form of a BERT based sentence classification. They show transformer models to greatly improve resume ranking accuracy when resume ranking quantifies the contextual similarities of job descriptions to candidate experience.

[8] Resume2Vec: Transforming Applicant Tracking Systems with Transformer-Based Deep Learning Models (2025)

Next, this paper presents Resume2Vec, a deep learning model based on transformer-based embedding to rank resumes. The research results show that BERT, RoBERTa and DistilBERT perform well on job descriptions and resume data for the task of recruitment automation, achieving state of the art results.

[9] Resume Evaluation through Latent Dirichlet Allocation and NLP for Effective Candidate Selection

Vidhita Jagwani, Smit Meghani, Krishna Pai, Sudhir Dhage (2023)

The resume evaluation in this paper is explored using LDA and NLP techniques for topic modelling. With the help of the entity extraction methods in resume screening, the efficiency is improved greatly because it focuses on key candidate attributes.

[10] Application of LLM Agents in Recruitment: A Novel Framework for Resume Screening

Chengguang Gan, Qinghao Zhang, Tatsunori Mori (2024)

In this paper, I give a framework for resume screening with Large Language Models (LLMs). The research presents how given LLM-based systems rely on the augmentation of recruitment efficiency through automatically summarizing, evaluating and ranking candidates better than classical ATS models.

Content of the literature survey shows the evolution of resume screening, beginning with keyword filtering and moving on to AI where NLP is used together with deep learning. It finds that transformer-based models like BERT have a huge impact on recruitment efficiency by boosting recruitment effectiveness via higher resume-job description fit, less bias and fair candidate shortlist.

EXISTING SYSTEM

Applicant Tracking Systems, or sometimes known as ATS, do have an approach to the automated resume screening where both resume screening and job matching are using keyword-based filtering: scan resumes looking for specific terms matching the job description. The reason is that this accelerates the rapid hiring process, but at the same time, ATS does not have contextual understanding and often rejects quite qualified candidates who talk differently. In addition to ranking the candidates mistakenly, it also struggles with finding false positive and false negatives. Keywords stuffing is also capable of manipulating results, thus allowing applicants with no qualifications to pass the screening. When resumes are submitted in non-standard formats such as pdf containing complex layouts, these formats may make it difficult to parse resume completely or incorrectly resulting in non-full or incorrect tow data extraction. Which may limit the efficiency and fairness of hiring process, sometimes needing to be vetted by a recruiter to manually eliminate the largest number of non-retentions.

Advantages:

- Automates resume screening.
- Speeds up shortlisting.
- Reduces manual effort.

Dis Advantages:

- Ignores context and meaning.
- Rejects qualified candidates.
- Requires manual review.

PROPOSED SYSTEM

The proposed system implements a BERT (Bidirectional Encoder Representations from Transformers) model which was specifically fine-tuned to perform resume screening duties as an artificial intelligence-driven system. The system examines resumes by understanding context because it determines how qualifications connect with stated job requirements. The system divides its operations into two processing categories that handle resumes. Candidates should match every aspect mentioned in the job posting requirements in order to qualify. A resume placed in this category fails to satisfy the necessary requirements needed by the opening position.

Advantages:

- The system achieves higher accuracy since it evaluates entire contexts as well as individual keywords during evaluation.
- The system automates resume screening tasks which decreases the need for human effort.

Dis Advantages:

- The achievement of accurate results depends on having high-quality training data.
- Needs computational resources for deep learning models.

METHODOLOGY

Our AI resume screening system utilizes the BERT model that operates on deep learning NLP technology to process recruiter requests. The methodology contains three essential elements that include the BERT model together with the dataset used and system architecture.

BERT MODEL

BERT operates as a transformer model because it establishes word relations throughout full sentences. The core difference between standard NLP systems that match keywords exists because BERT uses context-based word meaning comprehension.

For our system, we fine-tune the BERT model on a dataset of resumes and job descriptions. During training the model receives resumes grouped into "Suitable" or "Not Suitable" classifications according to their Job Post relevance.

DATASET USED

The training model uses this dataset: The training data consists of equally distributed matched and mismatched pairs between resumes and job descriptions. The dataset contains resumes obtained from experienced professionals and fresh graduates which represent multiple work roles across different industries. Relevant or irrelevant information for a particular job description will be specified through labelled data.

SYSTEM ARCHITECTURE

The system maintains a client-server system that runs resumes and job descriptions through multiple processing stages.

1. The React.js frontend allows users who function as recruiters to add their job descriptions together with resumes.
2. The Backend (Flask API) functions by transmitting resumes to the BERT model for its evaluation process.
3. A BERT-based Classifier within the machine learning model performs analysis to compare job descriptions with resumes as it creates classifications.
4. The system uses NLP techniques to process the resumes before giving evaluation scores through processing and filtering.
5. Users can see results showing their resumes as either "Suitable" or "Not Suitable" with corresponding match scores through the system.

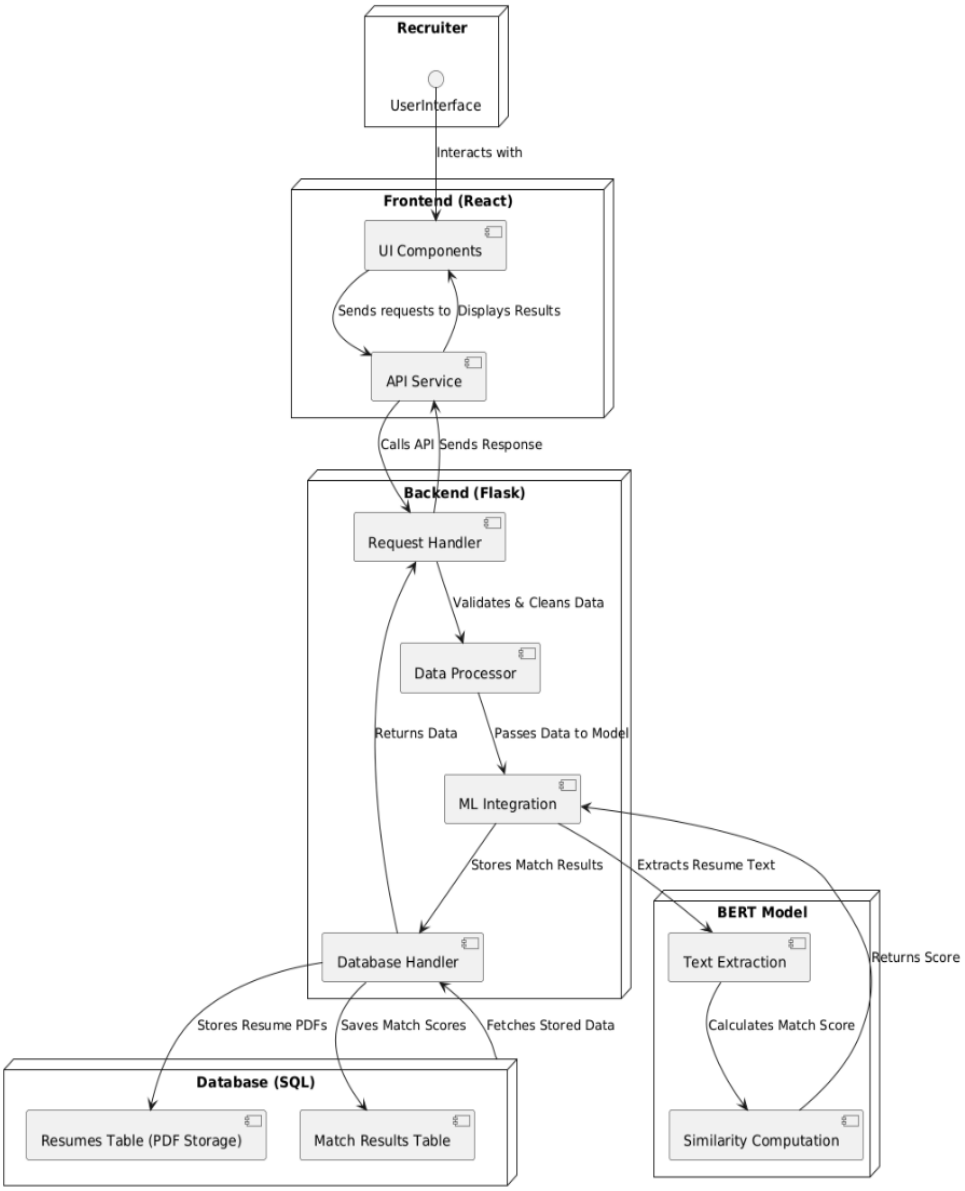

Figure1: Architecture of proposed Resume Screening System

RESULTS

The evaluation of our AI-driven resume screening system employed accuracy and precision along with recall in combination with the confusion matrix as classification metrics for assessment purposes. The assessment metrics help determine how well the model identifies appropriate resumes against unsuitable ones according to job specifications.

Metric	Value
Accuracy	98.54%
Precision	1.0
Recall	97.09%
F1 Score	98.52%

Table 1: Performance Metrics of the Model

	Predicted: Suitable	Predicted: Not Suitable
Actual: Suitable	341	14
Actual: Not Suitable	0	396

Table 2: Confusion Matrix

CONCLUSION:

The screening of resumes produces better results through the application of fine-tuned BERT model that functions within an artificial intelligence framework compared to traditional Applicant Tracking Systems. The Natural Language Processing systems with Deep Learning methods analyse complete resume meanings to enhance the screening accuracy of candidates within our model. Our system testing demonstrates that operational success and more precise hiring outcomes combine with decreased recruiter workload as key findings of the testing process. Current situations enable further development of enhancements which extend beyond current achievements. The system needs upgraded pre-emptive systems to create connections which enhance its resume processing capabilities for different types of documents. The system enables complete international use when more multilingual resumes are added to its training collection. The explainability characteristic unveils to recruiters' key factors that determine whether their candidates get matched or rejected status ratings. The system performance will enhance due to real-time resume analysis uniting with dynamic learning systems.

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