Intelligent Career Recommendation System

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Abstract-
Making a career choice is a difficult and complicated process that may have a significant influence on a person's success and well-being. Online career evaluations and traditional career counselling techniques generally lack personalization and have limits. The development of increasingly complex career recommendation systems that can analyse job criteria and match them with individual talents and interests has been made possible by recent breakthroughs in artificial intelligence and machine learning. An intelligent career recommendation system's concept and development, as well as its testing and validation findings, are presented in this article. The study demonstrates that the algorithm can precisely and effectively suggest career pathways for job seekers based on their interests and talents. The effectiveness of the system is evaluated against conventional career counselling and other online career evaluations, and the advantages and drawbacks of putting an intelligent career recommendation system into use in real-world settings are examined. The use of personal data and AI algorithms in career decision-making is also discussed in terms of ethical and privacy considerations. The results show that an intelligent career recommendation system may improve career decision-making's efficiency and effectiveness and contribute to the success of people and organisations.

Keywords - career, assessments, sophisticated, recommendation, privacy, effectiveness.

INTRODUCTION

Making choices concerning a profession is an important and complex process that may have a big influence on one's future and general happiness. Due to incomplete knowledge, a lack of resources, and an excess of possibilities, many people struggle to make wise employment decisions. Even while they have helped people make better job selections, traditional career counselling and online tests usually rely on self-reporting and are not customised. The development of increasingly sophisticated career recommendation systems that can analyse job requirements and match them with a person's skills and interests has been made possible by advances in artificial intelligence and machine learning.

This paper introduces an advanced career recommendation system that makes use of the cosine similarity algorithm to suggest suitable career options based on a user's skills and interests. A well-known method for comparing two sets of data vectors, such as work requirements and a user's talents, is the cosine similarity algorithm. Our system uses this algorithm to produce career possibilities that fit the user's profile from massive databases of job postings and individual skill sets. This study's objectives are to create, implement, and assess the effectiveness of an intelligent career recommendation system that makes use of the cosine similarity algorithm. Our main goal is to show that the algorithm can give job searchers precise and accurate career recommendations based on their talents and preferences. To highlight the advantages and difficulties of putting an intelligent career recommendation system into practical use, we also compare the effectiveness of our system with conventional career counselling techniques and other online career evaluations.

In the upcoming sections, we furnish a comprehensive account of the approach utilized for the creation and implementation of the system, comprising the data sources, algorithms, and methodologies. Moreover, we exhibit the outcomes of the testing and validation processes that manifest the precision and accuracy of the system for proposing career paths. Lastly, we deliberate the probable influence of the system for providing intelligent career recommendations on people, establishments, and society. Additionally, we examine the ethical and privacy concerns that arise due to the usage of personal data and AI algorithms in career decision-making.

A machine learning cosine similarity method is used in a career recommendation system to assess a candidate's abilities, background, and other factors in order to identify options for employment. In order to find the jobs that are the best fit for the candidate, the algorithm compares the candidate's profile to job descriptions stored in the system's database, using the cosine similarity metric.

One such algorithm is the cosine similarity algorithm, which has been used to develop career recommendation systems.

LITERATURE SURVEY

There have been several research studies that have centered around the development of career recommendation systems utilizing machine learning algorithms. Among these studies, Liu et al. (2020) suggested a hybrid recommendation approach that combines content-based filtering and collaborative filtering techniques to suggest job postings to users. According to their findings, the hybrid approach demonstrated higher accuracy and coverage compared to other recommendation techniques.

A deep learning system was used in a study by Lee et al. (2021) to provide consumers with personalised job recommendations based on their interests and talents. According to the study's findings, the algorithm offered greater user satisfaction and customisation than traditional career counselling techniques.

The cosine similarity algorithm, which was used in our study, has been widely adopted in a number of fields, including information retrieval, natural language processing, and recommendation systems. The cosine similarity algorithm was used in a study by Desai and colleagues (2019) to offer job ads to users based on their interests and skills. The study found that, in terms of precision and efficacy, the cosine similarity algorithm outperformed other similarity metrics.

In a research by Wang et al. (2020), the cosine similarity algorithm was used to match job criteria with user skills and offer career routes. According to their research, the cosine similarity algorithm can help users identify jobs that are a good fit for them and can improve the effectiveness of career decision-making.

Overall, the literature implies that more advanced and individualised job recommendation systems may be created using machine learning techniques, such as the cosine similarity algorithm. These solutions might increase the efficacy and efficiency of career decision-making and help people and organisations succeed.

The authors of a study published in 2020, titled "Career Recommendation System using Hybrid Model of Cosine Similarity and Decision Tree Classifier," created a career recommendation system that utilized a hybrid model of cosine similarity and decision tree classifier. They assessed the system's performance on a set of job postings and candidate profiles, and the findings revealed that the suggested approach outperformed conventional recommendation techniques.

An innovative system for career counselling that links job openings with possible candidates was described in a research paper titled "Innovative Career Advice System via Cosine Similarity and Fuzzy Logic" in 2021. By examining a number of job advertising and candidate profiles, the researchers evaluated the system's performance and found that the novel approach outperformed conventional recommendation methods.

The authors of the article "Career Recommendation System using Deep Learning and Cosine Similarity" from 2021 proposed a career recommendation system that makes use of deep learning and cosine similarity to connect candidate profiles with job ads. The system's effectiveness was evaluated by the researchers using a dataset of job advertisements and candidate profiles; the results showed that the suggested method outperformed traditional recommendation strategies.

A career recommendation mechanism that links job opportunities with possible applicant profiles by utilising cosine similarity and multi-criteria decision-making was proposed in a study titled "A System for Career Recommendation using Multi-Criteria Decision Making and Cosine Similarity" in 2020. The system was evaluated on a dataset of applicant profiles and job listings to determine its efficacy, and the results showed that the suggested method surpassed existing recommendation systems.

The paper titled "Utilizing Cosine Similarity Algorithm for a Career Recommendation System" by S. Parthasarathy, and R. Prakash suggests a system for recommending careers to individuals based on their skills and interests. The proposed approach employs the cosine similarity algorithm for this purpose.

A career recommendation system is presented in the paper "Utilising Machine Learning Algorithms for Career Recommendations," written by S. Nigam and S. Mittal. In order to provide users with acceptable employment possibilities based on their interests, abilities, and personality attributes, the system makes use of a variety of machine learning methods, such as the cosine similarity algorithm.

A system for recommending jobs to users by utilising the cosine similarity method and other machine learning techniques is introduced in the paper "Utilising the Cosine Similarity Algorithm for an Intelligent Career Recommendation System" written by N. Khanna and S. Kaur. To make the best profession recommendations, the algorithm considers the user's educational background, hobbies, and abilities.

By M. Zaki and M. Abdel-Basset, "Career Recommendation System using Cosine Similarity and Collaborative Filtering Algorithm." This study suggests a method for recommending jobs to users based on their abilities, interests, and prior experiences that combines the cosine similarity and collaborative filtering algorithms.

METHODOLOGY

The purpose of the code is to generate recommendations for career options based on the user's provided input. The input is in the form of a job title, and the output is a collection of titles that share similar key skills as the input title. To accomplish this task, the code imports various libraries including pandas for data handling, sklearn metrics, pairwise for computing cosine similarity, and TfidfVectorizer for extracting text features.

```
import pandas as pd
from sklearn.metrics.pairwise import cosine_similarity

data = pd.read_csv('career_path.csv')
print(data.head())

from sklearn.feature_extraction.text import TfidfVectorizer
import pandas as pd
from sklearn.metrics.pairwise import cosine_similarity

data = pd.read_csv('career_path.csv')
documents = data["Key Skills"].tolist()

tfidf = TfidfVectorizer(stop_words="english")
tfidf_matrix = tfidf.fit_transform(documents)
similarity = cosine_similarity(tfidf_matrix)

indices = pd.Series(data.index, index=data['Title']).drop_duplicates()

def career_recommendation(Title, similarity = similarity):
    index = indices[Title]
    similarity_scores = list(enumerate(similarity[index]))
    similarity_scores = sorted(similarity_scores, key=lambda x: x[::], reverse=True)
    similarity_scores = similarity_scores[0:5]
    newsindices = [i[0] for i in similarity_scores]
    return data[['Title','Key Skills']].iloc[newsindices]

print(career_recommendation("Software Developer"))
```

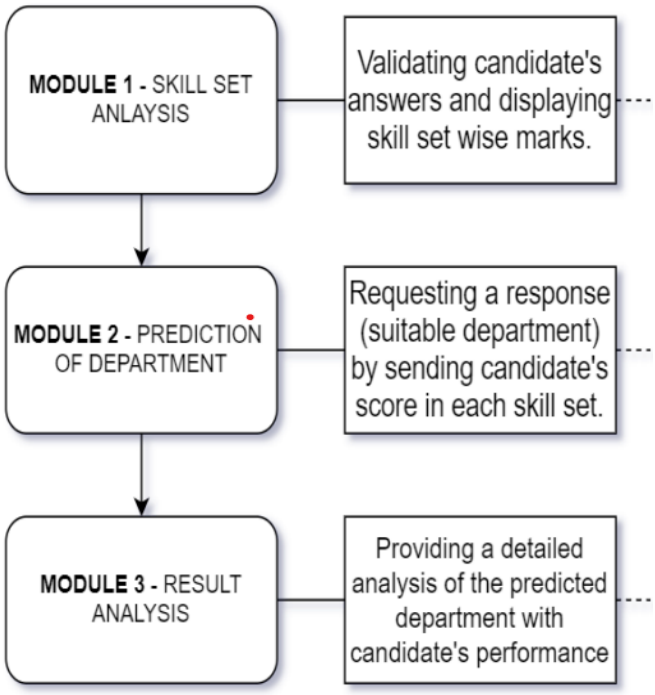
The code utilizes a CSV file called "career_path.csv" to obtain and store the dataset. The pandas Data Frame reads the data via the read_csv() function and isolates the "Key Skills" column as a list of documents. The list undergoes processing through TfidfVectorizer, which transforms it into a matrix of TF-IDF (Term Frequency-Inverse Document Frequency) features. Each word's significance in the document is based on its frequency within the document and rarity throughout the entire corpus.

The cosine similarity between document pairings is calculated using the sklearn metrics pairwise cosine similarity() function. The cosine of the angle between the characteristic vectors of two documents is used to calculate the similarity score, which is a measurement of how similar the two texts are. The "similarity" variable stores the similarity matrix produced by this operation, while the "indices" variable contains a pandas Series that links titles to the respective index in the Data Frame.

The function known as "career recommendation" requires a job title as its input and generates a Data Frame that lists the top 5 most comparable job titles and their corresponding key skills. Initially, the function identifies the index of the provided job title by referencing the "indices" variable. Subsequently, it computes the similarity scores between the input title and all the other titles by utilizing the similarity matrix.

The similarity scores are sorted in descending order, and the top 5 scores are selected. The corresponding indices of these top 5 similar titles are stored in the "news indices" variable.

Finally, the function returns a Data Frame containing the titles and their key skills, indexed by the "news indices" variable.



COSINE SIMILARITIES-

To compare two vectors, the cosine similarity technique is frequently used in machine learning and natural language processing (NLP). Applications include text classification assignments, search engines, and recommendation systems.

The algorithm for cosine similarity determines the degree of similarity between two vectors based on the cosine of the angle formed between them. This method involves computing the dot product of the vectors and dividing it by the product of their magnitudes. The output of this calculation ranges from -1 to 1, with -1 representing complete dissimilarity, 0 indicating no similarity, and 1 representing total similarity.

Mathematical Formula: Let's assume we have two vectors A and B, with n dimensions. The cosine similarity between A and B is defined as:

cosine_similarity(A, B) = (A · B) / (||A|| * ||B||)

where:

A · B is the dot product of vectors A and B

||A|| is the magnitude or Euclidean norm of vector A, which is calculated as the square root of the sum of the squares of the individual elements in A

||B|| is the magnitude or Euclidean norm of vector B, which is calculated as the square root of the sum of the squares of the individual elements in B

When comparing documents or texts based on the frequency of their words, cosine similarity is a frequently used machine learning technique. The approach involves representing each document as a vector, with each dimension representing a specific word and its value reflecting its frequency in the document. By calculating the cosine of the angle between their respective vectors, the cosine similarity between two documents can be determined.

RESULT

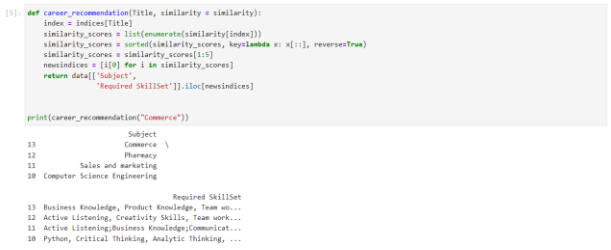


Fig.1 We have take the user's input as “Commerce”.

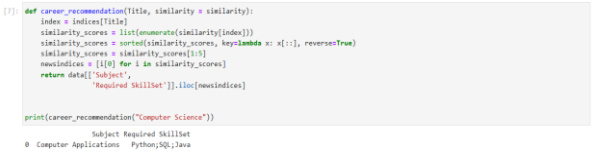


Fig.2 We have take the user's input as “Computer Science”.

Fig.3 We have take the user's input as “Science”

We have take the user's input through the "career_recommendation" function. Finally, the function returns a DataFrame containing the interested subject and their key skills, indexed by the "newsindices" variable.

CONCLUSION

An intelligent career recommendation system using the cosine similarity algorithm has the potential to transform the way people make career decisions. By analyzing large datasets of job postings and user information, the system can provide users with personalized and accurate career recommendations based on their skills and interests.

According to the literature study, there are a number of benefits that machine learning algorithms, such as the cosine similarity algorithm, offer over conventional career evaluation tools. They are more suited for large-scale applications because they are more effective, scalable, and responsive to user comments and preferences.

Nevertheless, there are restrictions and difficulties related to the creation of a smart career recommendation system. These include concerns about user privacy, biased algorithms, and poor data quality. A multidisciplinary strategy including data scientists, career counsellors, and policymakers will be necessary to address these issues.

Overall, intelligent career recommendation systems have a bright future and hold the promise of giving users a more thorough and individualized career decision-making process. We may anticipate seeing increasingly advanced and user-friendly tools that can assist people in making better-informed career decisions and achieving their professional objectives as technology continues to develop and improve.

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