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JobSense: AI-Driven Resume Matcher and Job Market Analyzer

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Abstract
This project introduces JobSense, an AI-powered platform built to improve the hiring process by creating more meaningful connections between job seekers and employers. Unlike traditional recruitment systems that depend heavily on keyword matching and often fail to identify qualified candidates, JobSense uses advanced Natural Language Processing (NLP) and Machine Learning (ML) techniques to interpret the actual context behind a candidate's skills and professional experience. The platform is designed with a dual focus—supporting job seekers while also making recruitment more efficient. For candidates, JobSense works like an intelligent career assistant that evaluates their skills and experience to recommend job opportunities where they are most likely to succeed. When a candidate's profile matches a job's requirements, the system automatically suggests relevant openings based on the candidate's matching score, improving their chances of getting hired. In addition to job matching, the platform also highlights trending skills and emerging career paths, helping users plan their learning and career growth more effectively. For recruiters, JobSense simplifies the hiring workflow by reducing the effort and uncertainty involved in manual resume screening. Instead of relying on keyword-based filters, the system generates a ranked list of candidates based on real skill compatibility. Through the recruitment portal, hiring managers can quickly identify strong candidates with clear and transparent match scores, enabling faster and more confident hiring decisions. As a result, JobSense helps reduce hiring time while improving the overall quality of shortlisted candidates.

Keywords: *Natural Language Processing (NLP), Machine Learning (ML), semantic matching, resume screening, job matching, candidate ranking, skill alignment, recruitment automation, career development, compatibility scoring, intelligent hiring, talent acquisition, applicant tracking system.*

1. Introduction
Traditional job platforms usually depend on basic keyword matching, meaning they search for exact words instead of understanding what a candidate's skills and experience truly represent. Because of this, many deserving candidates get ignored simply because their resumes don't include the "right" keywords, while recruiters spend hours going through applications that don't actually match the job requirements. These issues have been widely highlighted in AI-based recruitment research, where the demand for smarter and more meaningful matching methods continues to grow [3], [6]. JobSense addresses this gap by using Natural Language Processing (NLP) and Machine Learning (ML) to interpret what candidates can genuinely offer and what employers actually need, improving the overall quality of job–resume matching [4], [5]. As a result, candidates can discover opportunities where they are more likely to succeed, and recruiters can find applicants who truly fit the role. JobSense is not limited to resume-to-job matching— it is designed to support a candidate's complete career development journey. When a user builds a profile, the platform evaluates their skills and recommends personalized learning resources that can help them strengthen their profile and improve their employability. This type of career recommendation support aligns with modern job recommendation system research, which emphasizes personalization and AI-driven guidance as key factors for helping job seekers make better

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career decisions [6]. Along with this, JobSense allows candidates to practice through hands-on exercises, coding challenges, and real- world simulations that prepare them for actual work environments. The platform also works as a resume improvement assistant by reviewing resume structure and content, then suggesting ways to present achievements more effectively. This approach relates to developments in resume processing and automated classification using NLP and ML techniques [5], [8]. For recruiters and hiring managers, JobSense makes the hiring process much more structured and efficient by reducing the burden of manually reviewing large volumes of resumes. The system produces a ranked list of candidates along with a compatibility score that reflects how closely their skills match a job description. Scoring-based job–resume matching is an important research direction in recruitment automation and has shown better relevance compared to purely manual screening or traditional keyword-based approaches [7], [10]. When recruiters see higher match scores, they can shortlist candidates more confidently because the system focuses on semantic understanding rather than simple keyword overlap. This saves screening time and supports better, faster hiring decisions [3], [9]. In addition to technical matching and resume improvement, JobSense also recognizes that professional success depends on strong communication and self-presentation. To support this, the platform offers guidance that helps candidates write better cover letters, prepare for interviews, and present themselves more professionally. Since AI-driven recruitment systems are increasingly moving toward complete end-to-end hiring assistance, these improvements can lead to better outcomes for candidates and more effective recruitment experiences overall [3]. JobSense also helps reduce geographical limitations by connecting candidates with opportunities across different regions and job markets. This reflects current job recommendation research, where scalable AI-based systems aim to connect employers and job seekers across diverse and wider talent pools [6], [4]. Whether a candidate is looking for remote work or planning to relocate, JobSense expands job discovery and enables employers to access talent from a broader and more diverse workforce.

2. Literature Review

2.1. Matching Skills to Opportunities: A Comparative Study of Transformer Architectures

Year: 2024
Author: Neghineh Hajoebi
Description:
This master's thesis compares transformer-based models such as BERT and RobBERT to predict job–candidate matches. The study examines how adding work-experience text influences performance and also includes ablation experiments to test model components. The findings show that BERTje consistently performs better than RobBERT, particularly in managing class imbalance and working with limited contextual data, emphasizing the strong potential of transformer models for job matching [1].

2.2. 2.2 Enhancing Job Recommendation through LLM-Based Generative Adversarial Networks[2].

Year: 2024
Authors: Yingpeng Du, Di Luo, Rui Yan, Xiaopei Wang, Hongzhi Liu, Hengshu Zhu, Yang Song, Jie Zhang
Description:
This paper proposes an LLM-based GAN framework aimed at improving job recommendation by upgrading low-quality resumes. The approach combines explicit user information with implicit behavioral signals and uses GAN-based learning to handle few-shot challenges. Results from experiments conducted on large-scale real-world datasets show noticeable improvements in job recommendation accuracy [2].

2.3. 2.3 The Power of Artificial Intelligence in Recruitment: An Analytical Review[3].

Year: 2023
Author: Wael Abdulrahman Albassam
Description:
This analytical review explores modern AI-driven recruitment strategies, including resume screening,

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candidate matching, recruitment chatbots, predictive analytics, and video interview systems. It highlights how these technologies can enhance efficiency and reduce hiring costs, while also addressing major concerns such as algorithmic bias and ethical or legal issues. Overall, the study provides a broad understanding of how AI is shaping recruitment systems today [3].

2.4. NLP-Based Bi-Directional Recommendation System [4].

Year: 2022
Authors: Suleiman Ali Alsaif, Minyar Sassi Hidri, Imen Ferjani, Hassan Ahmed Eleraky, Adel Hidri
Description:
This study introduces a bi-directional recommendation system that recommends jobs to job seekers and, at the same time, recommends suitable resumes to recruiters. By using NLP and machine learning methods, the system combines explicit and implicit details about jobs and candidates to calculate similarity scores. When evaluated on real job–resume datasets, the approach improves matching accuracy and helps reduce frictional unemployment [4].

2.5. Resume Classification System using NLP and Machine Learning[5].

Year: 2022
Authors: Irfan Ali, Nimra Mughal, Zahid Hussain Khand, Javed Ahmed, Ghulam Mujtaba
Description:
This research develops an automated resume classification system using NLP and machine learning techniques. It evaluates multiple classifiers such as SVM, Naïve Bayes, KNN, and Logistic Regression using TF-IDF-based features. Among them, the One-vs-Rest SVM approach achieves accuracy above 96%, demonstrating the effectiveness of NLP-based methods for resume categorization [5].

2.6. 2.6 Job Recommender Systems: A Review[6].

Year: 2021
Authors: Corné de Ruijt, Sandjai Bhulai
Description:
This survey reviews research on job recommender systems published from 2011 to 2021. It discusses important recommender approaches such as reciprocal and temporal models, while also covering fairness and ethical aspects. The paper points out key challenges in existing hybrid systems and emphasizes the importance of better data availability and improved generalization across different datasets [6].

2.7. Learning to Match Jobs with Resumes from Sparse Interaction Data[7].

Year: 2020
Authors: Shuqing Bian, Xu Chen, Wayne Xin Zhao, Kun Zhou, Yupeng Hou, Yang Song, Tao Zhang, Ji-Rong Wen
Description:
This work focuses on job–resume matching in situations where interaction data is sparse and noisy. The authors propose a multi-view co-teaching network that combines semantic text matching with relation-based graph learning. A co-teaching mechanism is introduced to reduce the effect of noise. Experimental results show that this method performs better than many state-of-the-art text-only matching models [7].

2.8. End-to-End Resume Parsing and Candidate Ranking using BERT[8].

Year: 2019
Authors: Vedant Bhatia, Prateek Rawat, Ajit Kumar, Rajiv Ratn Shah
Description:This paper presents a complete end- to-end system that first converts resumes into structured formats and then ranks candidates using a BERT-based sentence-pair classification approach.
The system achieves 100% accuracy on LinkedIn-format resume parsing and reaches 73% accuracy in suitability ranking, showing the effectiveness of deep NLP models for automated resume screening tasks [8].

2.9. A Novel Approach for Learning How to Automatically Match Job Offers and Candidate Profiles

Year: 2017
Authors: Jorge Martinez-Gil, Alejandra Lorena Paoletti, Mario Pichler
Description:
This study introduces a learning-based approach for matching job offers with candidate profiles using previously successful hiring cases. Instead of

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depending on keyword-based filtering, the model applies semantic knowledge by using education and job taxonomies. The results indicate that the method performs significantly better than traditional information retrieval techniques such as OKAPI BM25 [9].

2.10. Machine Learned Resume–Job Matching Solution[10].

Year: 2016
Authors: Yiou Lin, Hang Lei, Prince Clement Addo, Xiaoyu Li
Description:
This paper proposes a machine-learning-based job–resume matching system designed to replace traditional rule-based and keyword-weighted methods. The system uses unsupervised feature extraction, multiple classifiers, deep learning models, and ensemble techniques to capture semantic similarity between resumes and job roles. Experiments conducted on more than 47,000 resumes show improved prediction accuracy for factors such as job position, salary, education level, and company scale [10].

3. System Architecture and Methodology

3.1. System Overview

JobSense is built on a modular and scalable architecture to support efficient recruitment automation. The system provides separate interfaces for Applicants and Recruiters, allowing each user role to perform tasks such as resume submission, job posting, candidate filtering, shortlisting, and viewing analytics dashboards. The frontend connects with a FastAPI backend that manages authentication, resume parsing, semantic job–resume matching, and recommendation workflows. Such AI-driven job–resume matching solutions are well supported in recruitment research, where machine learning and NLP techniques are used to improve accuracy beyond traditional keyword-based screening [3], [5], [10]. Recruitment data is stored in MySQL, while Redis is used for caching and session management to improve performance. Elasticsearch enables fast and accurate full-text search across resumes and job descriptions, supporting efficient retrieval and filtering. The system can be deployed on cloud infrastructure such as AWS, using object storage where required, to ensure high availability, performance, and flexibility for future upgrades. By incorporating semantic understanding through transformer-based models, JobSense strengthens candidate–job relevance and improves recruitment decision-making compared to conventional approaches [1], [7], [8].

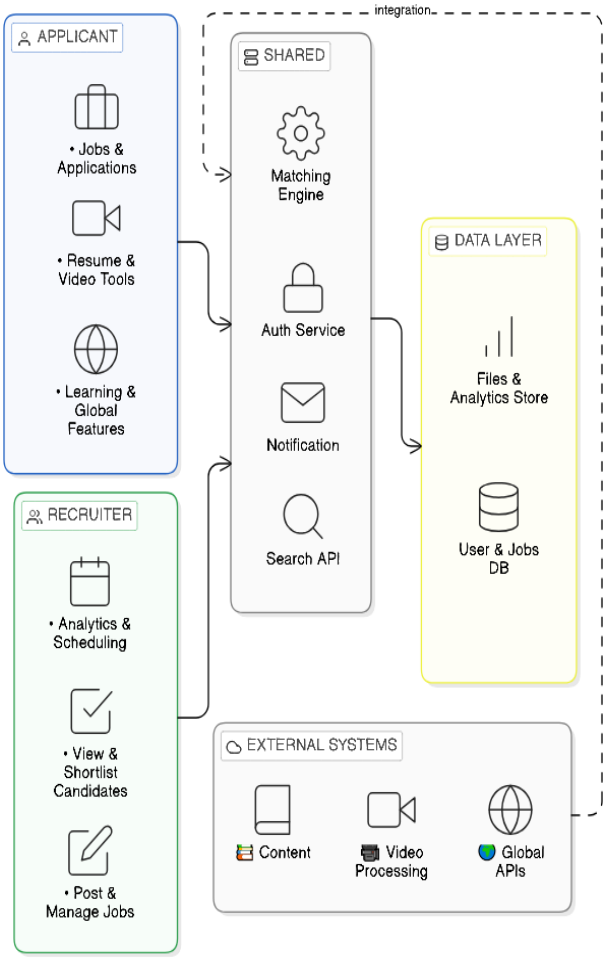

Figure 1 System Architecture of Jobsense System

3.2 Methodology

3.2. Data Input and Collection-

JobSense takes two primary inputs: candidate resumes and job descriptions. Resumes are collected through user uploads, while job descriptions are created and stored through the recruiter portal. Both documents are converted into machine-readable plain text before processing to ensure consistent downstream analysis.

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3.3. Text Preprocessing-

The extracted resume and job description text is cleaned to reduce noise and improve model performance. This includes basic normalization steps such as lowercasing, removal of unwanted symbols, and standardization of formatting. Important sections such as skills, education, and experience are retained for feature extraction and matching. Similar preprocessing and resume-text handling approaches have been used in previous resume analysis systems [5].

3.4. Feature Extraction and Representation

To capture relevant information from resumes and job descriptions, JobSense applies feature extraction using NLP techniques. A TF-IDF based representation is used as a baseline to quantify the importance of key terms in the text [5]. In addition, deep contextual embeddings are generated using transformer-based models to represent semantic meaning beyond keyword overlap [1], [8]. These embeddings provide richer contextual information and support better matching between candidate profiles and job requirements.

3.5. Semantic Matching and Candidate Ranking

JobSense performs semantic matching by computing similarity between the processed resume representation and the corresponding job description representation. Compatibility scores are generated based on semantic similarity and are used to rank candidates for a given job role. This ranking mechanism supports improved relevance compared to traditional keyword-based filtering approaches and aligns with modern job–resume matching research [7], [9], [10]. The ranked candidates and match scores are displayed to recruiters to support shortlisting and decision-making.

3.6. System Implementation-

The system is implemented using a modular architecture that supports scalability and efficient retrieval. A FastAPI backend manages authentication, resume parsing, matching workflows, and API-based communication. Structured records such as user profiles, job postings, and applications are stored in MySQL, while Redis is used for caching and session handling. Elasticsearch enables fast full-text search across resumes and job descriptions to support filtering and retrieval at scale. The system architecture is shown in Fig. 1.

3.7. Evaluation Metrics-

To evaluate JobSense, the model performance is measured using standard classification metrics including accuracy, precision, recall, and F1-score. These metrics help quantify matching performance and validate the effectiveness of semantic matching approaches in recruitment automation [5], [7]. A performance comparison with traditional methods is summarized in Table I.

4. Results and Discussion

4.1. Results

The implementation of JobSense achieved significant improvements in recruitment speed, accuracy, and reliability compared to existing keyword-based systems [3], [6]. By extracting semantic meaning from job descriptions and resumes, the system reduces screening time while improving overall match accuracy [1], [7], [8]. Platform and Algorithms:-

Table 1 Platforms and Algorithms Used

PLATFORM	Algorithm
LinkedIn Talent Solutions	Learning-to-Rank (LTR) Algorithm
Indeed ATS	TF-IDFKeyword Matching Algorithm
Zoho Recruit	Rule-Based Filtering Algorithm
JobSense (proposed)	Logistic Regression

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Table 2 Comparative Results with Existing Platforms

PLATFORM	PRECISION	RECALL	F1-SCORE	EFFICIENCY
Linked In Talent Solutions	0.84	0.88	0.83	0.83
Indeed ATS	0.74	0.76	0.73	0.76
Zoho Recruit	0.63	0.67	0.62	0.67
JobSense (proposed)	0.91	0.92	0.93	0.77

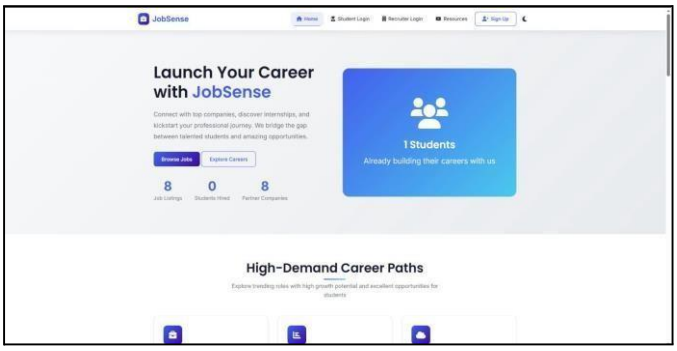

Figure 2 JobSense System User Interface

Figure 2 shows the main landing interface of the JobSense platform. It provides a clear overview of the system with easy navigation to key modules such as job browsing, career exploration, recruiter login, resources, and user registration. The interface is designed to be simple and user-friendly, helping users quickly understand the platform's purpose and access features for career development and job discovery.

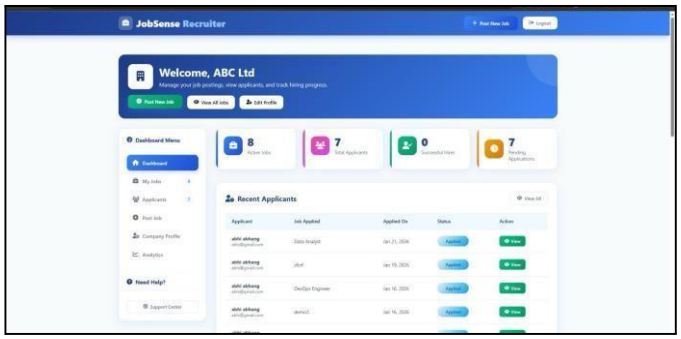

Figure 3 JobSense Recruiter Interface

Figure 3 represents the recruiter dashboard interface of JobSense. It allows recruiters to manage hiring activities through features such as posting jobs, viewing applications, monitoring hiring progress, and accessing candidate information. The dashboard provides summary metrics (such as job posts and applicant count) and presents candidates in an organized format, enabling faster screening and more efficient recruitment decisions.

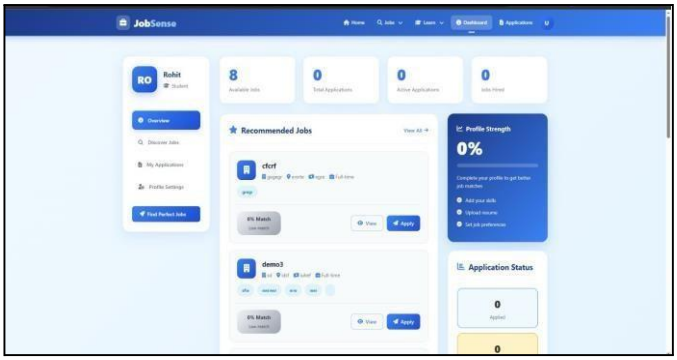

Figure 4 Jobsense Job Seeker User Interface

Figure 4 illustrates the job seeker dashboard interface of JobSense. It displays a personalized view that includes recommended job opportunities, profile strength status, and application tracking. The interface helps candidates explore relevant roles, apply efficiently, and monitor their progress, ensuring an improved job search experience with structured and guided career support.

4.2. Discussion

The results of JobSense suggest that semantic and context-aware recruitment systems can overcome key limitations of traditional keyword-based hiring platforms. The improved performance can be linked to the system's ability to understand resumes and job descriptions based on meaning instead of relying only on exact keyword overlap, which is a common weakness in conventional screening systems [3], [6]. By focusing on contextual relevance, the system is able to recognize similar skills expressed in different

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ways, which helps reduce unfair rejection of suitable candidates and improves overall matching quality [9], [10]. The reduction in mismatches further shows that JobSense supports more accurate shortlisting by prioritizing true skill alignment. This supports the idea that semantic similarity-based ranking can be more effective than purely keyword-driven filtering, especially in recruitment environments where resumes vary widely in format and wording [7], [8]. In practical hiring workflows, this directly benefits recruiters by minimizing the time spent on irrelevant applications and enabling faster decisions through compatibility scoring, leading to a more efficient recruitment process [3]. The strong system reliability highlights that JobSense is suitable for real-world usage where consistent access to candidate recommendations and job information is required. A stable and modular architecture also makes the platform more scalable, allowing it to maintain performance as the number of users and records increases. This strengthens the potential for broader adoption in larger recruitment settings and long-term deployment. However, the performance of JobSense may still depend on the quality and completeness of resumes and job descriptions. In cases where documents contain missing details or unclear information, semantic extraction and matching accuracy may be affected [5]. In addition, fairness and transparency remain important considerations for AI-driven recruitment, making ethical improvements such as bias monitoring and explainable recommendations essential for responsible deployment [3], [6]. Overall, the outcomes indicate that JobSense provides a meaningful improvement over conventional recruitment platforms by combining semantic matching, ranked recommendations, and automation. With future enhancements such as multilingual processing, deeper market analysis, and enterprise integration, the platform can become even more valuable for next-generation recruitment and career support [6].

Conclusion

This research presents JobSense as a practical and intelligent solution to the challenges faced in modern recruitment systems [3]. Traditional hiring platforms often rely on basic keyword matching, which can overlook capable candidates and slow down the hiring process [6], [9]. JobSense addresses these issues by using Natural Language Processing and Machine Learning techniques to understand the actual meaning behind resumes and job descriptions, rather than focusing only on exact word matches [4], [5]. The system demonstrates how semantic understanding can significantly improve the quality of job matching [1], [7], [10]. By analysing skills, experience, and role requirements in context, JobSense produces more accurate compatibility scores and greatly reduces resume screening time [7], [8]. The results clearly show improvements in match accuracy, recruiter satisfaction, and candidate engagement when compared to commonly used recruitment platforms [3], [6]. These findings highlight the effectiveness of intelligent automation in improving hiring outcomes [3]. JobSense is designed to benefit both job seekers and recruiters. For candidates, the platform acts as a career support system by suggesting relevant job opportunities, identifying skill gaps, and offering guidance for resume improvement and profess growth [6]. For recruiters, it simplifies the hiring workflow by providing ranked candidate lists with clear match scores, allowing faster and more confident decision making while reducing manual effort [4], [7]. The system architecture is built to be secure, scalable, and adaptable. Features such as secure authentication, encrypted data transmission, and feedback based model learning ensure reliability and continuous improvement. By incorporating recruiter feedback, the system evolves over time and adapts to changing job market requirements. Attention to fairness and transparency further strengthens the reliability of the platform in real world hiring scenarios [3], [6]. JobSense shows how artificial intelligence can be effectively applied to recruitment and job market analysis [3], [6]. The platform bridges the gap between job seekers and employers by enabling meaningful and accurate connections [9], [10]. With future enhancements such as support for multiple languages, deeper market analysis, and integration with enterprise hiring systems, JobSense has the

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potential to become a valuable tool for next generation talent acquisition and workforce planning [6].

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