

AI-Powered Job Recommendation System

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Abstract—The rapid expansion of online recruitment platforms has led to information overload for job seekers and increased screening complexity for recruiters. Traditional job portals rely heavily on keyword-based matching, which often fails to provide personalized job recommendations. This paper presents an AI-powered job recommendation system that uses machine learning techniques to analyze user skills, qualifications, and preferences to generate relevant job suggestions. The system employs a Random Forest algorithm to match job seeker profiles with job requirements and rank suitable opportunities. The platform supports job seekers, companies, and administrators to streamline the recruitment process. The proposed system improves recommendation accuracy, reduces manual effort, and enhances overall recruitment efficiency.

Index Terms—Artificial Intelligence, Job Recommendation System, Machine Learning, Random Forest, Recruitment Automation

I. INTRODUCTION

The rapid growth of online recruitment platforms has significantly transformed the job search and hiring process. With the increasing number of job portals and opportunities, job seekers are often overwhelmed by irrelevant job listings, while recruiters face difficulties in identifying suitable candidates from a large pool of applicants. Traditional recruitment systems rely mainly on manual screening and keyword-based matching, which are time-consuming and often inefficient.

Recommendation systems powered by Artificial Intelligence (AI) and Machine Learning (ML) have emerged as effective solutions to address these challenges. By analyzing user data such as skills, qualifications, experience, and preferences, intelligent systems can provide personalized job recommendations. This not only improves the efficiency of the recruitment process but also

enhances user satisfaction by reducing search effort and mismatched job applications.

In recent years, machine learning techniques have been widely adopted in recommendation systems due to their ability to learn patterns from historical data and make accurate predictions. Algorithms such as decision trees, clustering, and ensemble methods have shown promising results in matching user profiles with job requirements. However, many existing systems depend heavily on resume parsing and unstructured data, which may lead to ambiguity and reduced transparency.

This paper proposes an AI-powered job recommendation system that focuses on structured profile-based analysis rather than resume parsing. The system employs a Random Forest algorithm to compare job seeker profiles with job descriptions and generate ranked job recommendations. The platform supports three user roles: Job Seekers, Companies, and Admins, to ensure efficient recruitment management. The proposed approach aims to improve recommendation accuracy, reduce manual effort, and streamline the overall recruitment process.

II. RELATED WORK

Several studies have explored the application of machine learning techniques in job recommendation systems with the objective of improving recruitment efficiency and reducing manual screening effort. Early job recommendation platforms predominantly relied on keyword-based matching methods, where resumes and job descriptions were compared using exact or partial keyword overlaps. Although simple to implement, such approaches often fail to capture the contextual meaning of skills and user intent, resulting in inaccurate or irrelevant job recommendations.

To overcome these limitations, researchers introduced collaborative filtering and content-based filtering techniques. Collaborative filtering recommends jobs based on the behaviour and preferences of similar users, while content-based filtering focuses on matching user profiles with job attributes. Despite their effectiveness in certain scenarios, these approaches suffer from inherent challenges such as the cold-start problem, data sparsity, and limited personalization for new users with minimal interaction history.

More recent studies have investigated the use of ensemble learning models and advanced artificial intelligence techniques to enhance job matching accuracy. Ensemble models, including Random Forest and gradient-based classifiers, have demonstrated improved performance by combining multiple decision paths and handling complex feature interactions. Additionally, some research incorporates resume parsing and natural language processing techniques to extract skills and experience from unstructured resume data. However, reliance on unstructured text often introduces ambiguity, lack of transparency, and difficulty in interpreting recommendation outcomes.

These limitations highlight the need for structured, profile-based job recommendation systems that utilize clearly defined attributes such as skills, experience, and job preferences. By leveraging robust machine learning algorithms on structured data, such systems can provide more accurate, interpretable, and reliable job recommendations while minimizing dependency on ambiguous resume parsing techniques.

III. PROPOSED SYSTEM

The proposed system introduces an AI-powered job recommendation framework aimed at improving recruitment efficiency through structured profile-based job matching and assessment support. The primary objective of the system is to reduce irrelevant job recommendations and assist job seekers in identifying suitable employment opportunities that align with their skills, qualifications, and preferences. The system is composed of two main functional components: a job recommendation module and an assessment support module. Job seekers create structured profiles by providing details such as technical skills, educational qualifications, work

experience, and preferred job location, while companies publish job openings by specifying required skills, experience levels, and eligibility criteria in a structured format. This structured representation enables transparent, consistent, and interpretable comparison between candidate profiles and job requirements.

For job recommendation, the system employs a Random Forest-based machine learning approach. The model evaluates multiple profile and job attributes simultaneously and computes relevance scores for available job postings. Based on these scores, suitable job opportunities are ranked and recommended to users, offering improved accuracy and robustness compared to traditional keyword-based matching techniques.

The assessment support module utilizes a Large Language Model (LLM) to dynamically generate domain-specific and skill-based assessment questions. Users can attempt and submit these assessments through the platform to support basic skill validation alongside profile-based matching. During assessment attempts, camera access is enabled to provide basic online proctoring; however, video data is neither recorded nor stored, and automated cheating detection is not implemented in the current scope.

Overall, the proposed system offers a modular and scalable recruitment framework that integrates machine learning-based job recommendation with LLM-assisted assessment support. The design emphasizes structured data handling, transparency, and extensibility, allowing future enhancements such as automated assessment evaluation, analytics integration, and advanced proctoring mechanisms without impacting core system functionality.

IV. SYSTEM ARCHITECTURE

The proposed system architecture is designed to support secure user registration, structured profile management, assessment support, and intelligent job recommendation. The architecture follows a modular and layered approach to ensure scalability, clear separation of system components, and efficient data flow between the user interface, backend services, and machine learning modules. The system supports multiple user roles, including job seekers, companies, and administrators, enabling controlled access to

platform functionalities. Core services are organized as independent modules to facilitate maintainability

and future enhancements. The overall system architecture is illustrated in Fig. 1.

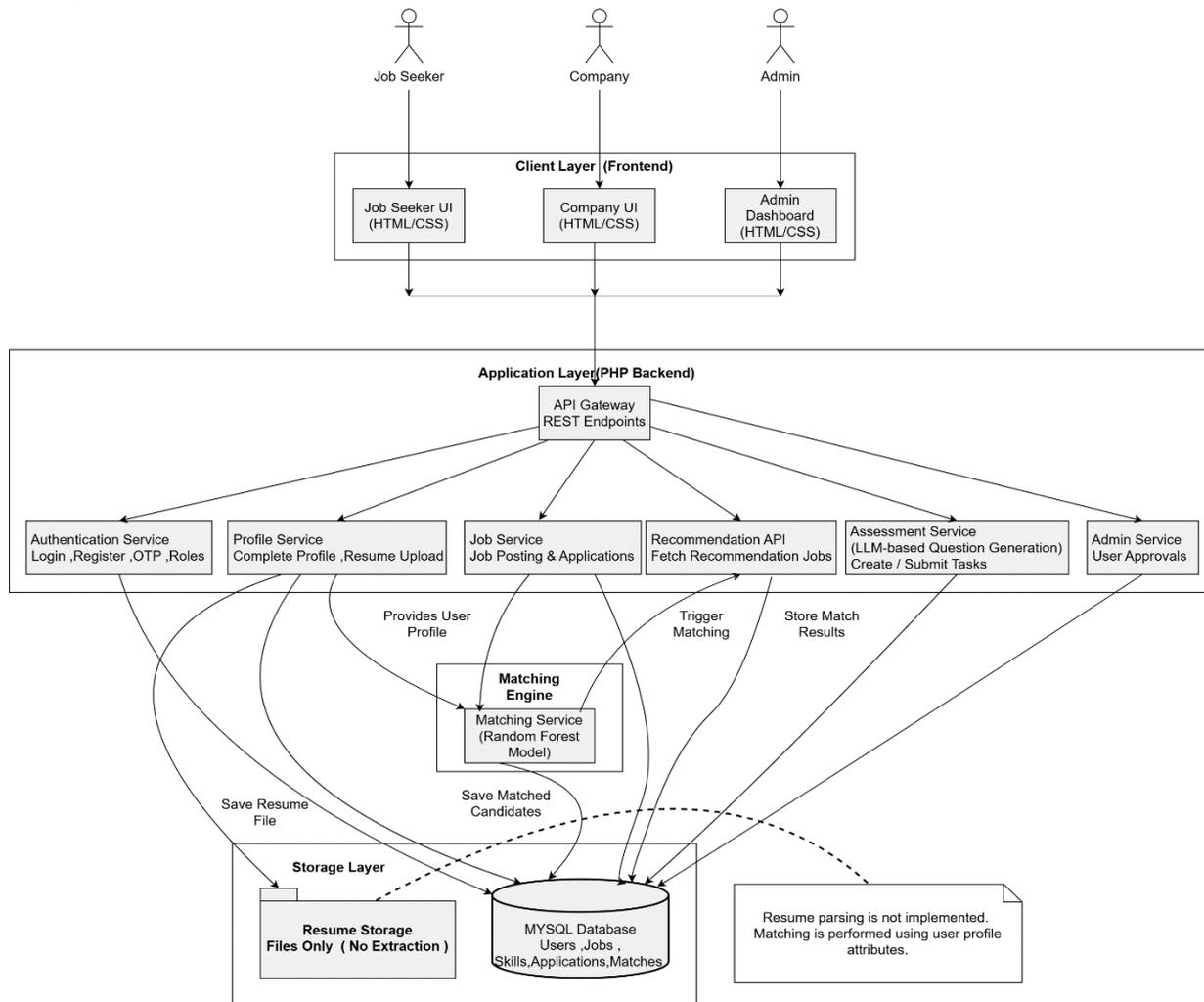


Fig. 1. Layered System Architecture of the AI-Powered Job Recommendation System

A. Component Description

The proposed AI-powered job recommendation system follows a modular and layered architecture, as illustrated in Fig. 1. The architecture is organized into four primary tiers: the Client Layer, Application Layer (PHP Backend), Matching Engine, and Storage Layer. This layered design ensures clear separation of responsibilities, scalability, and efficient data flow across system components.

The data flow begins at the Client Layer, where job seekers, companies, and administrators interact with the system through web-based interfaces developed using HTML and CSS. User requests are forwarded through REST-based APIs to the Application Layer for further processing.

Within the Application Layer, structured job seeker profiles and job postings are managed by dedicated backend services, including the Authentication Service, Profile Service, and Job Service. When a

job recommendation request is initiated or when profile or job data is updated, the structured profile attributes and job requirements are forwarded to the Matching Engine. The Matching Engine employs a Random Forest-based machine learning model to compare user profile features with job requirements and compute relevance scores. Based on these scores, suitable job opportunities are ranked and generated as recommendation results.

The ranked job recommendations are retrieved through the Recommendation API and presented to users via the Client Layer. Following job recommendation, users may optionally participate in assessments to support skill validation. Assessment-related requests are handled by the Assessment Service, which integrates a Large Language Model (LLM) to dynamically generate domain-specific and skill-based assessment questions. The generated assessment data is delivered to the user interface and

stored in the database for reference. Automated evaluation of responses and result visualization are not implemented in the current system scope and are considered future enhancements.

B. Security Considerations

Basic security mechanisms are incorporated into the proposed system to ensure user authenticity and controlled access to platform functionalities. User registration and verification are managed by the Authentication Service, which implements an OTP-based email verification mechanism during the registration process. This verification step helps prevent unauthorized or fake account creation. OTP verification is applied only at the time of registration and is not required during login.

Role-based access control is enforced to restrict system functionalities according to user roles, such as job seekers, companies, and administrators. Sensitive information including user profiles, job postings, assessment data, and recommendation results is securely stored in the database, ensuring data integrity and controlled access across system components.

C. Scalability and Extensibility

The proposed system architecture is designed to support scalability and future enhancements through a modular and service-oriented approach. Core functionalities such as profile management, job posting, recommendation generation, and assessment handling are implemented as independent services, allowing new features to be integrated without impacting existing components. The Matching Engine and Assessment Service can be extended in future versions to incorporate improved machine learning models, automated assessment evaluation, analytics integration, and advanced proctoring mechanisms. This modular design supports incremental development while maintaining system stability and performance.

D. Implementation Environment

The Application Layer is implemented using a PHP backend deployed within a XAMPP environment, which provides Apache server support and MySQL database management. Communication between the Client Layer and backend services is facilitated through an API Gateway using REST-based endpoints.

The Storage Layer utilizes a MySQL relational database to store verified user information, structured job seeker profiles, job postings, assessment data, and job recommendation results. A separate resume storage component is included for file persistence; however, resume parsing and extraction are not implemented in the current system scope.

V. METHODOLOGY AND ALGORITHM

A. Methodology

The methodology of the proposed AI-powered job recommendation system describes the step-by-step process followed to generate personalized job recommendations and to support optional skill assessment. The system combines structured profile analysis, a Random Forest-based machine learning model for job recommendation, and an LLM-based assessment mechanism to improve recruitment efficiency.

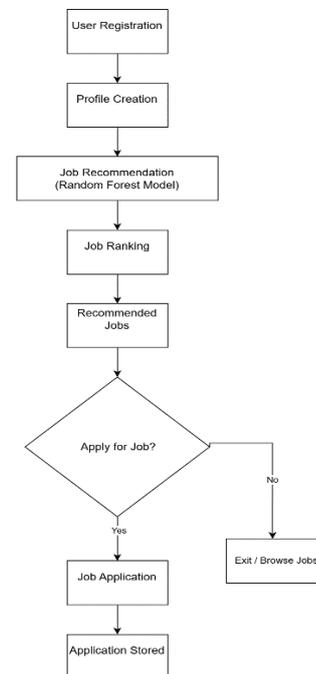


Fig. 2: Job Recommendation Workflow

As shown in Fig. 2, the job recommendation workflow starts with user registration and profile creation. Job seekers provide structured information such as skills, preferred job location, and experience. These structured inputs are processed by the Random Forest-based recommendation model to compute relevance scores for available job postings. Based on these scores, jobs are ranked and displayed to the user. The job seeker may then

choose to apply for a job or continue browsing recommendations.

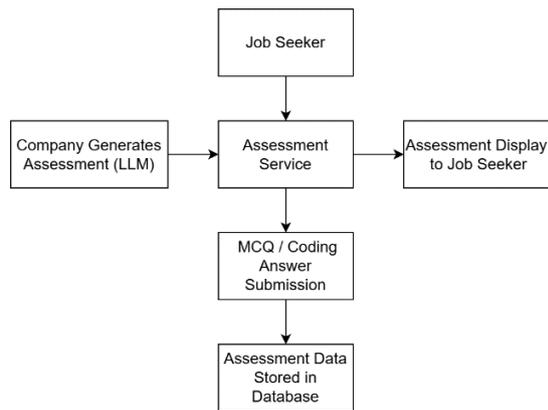


Fig. 3: Assessment Workflow

The assessment workflow, shown in Fig. 3, is optional and operates independently of the job application process. Companies generate assessments using a Large Language Model (LLM), and job seekers may choose to attempt these assessments for skill validation. The assessment system supports both MCQ-based and coding-based questions. Submitted assessment responses are stored in the database for reference; however, automated evaluation and result visualization are not included in the current scope.

This methodology ensures transparent job matching, optional skill validation, and a modular process flow that supports future system enhancements.

B. Algorithm

Algorithm 1: Job Recommendation System

Objective: To recommend relevant job opportunities to job seekers using structured profile data and machine learning.

Steps:

1. Collect user profile data
2. Retrieve job postings
3. Match profiles with jobs
4. Compute relevance scores
5. Rank job listings
6. Display recommended jobs

Algorithm 2: Job Application Process

Objective: To manage job applications submitted by job seekers.

Steps:

1. Display recommended job listings
2. Select job to apply
3. Store job application details
4. Continue browsing jobs

Algorithm 3: LLM-Based Assessment module

Objective: To support skill assessment using dynamically generated questions.

Steps:

1. Company initiates assessment creation
2. Generate questions using LLM
3. Display assessment to job seeker
4. Submit MCQ or coding answers
5. Store assessment responses in the database

VI. TOOLS AND TECHNOLOGIES

- Frontend: HTML, CSS, JavaScript
- Backend: PHP
- Server Environment: XAMPP (Apache Server)
- Database: MySQL
- Machine Learning Model: Random Forest
- AI Model: Large Language Model (LLM) for assessment question generation
- API Communication: RESTful APIs
- Development Tools: VS Code, phpMyAdmin

VII. RESULTS

A. Dataset Description and Overall Accuracy

The proposed AI-based Job Recommendation System was evaluated using a structured dataset consisting of job seeker profiles and job postings created by registered companies on the platform. Each job seeker profile contained structured attributes such as skills, educational qualifications, work experience, and preferred job location, while job postings included required skills, experience level, and eligibility criteria. The dataset was divided into training and testing subsets to validate the performance of the recommendation model.

Experimental evaluation results show that the system achieved an overall recommendation accuracy in the range of 80% to 85%. This indicates that the majority of job recommendations generated by the system were relevant to the job seeker profiles. The achieved accuracy demonstrates the effectiveness of using a Random Forest-based approach for profile-based job matching without relying on resume parsing.

B. System Performance and Functional Analysis

In addition to accuracy evaluation, the system was tested for functional correctness and operational reliability. The recommendation engine successfully generated ranked job suggestions for job seekers based on their profile information. The job

application workflow functioned correctly, with application data being properly stored and retrieved from the database, ensuring smooth interaction between job seekers and employers.

The LLM-based assessment module effectively generated domain-specific multiple-choice and coding questions for company-created assessments. Job seekers were able to attempt and submit assessments through the platform without errors. Although automated evaluation of assessment responses is not included in the current scope, the module demonstrates strong integration capability and future extensibility.

Overall, the system delivers consistent job recommendations with an accuracy of 80–85% and provides a reliable, scalable, and extensible solution for intelligent recruitment platforms, benefiting both job seekers and employers.

VIII. CONCLUSION

The proposed AI-powered job recommendation system successfully integrates structured profile-based job matching with assessment support to enhance recruitment efficiency. By utilizing a Random Forest-based machine learning model, the system effectively recommends relevant job opportunities based on user skills, experience, location, and work mode. The inclusion of an LLM-based assessment module further supports basic skill validation through dynamically generated questions. The system demonstrates reliable performance in job recommendation, application handling, and assessment data storage. The modular and layered architecture ensures scalability, maintainability, and clear separation of system components. Overall, the proposed approach provides a practical and extensible solution for intelligent recruitment platforms, benefiting both job seekers and employers.

IX. FUTURE SCOPE

The proposed AI-powered job recommendation system provides a strong foundation for further enhancement and scalability. Several extensions can be incorporated in future versions to improve functionality, accuracy, and user experience.

1. **Resume Parsing and Skill Extraction:**
Future versions of the system can include automated resume parsing to extract skills, experience, and

qualifications directly from uploaded resumes, reducing manual profile entry and improving matching accuracy.

2. **Integration with Multiple Job Portals:**

The system can be extended to integrate with external job portals such as Naukri, Monster, and Glassdoor to provide a wider range of job opportunities.

3. **Automated Assessment Evaluation:**

Assessment responses can be automatically evaluated using AI-based grading techniques, enabling instant feedback and performance scoring for job seekers.

4. **AI-Based Interview Assistant:**

A conversational AI chatbot can be introduced to conduct mock interviews and assess communication and technical skills.

5. **Mobile Application Development:**

Developing Android and iOS applications would enhance accessibility and allow users to interact with the platform on the go.

6. **Advanced Machine Learning Models:**

Deep learning and transformer-based models (such as BERT or GPT) can be integrated to further improve job matching accuracy and personalization.

7. **Analytics and Reporting Dashboard:**

Visual dashboards can be added to track job application trends, recommendation performance, and user engagement metrics.

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