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AI-Powered Resume Screening and Job Recommendation System

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Abstract: *The AI-Powered Resume Screening & Job Recommendation System is an intelligent recruitment platform that uses Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP) to automate the hiring process. Traditional recruitment methods require recruiters to manually review a large number of resumes, which is time-consuming and may lead to errors or biased decisions. This system simplifies the process by automatically analyzing resumes, extracting important information such as skills, education, and experience, and matching candidates with suitable job roles.*

The system uses NLP techniques to process resume data and identify relevant keywords and technical skills. Algorithms such as TF-IDF (Term Frequency–Inverse Document Frequency) and cosine similarity are used to compare candidate resumes with job descriptions and calculate matching scores. Based on these scores, the system ranks and shortlists the most suitable candidates for a particular job role. This improves recruitment accuracy and significantly reduces the manual effort involved in resume screening.

In addition to candidate shortlisting, the system also provides AI-based job recommendations. Candidates can receive job suggestions according to their qualifications, skills, and interests, helping them find better career opportunities. The project also supports AI-generated interview questions based on the candidate's technical skills and job profile, making the interview process more effective and structured for recruiters.

The project is developed using Python, Flask, Machine Learning libraries, and NLP tools such as spaCy and PyPDF2. The frontend is designed using HTML, CSS, and Bootstrap, while the backend manages resume processing and recommendation logic. Overall, the system improves hiring efficiency, reduces recruitment time, minimizes human bias, and provides a smart and automated solution for modern recruitment and job recommendation processes...

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Natural Language Processing (NLP), Resume Screening, Job Recommendation System, Candidate Shortlisting, TF-IDF, Cosine Similarity, Recruitment Automation, Interview Process Enhancement

I. INTRODUCTION

The AI-Powered Resume Screening & Job Recommendation System is an intelligent recruitment platform developed using Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP). The system is designed to automate the recruitment process by analyzing resumes, extracting important skills and qualifications, and recommending suitable job roles to candidates. It helps organizations improve recruitment efficiency and reduce manual effort in candidate selection.

Traditional recruitment methods require recruiters to manually review a large number of resumes, which is time-consuming and sometimes inaccurate. Companies often receive hundreds of applications for a single job opening,

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making the hiring process difficult and inefficient. The proposed system solves this problem by automatically processing resumes and matching candidate profiles with job descriptions using intelligent algorithms.

The system uses NLP techniques such as tokenization, stop-word removal, lemmatization, and skill extraction to analyze resume content. After preprocessing, TF-IDF vectorization and cosine similarity algorithms are used to compare resumes with job descriptions and identify the best matching jobs. The system then displays the top recommended job roles along with similarity scores.

In addition to resume screening and job recommendation, the project also enhances the interview process using AI-based features. The system can automatically shortlist candidates, generate interview questions based on candidate skills, and improve recruitment accuracy while reducing human bias. Overall, the project demonstrates how AI can make recruitment faster, smarter, and more efficient.

II. LITERATURE REVIEW

Artificial Intelligence (AI)-based recruitment systems have become important because organizations need faster, more accurate, and efficient hiring processes. Traditional recruitment methods such as manual resume screening are time-consuming, require more human effort, and may sometimes lead to human bias in candidate selection.

To overcome these problems, AI-powered recruitment systems use Machine Learning (ML) and Natural Language Processing (NLP) to analyze resumes and compare them with job descriptions. These systems extract important details like skills, education, certifications, and experience, helping recruiters identify suitable candidates quickly and improve the overall hiring process.

2.1 Artificial Intelligence

Artificial Intelligence (AI) is a branch of computer science that focuses on developing intelligent systems capable of performing tasks that normally require human intelligence. These tasks include learning, reasoning, decision-making, pattern recognition, and problem-solving. AI enables systems to analyze large amounts of data, identify patterns, and make intelligent decisions automatically.

In recruitment systems, AI is used to automate resume screening, candidate evaluation, and job recommendation processes. AI-based systems can quickly analyze candidate profiles and identify suitable job roles with higher accuracy compared to traditional methods. AI also helps reduce human bias and improves recruitment efficiency.

Artificial Intelligence includes technologies such as Machine Learning, Deep Learning, Natural Language Processing, and Computer Vision. These technologies help systems understand textual and visual information and perform intelligent analysis.

2.2 Machine Learning

Machine Learning (ML) is a subset of Artificial Intelligence that enables systems to learn from data and improve performance without being explicitly programmed. ML algorithms identify patterns in data and make predictions or recommendations based on previous information.

In the proposed system, machine learning algorithms are used for resume classification, candidate ranking, and job recommendation. Techniques such as TF-IDF vectorization and cosine similarity are used to compare resumes with job descriptions and calculate similarity scores.

Machine Learning improves recruitment systems by:

- Automating candidate selection
- Improving job recommendation accuracy
- Reducing manual effort
- Enhancing decision-making processes

Popular machine learning libraries such as Scikit-learn, TensorFlow, and Pandas are commonly used in recruitment-based AI systems.

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2.3 Natural Language Processing (NLP)

Natural Language Processing (NLP) is a branch of Artificial Intelligence that enables computers to understand, process, and analyze human language. NLP helps systems interpret textual information from resumes and job descriptions.

The NLP process generally includes:

- Tokenization
- Stop-word removal
- Lemmatization
- Skill extraction
- Text preprocessing

In the AI-powered recruitment system, NLP techniques are used to extract important information such as technical skills, education, certifications, and work experience from resumes. NLP improves the accuracy of candidate-job matching by understanding resume content semantically rather than only through keyword matching.

Technologies such as spaCy, NLTK, and Python libraries are commonly used for NLP-based applications.

2.4 Resume Screening

Resume Screening is the process of analyzing candidate resumes to identify suitable applicants for a job role. Traditional resume screening methods require recruiters to manually review large numbers of resumes, which is time-consuming and inefficienAI-powered resume screening systems automate this process using NLP and Machine Learning algorithms. The system extracts important details from resumes and compares them with job requirements to shortlist the most suitable candidates.

Modern resume screening systems provide:

- Faster resume analysis
- Better candidate-job matching
- Reduced recruitment time
- Improved hiring accuracy
- Automated candidate shortlisting

The proposed system uses TF-IDF and cosine similarity algorithms to calculate similarity scores between resumes and job descriptions.

2.5 Job Recommendation System

A Job Recommendation System is an intelligent system that suggests suitable job roles to candidates based on their skills, education, experience, and interests. Recommendation systems are widely used in online job portals and recruitment platforms.

The proposed system uses content-based filtering techniques to recommend jobs to candidates. The system compares resume content with job descriptions and displays the top matching job roles based on similarity scores.

Job recommendation systems improve:

- Candidate experience
- Recruitment efficiency
- Job matching accuracy
- Career guidance support

Advanced recommendation systems may also use Deep Learning and AI-based predictive analysis for better recommendations.

2.6 Interview Process Enhancement

Modern AI-based recruitment systems also improve the interview process using intelligent automation techniques. AI can automatically shortlist candidates, generate interview questions, and evaluate candidate performance.

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The proposed system includes AI-based interview process enhancement features such as:
• Automated candidate shortlisting
• AI-generated technical interview questions
• Candidate performance evaluation
• Personalized recommendations
• Bias reduction in recruitment
Future systems may also include:
• Video interview analysis
• Voice-based communication analysis
• AI chatbot interviews
• Real-time coding assessments
These technologies make the recruitment process faster, smarter, and more efficient for organizations.

III. METHODOLOGY

3.1 Working of implemented System

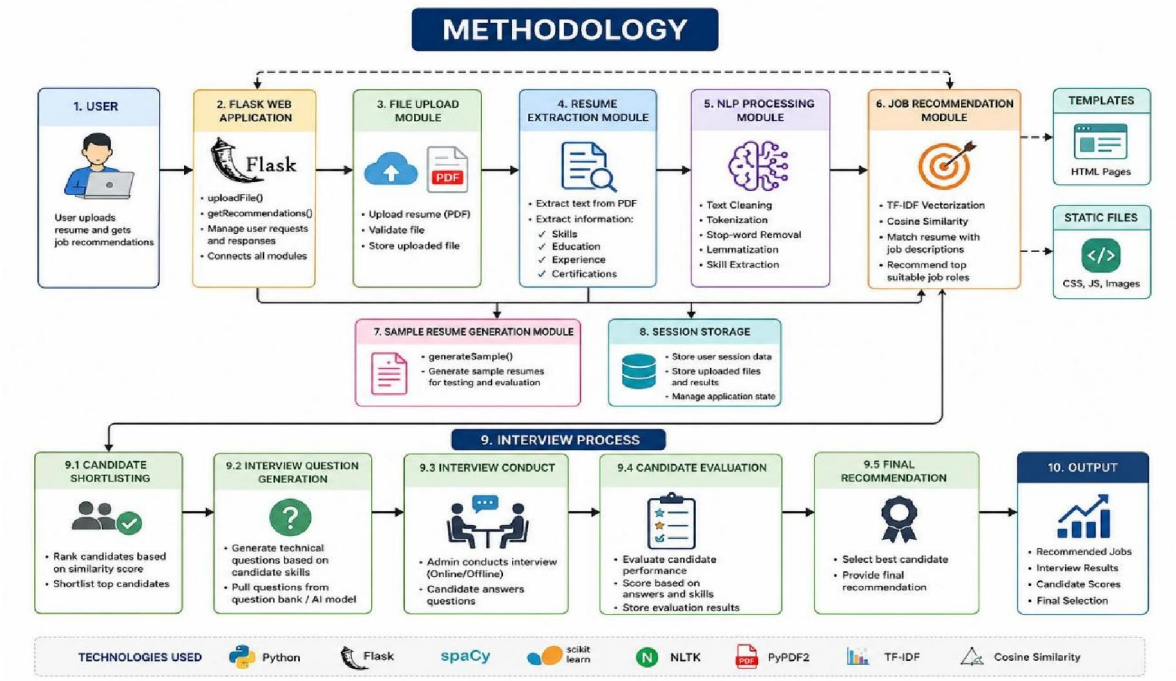

Figure 1: Working of implemented Model

3.2 Flask Web Application

The Flask Web Application acts as the central controller of the system. It manages all functionalities such as resume uploading, resume processing, job recommendation generation, and interview process management. The Flask framework is used because it is lightweight, flexible, and suitable for developing AI-based web applications.
The web application provides a user-friendly interface where candidates can upload resumes and view recommendation results. It also connects all backend modules and manages communication between the frontend and processing units.
Main functions handled by the Flask application include:
• Resume Upload Management

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• Resume Processing
• Job Recommendation Generation
• Result Display
• Interview Process Handling

3.2 Resume Upload Module

The Resume Upload Module is responsible for accepting resumes from users in PDF format through the web interface. Uploaded resumes are temporarily stored for processing and analysis

This module performs:

• File validation
• PDF format checking
• Secure file handling
• Resume storage management

The uploaded files are forwarded to the Resume Extraction Module for text extraction.

3.3 Resume Extraction Module

The Resume Extraction Module extracts textual information from uploaded resumes using text extraction libraries such as PyPDF2. This module converts PDF resumes into machine-readable text for further analysis.

The extracted information includes:

• Candidate Name
• Technical Skills
• Educational Qualifications
• Certifications
• Work Experience
• Projects and Achievements

This module is important because resumes are usually stored in unstructured PDF formats. Text extraction converts unstructured resume data into processable textual information.

3.4 NLP Processing Module

The NLP Processing Module performs preprocessing and analysis of resume text using Natural Language Processing techniques. NLP improves the system's ability to understand resume content semantically instead of relying only on keyword matching.

The preprocessing stage includes:

• Tokenization
• Stop-word Removal
• Lowercasing
• Lemmatization
• Punctuation Removal
• Text Cleaning

After preprocessing, the module performs skill extraction using NLP libraries such as spaCy and NLTK. Important technical skills such as Python, Java, SQL, Machine Learning, and Data Science are identified and stored for recommendation purposes.

The NLP module improves recommendation accuracy and helps identify relevant candidate information efficiently.

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3.5 Job Recommendation Module

The Job Recommendation Module compares candidate resumes with job descriptions using Machine Learning algorithms. This module uses:

- TF-IDF Vectorization
- Cosine Similarity Algorithm

TF-IDF (Term Frequency-Inverse Document Frequency) converts resumes and job descriptions into numerical vectors based on word importance. Cosine similarity calculates similarity scores between resumes and job descriptions.

Based on similarity scores, the system identifies the most suitable job roles and displays top recommendations to the user. The module helps improve candidate-job matching accuracy and reduces manual screening effort.

Functions of this module include:

- Resume-Job Matching
- Similarity Score Calculation
- Job Ranking
- Recommendation Generation

3.6 AI-Based Interview Process Module

The AI-Based Interview Process Module enhances the recruitment process using Artificial Intelligence techniques. This module automates candidate evaluation and supports intelligent interview management.

Features included in this module:

- Automated Candidate Shortlisting
- AI-Generated Interview Questions
- Candidate Skill Evaluation
- Personalized Recommendations
- Bias Reduction in Recruitment

The system generates technical interview questions according to candidate skills and qualifications. For example: Python candidates receive Python programming questions

- SQL candidates receive database-related questions
- Machine Learning candidates receive AI-based questions

Future enhancements of this module may include:

- Video Interview Analysis
- Voice-Based Communication Analysis
- AI Chatbot Interviews
- Real-Time Coding Assessments

This module improves recruitment efficiency and helps recruiters make better hiring decisions.

3.7 Result Display Module

The Result Display Module presents the final output to users through the web interface. The module displays:

- Extracted Skills
- Recommended Job Roles
- Similarity Scores
- Candidate Ranking
- Interview Recommendations

The results are displayed in a structured and user-friendly format using HTML templates and frontend technologies

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IV. SYSTEM IMPLEMENTATION AND RESULT

4.1 Implementation

1. Hardware Requirement

Processor: Intel Core i5 / AMD Ryzen 5 Reason:

The AI-Powered Resume Screening & Job Recommendation System performs tasks such as resume processing, NLP-based text analysis, TF-IDF vectorization, cosine similarity calculation, and job recommendation generation. These operations require fast computation and efficient processing power. Intel Core i5 and AMD Ryzen 5 processors provide multi-core performance and good processing speed, making them suitable for handling AI and machine learning operations efficiently.

RAM: 8GB and above Reason:

The system processes multiple resumes, performs NLP operations, and handles machine learning algorithms simultaneously. A minimum of 8GB RAM provides sufficient memory for smooth execution of Flask applications, Python libraries, and data processing tasks without performance issues.

2. Software Requirement

Operating System : Windows 10/11 or Ubuntu Linux

Reason: The project supports both Windows and Ubuntu operating systems. Ubuntu is preferred for faster execution, better compatibility with Python libraries, and improved performance for AI and machine learning applications.

1. Libraries Used Scikit-learn

Reason: Scikit-learn is a machine learning library used for TF-IDF vectorization, cosine similarity calculation, and recommendation algorithms. It provides efficient tools for data analysis and machine learning model implementation.

TensorFlow

Reason: TensorFlow is an open-source machine learning framework used for developing AI models and intelligent recommendation systems. It supports deep learning and neural network-based applications.

Pandas

Reason: Pandas is a data analysis and manipulation library used for handling structured datasets such as resumes and job descriptions. It provides data structures like DataFrame for efficient data processing.

NumPy

Reason: NumPy provides support for numerical operations, arrays, and mathematical computations required in machine learning and NLP tasks. It improves processing speed and computational efficiency.

spaCy and NLTK

Reason: spaCy and NLTK are Natural Language Processing (NLP) libraries used for:

- Text preprocessing
- Tokenization
- Stop-word removal
- Lemmatization
- Skill extraction

These libraries help improve resume analysis accuracy.

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2. Toolkit

Flask Framework

Reason: Flask is a lightweight Python web framework used to develop the web application interface. It handles resume uploads, recommendation requests, and displays job recommendation results to users.

PyPDF2

Reason: PyPDF2 is used to extract textual information from PDF resumes uploaded by candidates.

4.2 : Result:

The AI-Powered Resume Screening & Job Recommendation System successfully analyze resumes and recommends suitable job roles based on candidate skills, education, and experience. The system extracts important information from resumes using NLP techniques and compares them with job descriptions using TF-IDF vectorization and cosine similarity algorithms.

The proposed system improves recruitment efficiency by reducing manual resume screening and automating candidate-job matching. It provides faster and more accurate recommendations compared to traditional recruitment methods.

The system also enhances the interview process by automatically shortlisting candidates and generating interview questions based on technical skills. This helps recruiters save time and improve hiring decisions.

Output of the System

Resume Upload Success

• Skill Extraction from Resume
• Job Recommendation Based on Skills
• Candidate Shortlisting
• AI-Based Interview Question Generation
• Recommendation Results Display

The overall system demonstrates how Artificial Intelligence and NLP can improve modern recruitment systems by making hiring faster, smarter, and more efficient

V. CONCLUSION

The AI-Powered Resume Screening & Job Recommendation System successfully automates the recruitment process using Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP). The system analyzes resumes, extracts important candidate information, and recommends suitable job roles based on skills, education, and experience.

The proposed system reduces manual effort involved in traditional recruitment methods and improves hiring efficiency. By using NLP techniques such as text preprocessing and skill extraction along with TF-IDF vectorization and cosine similarity algorithms, the system provides accurate candidate-job matching and faster resume analysis.

The project also enhances the interview process through AI-based candidate shortlisting and interview question generation. These features help recruiters make better hiring decisions while reducing human bias and recruitment time.

Overall, the system demonstrates how AI-based technologies can improve modern recruitment systems by making the hiring process faster, smarter, and more efficient for both recruiters and job seekers.

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