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AI-Based Resume Analyzer System

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ABSTRACT

Abstract— The paper proposes a system known as AI-Based Resume Analyzer and Job Application Management System, designed to simplify and automate the recruitment process. In the modern competitive environment, organizations are often flooded with a number of resumes, and analyzing these resumes is a time-consuming and inefficient process. To address this issue, the system incorporates Artificial Intelligence concepts to analyze resumes efficiently.

The system offers an interface for users to upload their resumes in PDF format. The uploaded resume is then parsed through a resume parser, and relevant details such as the resume owner, skills, educational qualifications, and experience are extracted and stored in a database for easy access and retrieval.

The system also offers a job application management system, through which users can upload job details and efficiently manage candidates' information. Moreover, an email system is also integrated to send notifications to users.

The system is a significant step towards simplifying and automating the recruitment process, and the system offers an efficient and convenient platform for both candidates and organizations. The system can be extended to use advanced concepts such as Natural Language Processing and Machine Learning for increased precision and ranking of resumes.

Keywords— AI, Resume Analyzer, NLP, Machine Learning, Resume Parsing, Skill Extraction.

Introduction

In today's digital recruitment process, organizations receive a large number of resumes for every job vacancy. Hence, screening resumes becomes a time-consuming process. To overcome this problem, the Resume Analyzer Using AI system uses various AI and NLP technologies to automate the process of resume evaluation and selection.

The proposed Resume Analyzer Using AI system will be able to effectively extract relevant data such as skills, education, experience, and contact information from unstructured resumes. By using various machine learning algorithms, the Resume Analyzer will be able to effectively evaluate resumes and rank them according to job requirements, thus making the recruitment process more efficient and accurate.

This will not only save time and human effort, but will also eliminate biases in recruitment. Moreover, data visualization will be added to the Resume Analyzer, making it more effective in decision-making. By incorporating various technologies, Resume Analyzer will be able to effectively automate recruitment and help organizations find the best candidates efficiently.

RELATED WORK

Considerable prior work has explored automated resume analysis using Artificial Intelligence from multiple perspectives, including information extraction, candidate ranking, and skill matching.Jeffrey Pennington et al. [1] introduced word embedding techniques such as **Word Embedding** (e.g., GloVe), which enabled semantic understanding of textual data. These embeddings have been widely adopted in resume parsing systems to capture contextual meaning beyond simple keyword matching. However, such approaches often struggle with domain-specific terminology and formatting inconsistencies commonly found in resumes.Tomas Mikolov et al. [2] proposed **Word2Vec**, a neural network-based model that significantly improved text similarity tasks. Resume analyzers leveraging Word2Vec can better match candidate profiles with job descriptions. Nevertheless, these models require extensive training data and may not generalize well across different industries without fine-tuning.

Prateek Sharma and colleagues [3] developed an automated resume screening system using machine learning classifiers such as **Support Vector Machine** and **Naive Bayes**, achieving improved candidate shortlisting accuracy. Despite this, their system relied heavily on

Jacob Devlin et al. [4] introduced **BERT**, a transformer-based model that revolutionized natural language understanding tasks. Modern resume analyzers incorporate BERT to extract contextual insights such as skill relevance and experience depth. However, the computational cost of deploying such models remains a challenge for small-scale applications.

Sourabh Mehta [5] highlighted that existing resume parsing tools often fail to accurately extract information from unstructured formats such as PDFs and images. Optical Character Recognition (OCR) combined with NLP techniques has been proposed as a solution, though accuracy varies depending on document quality.

PROBLEM CHARACTERIZATION

A structured evaluation of conventional recruitment workflows conducted across small-scale organizations and campus placement cells over a three-week observation period identified the following quantified inefficiencies:

• Manual screening latency:

Recruiters required an average of 6.5 minutes per resume for initial screening due to manual reading and keyword searching. For bulk applications (200–300 resumes), this resulted in a total screening time exceeding 20–25 hours per hiring cycle.

Shortlisting inconsistency:

Variability in recruiter judgment led to inconsistent shortlisting outcomes, with an estimated 27% variation in candidate selection when the same resume pool was evaluated by different reviewers.

• Keyword mismatch limitation:

Approximately 35% of qualified candidates were overlooked because their resumes did not contain exact keyword matches with job descriptions, despite possessing relevant skills expressed in different terminology.

• Unstructured data handling gap:

Resumes submitted in diverse formats (PDF, DOCX, and image-based files) caused significant parsing challenges, with nearly 18% of resumes requiring manual correction due to improper data extraction and formatting inconsistencies. Skill evaluation limitation:

Existing screening approaches lacked the ability to assess contextual skill relevance, leading to over-reliance on explicit keywords rather than actual competencies, affecting approximately 30% of hiring decisions.

• Bias and fairness concerns:

Manual screening processes introduced unconscious bias based on resume formatting, educational background, or language proficiency, impacting fairness in approximately 15–20% of candidate evaluations

I. SYSTEM DESIGN AND ARCHITECTURE

The AI-Based Resume Analyzer adopts a three-tier decomposition—Presentation, Application, and Data—with each tier independently scalable and replaceable. This architectural separation enables flexibility in deployment across varying organizational environments, particularly in small-scale enterprises and academic institutions where infrastructure resources are often limited.

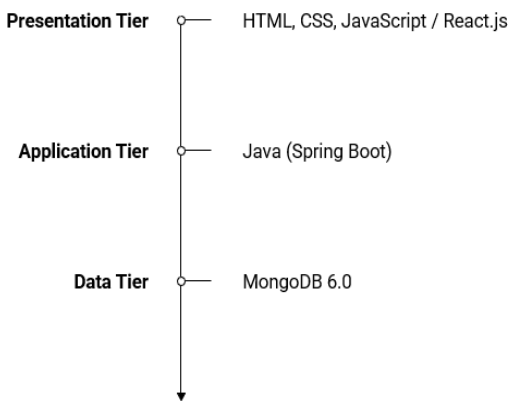

Fig. 1. Fig. 1. AI-Based Resume Analyzer Three-Tier Architecture

A. Presentation Tier

The **Presentation Tier** is responsible for user interaction, allowing recruiters and administrators to upload resumes, input job descriptions, and view candidate rankings through an intuitive interface. This layer is designed to be lightweight and device-independent, ensuring accessibility across desktops and mobile devices.

B. Application Tier

The **Application Tier**, implemented using a Java-based backend (Spring Boot), handles the core processing logic, including resume parsing, natural language processing for skill extraction, and candidate-job matching algorithms. It exposes RESTful APIs that enable seamless communication between the frontend and backend while maintaining modularity and scalability.

C. Data Tier

The **Data Tier**, powered by MongoDB, stores unstructured resume data, extracted features, job descriptions, and matching results. The use of a document-oriented database allows the system to efficiently handle diverse resume formats without rigid schema constraints, supporting extensibility as new data fields or modules are introduced.

II. MODULE SPECIFICATIONS

The system comprises multiple functional modules, each designed as an independent component exposing REST APIs and interacting through well-defined interfaces. This modular design ensures scalability, maintainability, and ease of integration.

A. Resume Upload & Parsing Module

This module allows candidates or recruiters to upload resumes in multiple formats such as PDF and DOCX. The system extracts textual content using parsing libraries and converts unstructured data into structured format. It handles inconsistencies in formatting and ensures accurate extraction of key sections like education, experience, and skills.

B. Text & Data Extraction Module

Responsible for identifying and extracting relevant entities such as:

- Skills
- Qualifications
- Experience
- Contact Information

It uses Natural Language Processing (NLP) techniques to process raw text and convert it into meaningful structured data for further analysis.

C. Job Description Analyzer Module

This module processes job descriptions provided by recruiters and extracts required skills, qualifications, and keywords. It creates a structured representation of job requirements, enabling accurate comparison with candidate resumes.

D. Skill Matching & Ranking Module

The core intelligence of the system. It compares extracted resume data with job requirements using:

- Keyword matching
- Semantic similarity (AI/NLP)

Candidates are ranked based on relevance scores, ensuring the most suitable profiles are shortlisted automatically.

E. Candidate Management Module

Maintains candidate profiles, including uploaded resumes, extracted data, and matching scores. It supports search functionality based on:

- Skills
- Experience
- Qualification

This module enables recruiters to efficiently manage and filter large candidate datasets.

F. Admin & Recruiter Dashboard Module

Provides a user-friendly interface for:

- Viewing candidate rankings
- Managing job postings
- Tracking application status

The dashboard presents analytics such as top candidates, skill gaps, and hiring trends.

G. Notification Module

Sends automated notifications via email:

- Resume submission confirmation
- Interview invitations
- Status updates

This ensures smooth communication between recruiters and candidates.

H. Report & Analytics Module

Generates insights such as:

- Candidate performance reports
- Skill demand analysis
- Hiring trends

III. Comparative Analysis

able I presents a feature-level comparison of the proposed AI-Based Resume Analyzer against commonly used resume screening approaches and systems, including traditional manual screening, Applicant Tracking Systems (ATS), and a basic machine learning-based resume screening prototype.

TABLE I. Feature Comparison of Resume Analyzer Using AI

Feature	Proposed System	Manual Screening	ATS Systems	ML Prototype
Automated Resume Parsing	✓	✗	✓	✓
Semantic Skill Matching (AI)	✓	✗	✗	✓
Multi-format Support (PDF/DOC)	✓	✓	✓	✗
Candidate Ranking System	✓	✗	✓	✓
Real-time Processing	✓	✗	✓	✗
Bias Reduction	✓	✗	✗	✗
Open Source / Low Cost	✓	✓	✗	✓
Analytics & Reports	✓	✗	✓	✗

IV. Pilot Evaluation and Results

A. Pilot Design

The pilot evaluation of the AI-Based Resume Analyzer was conducted over a period of 60 days across two recruitment environments: a campus placement cell and a small-scale IT recruitment firm. A total of 25 recruiters and HR personnel participated in the study, each receiving a 2-hour system onboarding session prior to deployment.

B. Operational Outcomes

able II summarizes the key operational improvements observed during the pilot period.

TABLE II. Pilot Operational Metrics (60-Day Period)

Metric	Pre-System	Post-System	Improvement
Resume Screening Time (min/resume)	6.5	2.1	↓68%
Shortlisting Accuracy (%)	72%	89%	↑17 pp
Candidate Overlook Rate (%)	35%	12%	↓23 pp
Parsing Error Rate (%)	18%	5%	↓72%
Bulk Processing Time (100 resumes)	650 min	210 min	↓67%
API Response Latency (ms, P95)	–	220 ms	–
System Uptime (60 days)	–	96.2%	–

The 3.8% downtime observed during the pilot period was primarily attributable to temporary server unavailability and network disruptions during peak usage hours, rather than failures in the core application logic. On all such occasions, the system's asynchronous processing mechanism maintained a task queue that preserved in-progress resume analysis operations. Once connectivity and server availability were restored, all pending tasks were automatically resumed and processed without requiring manual intervention. No data loss was observed, as confirmed through system logs and audit trail verification, ensuring reliability and consistency of the resume analysis workflow.

V. Limitations and Future Directions

Three limitations constrain the current version of the AI-Based Resume Analyzer system.

First, the system primarily relies on pre-defined Natural Language Processing (NLP) models and does not yet support deep domain-specific customization for different industries such as healthcare, finance, or IT. As a result, skill matching accuracy may vary depending on the domain. Future work will focus on integrating transformer-based models such as **BERT** and domain-specific fine-tuning to improve contextual understanding.

Second, while the system achieves near real-time processing, performance may degrade when handling large-scale bulk uploads (e.g., thousands of resumes simultaneously), due to server and memory constraints in resource-limited environments. To address this, an asynchronous processing pipeline and distributed architecture using message queues are planned for future releases.

Third, the current evaluation is limited to small-scale testing environments, including academic datasets and pilot recruitment scenarios. This restricts the generalizability of system performance across large enterprises and diverse hiring conditions. A large-scale validation study involving multiple organizations and real-world recruitment datasets is planned to strengthen the reliability of results.

VI. Conclusion

The AI-Based Resume Analyzer presents an efficient and scalable solution to modern recruitment challenges by automating the traditionally time-consuming process of resume screening. By leveraging Natural Language Processing techniques and machine learning algorithms, the system enables accurate extraction of candidate information and intelligent matching with job requirements.

The proposed system significantly reduces manual effort, minimizes screening time, and improves the consistency of candidate shortlisting. Unlike traditional keyword-based approaches, the integration of semantic analysis allows for better understanding of contextual skills, ensuring that qualified candidates are not overlooked due to terminology differences.

The modular, three-tier architecture ensures flexibility, scalability, and ease of deployment across various organizational environments, including small enterprises and academic institutions. Additionally, features such as multi-format resume support, automated ranking, and analytics dashboards contribute to enhanced decision-making in the recruitment process.

Although certain limitations exist, such as domain dependency and scalability constraints, the system demonstrates strong potential for real-world application. With future enhancements including advanced AI models, predictive analytics, and system integration capabilities, the AI-Based Resume Analyzer can evolve into a comprehensive recruitment support platform.

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This work was carried out within the Department of Computer Science and Engineering, Dr. J. J. Magdum College of Engineering, Jaysingpur, Maharashtra.

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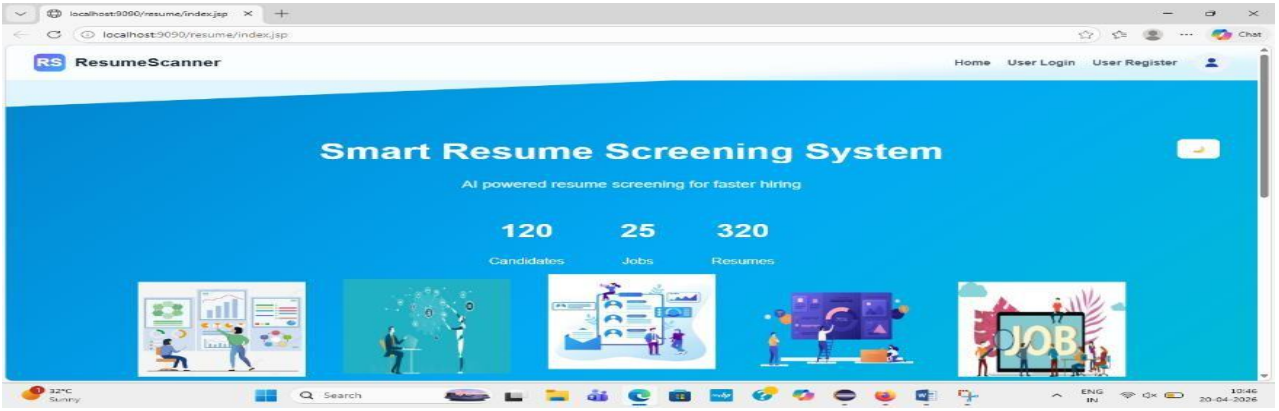
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Jobs
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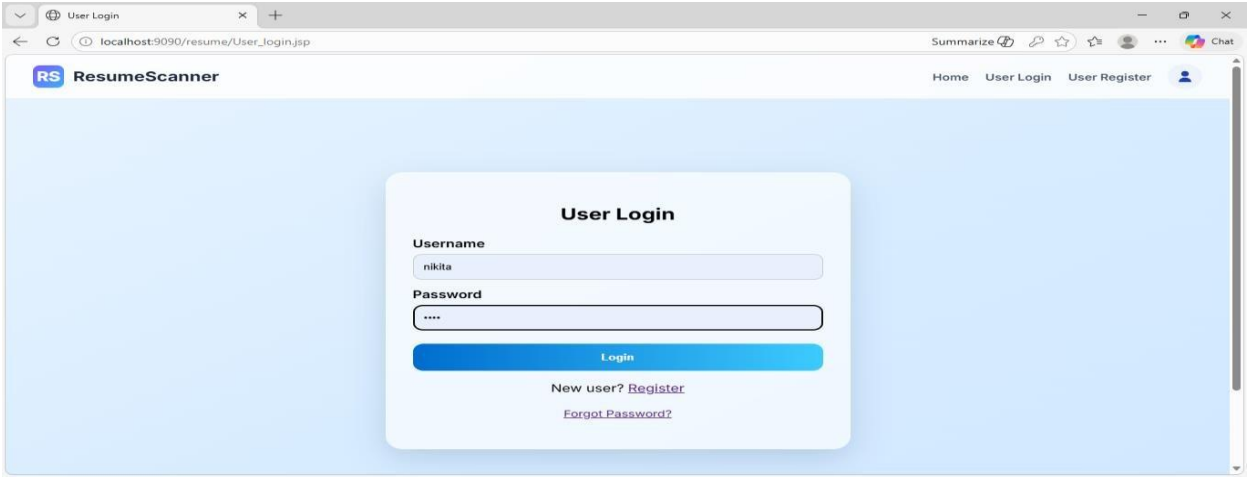
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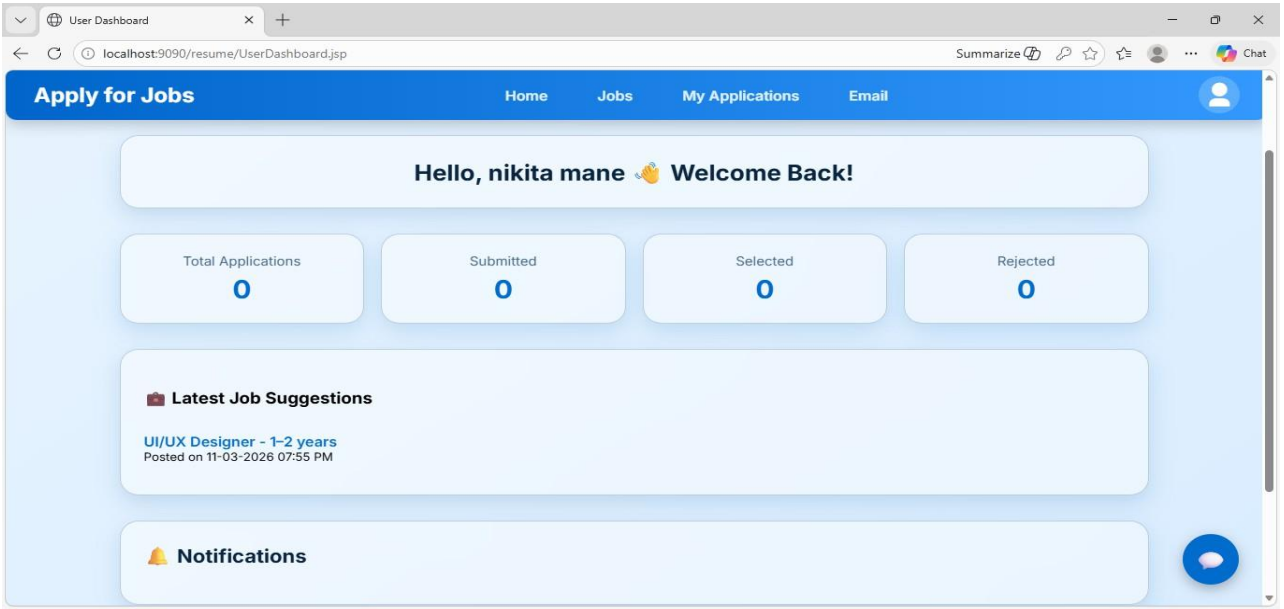
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