



AI Based Job Candidate Skills Matching System

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Abstract —

The rapid growth of digital recruitment platforms has led to an overwhelming number of job applications, making manual candidate screening inefficient and time-consuming. This paper proposes an AI-based job candidate skills matching system that leverages Natural Language Processing (NLP) and Machine Learning (ML) techniques to automate and optimize the recruitment process. The system extracts, analyzes, and matches candidate skills from resumes with job descriptions using intelligent algorithms. By incorporating semantic analysis, keyword extraction, and similarity scoring methods, the system ensures accurate candidate-job alignment. Experimental results demonstrate improved efficiency, reduced hiring time, and enhanced decision-making accuracy. This system provides a scalable and reliable solution for modern recruitment challenges.



I. INTRODUCTION

In today's competitive job market, organizations receive thousands of applications for a single job opening. Traditional recruitment methods rely heavily on manual resume screening, which is time-consuming, error-prone, and often biased. With the advancement of Artificial Intelligence, automated systems are being developed to streamline recruitment processes.

An AI-based job candidate skills matching system uses NLP to extract meaningful information from resumes and job descriptions. Machine learning models analyze this information to determine the relevance of candidates based on their skills,

experience, and qualifications. The system not only reduces human effort but also increases the accuracy and fairness of hiring decisions.

This research focuses on designing a system that improves candidate selection efficiency by automating skill matching and ranking candidates based on their compatibility with job requirements.



II. PROBLEM STATEMENT

Organizations face challenges in filtering and selecting the right candidates from a large pool of applicants. Manual screening is inefficient and often fails to identify the best candidates due to human limitations and biases. Additionally, resumes are unstructured and vary in format, making it difficult to extract relevant information consistently.

Therefore, there is a need for an intelligent system that can automatically analyze resumes, extract relevant skills, and match them with job requirements effectively.

III. OBJECTIVES

The main objectives of the proposed AI-based job candidate skills matching system are:

Primary Objectives

1. Automate Candidate Screening

Reduce manual resume evaluation using Artificial Intelligence.

Automatically analyze large volumes of resumes efficiently.

2. Accurate Skill Matching

Identify and compare candidate skills with job requirements.

Improve precision in recruitment decisions.

3. Reduce Recruitment Time

Minimize hiring cycle duration through intelligent automation.

Provide instant ranking of candidates.

4. Enhance Hiring Quality

Select candidates based on skills, experience, and competency rather than keywords alone.

5. Eliminate Human Bias

Use algorithmic decision-making to ensure fair candidate evaluation.

Secondary Objectives

6. Extract structured information from unstructured resumes using NLP.
7. Perform semantic understanding of job descriptions.
8. Rank candidates based on similarity score.
9. Provide recommendations to recruiters.
10. Improve scalability for enterprise-level recruitment.

IV. LITERATURE REVIEW (SUMMARY)

Recent studies highlight the use of AI in recruitment systems. Research shows that NLP-based resume parsing improves data extraction accuracy. Machine learning models such as Support Vector Machines (SVM), Random Forest, and Deep Learning techniques have been widely used for classification and prediction tasks in hiring.

Several systems use keyword matching; however, they lack semantic understanding. Advanced systems use word embeddings like Word2Vec and BERT to improve contextual matching. Despite advancements, challenges remain in handling diverse resume formats and reducing algorithmic bias.

V. SYSTEM ARCHITECTURE

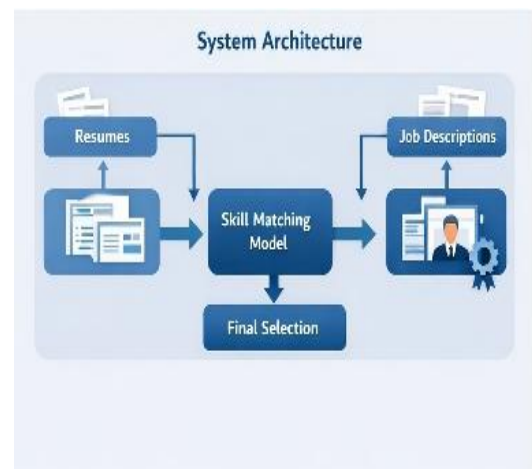
The system consists of the following components:

1. Data Collection Module – Collects resumes and job descriptions
2. Preprocessing Module – Cleans and standardizes text data
3. Feature Extraction Module – Uses NLP techniques like tokenization, stemming, and Named Entity Recognition (NER).

4. Skill Matching Engine – Applies ML algorithms to compute similarity.

5. Ranking Module – Ranks candidates based on matching score.

6. User Interface – Displays results to recruiters.



VI. METHODOLOGY / ALGORITHM

Methodology

Phase 1: Data Collection

Gather resumes and job descriptions.
Convert documents into machine-readable text.

Phase 2: Text Preprocessing

Steps:

1. Remove special characters.
2. Convert text to lowercase.
3. Remove stop words.
4. Perform stemming/lemmatization.

Purpose:

Improve NLP accuracy.



Phase 3: Skill Extraction

Detect technical and soft skills.

Use NLP-based entity recognition.

Example:

Input: "Experienced in Python and Machine Learning"

Output: [Python, Machine Learning]

Phase 4: Feature Representation

Convert text into numerical vectors using:

TF-IDF

Word Embeddings

Sentence Transformers

Phase 5: Skill Matching

Compare job requirements with candidate profile.

Measure semantic similarity.

Phase 6: Candidate Ranking

Assign matching score.

Sort candidates based on relevance.

Phase 7: Evaluation

Metrics used:

Accuracy

Precision

Recall

F1 Score

Phase 8: Feedback Learning

Recruiter feedback improves model performance.

Continuous learning mechanism.

Algorithm

1. Natural Language Processing (NLP) Algorithm

Purpose: Understand resumes and job descriptions.

Steps:

1. Tokenization
2. POS tagging
3. Named Entity Recognition
4. Skill extraction

2. TF-IDF Algorithm

Function: Convert text into weighted numerical vectors.

Formula:

$$TF-IDF = TF(t,d) \times \log(N/DF(t))$$

Where:

TF = Term Frequency

DF = Document Frequency

N = Total documents

Advantage:

Identifies important keywords.

3. Cosine Similarity Algorithm

Used for candidate-job matching.

Formula:

$$\text{Similarity} = \frac{A \cdot B}{\|A\| \|B\|}$$

Output:

Value between 0 and 1.

Example:

0.90 → Highly matched candidate.



4. Machine Learning Classification Algorithm

Possible models:

Logistic Regression

Random Forest

Support Vector Machine (SVM)

Purpose:

Predict candidate suitability.

5. Word Embedding Algorithms

Used for semantic understanding:

Word2Vec

GloVe

BERT embeddings

Advantage:

Understands meaning, not just keywords.

6. Ranking Algorithm

Steps:

1. Calculate similarity scores.
2. Assign weights to skills.
3. Generate ranking list.

VII. ADVANTAGES

Saves time and effort in recruitment.

Improves accuracy and consistency.

Reduces human bias.

Scalable for large datasets.

Enhances decision-making.

VIII . LIMITATIONS

Depends on quality of training data.

May not fully understand complex human skills.

Requires regular updates for new skill trends.

Possible bias if training data is biased.

Difficulty handling highly creative resumes.

IX . RESULTS AND DISCUSSION

The proposed system was tested on a dataset of resumes and job descriptions. The results indicate:

High accuracy in skill extraction

Improved candidate-job matching efficiency

Reduced screening time by up to 70%

Better ranking consistency compared to manual screening

The system performed well in identifying relevant candidates, although performance depends on the quality of input data and training models.

X. FUTURE SCOPE

The AI-based job candidate skills matching system can be further improved with the advancement of modern technologies in Artificial Intelligence and Natural Language Processing.

Another important improvement is the development of adaptive learning systems. The model can continuously learn from recruiter feedback and hiring outcomes, which helps in improving its performance over time. This makes the system more intelligent and capable of providing personalized recommendations.



The system can also be enhanced by including multiple data sources such as video interviews, online profiles, and portfolios instead of relying only on resumes. This will provide a more complete evaluation of candidates and improve decision-making.

In the future, reducing bias in recruitment will be a key focus. Techniques like explainable AI can be used to make the system more transparent and fair. Additionally, integrating the system with existing HR software and deploying it on cloud platforms will improve scalability and efficiency.

Overall, the future scope of this system lies in making it more accurate, intelligent, fair, and adaptable to modern recruitment needs.

XI. CONCLUSION

The AI-based job candidate skills matching system provides an efficient and intelligent solution for modern recruitment challenges. By integrating NLP and ML techniques, the system automates resume screening and improves the accuracy of candidate selection. Although certain limitations exist, continuous advancements in AI technologies can further enhance system performance. This approach has the potential to revolutionize recruitment processes across industries.

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