A Survey on Skill-Based Hiring Systems Using Intelligent Matching Techniques

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***Abstract*—Traditional recruitment systems rely heavily on academic qualifications and keyword-based resume filtering, which often fail to recognize practical skills and real-world competencies of candidates. This limitation results in biased hiring decisions and inefficiencies in talent acquisition. Skill-based hiring systems aim to overcome these challenges by focusing on candidate skills, experience, and job requirements rather than formal degrees alone. This survey paper reviews existing skill-based hiring and job recommendation systems, highlighting intelligent matching techniques such as cosine similarity, machine learning, and recommendation algorithms. The paper analyzes various methodologies, compares their performance, identifies research gaps, and discusses challenges in deploying scalable and inclusive hiring platforms. Based on the study, future research directions are outlined to enhance accuracy, fairness, and automation in recruitment systems.**

***Index Terms*—Skill-Based Hiring, Job Recommendation System, Cosine Similarity, Recruitment Automation, Intelligent Matching.**

I. INTRODUCTION

Recruitment is a critical process for organizations, directly influencing productivity and workforce quality. Conventional hiring methods primarily depend on resumes, academic qualifications, and keyword searches, which may overlook skilled candidates who possess strong practical abilities but lack formal credentials. As the job market becomes increasingly competitive and digitalized, recruiters face difficulties in efficiently screening a large volume of applications.

Skill-based hiring systems have emerged as an effective solution to these challenges by prioritizing candidate skills, experience, and competencies. These systems employ intelligent algorithms to match candidate profiles with job requirements, reducing bias and improving transparency in the recruitment process. This survey paper focuses on reviewing existing research related to skill-based hiring systems, job recommendation platforms, and intelligent matching techniques. The objective is to provide a comprehensive understanding of current approaches, their strengths and limitations, and potential areas for improvement.

II. BACKGROUND AND MOTIVATION

The motivation for skill-based hiring arises from the need to create fair, efficient, and data-driven recruitment processes. Many qualified candidates are rejected due to rigid degree requirements or resume formatting issues. Organizations, on the other hand, struggle with time-consuming manual screening and inconsistent evaluation criteria.

Recent advancements in web technologies, data mining, and recommendation systems have enabled the development of automated hiring platforms. These systems aim to reduce recruiter workload, improve candidate–job matching accuracy, and promote inclusive employment opportunities. A survey of such systems is essential to understand evolving trends and guide future development.

III. LITERATURE SURVEY

Several researchers have proposed skill-based recruitment and job recommendation systems using different techniques. Early systems focused on keyword matching, which often resulted in inaccurate recommendations. Later approaches introduced machine learning and similarity-based algorithms to improve matching performance.

Studies have shown that cosine similarity is widely used to compare job descriptions and candidate profiles by converting them into vector representations. Other works explore collaborative filtering, content-based recommendation, and hybrid models. While these systems demonstrate improved

accuracy, they also face challenges such as data sparsity, scalability, and lack of real-time adaptability.

To improve matching accuracy, similarity-based techniques such as cosine similarity and vector space models were introduced. These methods represent resumes and job descriptions as numerical vectors and compute their similarity to identify suitable candidates. Although these techniques perform better than keyword matching, they depend on manual feature extraction and struggle with complex skill relationships.

TABLE I: COMPARISON OF EXISTING SKILL-BASED HIRING APPROACHES

Work	Domain	Technique Used	Limitations
Bibi *et al.*	Recruitment Systems	Rule-based skill matching	Limited scalability; manual rules
Munir *et al.*	Job Recommendation	NLP-based similarity (TF-IDF)	Ignores deep skill relationships
Maghsoodi *et al.*	HR Analytics	Social network analysis	Complex implementation
Kumar *et al.*	E-recruitment	Machine learning classifiers	Requires large labeled data
Proposed System	Skill-Based Hiring	Cosine similarity with clustering	Depends on quality of input data

IV. RELATED WORK

Existing recruitment systems mainly use keyword-based resume screening and rule-based matching to compare candidate profiles with job requirements. These methods are easy to implement but often fail to identify actual skills and practical experience of candidates.

To improve accuracy, similarity-based techniques such as TF-IDF and cosine similarity have been used in job recommendation systems. These approaches provide better matching than keyword filtering, but challenges like data bias and limited understanding of skill relationships still exist. The JobMate system focuses on skill-based matching to overcome these limitations and improve hiring efficiency.

V. SYSTEM ARCHITECTURE

The system architecture of the JobMate platform follows a client–server model. Users access the system through a Mobile or PC Browser, which provides an interface for job seekers and recruiters to enter resumes, skills, and job requirements. The browser communicates with the Web Server, which handles user requests and forwards them to the backend services.

The Application Server performs the core processing tasks of the system. It is responsible for skill extraction, text preprocessing, and executing the cosine similarity algorithm to match candidate skills with job requirements. The application server interacts with the Database Server to retrieve and store user profiles, job details, and matching results.

The Database stores all persistent data, including resumes, job descriptions, extracted skills, and recommendation outputs. This layered architecture improves system scalability, security, and performance by separating user interaction, processing logic, and data storage. As a result, JobMate efficiently delivers skill-based job recommendations to users.

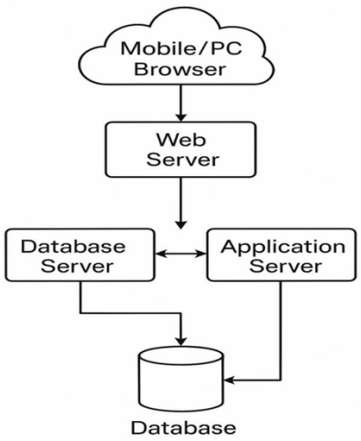

Fig. 1. System Architecture of JobMate

TABLE II: MODULE DESCRIPTION OF JOBMATE SYSTEM

Module Name	Description
User Interface	Provides interaction for job seekers and recruiters.
Web Server	Manages client requests and communication.
Application Server	Executes skill matching and processing logic.

Module Name	Description
Database Server	Stores user and job-related information.
Recommendation Module	Generates job recommendations based on skills.

VI. COSINE SIMILARITY ALGORITHM

similarity algorithm to measure the relevance between a candidate's skills and job requirements. Cosine similarity determines the similarity between two non-zero vectors by calculating the cosine of the angle between them. In the proposed system, one vector represents the candidate's skill set extracted from the resume, and the other represents the skills required for a specific job.

Mathematically, cosine similarity is defined as:

$$\text{Cosine Similarity}(A, B) = \frac{A \cdot B}{\| A \| \times \| B \|}$$

where $A$and $B$are the vector representations of the candidate profile and job description respectively, $A \cdot B$denotes the dot product of the vectors, and $\| A \|$and $\| B \|$represent their magnitudes.

In JobMate, resumes and job descriptions are preprocessed and converted into numerical vectors using term frequency techniques. The cosine similarity score ranges from 0 to 1, where a value closer to 1 indicates a higher degree of match. Based on these similarity scores, the system ranks job opportunities and recommends the most suitable jobs to candidates, enabling effective and fair skill-based hiring.

VII. FUTURE SCOPE

The future development of the proposed system can focus on enhancing personalization, accessibility, and career-oriented features. By integrating advanced technologies and expanding platform capabilities, the system can evolve into a comprehensive learning and career development solution. Artificial intelligence–powered recommendation mechanisms can be incorporated to provide personalized suggestions for competitions, projects, and mentorship opportunities based on user skills and interests. Such intelligent recommendations can help users improve their competencies and career readiness.

Additionally, the development of a dedicated mobile application can significantly improve system accessibility by allowing users to receive real-time updates, notifications, and job alerts. Expanding the platform to support global collaboration can promote international participation and cross-cultural learning, thereby increasing exposure to diverse opportunities. Resume and portfolio integration features can automatically update user achievements, certifications, and project work, improving employability and professional visibility. Furthermore, gamification techniques such as badges, points, leaderboards, and rewards can be introduced to encourage active participation, continuous learning, and skill development among users.

VIII. CONCLUSION

This survey paper reviewed existing skill-based hiring and job recommendation systems, emphasizing intelligent matching techniques and their role in modern recruitment. The analysis highlights that skill-focused approaches improve fairness, efficiency, and inclusivity in hiring. Although current systems show promising results, challenges related to scalability, data quality, and explainability remain. Addressing these issues through advanced algorithms and user-centric design can significantly enhance the effectiveness of future recruitment platforms.

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