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AI-Based Job Skill Analyzer

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Abstract The rapid advancement of digital recruitment platforms and the exponential growth in job applications have significantly increased the complexity of candidate screening and recruitment management. Traditional recruitment systems largely depend on manual resume screening, which is time-consuming, inefficient, and often unable to accurately identify the most suitable candidates for specific job roles. Furthermore, job seekers frequently struggle to understand industry requirements, optimize their resumes, and identify the skill gaps preventing them from securing suitable opportunities. To address these challenges, this paper proposes an AI-Based Job Skill Analyzer that integrates Natural Language Processing (NLP), Machine Learning, and Web Automation technologies to automate and optimize recruitment workflows. The proposed system extract candidate information from resumes in PDF format, identifies technical and professional skills using NLP algorithms, scrapes real-time job listings from multiple recruitment platforms, and performs intelligent resume-job matching using TF-IDF vectorization and Cosine Similarity algorithms. The system further performs skill gap analysis by comparing candidate competencies with industry requirements and provides personalized recommendations for improvement. A dedicated recruiter dashboard enables recruiters to filter candidates based on skills, match scores, salary expectations, and experience levels, thereby improving recruitment efficiency and decision-making processes. The implementation of this system demonstrates significant improvements in recruitment automation, candidate-job alignment, and hiring accuracy while reducing manual effort and operational costs. The proposed architecture is scalable, secure, and adaptable to future AI-driven recruitment ecosystems.

Keywords:. Artificial Intelligence, Resume Analyzer, Recruitment Automation, Natural Language Processing, Machine Learning, Selenium, Skill Extraction, TF-IDF, Cosine Similarity, Job Matching, Web Scraping, Recruiter Dashboard.

I. INTRODUCTION

The global recruitment industry has experienced significant transformation due to digitalization, online job portals, and AI-driven hiring technologies. Organizations today receive thousands of resumes for a single job opening, making traditional manual resume screening highly

inefficient and resource-intensive. Simultaneously, job seekers face increasing competition and often struggle to identify suitable job opportunities aligned with their skills and qualifications.

Recruiters spend considerable time manually evaluating resumes, shortlisting candidates, and analyzing job compatibility. This process is often affected by:

- Human bias
- Inconsistent evaluation criteria
- Delayed hiring decisions
- Poor candidate-job alignment
- Lack of real-time skill analysis

Additionally, many job seekers lack awareness regarding:

- Industry-required skills
- Resume optimization strategies
- Current job market trends
- Skill gaps affecting employability

Artificial Intelligence (AI) and Natural Language Processing (NLP) technologies offer innovative solutions to automate recruitment workflows and improve hiring accuracy. AI-based systems can analyze resumes, extract meaningful information, compare skills with job descriptions, and generate intelligent recommendations for both candidates and recruiters.

The proposed AI-Based Intelligent Resume Analyzer and Automated Job Matching System is designed to:

- Automate resume parsing and skill extraction
- Scrape real-time job data from recruitment platforms
- Match resumes with suitable jobs
- Identify missing skills and recommend improvements
- Provide recruiters with intelligent candidate analytics

The integration of machine learning algorithms, web automation, and recruiter dashboards creates a comprehensive recruitment solution capable of modernizing hiring ecosystems and improving overall recruitment efficiency.

II. PROBLEM STATEMENT

Traditional recruitment systems rely heavily on manual processes for resume evaluation and candidate selection. Recruiters often spend significant time reviewing resumes, filtering candidates, and identifying suitable applicants. Thes manual processes are prone to inefficiencies, delays, and inaccurate hiring decisions.

Similarly, job seekers frequently submit resumes without understanding:

- Job-specific requirements
- Missing technical skills
- ATS optimization standards
- Current industry trends As a result:
- Qualified candidates may be overlooked
- Recruiters face increased workload
- Hiring efficiency decreases
- Skill mismatch rates increase

The lack of intelligent automation in traditional recruitment systems highlights the need for an AI-driven platform capable of:

- Automating resume analysis
- Performing intelligent job matching
- Providing skill gap analysis
- Improving recruitment workflows

III. OBJECTIVES OF THE PROJECT

The primary objective of this project is to develop an AI-powered recruitment platform capable of automating and optimizing candidate-job matching processes.

Specific Objectives

- Resume Parsing and Skill Extraction
- To extract meaningful information from PDF resumes using NLP techniques.
- Real-Time Job Scraping
- To collect updated job listings dynamically from platforms such as:
- LinkedIn
- Indeed
- Naukri

Intelligent Skill Matching
To compare candidate skills with job requirements using machine learning algorithms.

Skill Gap Analysis
To identify missing competencies and recommend improvements.

Recruitment Automation
To automate candidate shortlisting and improve recruitment efficiency

Recruiter Dashboard
To provide recruiters with analytics and intelligent candidate filtering mechanisms.

IV. LITERATURE SURVEY

Several studies have explored AI-driven recruitment systems and automated hiring solutions.
Existing Research Areas

Resume Parsing Systems
Resume parsing systems extract candidate information from resumes using NLP techniques. However, many systems rely solely on keyword matching and lack contextual understanding.

Applicant Tracking Systems (ATS)
ATS platforms automate resume storage and filtering but often fail to provide intelligent skill analysis and personalized recommendations.

Recommendation Systems
Machine learning recommendation systems have been used in recruitment platforms but lack real-time scraping and skill gap analysis.

AI-Based Hiring Platforms
Modern recruitment systems use AI for candidate ranking and resume analysis but often require expensive enterprise-level infrastructure.
Research Gaps

Existing systems suffer from several limitations:
- Lack of real-time job scraping
- Inadequate skill gap detection
- Limited personalization
- Poor analytics support
- High implementation costs
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The proposed system addresses these gaps through intelligent automation and scalable AI-based architecture.

V. PROPOSED SYSTEM

The proposed system is an AI-driven recruitment platform that automates resume analysis, job scraping, and candidate-job matching processes.

Resume Upload Module
Candidates upload resumes in PDF format through the user interface.

Functionalities:
- PDF validation
- Resume storage
- Text extraction using PyMuPDF
- Error handling for invalid files

This module converts unstructured resume documents into machine-readable textual content for further analysis.

NLP Processing Module
Natural Language Processing techniques are used to process extracted resume text.
NLP Operations:
- Tokenization
- Lemmatization
- Stop-word removal
- Named Entity Recognition (NER)
- Skill extraction The system identifies:
- Technical skills
- Certifications
- Educational qualifications
- Experience details

Job Scraping Module
The system dynamically scrapes job postings from:
- LinkedIn
- Naukri
- Indeed

Technologies Used:

- Selenium WebDriver
- BeautifulSoup
- Requests Library

Data Extracted:

- Job title
- Company name
- Required skills
- Experience level
- Job descriptions

This ensures that job recommendations remain updated with current market demands.

Skill Matching Module

The extracted candidate skills are compared with job requirements using machine learning algorithms.

Algorithms:

- TF-IDF Vectorization
- Cosine Similarity

Outputs:

- Resume-job compatibility score
- Skill overlap percentage
- Recommendation status

Skill Gap Analysis Module

This module identifies missing skills required for specific job roles.

Features:

- Missing skill detection
- Improvement recommendations
- Suggested learning paths
- Resume optimization guidance

Recruiter Dashboard

Recruiters can securely access candidate profiles and analytics.

Features:

- Candidate filtering
- Resume download
- Match score visualization
- Analytics dashboard
- Job-specific candidate recommendations

VI. SYSTEM ARCHITECTURE

The proposed system follows a modular layered architecture consisting of:

Frontend Layer

Responsible for:

- Resume upload
- User interaction
- Dashboard visualization
- Authentication Technologies:
- HTML/CSS
- React.js
- Bootstrap

Backend Layer

Handles:

- API processing
- Resume parsing
- Database interaction
- Business logic Technologies:
- Python
- Flask/FastAPI

AI Processing Layer

- Responsible for:
- NLP processing
- Skill extraction
- Similarity calculation
- Recommendation generation Technologies:
- spaCy
- Scikit-learn

Database Layer

Stores:

- Candidate profiles
- Resume data
- Job listings
- Skill mappings
- Match scores Technologies:
- SQLite/MySQL

Recruiter Interface

Provides:

- Candidate analytics
- Job-specific filtering
- Recruitment insights

VII. METHODOLOGY

The project methodology consists of the following phases:

Step 1: Resume Upload
Users upload resumes in PDF format.

Step 2: Text Extraction
PyMuPDF extracts textual information from resumes.

Step 3: NLP Processing
spaCy processes text and extracts relevant skills.

Step 4: Job Scraping
Selenium automates job collection from recruitment platforms.

Step 5: Skill Matching
TF-IDF and Cosine Similarity calculate matching scores.

Step 6: Recommendation Generation
The system recommends suitable jobs based on candidate profiles.

Step 7: Skill Gap Detection
Missing skills are identified and improvement recommendations are generated.

VIII. ALGORITHMS USED

TF-IDF Algorithm
TF-IDF converts textual data into weighted vectors.
Formula:
[TF-IDF = TF(t,d) \times IDF(t)]
Where:
- TF = Term Frequency
- IDF = Inverse Document Frequency

Cosine Similarity
Measures similarity between vectors.
Formula:
[Similarity = \frac{A \cdot B}{||A|| ||B||}]

NLP-Based Skill Extraction
spaCy NLP identifies:
- Skills
- Keywords
- Experience
- Certifications

IX. EXPERIMENTAL RESULTS

The system successfully:
- Extracted candidate skills
- Scraped real-time jobs
- Calculated match scores
- Recommended jobs
- Identified missing skills

Sample Results

Candidate	Job Role	Match Score
Candidate A	Data Analyst	84%
Candidate B	Python	76% Developer
Candidate C	ML Engineer	48%

Candidates scoring below 50% received resume improvement recommendations

X. ADVANTAGES OF THE SYSTEM

- Automates recruitment workflows
- Reduces recruiter workload
- Improves hiring accuracy
- Provides personalized recommendations
- Detects skill gaps intelligently
- Supports scalable deployment
- Enhances candidate-job alignment

XI. FUTURE SCOPE

Future enhancements include:
- Deep learning-based recommendation systems
- AI-powered resume rewriting
- Blockchain resume verification
- Multilingual resume parsing
- Mobile application deployment
- Virtual AI career assistants
- Predictive recruitment analytics
- The platform can evolve into a complete AI-driven recruitment ecosystem.

XII. CONCLUSION

The AI-Based Intelligent Resume Analyzer and Automated Job Matching System demonstrates the effective integration of Artificial Intelligence, Natural Language Processing, Machine Learning, and Web Automation technologies to modernize recruitment workflows.

The proposed system automates resume parsing, skill extraction, job scraping, and intelligent candidate-job matching while reducing manual recruitment effort and improving hiring accuracy. Skill gap analysis and personalized recommendations further enhance candidate employability and career development.

The system benefits both job seekers and recruiters by providing intelligent automation, real-time analytics, and data-driven recruitment insights. The scalable architecture and modular design ensure adaptability for future AI-driven recruitment advancements.

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