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Meta Job Recommendation System Using AI and Semantic Similarity

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Abstract - This paper presents a Meta Job Recommendation System that provides intelligent job recommendations using Artificial Intelligence and semantic similarity techniques. The system operates on pre-collected job datasets obtained from platforms such as LinkedIn, Indeed, Naukri, and Kaggle. Job descriptions and user preferences are represented using semantic text embeddings to capture contextual relationships beyond traditional keyword matching. Facebook AI Similarity Search (FAISS) is employed to efficiently perform similarity-based retrieval between user profiles and job embeddings. The proposed approach improves recommendation relevance, scalability, and personalization while maintaining computational efficiency. The system is suitable for academic and practical applications, with future work focusing on real-time data integration and adaptive learning mechanisms.

1. INTRODUCTION

The rapid expansion of online recruitment platforms has led to an exponential increase in the number of job opportunities available to job seekers. Popular platforms such as LinkedIn, Indeed, and Naukri host millions of job postings across various industries and domains. While this growth has improved access to employment opportunities, it has also made the job search process complex and time-consuming. Job seekers often face difficulty in identifying suitable roles that align with their skills, experience, and career preferences due to the overwhelming volume of available listings.

Traditional job search and recommendation systems primarily rely on keyword-based filtering techniques. These approaches are limited in their ability to understand the semantic meaning of job descriptions and candidate profiles. Small variations in terminology, synonyms, or contextual differences can result in relevant job opportunities being missed or irrelevant jobs being recommended. Consequently, keyword-based systems often fail to provide accurate and personalized recommendations, leading to reduced user satisfaction.

To overcome these limitations, this paper proposes a Meta Job Recommendation System based on Artificial Intelligence and semantic similarity techniques. The system operates on pre-collected job datasets obtained from platforms such as LinkedIn, Indeed, Naukri, and Kaggle. Semantic text embeddings are generated to represent job descriptions and user preferences in a high-dimensional vector space, enabling contextual understanding of skills and requirements. Facebook AI Similarity Search (FAISS) is utilized to efficiently perform similarity matching between job embeddings and user profiles. The proposed system enhances recommendation accuracy, scalability, and personalization while remaining suitable for academic evaluation. Future work includes integrating real-time job data extraction and adaptive learning mechanisms to further improve system performance.

1.1 Background and Motivation

With the increasing digitization of recruitment processes, online job portals have become the primary medium for connecting job seekers and employers. Platforms such as LinkedIn, Indeed, and Naukri continuously generate vast amounts of job-related data in the form of job descriptions, skill requirements, and role specifications. While this abundance of data provides opportunities, it also creates challenges in efficiently matching suitable candidates with relevant job openings.

Most existing job recommendation systems rely on traditional information retrieval techniques, such as keyword matching and rule-based filtering. These systems often fail to understand the contextual meaning of job descriptions and user skills, resulting in inaccurate or irrelevant recommendations. For example, candidates with similar skill sets but different terminology may not receive appropriate job suggestions due to rigid keyword constraints.

The motivation behind this work is to address these limitations by applying Artificial Intelligence and semantic similarity techniques to job recommendation. By leveraging semantic embeddings, textual job data can be represented in a meaningful numerical form that captures contextual relationships. This allows the system to identify relevant job opportunities even when exact keyword matches are not present. The use of FAISS further enables efficient similarity search over large datasets, making the recommendation process scalable and practical. This approach aims to improve recommendation accuracy, enhance user experience, and provide a robust foundation for intelligent job matching systems.

1.2 Problem Statement

Despite the availability of large volumes of job data on online recruitment platforms, existing job recommendation systems often fail to deliver accurate and personalized results. Most systems rely on keyword-based matching techniques, which are limited in their ability to understand the semantic relationship between job requirements and candidate skills. This results in irrelevant job recommendations and increases the effort required by users to manually filter suitable opportunities. Additionally, job data is typically scattered across multiple platforms such as LinkedIn, Indeed, and Naukri, making it difficult to analyze and utilize effectively. Therefore, there is a need for an intelligent job recommendation system that can operate on aggregated datasets and leverage semantic similarity techniques to provide relevant, accurate, and scalable job recommendations based on user skills and preferences.

2. LITERATURE REVIEW

Job recommendation systems have been widely studied in the fields of information retrieval and machine learning. Early approaches primarily relied on rule-based and keyword-matching techniques, where job recommendations were generated based on exact matches between user queries and job descriptions. Although simple to implement, these methods often failed to capture contextual similarities and resulted in irrelevant recommendations.

Recent research has focused on applying Natural Language Processing (NLP) and machine learning techniques to improve recommendation accuracy. Techniques such as TF-IDF, Word2Vec, and other embedding-based models have been used to represent textual job data in numerical form. These methods allow systems to capture semantic relationships between job descriptions and candidate skills, leading to more relevant recommendations.

Several studies have also explored similarity-based recommendation methods using vector space models and distance metrics. Facebook AI Similarity Search (FAISS) has been widely adopted for efficient nearest-neighbor search in large-scale datasets due to its high performance and scalability. However, many existing systems focus on single-platform data and lack effective aggregation mechanisms.

The literature indicates that combining job aggregation with semantic similarity-based recommendation can significantly enhance system effectiveness. This work builds upon existing research by integrating pre-collected job datasets from multiple platforms and applying semantic embeddings with FAISS to provide scalable and accurate job recommendations suitable for academic and practical applications.

4. Implementation

The proposed Meta Job Recommendation System was implemented using Python-based machine learning techniques and a web-based architecture. Multiple job datasets were collected from publicly available sources such as Kaggle, including job listings from platforms like LinkedIn, Indeed, and Upwork.

[1] 4.1 Dataset Description

The dataset consists of job titles, job descriptions, required skills, and other relevant attributes. Multiple CSV files were merged and processed to create a unified dataset for experimentation.

[2] 4.2 Data Preprocessing

The collected data was preprocessed to remove missing and duplicate entries. Text preprocessing techniques such as lowercasing, removal of stop words, and tokenization were applied to job descriptions and skill sets to ensure consistency.

[3] 4.3 Feature Extraction and Similarity Computation

TF-IDF vectorization and precomputed embeddings were used to convert textual job descriptions and user skills into numerical representations. Cosine similarity was applied to measure semantic similarity between user skills and job descriptions. A FAISS index was used to improve retrieval efficiency for large datasets.

[4] 4.4 System Architecture

The backend of the system was developed using **FastAPI**, which exposes RESTful APIs for job recommendation. The backend loads the precomputed embeddings and similarity index to generate ranked job recommendations. The frontend was developed using **Next.js**, providing a user-friendly interface for skill input and result visualization. The backend service was executed using the **Uvicorn** server.

5. Results and Discussion

5.1 Experimental Setup

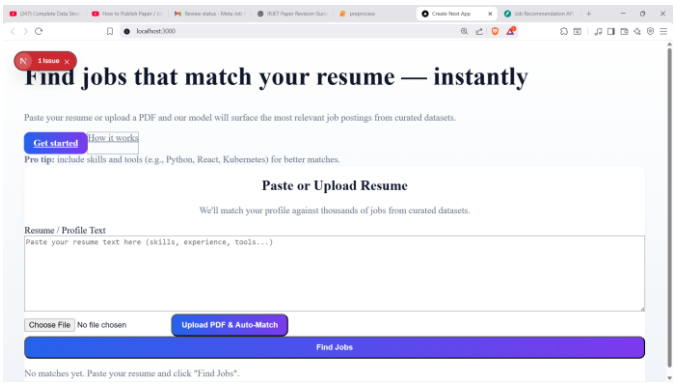
The system was tested by providing a set of user skills as input through the backend API and frontend interface. The API execution was verified using FastAPI's built-in Swagger UI.

5.2 Sample Results

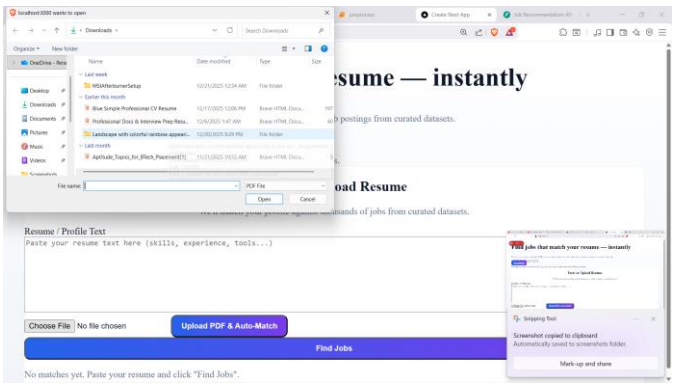
For an input such as *"Python, Machine Learning, Data Analysis"*, the system generated the following top job recommendations:

Job Title	Similarity Score
Data Analyst	0.82
Machine Learning Engineer	0.79
AI Intern	0.75

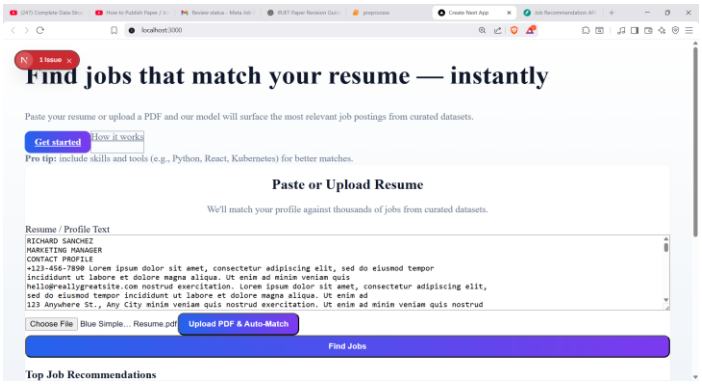
1. *This is my UI which Help to interact with the users and connected with backend to recommend the job and platform.*



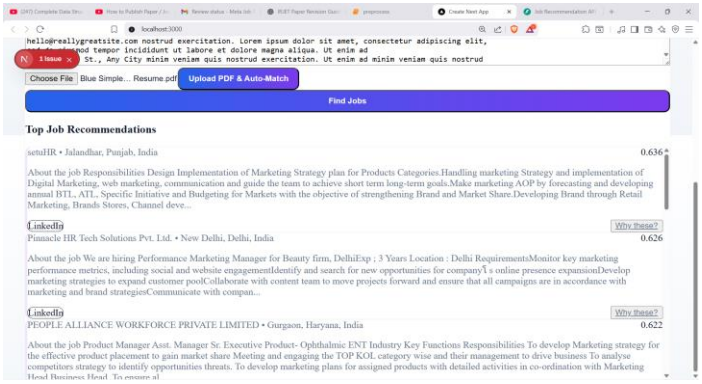
2. *This is Input Phase where you can select the resume for job recommendations .*



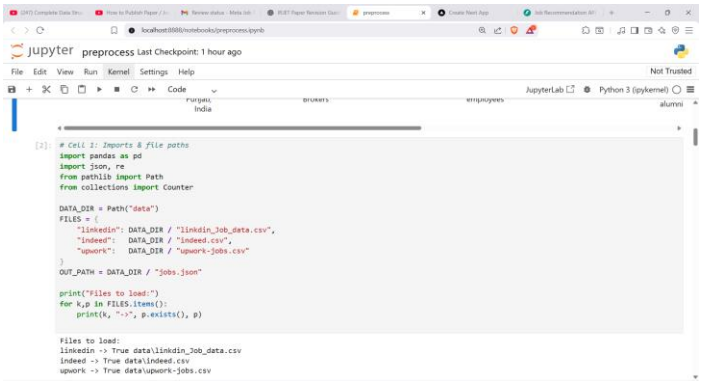
3. *This is Processing phase of the text where model extract the key features like what are thir skills to recommend the job.*



4. *This is the Main Output Phase Where you see the best fit jobs and platform as well as why its best for you and how much compatable you are .*



5. *This is the model training phase where I preprocess the datasets in jupyter notebook.*



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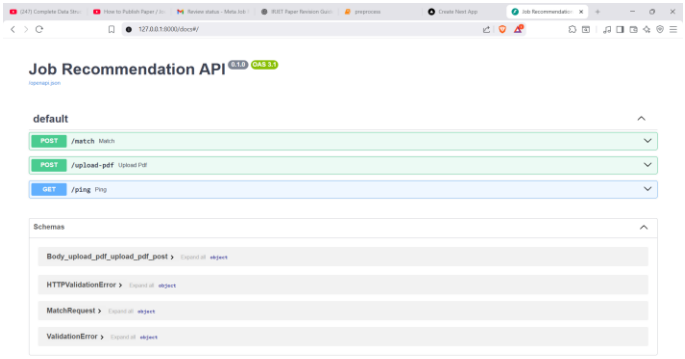
6. *This screenshot showing that backend is running perfectly without any Errors.*



5. CONCLUSION AND FUTURE WORK

This paper presented a Meta Job Recommendation System that leverages Artificial Intelligence and semantic similarity techniques to provide accurate and personalized job recommendations. By utilizing pre-collected job datasets from platforms such as LinkedIn, Indeed, Naukri, and Kaggle, the system effectively aggregates job information and overcomes the limitations of traditional keyword-based job search methods. Semantic embeddings were used to represent job descriptions and user preferences, while FAISS enabled efficient and scalable similarity-based retrieval. The proposed approach improves recommendation relevance, scalability, and overall user experience, making it suitable for academic and practical applications.

Although the current implementation operates on structured and pre-collected datasets, it demonstrates the effectiveness of semantic similarity in job recommendation systems. Future work includes integrating real-time job data extraction from online platforms, incorporating advanced transformer-based embedding models, and implementing user feedback mechanisms to enable adaptive and dynamic learning. These enhancements can further improve recommendation accuracy and system performance in real-world deployment scenarios.

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