An AI-Driven, Data-Centric Job Search Engine for Personalized Career Development and Recruitment Enhancement

Manasi Deshpande
Department of Artificial Intelligence and Data Science
Marathwada Mitramandal's College of Engineering
Savitribai Phule Pune University
Pune, Maharashtra, India

Manthan Makode
Department of Artificial Intelligence and Data Science
Marathwada Mitramandal's College of Engineering
Savitribai Phule Pune University
Pune, Maharashtra, India

Vishakha Dhumal
Department of Artificial Intelligence and Data Science
Marathwada Mitramandal's College of Engineering
Savitribai Phule Pune University
Pune, Maharashtra, India

Ishita Naik
Department of Artificial Intelligence and Data Science
Marathwada Mitramandal's College of Engineering
Savitribai Phule Pune University
Pune, Maharashtra, India

Snehal P. Khajurgi
Department of Artificial Intelligence and Data Science
Marathwada Mitramandal's College of Engineering
Savitribai Phule Pune University
Pune, Maharashtra, India

Abstract- In today's competitive job market, the process of connecting job seekers with employers can be overwhelming and inefficient. Traditional job portals often lack the necessary tools to assess candidates' skills, streamline the application process, or provide personalized career development opportunities. This project focuses on developing a data-driven job search engine and career development platform that simplifies and enhances the recruitment process for both job seekers and employers. By utilizing technologies such as Python, PostgreSQL, and AWS, we offer a seamless and efficient experience. Key features include the Bluestock Fintech Aptitude Test (BFAT), real-time interview preparation tools, skill assessments, and a smart resume builder. The platform enables employers to manage job postings, conduct interviews, and filter candidates efficiently. AI-driven recommendations and natural language processing (NLP) are used to offer personalized profile-based job suggestions and interview analysis. By integrating real-time databases and cloud services, the platform ensures scalability and quick access to relevant job opportunities.

Keywords – Data-driven job search engine, AI-powered recruitment, skill assessments, smart resume builder, job portal, BFAT, cloud services, job seeker platform

I. INTRODUCTION

In today's world, finding a job can be a challenging task [5]. The job market is changing rapidly, with new jobs being created and some becoming less common. Job seekers face many difficulties, such as not knowing where to look for jobs, facing a lot of competition, and not being able to show their skills effectively [2]. At the same time, employers also struggle to find the right candidates for their open positions. They often receive too many applications that do not match their needs, making the hiring process long and complicated.

The main purpose of this study is to explore how our Job Portal can help improve the job search experience for seekers and make hiring easier for employers. Our platform aims to use technology to connect job seekers and employers in a better way. We want to find out what challenges both groups face and how our platform can address those problems.

This study is important because it seeks to provide solutions to common issues in the job market. By understanding the needs of both job seekers and employers, we can create a platform that enhances the job search experience and helps employers find the right people for their jobs. Our Job Portal can play a significant role in improving how people connect over job opportunities, thus making the job market more efficient and effective.

In this research, we will look closely at the features and tools our platform offers, such as one-click applications, skill assessments, and expert webinars. We will also consider the feedback from users to ensure that the portal meets their needs.

II. LITERATURE SURVEY

The job market has undergone significant changes in recent years, influenced by technological advancements and shifting workforce demands. Numerous studies have explored the challenges faced by job seekers and employers, highlighting the need for innovative solutions to improve the recruitment process [16]. This literature survey examines existing research on job search platforms, recruitment strategies, and user experiences, providing a foundation for understanding how our Job Portal can address these challenges and enhance the connection between job seekers and employers.

[1] This research creates an online job portal for university students to help them find on-campus jobs. The system allows students to apply easily and track their applications. Built with React.js, Express.js, MongoDB, and Node.js, it lets students create profiles with their skills and education. Administrators can manage job postings to keep students updated on opportunities.

[2] This research looks at how job opportunities connect with skill development. The authors suggest a new job portal that combines job listings and skill-building resources. They compare job platforms like LinkedIn and Indeed with online learning sites like Udemy and Coursera to see how they help job seekers develop necessary skills.

[3] This research aims to create a job search engine that uses data to help job seekers. It allows users to filter job postings by their skills and company characteristics. The authors gather data from sites like Indeed and use techniques to ensure the information is accurate, making the job search more tailored and efficient.

[4] This paper proposes an online job board for colleges to connect students with job opportunities. It automates recruitment, offering job recommendations based on students' skills and providing CV creation tools. Designed for Pulchowk Campus in Nepal, it helps companies filter candidates and includes diagrams showing the system's structure.

[5] This paper focuses on developing an online job platform to improve job searching and work portability. The portal is based on survey feedback from students and compares traditional job application methods with modern online platforms, showing the benefits of online job services.

[6] This paper discusses creating a web-based job portal to enhance job matching efficiency. It allows direct interaction between job seekers and employers, using a modular approach with features like dynamic job searches and safe file uploads. The system aims to be user-friendly and effective for all users.

[7] This paper presents a website for building resumes and recommending courses. It includes a resume creation page and a course recommendation page using algorithms like content-based filtering. Built with Python, HTML, CSS, and JavaScript, it helps users create resumes and find relevant courses.

[8] This paper explores using natural language processing (NLP) to improve a job portal's search algorithms. It discusses techniques like tokenization and keyword extraction to analyze resumes and job descriptions. The system refines job searches and enhances CV parsing to better match candidates with jobs.

[9] This paper introduces a system that automates resume ranking using machine learning, improving how resumes match job descriptions. The system achieved 85% accuracy in parsing and 92% in ranking. It uses TF-IDF vectorization and K-nearest neighbors (KNN) to rank resumes and suggests further improvements with collaborative filtering.

[10] This paper develops a job recommendation system that combines machine learning and non-machine learning techniques. It achieved a 63% increase in click-through rates by using a Bi-directional LSTM model and addressing the cold-start problem. The system enhances job recommendations based on candidates' selection history.

[11] This paper presents a job portal that helps students find IT jobs after graduation. It shows how e-recruitment has made hiring more efficient. The system, using Convolutional Neural Networks (CNN), recommends companies and job vacancies based on students' skills and interests, allowing both job seekers and employers to interact.

[12] This paper explores creating an online job portal to improve job-seeking efficiency. It analyzes user needs and portal features, highlighting the benefits of online platforms over traditional methods in job searching.

[13] This paper evaluates how online job portals impact recruitment, showing they save time and effort compared to traditional methods. It compares online and traditional job-seeking methods and discusses the advantages of online platforms, emphasizing the need to address gender biases in job ads.

[14] This paper develops a hybrid job recommendation system combining content-based and collaborative filtering. Using Word2Vec's skip-gram model, it achieved a recall rate of 63.97% on a dataset of jobs and applicants. The study shows the effectiveness of this approach and suggests applying it to other areas like movie recommendations.

III. SCOPE AND OBJECTIVES

A. Scope

The project aims to develop a Data-Driven Job Search Engine, consisting of an application for job seekers and for MNCs, administrators, and other stakeholders. This platform will cater to the needs of both job seekers looking for employment opportunities and companies seeking talent. The system will feature tools for automating and enhancing recruitment processes, integrating AI-driven features to optimize the user experience, and ensuring seamless interaction between job seekers and employers.

B. Objectives

- Simplify the Job Application Process: Implement a "One-Click Apply" feature that streamlines the application process for job seekers, increasing engagement and saving time.
- Assess Candidate Skills Efficiently: Integrate aptitude and technical assessments, such as the Bluestock Fintech Aptitude Test (BFAT) and specific technical skill tests, to evaluate and filter candidates effectively.
- Support Candidate Career Development: Offer features like expert webinars, smart resume builders, and profile-based recommendations to guide candidates in their career progression.
- Provide Tools for Employers and Administrators: Equip companies with a cost-effective platform for managing job postings, filtering candidates, and conducting interviews.
- Leverage AI and Machine Learning: Implement AI-based profile recommendations and NLP for analyzing interview responses, ensuring that the platform is responsive and personalized to each user's needs.

- Ensure Scalability and Efficiency: Build the platform using scalable technology stacks, including AWS for cloud services, Python/Django for backend to handle large volumes of users and data efficiently.
- Facilitate Continuous Learning and Improvement: Provide opportunities for users to engage in webinars and receive feedback on assessments, encouraging ongoing professional development and learning.

Table -1 Comparison of Popular Job Portals

Feature	***Naukri.com***	***Unstop***	***LinkedIn***
One-Click Apply	Yes	No	No
Resume Builder	Yes	No	No
Application Tracker	Yes	Yes	Yes
Practice Tests	Yes	Yes	No
Recommendations	Yes (job suggestions)	Yes (based on skills)	Yes (job and connections)
Alert Notifications	Yes	Yes	Yes
Performance Tracking	Yes	Yes (for assessments)	Yes (profile views, connections)
Aptitude Test	Yes	Yes	No
Skill Assessment	No	Limited	No
Technical Interview with a Real Person	No	No	No
Expert Webinars	No	Yes	No
User Type	Job seekers and employers	Students and recent graduates	Professionals, job seekers and recruiters

IV. Feature Implementation

- One-Click Apply : The "One-Click Apply" feature lets users apply for multiple jobs with just one click. It makes applying easier by filling out forms automatically using the user's profile data. This saves time and encourages users to apply for more jobs. Users can also track the status of their applications in real time.
- BFAT (Bluestock Fintech Aptitude Test) : The BFAT is a test to check basic skills like logical reasoning, math, and language. It helps employers filter candidates before hiring. The test is done online, gives instant scores and includes features to prevent cheating. Candidates can only retake the test after thirty minutes.
- Skill Assessments: This feature checks candidates' technical or non-technical skills needed for specific jobs, such as programming or AI. It helps companies find the best talent quickly. Candidates complete online tasks that are scored.
- Technical Interview with a Real Person: This feature offers live technical interviews with experts. It allows for a thorough evaluation of candidates' skills and provides a personal touch. Candidates can solve problems in real time, and interviewers can manage the interviews and give feedback.
- Expert Webinar: The expert webinar feature lets industry professionals host live sessions to share knowledge and trends. This helps users learn from experts and enhances the platform’s reputation. It also encourages continuous learning and professional development.

- Smart Resume Builder/Template Recommendation: The Smart Resume Builder helps users create professional resumes quickly. It offers various templates and provides guidance for those who struggle with writing. The tool makes resumes more likely to be noticed by recruiters by optimizing them for Applicant Tracking Systems (ATS).
- Profile-Based Recommendation: This feature uses AI to suggest jobs, internships, and learning opportunities based on users' profiles and interests. It personalizes content for each user, helping them find relevant opportunities that match their career goals. Feedback is used to improve recommendations over time. Job Recommendations based on user profile and preferences:
  a. Based on Profile: Jobs are recommended based on the user's existing profile.
  b. Based on Preferences: Users get recommendations based on their specific job interests.

IV. PROPOSED SYSTEM

A. *System Architecture*

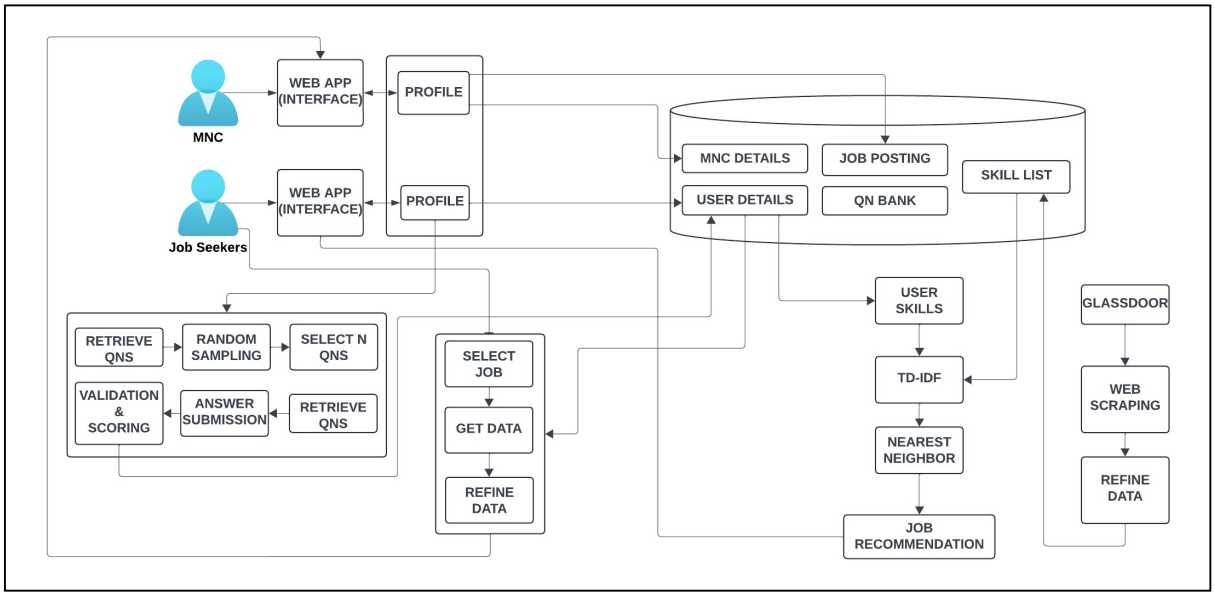

Figure 1. System Architecture

The architecture of this job portal system, as shown in Figure 1, works by connecting two main types of users: MNCs (companies posting jobs) and Job Seekers (people looking for jobs). Both of them use different Web App Interfaces to manage their profiles. The portal stores important information in a central database, such as details about the companies, the available job postings, the profiles of job seekers, a question bank for skill tests, and a list of skills. When it comes to Skill Assessments, the system picks random questions from the question bank for job seekers to answer. Once the answers are submitted, they are scored and checked for correctness. To help job seekers find the best jobs, the system analyzes their skills. It uses a method called TD-IDF to measure how relevant their skills are to different job openings. Then, it uses a Nearest Neighbor approach to find jobs that match the job seeker's skills. The system then provides personalized Job Recommendations. Additionally, the system uses Web Scraping to gather extra data from websites like Glassdoor, which helps improve the accuracy of job listings and skill information. Overall, this system helps job seekers find suitable jobs based on their skills and helps companies find the right candidates for their job openings.

VI. PROPOSED OUTCOMES

A. For Job Seekers:

1. Efficient Job Application Process:
   - Job seekers can quickly apply to jobs with the "One-Click Apply" feature, saving time and effort. This feature makes the process faster and more efficient.

- **Use Case:**

  A, a data science graduate, leverages the "One-Click Apply" feature to apply for multiple relevant roles suggested by the AI-based recommendation engine. This significantly reduces their application time.

2. Personalized Job Recommendations:

   - The platform uses artificial intelligence to suggest job openings that closely match the user's profile, skills, and career goals. This improves the chances of finding the right job without having to search manually.

   - **Use Case:**

     B's job recommendations, including roles at top companies, illustrate how the platform personalizes the job search experience and enhances employment opportunities.

3. Comprehensive Career Development:

   - Job seekers have access to tools like smart resume builders, interview preparation resources, and webinars.

   - **Use Case:**

     C, a marketing professional, transitions into digital marketing by attending webinars on "Emerging Trends in Digital Marketing" and using the Smart Resume Builder to enhance their profile.

B. For Employers:

1. Comprehensive Job Management:

   - Employers can post job openings, manage their listings, receive up-to-date data on how many people have applied, and access a wide range of potential candidates from the platform's large database.

2. Efficient Candidate Sorting/Filtering:

   - Employers can use filters to sort and review candidates efficiently, helping them quickly find qualified applicants. Tools like the Bluestock Fintech Aptitude Test (BFAT) and skill assessments are used to pre-screen candidates efficiently.

   - **Use Case:**

     Company 'D' uses BFAT to narrow 1,000 applicants to 100 qualified candidates for a "Software Engineer" position, saving time and ensuring the right talent is shortlisted.

C. For Admins:

1. Admins have full access to oversee all aspects of the platform, including managing job postings, handling user data (both job seekers and employers), and ensuring that security measures are in place to protect the platform.

2. Admins work with simple and user-friendly dashboards to manage the platform's operations, making it easier to handle information from both companies and job seekers efficiently.

VII. CHALLENGES AND LIMITATIONS

1. Data Privacy Concerns:
   - Protecting test results, user data, and IP addresses used in monitoring is crucial to prevent misuse.
   - Protecting sensitive user data, like resumes and contact details, is critical.
2. Cheating Prevention:
   - Using webcams to monitor users and detect multiple faces may lead to privacy complaints
   - Features like tracking tab switches or logging IPs might not work well for users with unstable internet connections
3. Scalability Issues:
   - Handling many users taking skill assessments at the same time could slow the system down.
   - Randomizing questions and running coding tests in real-time require powerful and scalable infrastructure.

4. Question Bank Management:
   - Keeping the question bank diverse, relevant, and up-to-date is time-consuming.
   - Questions need to be tested for difficulty to ensure fairness across all test-takers.
5. User Profile Completeness
   - Users must fill in all details (like resumes and contact info) to smooth feature implementation.
6. Format Issues
   - Created resumes can be downloaded or shared in formats like PDF or DOC.

VIII.CONCLUSION

In this study, we presented the design and framework of an AI-driven job portal tailored to enhance the job search process for candidates while simplifying recruitment for employers. The platform incorporates features such as the Bluestock Fintech Aptitude Test (BFAT), AI-powered job recommendations, and skill assessments, which together aim to create a seamless and personalized experience for all users.

Our work addresses several challenges in traditional recruitment methods, including inefficiencies in matching candidates with jobs, the lack of scalable tools for skill assessment, and opportunities for career development. By using advanced technologies like AI, NLP, and cloud computing, the platform ensures robust performance, accurate recommendations, and a streamlined hiring process.

Furthermore, this project contributes significantly to both academia and industry by demonstrating the practical application of AI in recruitment. The use cases discussed, such as one-click applications and expert-led webinars, underline the platform's potential to revolutionize how job seekers and employers interact.

In conclusion, this AI-powered job portal represents a significant step forward in personalized career development and recruitment technology.

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