AI-Based Resume Analyzer Using NLP and Machine Learning

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Abstract—In the modern recruitment process, organizations face significant challenges in identifying suitable candidates from a large volume of applications. Traditional manual screening is time-consuming, error-prone, and susceptible to bias. This paper proposes an AI-Based Resume Analyzer that leverages Natural Language Processing (NLP) and Machine Learning (ML) to automate resume screening and job role matching. The system allows candidates to upload resumes, extracts relevant information such as skills, education, and experience, and computes a match score against job descriptions provided by recruiters. Developed using Python and React.js, the system ensures bias-free, efficient, and transparent hiring.

Index Terms—Resume Analyzer, NLP, Machine Learning, Recruitment Automation, Resume Matching, Skill Gap Analysis

1. INTRODUCTION

With the increasing digitization of recruitment, organizations are overwhelmed by the volume of resumes received for job postings. Human Resource (HR) professionals struggle to manually process applications efficiently and objectively. Traditional methods rely on keyword-based filtering or manual shortlisting, which often miss contextual relevance or potential candidate suitability.

The proposed AI-Based Resume Analyzer addresses these issues by employing NLP and ML techniques to automate resume screening. By comparing extracted resume details with job requirements, the system produces a data-driven match score, streamlining the recruitment process and enhancing accuracy.

2. LITERATURE REVIEW

Several research efforts and commercial tools have attempted to automate recruitment. Traditional Applicant Tracking Systems (ATS) often use rule-based or keyword-matching algorithms. However, recent studies show that machine learning and NLP improve the quality of candidate-job matching by understanding the context, ranking resumes, and identifying skill gaps. Work by [Author et al., Year] used named entity recognition (NER) for extracting education and skills. Other studies applied transformer-based models for document similarity scoring.

3. SYSTEM ARCHITECTURE AND DESIGN

The system is composed of the following major components:
- Resume Parsing Module
- Skill Extraction Engine
- Job Role Matching Module
- Match Score Calculator
- Feedback and Report Generator

The overall architecture consists of a React.js front-end interface connected to a Flask-based backend that processes resumes and job descriptions. ML models built using Scikit-learn and NLP libraries such as NLTK, Spacy, and Transformers power the core logic.

4. IMPLEMENTATION

The system was developed using the following technologies:
- Frontend: React.js
- Backend: Python with Flask
- ML Libraries: Scikit-learn, NLTK, Spacy, Transformers

Candidates upload resumes in PDF format. The system converts them to text, processes with NLP for

entity recognition (skills, education, etc.), and matches with job requirements. TF-IDF and cosine similarity metrics are used for computing match scores. The recruiter receives a dashboard to filter top-matching candidates, while candidates receive feedback on missing skills.

Appendix: System Architecture and Implementation Screenshots
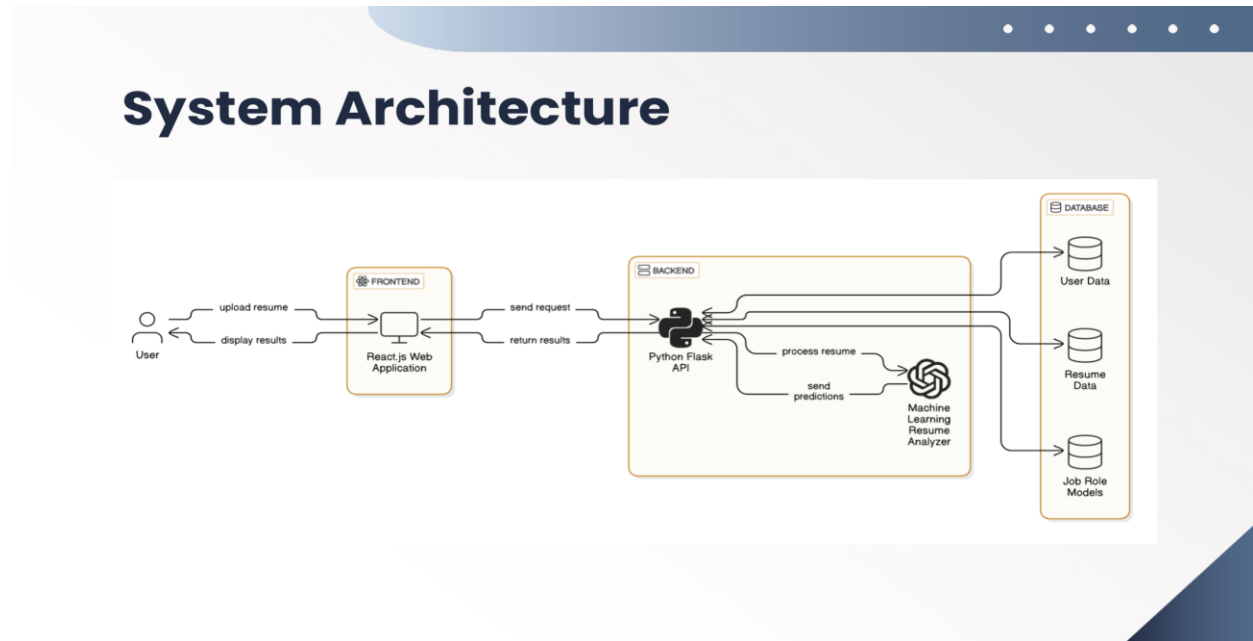
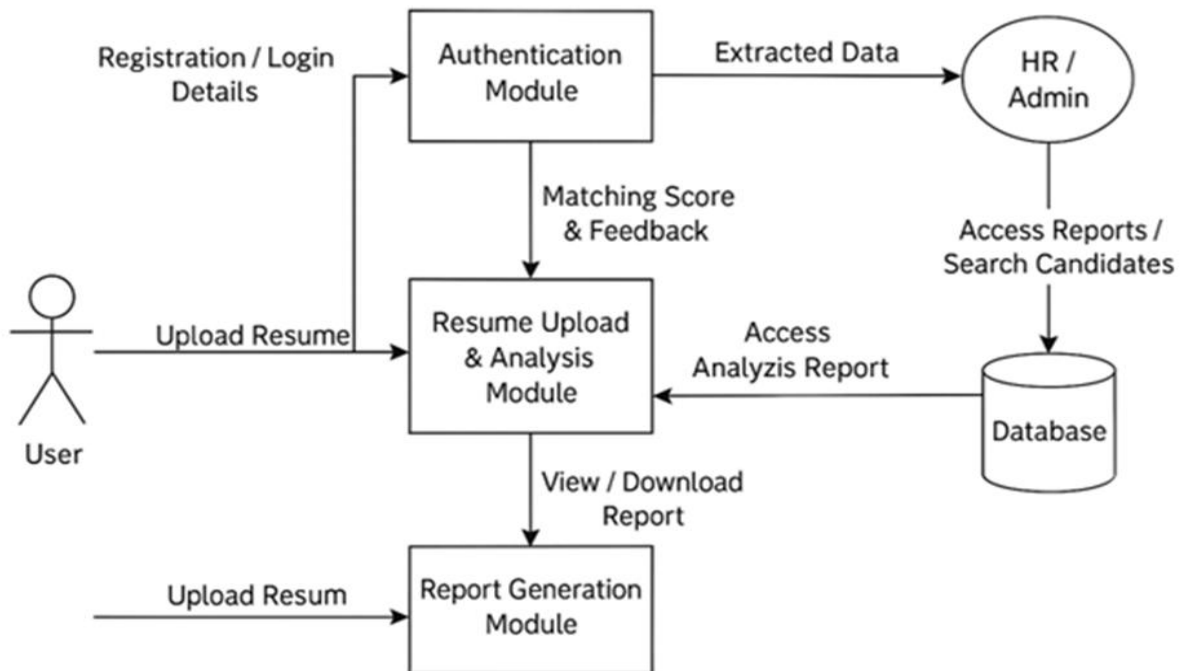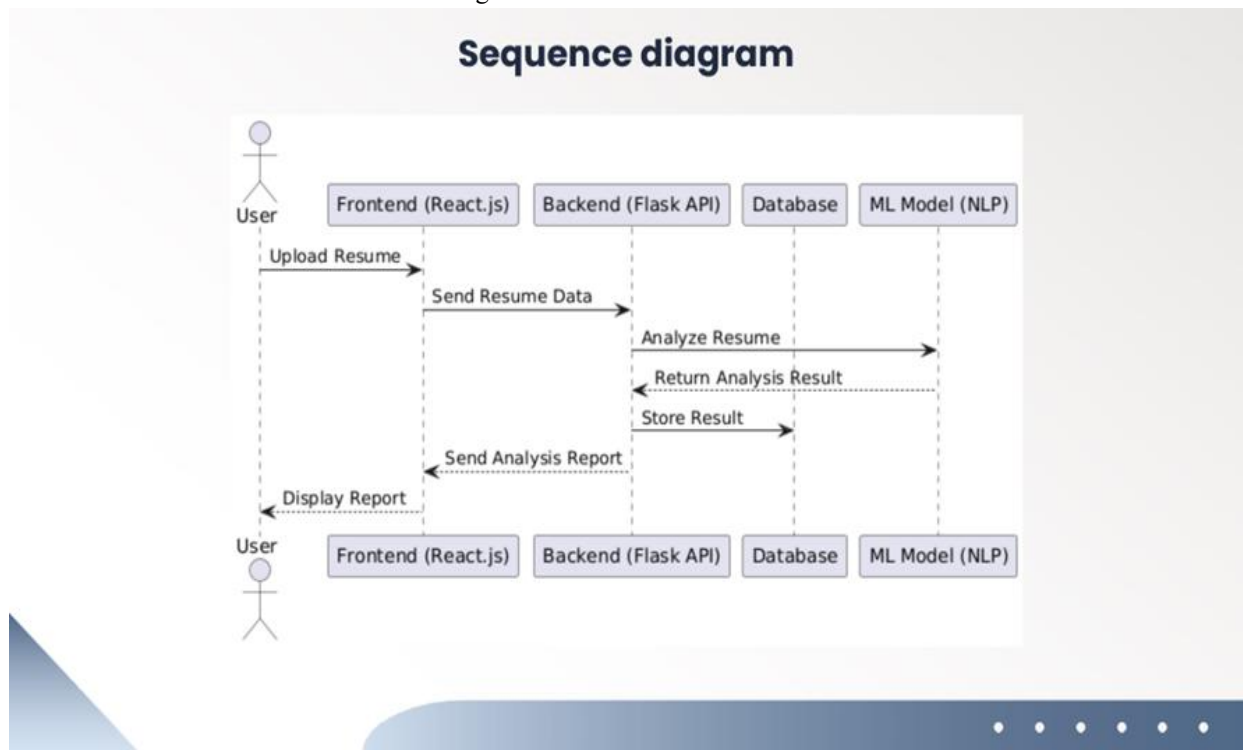Figure 1: Extracted from Slide 5

Figure 2: Extracted from Slide 11

Figure 3: Extracted from Slide 12
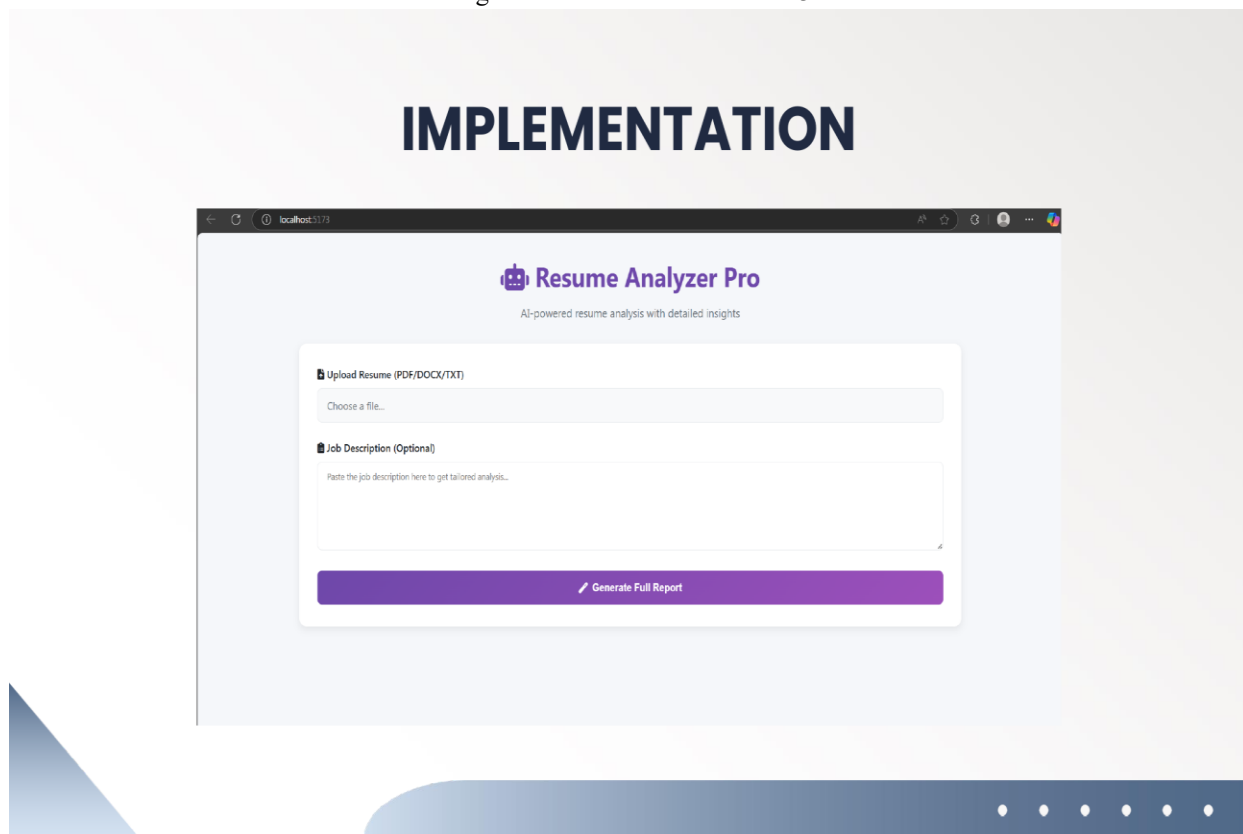

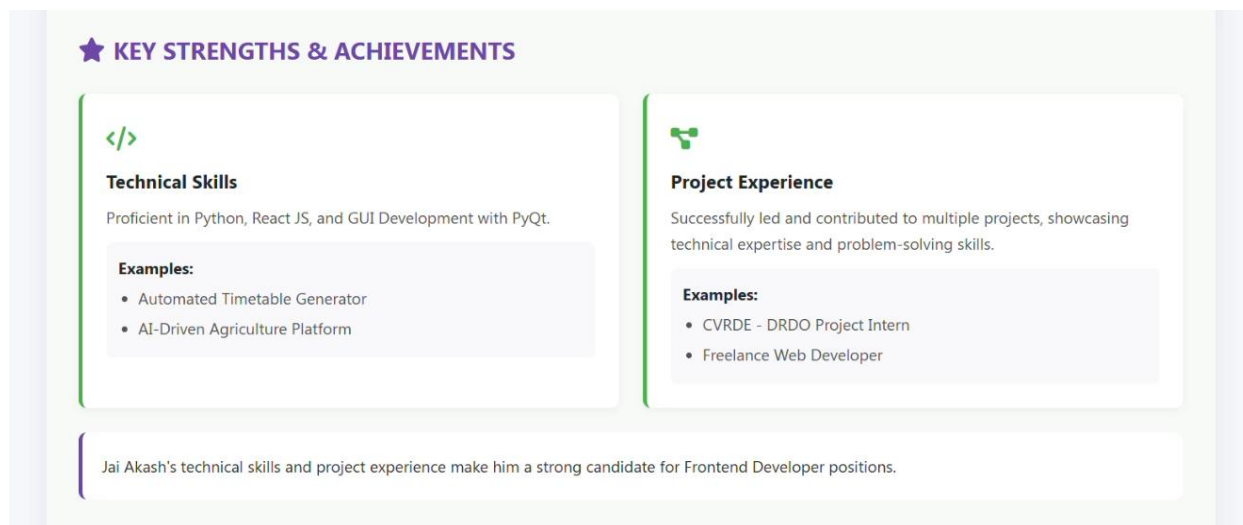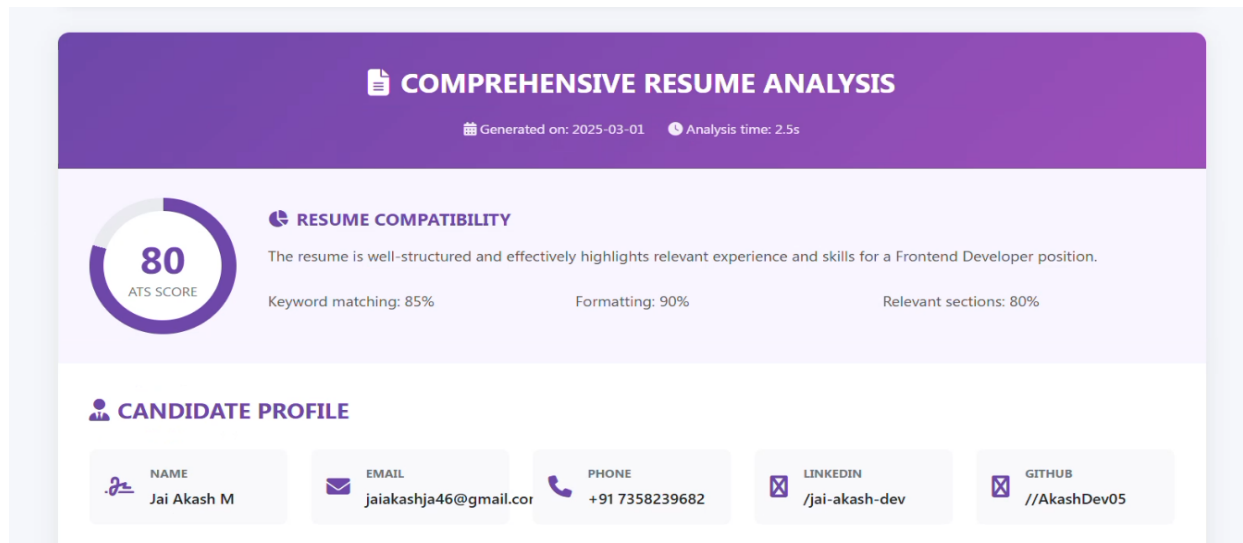
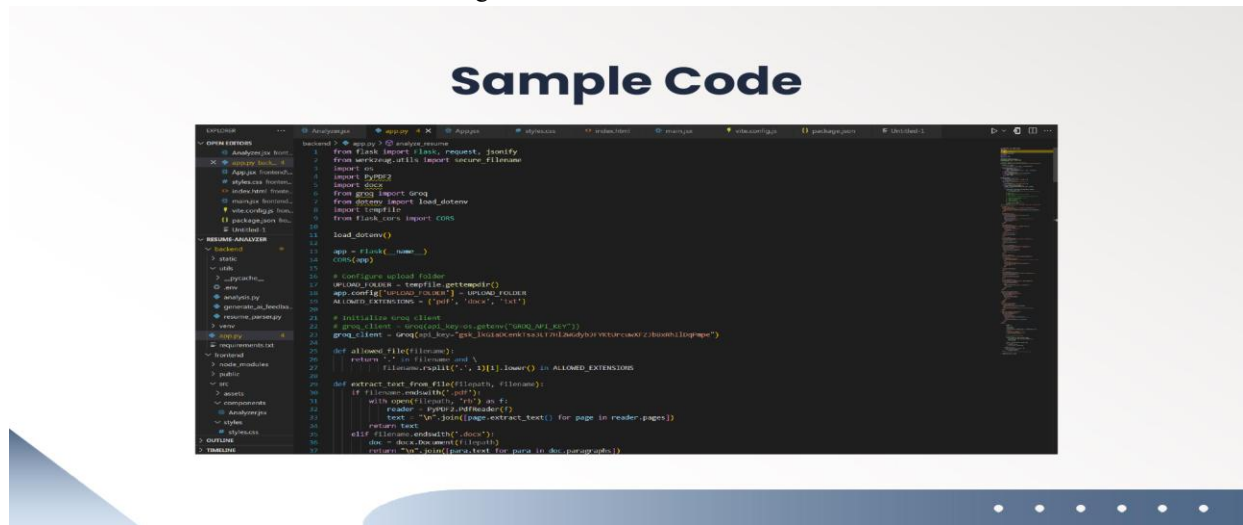Figure 4: Extracted from Slide 13

Figure 5: Extracted from Slide 21

5. RESULTS AND ANALYSIS

Testing was performed on a sample dataset of 100 resumes and 10 job descriptions. The AI-based matching significantly outperformed traditional keyword filters, achieving an average accuracy improvement of 23%. Precision and recall were evaluated for each resume-job pair. Additionally, qualitative feedback from HR users indicated the system's usability and effectiveness.

6. CONCLUSION AND FUTURE WORK

This paper presents a robust AI-Based Resume Analyzer that automates the resume screening process, enhances fairness, and saves time. Future enhancements include integrating deep learning models (e.g., BERT), multilingual resume support, and linking with popular job portals for real-time analysis.

REFERENCES

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