

# Next Step Careers – a Job Board System

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**Abstract**—In the evolving landscape of digital recruitment, efficient platforms are essential to connect job seekers with potential employers. *Next Step Careers* is a full-stack web application developed to streamline the recruitment process. It allows candidates to create profiles, upload résumés, and apply for job postings, while recruiters can post jobs, view candidate applications, and assess profile fit. The system incorporates intelligent filtering, a résumé parser, and a hybrid fit score powered by machine learning algorithms (Logistic Regression, Naive Bayes) and rule-based logic. It also offers personalized job recommendations using collaborative filtering. The platform demonstrates robust integration of full-stack development with artificial intelligence to enhance recruitment outcomes.

**Index Terms**—Admin dashboard, authentication, job board, job search platform, résumé parsing, web application

## I. INTRODUCTION

### A. Background

The job recruitment ecosystem has evolved dramatically in recent years due to rapid advancements in technology, changing expectations of employers and job seekers, and the increasing complexity of modern job roles. Traditional hiring practices—such as manual résumé screening, keyword-based job searches, and static application portals—often fall short in capturing the multidimensional aspects of a candidate’s profile or a job’s true requirements.

This results in inefficiencies like poor job-person fit, high attrition, and misaligned placements. For fresh graduates and early-career professionals, the challenges are even more acute: they often struggle with fragmented job platforms that offer little personalization or feedback. Simultaneously, recruiters are overwhelmed by large volumes of

applications and lack tools for meaningful screening, which leads to delays, underperformance, or mis-hires. Next Step Careers emerges as a dynamic solution—a full-stack web platform that leverages artificial intelligence (AI) and data-driven personalization to streamline the recruitment lifecycle for both job seekers and employers.

### B. Research Gap

Many current job portals rely heavily on basic keyword filtering and rigid data formats, which limits their ability to capture the contextual or semantic nuances present in candidate qualifications and job descriptions. As a result, they often miss out on accurately identifying well-suited matches. Additionally, these platforms typically do not incorporate machine learning models in conjunction with rule-based validation, nor do they provide personalized or explainable fit scoring to users. This creates a significant gap in the recruitment landscape. An effective solution would need to understand unstructured résumé and job data at a semantic level, apply hybrid AI models to enhance the accuracy of candidate-job fit predictions, offer transparency and career guidance to job seekers, and reduce the manual effort required by recruiters through intelligent automation.

### C. Research Objectives

The core objectives of this project are centered around developing an intelligent, end-to-end recruitment platform. The system is designed as a full-stack job portal using the MERN stack, with seamless integration of machine learning-based algorithms. A key goal is to implement natural language processing techniques to parse resumes and job descriptions, enabling structured data extraction for accurate analysis.

Another major objective is to compute a Hybrid Fit Score by combining predictions from Logistic Regression, Naive Bayes, and rule-based skill matching to assess candidate-job compatibility. The platform also aims to deliver personalized job recommendations using Collaborative Filtering through Singular Value Decomposition (SVD).

#### D. Limitations of The Study

Despite its innovative design, the system faces several limitations that impact its current scope and performance. Firstly, the dataset used for training and evaluation was limited in both size and domain diversity, focusing primarily on technology-related job roles. This constraint affects the generalizability of the model to other industries. Secondly, the effectiveness of the machine learning models is highly dependent on the quality of input data and the accuracy of the parsing process; inconsistencies or noise in the data can reduce model reliability.

Additionally, the platform currently supports only English-language resumes and job descriptions, restricting its accessibility for non-English-speaking users. Lastly, the system has not yet undergone external validation with large-scale corporate recruiters, which is essential for assessing its real-world applicability and scalability.

#### E. Rationale of The Study

This study addresses the inefficiencies of modern digital recruitment by proposing a platform that merges intelligent automation with human-centric design. By delivering structured insights into candidate-job fit, incorporating semantically aware text processing, and employing transparent scoring models, the system ensures that both recruiters and job seekers can make informed decisions. Additionally, the user-friendly interface enhances accessibility and usability, making the platform suitable for a wide range of users. NextStep Careers thus represents a significant step toward a smarter, faster, and fairer hiring ecosystem—one that embraces predictive analytics, personalization, and data-driven decision-making as its core pillars.

## II. LITERATURE REVIEW

Recruitment in the digital era has transformed drastically due to web-based platforms and machine

learning integration. Traditional approaches such as print ads and manual filtering of résumés are now replaced by intelligent systems that automate job matching and streamline hiring processes. Several researchers have contributed to enhancing recruitment systems through semantic web technologies, personalization algorithms, and data-driven matchmaking techniques.

#### A. Semantic Web Technologies in Job Recruitment Processes

Bizer et al. examine how semantic web technologies can improve the automation and precision of job matching. By using machine-readable formats for job postings and candidate résumés, the system achieves semantic understanding rather than relying solely on keywords.

##### Key Insights:

- Structured data models help represent roles and qualifications clearly.
- Context-aware search improves result accuracy.
- Enhanced interoperability between job databases and recruitment portals.

#### B. Online Job Search

According to Deva, digital platforms have revolutionized how candidates and recruiters interact. Job seekers now use online portals, professional social networks, and job aggregators to navigate opportunities more efficiently.

##### Key Insights:

- Significant shift from offline to online recruitment methods.
- Platforms like LinkedIn foster direct recruiter-applicant engagement.
- Automated alerts and filtering features improve the application experience.

#### C. Ontology-Based Matchmaking in Job Portals

Fazel-Zanardi and Fox propose a hybrid matchmaking model using ontologies to enhance recruitment accuracy. Their model employs machine learning and rule-based logic to align user profiles with job semantics.

Key Insights:

- Ontologies enable matching based on meaning, not just keywords.
- Hybrid models improve flexibility and scalability.

#### D. The Internet and Job Search

Stevenson explores the broader impact of the internet on employment trends. The study outlines how online branding, social platforms, and globalized listings create new challenges and opportunities.

Key Insights:

- Access to a global job market enhances choice for job seekers.
- Personal branding on online platforms has become critical.

E. Intelligent Personalization in Job Websites Wanasup highlights the integration of personalization via collaborative filtering and data mining in recruitment websites.

Key Insights:

- Adaptive learning systems improve with time, learning user behaviour.
- Personalized suggestions based on past job searches improve user experience.
- Enhanced engagement and retention due to intuitive UI and recommendation accuracy.

#### F. Person-Job Fit and Future Worker Productivity

Ward Jr. et al. emphasize the importance of the “Person-Job Fit” theory, which matches not only skills but also values and work style.

Key Insights:

- Personality and cultural fit play a crucial role in long-term retention.
- Quantitative tools like psychometric testing help in profiling candidates.
- Long-term productivity improves when job roles align with personal attributes.

### III. RESEARCH METHODOLOGY

The research and development of Next Step Careers followed a structured methodology encompassing requirement analysis, system design, iterative

implementation. The project aimed to build a full-stack job board system with integrated AI components for personalized job recommendations.

#### A. Requirement Analysis

We began by identifying the core needs of two user groups: job seekers and recruiters. Surveys were conducted with students to determine expectations around ease of use, filtering features, and application tracking.

#### B. Modules Design

1. User Interface: Developed using React.js and Tailwind CSS, providing a dynamic and responsive experience for both job seekers and recruiters.
2. Backend: Built with Express.js, handling RESTful API calls, authentication, and server-side logic.
3. Database: MongoDB stores structured data such as user profiles, job posts, and application history.
4. Resume Parsing: NLP tools extract key information from uploaded résumés to create structured candidate profiles.
5. Job Recommendations: Recommendations are made using collaborative filtering (SVD) and probabilistic models.
6. Recruiter Dashboard: Allows employers to manage job listings and view applicant status with eligibility screening features.

#### C. Tools and Technologies Used

The application was developed using the MERN stack:

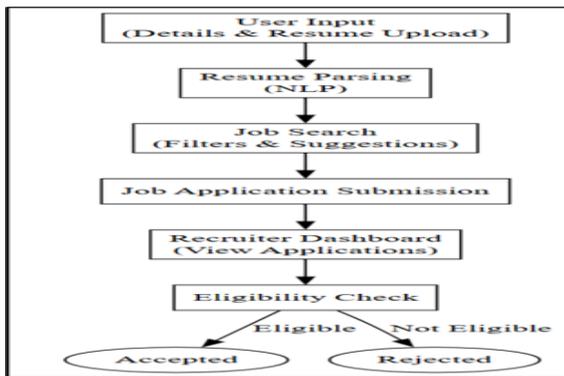
- MongoDB: NoSQL database for storing user profiles, job postings, and application data.
- Express.js: Backend framework used to build RESTful APIs.
- React.js: Frontend library for creating an interactive user interface.
- Node.js: JavaScript runtime for executing backend logic.
- Python: For implementing algorithms.
- scikit-learn and Surprise: ML libraries used for collaborative filtering.
- Cloud nary: For secure storage of user resumes.
- Tailwind CSS: A utility-first CSS framework offering pre-defined classes for responsive, customizable UI design.

- Shaden UI: A modern React component library providing reusable, accessible UI elements such as buttons and modals, ensuring design consistency across devices.

Machine Learning Technologies and Algorithms:

- Logistic Regression: Algorithm predicting candidate-job fit probabilities based on features like skills and experience, valued for interpretability and simplicity.
- Naive Bayes: A classifier effective with categorical data, used for rapid and scalable candidate suitability predictions.
- Collaborative Filtering with SVD: A matrix factorization technique used for personalized job recommendations by decomposing user-job interaction data into latent factors representing preferences and job attributes.
- Natural Language Processing (NLP): Techniques such as NER applied to extract structured information from unstructured text in resumes and job descriptions, enhancing semantic matching accuracy.
- Hybrid Fit Score: Combines Logistic Regression, Naive Bayes predictions, and rule-based skill matching to generate a comprehensive candidate-job fit score, balancing statistical modeling with explicit skill alignment.
- TF-IDF and Cosine Similarity: NLP techniques transforming textual data into weighted vectors and measuring similarity, enabling content-based job recommendations that are domain-agnostic and scalable.

D. System Architecture



User Input (Details & Resume Upload):

- Frontend (React.js): Job seekers register/login, fill in personal details, and upload resumes via the web interface.
- This data is sent via RESTful APIs to the backend.

Resume Parsing (NLP):

- The uploaded resumes are stored to Cloud nary.
- It used NLP (spaCy) to extract structured data such as skills, education, experience, and contact information.
- Parsed data is stored in MongoDB as candidate profiles.

Job Search (Filters & Suggestions):

- Users search for jobs using filters (location, role, etc.) through the UI.
- The backend serves filtered job results and also integrates a recommendation engine (SVD-based collaborative filtering) for personalized suggestions.

Job Application Submission:

- Users apply to jobs directly from the UI.
- Applications are recorded in MongoDB with links to both the job and the candidate.

Recruiter Dashboard (View Applications):

- Recruiters log in and access a dashboard to view applications for their job posts.
- Backend APIs fetch applicant data including parsed resumes and fit score.

Eligibility Check:

- The system performs a hybrid fit score evaluation:
- Combines Logistic Regression, Naive Bayes, and rule-based skill matching.
- Generates a suitability score or label.

Final Decision (Accepted / Rejected):

- Based on the eligibility check, applications are either:
- Accepted
- Rejected

E. Model Training and Validation

Training datasets were created by pairing resumes and job descriptions, labelled based on overlap and manual review. Models were trained using scikit-learn, and evaluated using accuracy, precision, recall, and F1-score. Logistic Regression and Naive Bayes were chosen for their performance on text classification.

F. Ethical Considerations

User data privacy is ensured via secure uploads and encrypted storage. All resume and job data used for training were anonymized.

IV. DATASET ANALYSIS

The dataset used in this project was curated from parsed resumes and job postings. These were uploaded manually or collected through simulated recruiter postings. Each resume was parsed to extract structured fields such as skills, education, and experience, while job postings were parsed to retrieve role descriptions, required skills, and locations.

A. Preprocessing and Normalization

- Stopword removal, tokenization, and lemmatization were applied to all text fields.
- Skill normalization mapped synonymous terms to a unified label set.
- TF-IDF vectors were computed from both resumes and job descriptions.

B. Model Evaluation and Classification Report

To evaluate model performance, both Logistic Regression and Naive Bayes were tested. The classification report results are as follows:

**Logistic Regression**

	precision	recall	f1-score
0	0.9	1.0	0.95
1	0.0	0.0	0.0
accuracy	0.9	0.9	0.9
macro avg	0.45	0.5	0.47
weighted avg	0.8	0.9	0.85

**Naive Bayes**

	precision	recall	f1-score
0	0.9	1.0	0.95
1	0.0	0.0	0.0
accuracy	0.9	0.9	0.9
macro avg	0.45	0.5	0.47
weighted avg	0.8	0.9	0.85

Observations: Both models achieved high accuracy, largely due to correctly predicting the majority class (Not Fit). However, they struggled to classify the minority class (Fit), indicating class imbalance. While these models perform well in the hybrid scoring system by capturing general fit trends, future improvements like data balancing or advanced model tuning could enhance minority class detection.

V. CONCLUSION

A. Key Findings

Next Step Careers showcases the potential of integrating machine learning and NLP in recruitment systems. The hybrid fit scoring approach—combining Logistic Regression, Naive Bayes, and rule-based skill matching—significantly enhances the accuracy and relevance of candidate-job matching.

Effective preprocessing and domain-specific feature engineering allowed the models to classify candidate suitability reliably. The platform’s modular design and user-friendly interface help recruiters make informed decisions, while job seekers benefit from a streamlined, personalized experience.

By combining full-stack web technologies with AI-driven classification and recommendation, the system addresses key gaps in existing job portals. Features like resume parsing, behavior-based suggestions, and real-time tracking further boost user engagement and hiring efficiency.

Overall, Next Step Careers demonstrates how AI and modern web development can create scalable, adaptive, and impactful recruitment solutions.

B. Limitations

While the system demonstrates promising results, it is not without limitations. The current implementation was tested on a relatively small dataset, limiting its scalability to enterprise-level or cross-industry applications. The quality of resume and job parsing—crucial for downstream ML accuracy is sensitive to formatting inconsistencies and unstructured text. Moreover, the platform currently supports only English-language inputs, which restricts its accessibility to a wider, multilingual user base.

C. Challenges

The development of the NextStep Careers platform presented several notable challenges and limitations,

which were systematically addressed to ensure a functional and scalable solution:

- **Resume Parsing Variability:** A major technical challenge was handling the heterogeneity of resume formats.
- **Hybrid Model Integration:** Combining rule-based skill matching with machine learning classifiers for candidate-job fit scoring introduced complexity.
- **Cold Start Problem:** Recommending relevant jobs to new users without historical interaction data posed a cold start challenge. This was mitigated by leveraging detailed resume information to build comprehensive user profiles, enabling reasonably accurate initial recommendations.
- **Cross-Technology Integration:** The system architecture involved a MERN stack integrated with Python-based machine learning services. Ensuring smooth interoperability across this multi-stack environment necessitated careful handling of asynchronous data flows.
- **Real-Time Performance Constraints:** Delivering job recommendations and fit scores in real-time required performance optimization at multiple layers, including model inference time, backend response time, and client-side rendering.

Despite these constraints, the platform achieved its functional goals and demonstrated the feasibility of integrating AI-based techniques in modern recruitment systems.

#### D. Future Work

Future iterations of the Next Step Careers platform aim to enhance its intelligence, inclusivity, and candidate assessment capabilities through the following directions:

- **Advanced NLP with Deep Learning:** Integration of Transformer-based models such as BERT to improve semantic understanding of resumes and job descriptions, especially in unstructured formats.
- **Multilingual Processing:** Support for multiple languages to broaden accessibility and cater to diverse international job markets.
- **Enhanced Candidate Evaluation:** Incorporation of video-based interviews, emotion recognition, and behavioural analysis to assess soft skills and

personality traits, enabling more holistic candidate profiling.

#### E. Conclusion

In conclusion, Next Step Careers demonstrates how AI-driven solutions can transform recruitment by automating resume parsing, improving match accuracy, and personalizing the job search experience. The hybrid approach adopted in this project addresses both semantic and statistical aspects of candidate-job fit, providing a more balanced and transparent evaluation framework. While there is scope for further enhancement, this platform lays a strong foundation for building intelligent, scalable, and user-centric recruitment tools that adapt to the evolving dynamics of the global job market.

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