

A Project Report on Job Recommendation System  
Using Python

*Submitted by*

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## **Index**

<b>Title</b>	<b>Page No</b>
<b>Aim</b>	<b>3</b>
<b>Objective</b>	<b>3</b>
<b>Introduction</b>	<b>4</b>
<b>Proposed Work</b>	<b>5-7</b>
<b>Architecture Diagram</b>	<b>8</b>
<b>Implementation</b>	<b>9-27</b>
<b>Result</b>	<b>28-30</b>
<b>Conclusion</b>	<b>31</b>

## **Aim**

The aim of this project is to implement a system which can recommend jobs to candidates based on their skills or previous job title, or job description and help candidates during job hunting season.

## **Objective**

With there being many jobs across various job hunting portals such as LinkedIn, Indeed, Naukri, Glass Door, and etc it is often very difficult for candidates to find jobs suitable for them. So often a job recommendation system is needed by candidates to filter through all the jobs posted across the various job hunting portals available in the Internet and find the jobs that are most suited to them based on their previous job title or job skills or job description. With the help of this recommendation system candidates can find the best available jobs in the market according to their skills or previous job titles. The recommendation system will be using the power of Artificial Intelligence to recommend jobs to candidates.

## Introduction

For recommending jobs there are lots of methods to do so but the most commonly used method to recommend jobs is Content-based filtering which is the method we will be using to recommend jobs to users based on their job title, job skills or job description. The content-based filtering approach mainly focuses on item similarity that is similarity in job titles or similarity in job skills or similarity in job description. Based on this item similarity recommendations are provided to the user based on this similarity. To do this we will be using TD-IDF (Term Frequency-Inverse Document Frequency) Vectorizer to help transform the data like job skills or job titles or job descriptions into a matrix containing td-idf scores between each data which determines the importance of each data/document in a group of all the documents then using cosine similarity we compute the similarity scores between the data present in the same group of documents represented by their td-idf scores and after sorting the similarity scores in descending order the job titles/job skills/job descriptions having the highest similarity compared to the data given by the user will be given as recommendations to the user.

## Proposed Work

- We first plan to preprocess the dataset we have downloaded from kaggle based on which our model will give job recommendations to the candidates who will give either their previous job title/job skills/job descriptions
- The Dataset Link :  
<https://www.kaggle.com/datasets/asaniczka/software-engineer-job-postings-linkedin>
- Our model will be completely coded in python programming language and libraries from scikit learn, nltk , beautiful soup , pandas and etc will be used
- Then for preprocessing our data,we are going to remove all the duplicate values from the columns such as job\_title, company,job\_description and job\_skills so that our model avoid any issues that may arise when giving data to our model and maintain accuracy.
- And also we will remove column first\_seen as it contains the same date which is not useful for our model.
- Then in the job\_description column we will remove all the html links using beautiful\_soup from the data in job\_description then we will remove all the stopwords(which are the words most commonly used in English but not relevant in machine learning) not relevant for our model will also be removed using nltk library.
- We will also have removed all the null values from the dataset.

- After preprocessing the data we will fit this preprocessed data into our model by utilizing only one column at a time such as job\_title, job \_skills and job\_description and making recommendations based on that to the user.
- After selecting the column based on which we want to give recommendations, fit the data inside the TF-IDF Vectorizer which will transform the data into a matrix containing the td-idf scores which determines the importance of each data entry/document.
- Based on these td-idf scores we will then compute the cosine similarity between two identical vector which will contain each data entry/document which will be represented by the td-idf scores.
- After the cosine similarity scores is computed the scores will be represented by a symmetric matrix containing all the similarity scores.
- After the similarity scores matrix is computed and generated, we will then give the top 25 job recommendations to the candidates which have the highest similarity scores.
- Approach to be followed for implementation of model
- This model is built based on content-based recommendation, using TF-IDF vectorization and cosine similarity to analyze job titles.

- **TF-IDF Vectorization:**

- Using `TfidfVectorizer` from `scikit-learn`, job titles/job skills/job descriptions are transformed into TF-IDF matrices, where each row represents a job title, and each column represents a term in the vocabulary. TF-IDF scores quantify the importance of each term within a job title relative to the entire collection of job titles/job skills/job descriptions.

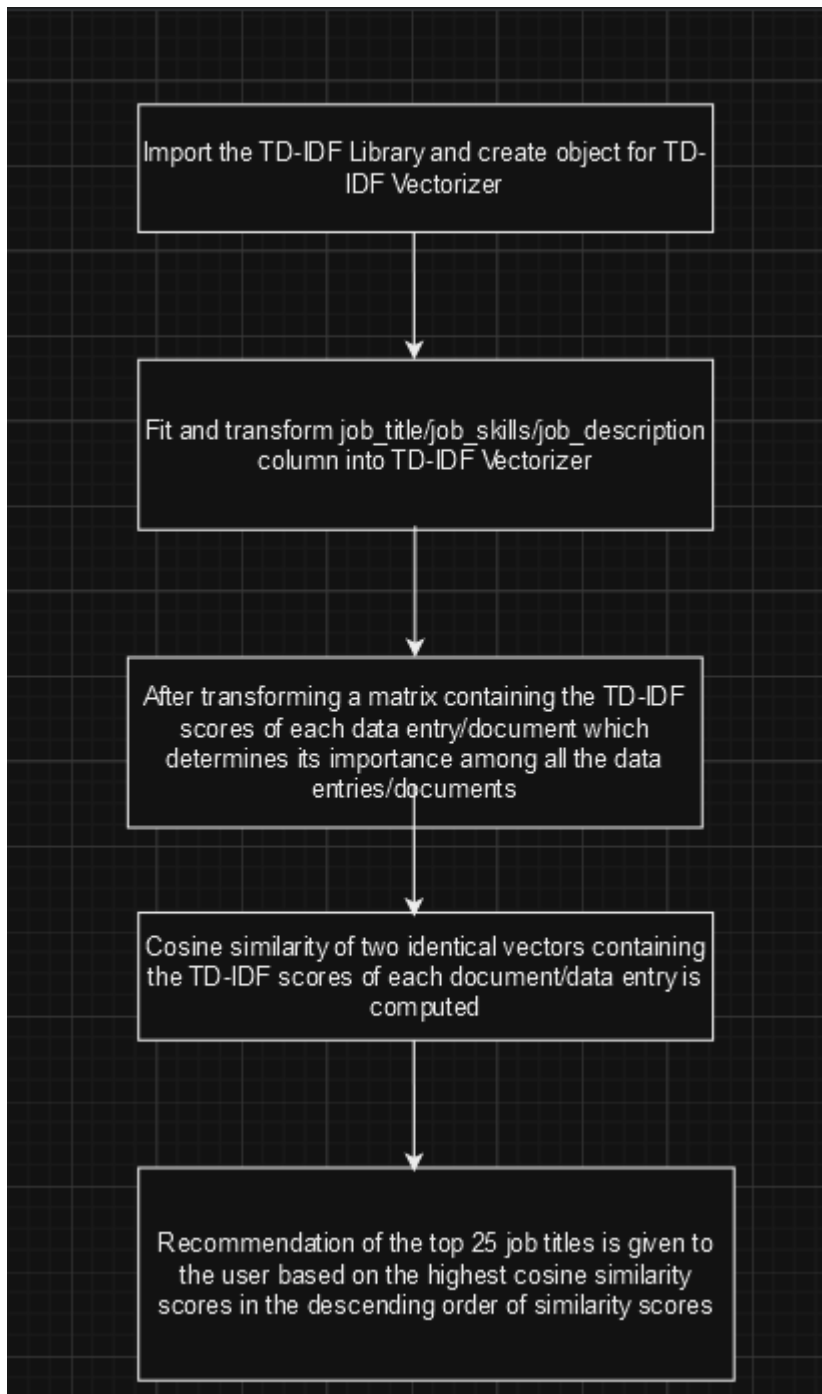
- **Cosine Similarity Calculation:**

- `cosine_similarity` from `scikit-learn` computes the cosine similarity between pairs of job titles based on their TF-IDF scores. The resulting matrix contains similarity scores, indicating the resemblance between job titles/job skills/job descriptions.

- **Recommendation Function:**

- A function called `recommendation` is defined to provide job title recommendations for a given input job title.
- It retrieves the index of the input job title, sorts similarity scores in descending order, selects the top 25 similar job titles, and returns them as recommendations.

## Architecture Diagram





# IMPLEMENTATION

## Preprocessing of the data

```
[134] #Creating kaggle.json file to download the dataset
mkdir -p ~/.kaggle
!cp kaggle.json ~/.kaggle/

mkdir: cannot create directory 'p': File exists
mkdir: cannot create directory '/root/.kaggle': File exists
cp: cannot stat 'kaggle.json': No such file or directory

[135] #Downloading the dataset from kaggle
!kaggle datasets download -d asaniczka/software-engineer-job-postings-linkedin

Dataset URL: https://www.kaggle.com/datasets/asaniczka/software-engineer-job-postings-linkedin
License(s): ODC Attribution license (ODC-BY)
software-engineer-job-postings-linkedin.zip: Skipping, found more recently modified local copy (use --force to force download)

[136] #Importing the required modules such as numpy pandas and zipfile
import numpy as np
import pandas as pd
import zipfile

#Extracting the downloaded dataset as a csv file
zip_ref=zipfile.ZipFile('/content/software-engineer-job-postings-linkedin.zip','r')
zip_ref.extractall('/content')
#Reading the extracted csv file
df=pd.read_csv('/content/postings.csv')
df.head()
```

	job_title	company	job_location	job_link	first_seen	search_city	search_country	job_level	job_type	job_summary	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	<a href="https://www.linkedin.com/jobs/view/c%23-softwa...">https://www.linkedin.com/jobs/view/c%23-softwa...</a>	2023-12-25	Covington	United States	Associate	Remote	At E Tech Group, joining our team means joinin...	C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Progr...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	<a href="https://www.linkedin.com/jobs/view/software-im...">https://www.linkedin.com/jobs/view/software-im...</a>	2023-12-25	Covington	United States	Associate	Remote	Kardex Remstar is looking for a\nSoftware Impl...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...)	Jobs for Humanity	Chattanooga, TN	<a href="https://www.linkedin.com/jobs/view/senior-soft...">https://www.linkedin.com/jobs/view/senior-soft...</a>	2023-12-25	Chattanooga	United States	Mid senior	Onsite	Company Description\nJobs for Humanity is part...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
3	Senior Manager, Software Engineering, Full Stack	Jobs for Humanity	Chattanooga, TN	<a href="https://www.linkedin.com/jobs/view/senior-mana...">https://www.linkedin.com/jobs/view/senior-mana...</a>	2023-12-25	Chattanooga	United States	Mid senior	Onsite	Company Description\nJobs for Humanity is part...	JavaScript, Java, TypeScript, SQL, Python, Go...
4	Lead Software Engineer, Full Stack(JavaScript/...	Jobs for Humanity	Chattanooga, TN	<a href="https://www.linkedin.com/jobs/view/lead-softwa...">https://www.linkedin.com/jobs/view/lead-softwa...</a>	2023-12-25	Chattanooga	United States	Mid senior	Onsite	Company Description\nJobs for Humanity is part...	JavaScript, Java, AWS, Vue.js, HTML/CSS, TypeS...

Next steps: [Generate code with df](#) [View recommended plots](#)

```
[137] #Checking the data type of all the columns used in the dataset
df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9380 entries, 0 to 9379
Data columns (total 11 columns):
 #   Column             Non-Null Count  Dtype  
---  --
 0   job_title          9380 non-null   object  
 1   company            9380 non-null   object  
 2   job_location       9380 non-null   object  
 3   job_link           9380 non-null   object  
 4   first_seen         9380 non-null   object  
 5   search_city        9380 non-null   object  
 6   search_country     9380 non-null   object  
 7   job_level          9380 non-null   object  
 8   job_type           9380 non-null   object  
 9   job_summary        9376 non-null   object  
10   job_skills         9367 non-null   object  
dtypes: object(11)
memory usage: 806.2+ KB

[138] #Frequency of the data from job_title column
df['job_title'].value_counts()

job_title
Senior Software Engineer    794
Software Engineer           588
Software Developer          178
Senior Software Developer   145
Embedded Software Engineer  118
...
Jr. Software Developer      1
Software Developer - Fixed Income  1
Software Engineer - Web Front End  1
Software Developer (ASP.NET / C#)  1
6J7BI3-Software Engineer 3 - 6D6-Real Time Software Engineer with Security Clearance  1
Name: count, Length: 3870, dtype: int64

[139] #Frequency of the data from company column
df['company'].value_counts()
```

```

company
Jobs for Humanity      681
Canonical              289
Recruiting from Scratch 201
Affirm                 137
ClearanceJobs          110
...
Applied EV - Software Defined Machines™ 1
V2 Digital             1
MedHealth              1
Cadmus                 1
IAMUS                  1
Name: count, Length: 3373, dtype: int64

[140] #Frequency of the data from company column
df['job_location'].value_counts()

job_location
San Francisco, CA      133
London, England, United Kingdom 104
New York, NY           98
United States          82
Boston, MA             81
...
Devon, England, United Kingdom 1
Livermore, CA             1
Farrington, England, United Kingdom 1
Bryn Mawr, PA            1
Baton Rouge, LA         1
Name: count, Length: 1618, dtype: int64

[141] #Frequency of the data from job_link column
df['job_link'].value_counts()

job_link
https://www.linkedin.com/jobs/view/cx23-software-engineer-at-e-tech-group-3780474203 1
https://www.linkedin.com/jobs/view/embedded-software-engineer-a-at-anka-group-lp-3769753918 1
https://www.linkedin.com/jobs/view/senior-software-engineer-distributed-systems-at-recruiting-from-scratch-3744398100 1
https://www.linkedin.com/jobs/view/senior-software-engineer-protocol-at-recruiting-from-scratch-3744392276 1
https://www.linkedin.com/jobs/view/senior-embedded-software-engineer-at-recruiting-from-scratch-3773088748 1
...
https://www.linkedin.com/jobs/view/senior-software-engineer-at-siriusxm-3665706452 1
https://www.linkedin.com/jobs/view/staff-software-engineer-at-pandora-3786100094 1
https://www.linkedin.com/jobs/view/software-data-engineer-java-at-jobs-for-humanity-3791055047 1
https://www.linkedin.com/jobs/view/software-data-engineer-java-at-jobs-for-humanity-3786353531 1
https://www.linkedin.com/jobs/view/6f7b13-software-engineer-3-6d6-real-time-software-engineer-with-security-clearance-at-clearancejobs-3790463682 1
Name: count, Length: 9388, dtype: int64

[142] #Frequency of the data from first_seen column
df['first_seen'].value_counts()

first_seen
2023-12-25    9380
Name: count, dtype: int64

[143] #Frequency of the data from search_city column
df['search_city'].value_counts()

search_city
Novato      92
Layton      77
Baltimore   76
Alabama     75
Pasadena    74
..
San Francisco 1
Connecticut  1
Killeen      1
Southend-on-Sea 1
Corona       1
Name: count, Length: 709, dtype: int64

[144] #Frequency of the data from search_country column
df['search_country'].value_counts()

search_country
United States    7335
United Kingdom  1108
Canada          675
Australia       262
Name: count, dtype: int64

[145] #Frequency of the data from job_level column
df['job_level'].value_counts()

job_level
Mid senior    8101
Associate    1279
Name: count, dtype: int64

```

```
[146] #Frequency of the data from job_type column
df['job_type'].value_counts()

job_type
Onsite    4316
Hybrid    2745
Remote    2319
Name: count, dtype: int64

[147] #Frequency of the data from job_skills column
df['job_skills'].value_counts()

job_skills
Java, Python, SQL, Node, Go, Scala, AWS, GCP, Azure, Agile, Open source frameworks
3
Python, Django, Flask, Celery, React, Angular, Node.js, Go, RDS Aurora, GitHub, ArgoCD, Pants, CircleCI, Datadog, Honeycomb, AWS, Kubernetes, Traefik
3
Backend engineering, Fullstack engineering, Infrastructure engineering, Platform engineering, Site reliability engineering, Engineering management, Data engineering, Machine learning engineering, Principal software engineering
3
Cloud, AI, ML, IoT, 5G, Quantum computing, RPA, BluePrism, Automation Anywhere, UIPath, WorkFusion, SQL
3
Java, React
2
..
Java, Python, Scala, Cassandra, Redis, AWS, Apache Spark, NoSQL, UNIX/Linux, Agile, Machine learning, Microservices, Cloud computing, Full stack development
1
Machine Learning, Cyber Security, Big Data Analytics, Full Stack Development, Agile Development, Cloud Computing, DevOps, React, Node.js, TypeScript, SQL, Python, Apache Spark, AWS RDS Databases, Docker, Kubernetes, Unit Testing, Code Review, Infrastructure Management, Deployment Pipelines
1
TypeScript, JavaScript, Playwright, Selenium, Robot, GitLab, Docker, Git, CI/CD, API testing, Agile, SCRUM, Manual regression test cases, Test automation, Test framework development, Azure DevOps, AWS, .NET technologies, Source control, Branch management strategies
1
Python, Node JS, GraphQL, REST, JavaScript, HTML, CSS, SASS, LESS, Bootstrap, React, Angular, Vue, AWS, API Gateway, Lambda, Event Bridge, SQS, SNS, S3, CloudWatch, Responsive web design, Agile, Jenkins, Gulp
1
C, C++, C#, Python, Java, Ada, Cameo, Open Architecture, OMS, DevSecOps, AvionX Defense Mission Computing (DMC), Jira, Agile, U.S. Security Clearance, Software Engineering, Computer Science, Engineering, Mathematics, Physics, Chemistry
1
Name: count, Length: 9340, dtype: int64

#Frequency of the data from job_summary column
df['job_summary'].value_counts()

job_summary
For more than 50 years, NISC has worked to develop technology solutions for our customers, who we call our "Members". Those Members are comprised primarily of 900+ utility and broadband companies across the country and abroad and we strive to provide services and technology to help them operate efficiently and better serve their end users. Our Members have over 16 million end customers (residential and businesses who receive power, internet, television and/or telephone services) that our enterprise software solution enables our Members to compete effectively in the industry, while excelling in customer service. NISC is always seeking out experienced and talented software engineers that are motivated, enjoy working with others and solving complex challenges. We look for individuals who will thrive in a team environment, be committed to accomplishing a common goal and aren't afraid to learn new things and have some fun along the way. Primary Responsibilities: Whether you're a full stack engineer or have preferences in certain areas of development we do it all. NISC's core business is developing software it's who we are. So if you like iOS or Android, great! If you prefer backend over front end, awesome! Server side to client side, web apps to desktop just apply here and we'll take the conversation from there. NISC is looking for passionate engineers to add to our team to push our Cloud solutions to their fullest potential. You'll work with our talented engineers to design, build and evolve our browser-based solutions. This position will work closely with our product, quality assurance and support staff to ensure quality and functionality requirements are met. Essential Functions: Complete complex software maintenance and enhancements independently within assigned software application or program with impact the broader solution, contributing to the development of existing frameworks and system architecture. Analyze and translate advanced level user requirements and design into software, with a focus on multiple areas of the solution. Follow and enforce established software development methodologies and procedures. Design and build responsive web applications. Stand up restful web services. Contain driven development (Kubernetes, micro-services). Collaborate with cross-functional teams to research, design and implement new features. Research, analyze, and resolve moderately complex customer issues and bugs. Unit test and integration test code as needed. Follow all established software development methodologies and procedures. Other duties as assigned. Desired Experience and Skills: Generally, requires 6+ years' experience in software development. Proficient with Angular, Java, React, TypeScript or GWT. Experience with cloud technology stack (AWS, Kubernetes, Spring Boot, Kafka, SSO, Cassandra). Proficient with developing responsive content. Java or other Object Oriented Languages Experience. Experience with RDBS (Postgres, SQL, Oracle). Understand the core aspects of web development (patterns, architecture, IDE). Experience with asynchronous workflows/patterns. Working knowledge of web trends, architecture and deployment patterns. Experience with Git including branching/merging workflows. Experience with JIRA, Confluence, Bitbucket, Bamboo. Commitment to NISC's Statement of Shared Values. NISC's Shared Values & Competencies: We're a cooperative, which means we're owned by the Members we serve. It also means that our focus is on taking care of our Members and our employees, rather than having a big bottom line. Quality service and innovative technology starts with happy and dedicated employees. Join our team and learn for yourself what sets NISC apart. Integrity - We are committed to doing the right thing - always. Relationships - We are committed to building and preserving lasting relationships. Innovation - We promote the spirit of creativity and champion new ideas. Teamwork - We exemplify the cooperative spirit by working together. Empowerment - We believe individuals have the power to make a difference. Personal Development - We believe the free exchange of knowledge and information is absolutely necessary to the success of each individual and the organization. Benefits: Medical, Dental and Vision Insurance. Health Savings Account (HSA) with $100 monthly contributions from NISC. Like to walk? Improve your overall wellness knowledge? Ability to earn up to $800 additional dollars into your HSA each year through our Wellness Rewards program. Dependent Care Flexible Spending Account (FSA) thru Paylocity. Fully covered life insurance up to x3 annual base salary. Fully covered short- and long-term disability. 401(k), traditional or Roth, with employee match up to 6% and employer 4% salary base contributions. PTO accrual levels dependent on years of service, 120 life Leave Event hours, and 9 paid sick leave days and 120 annual leave days. Accrued leave procedures and documents. Test results to ensure software system requirements are met. Proven technical leadership for software projects, support, generation and maintenance of software processes, tools and metrics. Executes and documents software research and development projects. Serves as a subject matter expert for software domains, system-specific issues, processes and regulations. Tracks and evaluates software team to ensure product and process conformance to project plans and industry standards. Works under general direction. Required Skill Set: Bachelor of Science degree from an accredited course of study, in Computer Engineering, Software Engineering, Computer Science or other technical degree. 5+ experience programming in C, C++, C#, Python, Java, or Ada. 1+ experience with developing embedded real time software. 1+ experience with requirements, design, development, and test of software systems products. Desired Skills Set: Experience developing mission systems software on aircraft platforms. Experience developing and documenting software architecture using Cameo, or similar Model Based Systems Engineering tools. Experience with Open Architecture standards, such as OMS. Experience with DevSecOps and/or complex software build plans. Experience with integrating/utilizing AvionX Defense Mission Computing (DMC) software. Experience working on an Agile team using Agile methodologies and tools such as Jira. Active Secret U.S. Security Clearance. Ability to obtain special program access. Strong coordination and communication skills. Ability to work in a multi-tasking environment while supporting multiple concurrent activities. Ability to work effectively in a collaborative team environment. Education Qualification: Education/experience typically acquired through advanced technical education from an accredited course of study in engineering, computer science, mathematics, physics or chemistry (e.g. Bachelor) and typically 5 or more years' related work experience or an equivalent combination of technical education and experience (e.g. PhD, Master+3 years' related work experience). In the USA, AClient accreditation is the preferred, although not required, accreditation standard. Indotronix is an Equal Opportunity Employer. Show more. Show less
1
Name: count, Length: 7763, dtype: int64

[149] #Checking Sum of null values of all the columns in the dataset
df.isna().sum()

job_title      0
company        0
job_location   0
job_link       0
first_seen     0
search_city    0
search_country 0
job_level      0
job_type       0
job_summary    4
job_skills     13
dtype: int64
```

```
#Removing column first seen as it is all the data on the same day and will not be required for the job recommendation system
df.drop('first_seen',axis=1,inplace=True)
df
```

	job_title	company	job_location	job_link	search_city	search_country	job_level	job_type	job_summary	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	https://www.linkedin.com/jobs/view/c%23-softwa...	Covington	United States	Associate	Remote	At E Tech Group, joining our team means joinin...	C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Progr...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	https://www.linkedin.com/jobs/view/software-impl...	Covington	United States	Associate	Remote	Kardex Remstar is looking for a nSoftware Impl...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-soft...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
3	Senior Manager, Software Engineering, Full Stack	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-mana...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, TypeScript, SQL, Python, Go...
4	Lead Software Engineer, Full Stack(JavaScript/...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/lead-softwa...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, AWS, Vue.js, HTML/CSS, TypeS...
...	...	...	...	...	...	...	...	...	...	...
9375	Software Engineer 3 - 6D6-Real Time Software E...	HireTalent - Diversity Staffing & Recruiting Firm	Berkeley, MO	https://www.linkedin.com/jobs/view/software-en...	Saint Paul	United States	Mid senior	Onsite	Job Description: We are currently seeking an i...	C, C++, C#, Agile software development, Comput...
9376	Real Time Software Engineer 3	Blackstone Talent Group	Berkeley, MO	https://www.linkedin.com/jobs/view/real-time-s...	Saint Paul	United States	Mid senior	Onsite	Blackstone Talent Group, an award-winning tech...	Real Time Software Engineer, Computer Engineer...
9377	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C/C++, C#, Python, Java, Ada, Linux, Windows, ...
9378	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	LanceSoft, Inc.	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Job Description/nClient is looking for a Senio...	C, C++, C#, Python, Java, Ada, Linux, Windows...
9379	6J7B13-Software Engineer 3 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b13-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C, C++, C#, Python, Java, Ada, Cameo, Open Arc...

9380 rows x 10 columns

```
[151] #Renaming columns from dataset for easier reading
df.rename(columns = {'search_city':'city_name'}, inplace = True)
df.rename(columns = {'search_country':'country_name'}, inplace = True)
df.rename(columns={'job_type':'mode_of_job'},inplace=True)
df.rename(columns={'job_summary':'job_description'},inplace=True)
df.rename(columns={'job_level':'job_level'},inplace=True)
df
```

	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	https://www.linkedin.com/jobs/view/c%23-softwa...	Covington	United States	Associate	Remote	At E Tech Group, joining our team means joinin...	C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Progr...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	https://www.linkedin.com/jobs/view/software-im...	Covington	United States	Associate	Remote	Kardex Remstar is looking for a nSoftware Impl...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-soft...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
3	Senior Manager, Software Engineering, Full Stack	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-mana...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, TypeScript, SQL, Python, Go...
4	Lead Software Engineer, Full Stack(JavaScript/...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/lead-softwa...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, AWS, Vue.js, HTML/CSS, TypeS...
...	...	...	...	...	...	...	...	...	...	...
9375	Software Engineer 3 - 6D6-Real Time Software E...	HireTalent - Diversity Staffing & Recruiting Firm	Berkeley, MO	https://www.linkedin.com/jobs/view/software-en...	Saint Paul	United States	Mid senior	Onsite	Job Description: We are currently seeking an i...	C, C++, C#, Agile software development, Comput...
9376	Real Time Software Engineer 3	Blackstone Talent Group	Berkeley, MO	https://www.linkedin.com/jobs/view/real-time-s...	Saint Paul	United States	Mid senior	Onsite	Blackstone Talent Group, an award-winning tech...	Real Time Software Engineer, Computer Engineer...
9377	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C/C++, C#, Python, Java, Ada, Linux, Windows, ...
9378	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	LanceSoft, Inc.	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Job Description/nClient is looking for a Senio...	C, C++, C#, Python, Java, Ada, Linux, Windows...
9379	6J7B13-Software Engineer 3 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b13-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C, C++, C#, Python, Java, Ada, Cameo, Open Arc...

9380 rows x 10 columns

```
#Removing all null values from columns job_description and job_skills
df.dropna(inplace=True)
df.isna().sum()
```

```
job_title      0
company        0
job_location   0
job_link       0
city_name      0
country_name   0
job_level      0
mode_of_job    0
job_description 0
job_skills     0
dtype: int64
```



```
#The job description column and job skills column is long so we have to find to reduce the content to help our model interprete the data more efficiently
#One way will be to remove the jobs with repeating job_description
df.drop_duplicates(subset=['job_description'],inplace=True)
df
```

	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	https://www.linkedin.com/jobs/view/c%23-softa...	Covington	United States	Associate	Remote	At E Tech Group, joining our team means joinin...	C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Progr...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	https://www.linkedin.com/jobs/view/software-im...	Covington	United States	Associate	Remote	Kardex Remstar is looking for aInSoftware Impl...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-soft...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
3	Senior Manager, Software Engineering, Full Stack	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-mana...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, TypeScript, SQL, Python, Go...
4	Lead Software Engineer, Full Stack(JavaScript/...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/lead-softwa...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, AWS, Vue.js, HTML/CSS, TypeS...
...	...	...	...	...	...	...	...	...	...	...
9375	Software Engineer 3 - 6D6-Real Time Software E...	HireTalent - Diversity Staffing & Recruiting Firm	Berkeley, MO	https://www.linkedin.com/jobs/view/software-en...	Saint Paul	United States	Mid senior	Onsite	Job Description: We are currently seeking an i...	C, C++, C#, Agile software development, Comput...
9376	Real Time Software Engineer 3	Blackstone Talent Group	Berkeley, MO	https://www.linkedin.com/jobs/view/real-time-s...	Saint Paul	United States	Mid senior	Onsite	Blackstone Talent Group, an award-winning tech...	Real Time Software Engineer, Computer Engineer...
9377	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-sof...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C/C++, C#, Python, Java, Ada, Linux, Windows, ...
9378	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	LanceSoft, Inc.	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-sof...	Saint Paul	United States	Mid senior	Hybrid	Job Description/nClient is looking for a Senio...	C, C++, C#, Python, Java, Ada, Linux, Windows...
9379	6J7B13-Software Engineer 3 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b13-sof...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C, C++, C#, Python, Java, Ada, Cameo, Open Arc...

7756 rows x 10 columns

```
[154] #Checking the frequency of the job_description column after deleting duplicated data
df['job_description'].value_counts()
```

job\_description

At E Tech Group, joining our team means joining a group of passionate and forward-thinking experts. We're one of the largest engineering and system integration firms in the United States providing value for our clients through IT automation and control solutions for more than 25 years to the Life Sciences, Mission Critical, Metals, Material Handling, Consumer Products and Food & Beverage industries. Our national scale allows us to help our clients develop and implement standardized solutions at any of their facilities regardless of physical location or the local resources available at that site. We are seeking a nC# Software Engineer/nTo develop solutions for our client's most complex automation challenges. You will be a key member of a diverse team of professionals developing solutions for our client's most complex automation challenges. nYou Will: nSupport new development projects, gather customer requirements, perform analytical programming, and provide excellent documentation nProgram within multiple languages and platforms with a willingness to learn new and emerging technologies nWork with a team to deliver multi-discipline projects nYou Have: nBA/BS degree in Engineering, Computer Science or related field or equivalent educational background nA DNA comprised of collaboration and teamwork. n3+ years of professional experience nStrong written and verbal communication skills nSpecific Programming Knowledge: nC# required nC# / .NET development including WPF desktop applications, ASP.NET MVC and WebAPI nC++, Programmable Logic Controllers (Allen Bradley or others) nFull-stack Web Development including ASP.net, HTML5, CSS, Javascript and various front-end and backend frameworks. nMicrosoft SQL Server including database design, application integration, reporting, analytics, and maintenance nMES Solution Integration. nUnity Engine experience a plus nTechnical Skills: nC#, C++, Programmable Logic Controllers (Allen Bradley or others) nBasic database experience, including SQL and database design nExperience in either desktop app, web app, or mobile app design and execution nGit version control or experience with other source control systems nBenefits & Perks: n401k + match + prompt enrollment. E Tech Group employees are 100% vested upon entry. nPrompt enrollment into Medical, Dental, and Vision benefits. nGenerous paid time off that includes paid vacation, paid holidays, paid family leave and sick time off. nLearning and growth are key parts of the E Tech culture. We provide you with training and continuing education from day one, so you can advance your career. As an E Tech associate, you can unlock your greatest potential through challenges and opportunities. nE Tech Group is an Equal Opportunity / Affirmative Action Employer. Applicants are considered for employment without regard to race, color, religion, sex, age, disability, military status, genetic information, gender identity, sexual orientation, citizenship status, or any other basis prohibited by law. E Tech Group will provide reasonable accommodations to qualified individuals with disabilities and for religious beliefs. nShow more nShow less

team environment Education Qualification : Education/experience typically acquired through advanced technical education from an accredited course of study in engineering, computer science, mathematics, physics or chemistry (e.g. Bachelor) and typically 5 or more years' related work experience or an equivalent combination of technical education and experience (e.g. PhD, Master+3 years' related work experience). In the USA, AClient accreditation is the preferred, although not required, accreditation standard. Indotronix is an Equal Opportunity Employer nShow more nShow less

1  
Name: count, Length: 7756, dtype: int64

+ Code + Text

```
[155] #We have to also remove duplicate values from skills as well as it may affect the results of our model
```

```
df.drop_duplicates(subset=['job_skills'],inplace=True)
df
```

	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	https://www.linkedin.com/jobs/view/c%23-softwa...	Covington	United States	Associate	Remote	At E Tech Group, joining our team means joinin...	C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Progr...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	https://www.linkedin.com/jobs/view/software-im...	Covington	United States	Associate	Remote	Kardex Remstar is looking for a/anSoftware Impl...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-soft...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
3	Senior Manager, Software Engineering, Full Stack	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-mana...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, TypeScript, SQL, Python, Go...
4	Lead Software Engineer, Full Stack/JavaScript/...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/lead-softwa...	Chattanooga	United States	Mid senior	Onsite	Company Description/nJobs for Humanity is part...	JavaScript, Java, AWS, Vue.js, HTML/CSS, TypeS...
...	...	...	...	...	...	...	...	...	...	...
9375	Software Engineer 3 - 6D6-Real Time Software E...	HireTalent - Diversity Staffing & Recruiting Firm	Berkeley, MO	https://www.linkedin.com/jobs/view/software-en...	Saint Paul	United States	Mid senior	Onsite	Job Description: We are currently seeking an I...	C, C++, C#, Agile software development, Comput...
9376	Real Time Software Engineer 3	Blackstone Talent Group	Berkeley, MO	https://www.linkedin.com/jobs/view/real-time-s...	Saint Paul	United States	Mid senior	Onsite	Blackstone Talent Group, an award-winning tech...	Real Time Software Engineer, Computer Engineer...
9377	6/7B/4-Software Engineer 4 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/67b/4-sof...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C/C++, C#, Python, Java, Ada, Linux, Windows, ...
9378	6/7B/4-Software Engineer 4 - 6D6-Real Time Sof...	LanceSoft, Inc.	Berkeley, MO	https://www.linkedin.com/jobs/view/67b/4-sof...	Saint Paul	United States	Mid senior	Hybrid	Job Description/nClient is looking for a Senio...	C, C++, C#, Python, Java, Ada, Linux, Windows...
9379	6/7B/3-Software Engineer 3 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/67b/3-sof...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job - Senior Re...	C, C++, C#, Python, Java, Ada, Cameo, Open Arc...

#Checking the frequency of the job\_skills column after removing duplicate data from the job\_skills coulmn  
df['job\_skills'].value\_counts()

job\_skills  
C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Programmable Logic Controllers, SQL Server, ASP.net, HTML5, CSS, Javascript, Git, Unity Engine, Desktop app design, Web app design, Mobile app design, Database design  
1  
React, Angular, Python, JavaScript, CSS, HTML, Material UI, SIMP Project, Ansible, Docker, GIT, Red Hat Enterprise Linux (RHEL), Suricata, Zeek, Kibana, Logstash, Elastic Search, PostgreSQL, Agile software development, Agile methodologies, Agile project management, Software project management, Defensive cyber operations, Software development life cycle management, Program/project management, Crossfunctional team, Scaled Agile Framework (SAFe), Security+, DoD, Industry, Cyber Operations Branch (SSC/SZY0) program office, Advisory and Assistance Service (A&AS), System Engineering and Technical Assistance (SETA), Government, ACAT I/II level acquisition programs, Top Secret Clearance, SCI, Salary, Healthcare, Dental, vision coverage, 401(k), Company match, PTO, Paid holidays, Education, Training, Tech, Gadgets, Snacks, Remote work, Hybrid work, flexible work, Offsite team events, Referral Bonuses  
1  
Java, Python, SQL, Node, Go, Scala, Opensource frameworks, NoSQL databases, Container orchestration services, Amazon Web Services (AWS), Cloud computing (AWS Microsoft Azure Google Cloud), Agile practices, People management, Distributed microservices, Full stack systems  
1  
Software Engineering, Full Stack Development, Data Analysis, Emerging Technologies, Distributed Microservices, Systems Administration, Regulatory Compliance, JavaScript, Java, HTML/CSS, TypeScript, SQL, Python, Go, AWS Tools and Services, Cloud Computing, Agile, Open Source Frameworks, People Management, Agile Practices  
1  
DevOps Engineering, Agile Development, Cloud Native Technologies, Docker, Kubernetes, Ansible, Terraform, Java, Python, SQL, Ruby, Golang, Bash, Perl, AWS  
1  
..  
Java, Python, C#, PHP, Ruby, Go, Rust, C++, VB.NET, JavaScript, HTTP, Spring, Django, Rails, Laravel, Razor, Classic ASP, PostgreSQL, SQL Server, MySQL, Oracle, Docker, Kubernetes, Azure, Logging, Monitoring, ORM, Authentication, Authorization, Cloud hosting, Systems Integration, Source control, Package management, Leadership, Delivering at Pace, Mentoring, Coaching, Testing, Team work, Learning, Problem solving  
1  
Software Systems Engineer, MES, Program design, Coding, Testing, Documentation, Modification, Software Development, Operations, Manufacturing, Projectbased work, Programming language  
1  
Customer service, IT support, Communication, System learning, Numerical analysis, Problem solving, Selfmotivation, Initiative, Cando attitude, Solution finding, Microsoft SQL, Microsoft Server platforms, Windows operating systems, Excel, Accounting software, Construction industry  
1  
Software Development, MS Visual Studio, C#, TypeScript, HTML, .NET Framework, JavaScript, Angular, Aurelia, React, IIS Web Server, Relational Databases, MS SQL Server, Object Oriented Programming, ESRI, GIS, Mapping Tools  
1  
C, C++, C#, Python, Java, Ada, Cameo, Open Architecture, OMS, DevSecOps, AvionX Defense Mission Computing (DMC), Jira, Agile, U.S. Security Clearance, Software Engineering, Computer Science, Engineering, Mathematics, Physics, Chemistry  
1  
Name: count, Length: 7740, dtype: int64

#After Removal of duplicate and null values from the job\_description column we have to then  
#remove all the links and punctuations from the job\_description as it is of now relevance  
#to our model  
from bs4 import BeautifulSoup  
import re  
def remove\_html\_tags(text):  
 soup = BeautifulSoup(text, "html.parser")  
 return soup.get\_text()  
def remove\_punctuation(text):  
 return re.sub(r'[\W\s\!]', '', text)  
df['job\_description'] = df['job\_description'].apply(remove\_html\_tags)  
df['job\_description'] = df['job\_description'].apply(remove\_punctuation)  
df.drop\_duplicates(subset=['job\_description'],inplace=True)  
df['job\_description'] = df['job\_description'].str.replace('\n', '')  
df.drop\_duplicates(subset=['job\_description'],inplace=True)  
df['job\_description'].value\_counts()

<ipython-input-157-a42b17903176>:7: MarkupResemblesLocatorWarning: The input looks more like a filename than markup. You may want to open this file and pass the filehandle into BeautifulSoup.  
 soup = BeautifulSoup(text, "html.parser")  
job\_description  
At E Tech Group joining our team means joining a group of passionate and forwardthinking experts Were one of the largest engineering and system integration firms in the United States providing value for our clients through automation and control solutions for more than 25 years to the Life Sciences Mission Critical Metals Material Handling Consumer Products and Food Beverage industries Our national scale allows us to help our clients develop and implement standardized solutions at any of their facilities regardless of physical location or the local resources available at that sitewe are seeking ac Software Engineersto develop solutions for our clients most compl automation challenges You will be a key member of a diverse team of professionals developing solutions for our clients most complex automation challengesYou Willsupport new development projects gather customer requirements perform analytical programming and provide excellent documentationProgram within multiple languages and platforms with a willingness to learn new and emerging technologiesWork with a team to deliver multidiscipline projects HaveBABS degree in Engineering Computer Science or related field or equivalent educational backgroundA DMA comprised of collaboration and teamwork3 years of professional experienceStrong written and verbal communication skillsSpecific Programming Knowledgec requiredC .NET development including WPF desktop applications ASP.NET MVC and WebAPIC Programmable Logic Controllers Allen Bradley or othersFullstack Web Development including ASPnet HTM CSS Javascript and various frontend and backend frameworksMicrosoft SQL Server including database design application integration reporting analytics and maintenanceMES Solution integrationUnity Engine experience a plusTechnical Skillsc C Programmable Logic Controllers Allen Bradley or othersBasic database experience including SQL and database designExperience In either desktop app web app or mobile app design and executionGit version control or experience with other source control systemsBenefits: Backs401k match, remote enrollment E Tech Group employees are 100% united upon entryPromot enrollment into Medical Dental and Vision benefitsGenerous paid tim

Computer science mathematics physics or chemistry eg bachelor and typically 3 or more years related work experience or an equivalent combination of technical education and experience eg PhD and experience in the USA AClient accreditation is the preferred although not required accreditation standard Indotronix is an Equal Opportunity EmployerShow moreShow less										
1 Name: count, Length: 7719, dtype: int64										
[158] #Checking the changes we have made to our dataset so far df										
	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	https://www.linkedin.com/jobs/view/c%23-softwa...	Covington	United States	Associate	Remote	At E Tech Group joining our team means joining...	C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Progr...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	https://www.linkedin.com/jobs/view/software-im...	Covington	United States	Associate	Remote	Kardex Remstar is looking for aSoftware Imple...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-soft...	Chattanooga	United States	Mid senior	Onsite	Company DescriptionJobs for Humanity is partne...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
3	Senior Manager, Software Engineering, Full Stack	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-mana...	Chattanooga	United States	Mid senior	Onsite	Company DescriptionJobs for Humanity is partne...	JavaScript, Java, TypeScript, SQL, Python, Go...
4	Lead Software Engineer, Full Stack(JavaScript/...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/lead-softwa...	Chattanooga	United States	Mid senior	Onsite	Company DescriptionJobs for Humanity is partne...	JavaScript, Java, AWS, Vue.js, HTML/CSS, TypeS...
...	...	...	...	...	...	...	...	...	...	...
9375	Software Engineer 3 - 6D6-Real Time Software E...	HireTalent - Diversity Staffing & Recruiting Firm	Berkeley, MO	https://www.linkedin.com/jobs/view/software-en...	Saint Paul	United States	Mid senior	Onsite	Job Description We are currently seeking an in...	C, C++, C#, Agile software development, Comput...
9376	Real Time Software Engineer 3	Blackstone Talent Group	Berkeley, MO	https://www.linkedin.com/jobs/view/real-time-s...	Saint Paul	United States	Mid senior	Onsite	Blackstone Talent Group an awardwinning techn...	Real Time Software Engineer, Computer Engineer...
9377	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job Senior Rea...	C/C++, C#, Python, Java, Ada, Linux, Windows,...
9378	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	LanceSoft, Inc.	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Job DescriptionClient is looking for a Senior ...	C, C++, C#, Python, Java, Ada, Linux, Windows...
9379	6J7B13-Software Engineer 3 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b13-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix is seeking a Onsite Job Senior Rea...	C, C++, C#, Python, Java, Ada, Cameo, Open Arc...
7719 rows x 10 columns										
[159] #Importing nltk library and stopwords library from nltk.corpus library import nltk from nltk.corpus import stopwords # Downloading the stopwords as it is not available as default option in system nltk.download('stopwords') # Loading all available stopwords in english language stop_words = set(stopwords.words('english')) print(stop_words)										
{'did', 'wouldn't', 'the', 'you've', 'down', 'wouldn', 'am', 'own', 'she', 'or', 'by', 'into', 'hasn't', 'wasn', 'most', 'of', 're', 've', 'was', 'them', 'should', 'wasn't', 'doing', 'haven', 'than', 'yourself', 'our', 'll', [nltk_data] Downloading package stopwords to /root/nltk_data... [nltk_data] Package stopwords is already up-to-date!										
[160] #Importing nltk (Natural Language Toolkit) library and stopwords from nltk.corpus library #to remove all stopwords like 'over','or' and etc from the column job_description import nltk from nltk.corpus import stopwords # Load the stopwords stop_words = set(stopwords.words('english')) def remove_stopwords(text): # Tokenize the text words = text.split() # Remove stop words filtered_words = [word for word in words if word.lower() not in stop_words] # Join the filtered words back into a sentence return ' '.join(filtered_words) # Removing all stop words from the column job_description so our model will use only the most related words from job description column df['job_description'] = df['job_description'].apply(remove_stopwords) df										
	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	https://www.linkedin.com/jobs/view/c%23-softwa...	Covington	United States	Associate	Remote	E Tech Group joining team means joining group...	C#, .NET, WPF, ASP.NET MVC, WebAPI, C++, Progr...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	https://www.linkedin.com/jobs/view/software-im...	Covington	United States	Associate	Remote	Kardex Remstar looking aSoftware Implementation...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-soft...	Chattanooga	United States	Mid senior	Onsite	Company DescriptionJobs Humanity partnering Ca...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
3	Senior Manager, Software Engineering, Full Stack	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/senior-mana...	Chattanooga	United States	Mid senior	Onsite	Company DescriptionJobs Humanity partnering Ca...	JavaScript, Java, TypeScript, SQL, Python, Go...
4	Lead Software Engineer, Full Stack(JavaScript/...	Jobs for Humanity	Chattanooga, TN	https://www.linkedin.com/jobs/view/lead-softwa...	Chattanooga	United States	Mid senior	Onsite	Company DescriptionJobs Humanity partnering Ca...	JavaScript, Java, AWS, Vue.js, HTML/CSS, TypeS...
...	...	...	...	...	...	...	...	...	...	...
9375	Software Engineer 3 - 6D6-Real Time Software E...	HireTalent - Diversity Staffing & Recruiting Firm	Berkeley, MO	https://www.linkedin.com/jobs/view/software-en...	Saint Paul	United States	Mid senior	Onsite	Job Description currently seeking individual d...	C, C++, C#, Agile software development, Comput...
9376	Real Time Software Engineer 3	Blackstone Talent Group	Berkeley, MO	https://www.linkedin.com/jobs/view/real-time-s...	Saint Paul	United States	Mid senior	Onsite	Blackstone Talent Group awardwinning technolog...	Real Time Software Engineer, Computer Engineer...
9377	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix seeking Onsite Job Senior Real Time...	C/C++, C#, Python, Java, Ada, Linux, Windows,...
9378	6J7B14-Software Engineer 4 - 6D6-Real Time Sof...	LanceSoft, Inc.	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b14-soft...	Saint Paul	United States	Mid senior	Hybrid	Job DescriptionClient looking Senior Real Time...	C, C++, C#, Python, Java, Ada, Linux, Windows...
9379	6J7B13-Software Engineer 3 - 6D6-Real Time Sof...	ClearanceJobs	Berkeley, MO	https://www.linkedin.com/jobs/view/6j7b13-soft...	Saint Paul	United States	Mid senior	Hybrid	Indotronix seeking Onsite Job Senior Real Time...	C, C++, C#, Python, Java, Ada, Cameo, Open Arc...
7719 rows x 10 columns										

```
#An sample data from which stopwords were removed
df['job_description'][0]

'E Tech Group joining team means joining group passionate forwardthinking experts one largest engineering system integration firms United States providing value clients automation control solutions 25 years Life Sciences Mission Critical Metals Material Handli
ng Consumer Products Food Beverage Industries national scale allows us help clients develop implement standardized solutions facilities regardless physical location local resources available site seeking aC Software Engineerto develop solutions clients compl
ex automation challenges key member diverse team professionals developing solutions clients complex automation challengesYou Willsupport new development projects gather customer requirements perform analytical programming provide excellent documentationProgram
within multiple languages platforms willingness learn new emerging technologieswork team deliver multidiscipline projectsYou HaveBBS degree Engineering Computer Science related Field equivalent educational backgroundA D...'

[162] #Removing all duplicated data from the columns company and job_title
df.drop_duplicates(subset=['job_title'],inplace=True)
df.drop_duplicates(subset=['company'],inplace=True)
#Displaying the frequency of the data of columns company and job_title
print(df['job_title'].value_counts())
print("-----")
print(df['company'].value_counts())

job_title
C# Software Engineer      1
Lead Software Engineer (Remote)  1
Senior Software Engineer -Contract  1
Software & Infrastructure Engineer III  1
Senior Enterprise Software Engineer  1
..
Software Eng III, Bioinformatics (South Sf, CA, Hybrid, USA)  1
Sr. Software Engineer (Hybrid/Remote)  1
Manager, Software Engineer - Platform Engineering  1
Staff Software Engineer, Backend  1
Real Time Software Engineer 3  1
Name: count, Length: 1897, dtype: int64
-----
company
E Tech Group      1
Ghostpunch Games  1
Park Place Technologies  1
First Mutual Holding Co.  1
Cleveland State University  1
..
Myriad Genetics      1
UMB Bank      1
Mastercard      1
Varo Bank      1
Blackstone Talent Group  1
Name: count, Length: 1897, dtype: int64

[163] #Displaying the final preprocessed data
df
```

	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
0	C# Software Engineer	E Tech Group	West Chester, OH	<a href="https://www.linkedin.com/jobs/view/23-softwa...">https://www.linkedin.com/jobs/view/23-softwa...</a>	Covington	United States	Associate	Remote	E.Tech Group joining team means joining group ...	C#, .NET, WPF, ASP.NET MVC, Web-API, C++, Prog...
1	Software Implementation Engineer	Kardex	Cincinnati, OH	<a href="https://www.linkedin.com/jobs/view/software-im...">https://www.linkedin.com/jobs/view/software-im...</a>	Covington	United States	Associate	Remote	Kardex Remstar looking aSoftware Implementatio...	Software Implementation, Software Testing, Sof...
2	Senior Software Engineer, Back End (Go, AWS, J...)	Jobs for Humanity	Chattanooga, TN	<a href="https://www.linkedin.com/jobs/view/senior-soft...">https://www.linkedin.com/jobs/view/senior-soft...</a>	Chattanooga	United States	Mid senior	Onsite	Company DescriptionJobs Humanity partnering Ca...	Java, Python, SQL, Node.js, Go, Scala, AWS, GC...
5	Sr. Software Engineer	BlueCross BlueShield of Tennessee	Chattanooga, TN	<a href="https://www.linkedin.com/jobs/view/sr-software...">https://www.linkedin.com/jobs/view/sr-software...</a>	Chattanooga	United States	Mid senior	Onsite	Provides application design analysis programmi...	Application design, Analysis, Programming, Tes...
8	Senior Software Engineer	FDS Avionics Corp.	Las Cruces, NM	<a href="https://www.linkedin.com/jobs/view/senior-soft...">https://www.linkedin.com/jobs/view/senior-soft...</a>	Las Cruces	United States	Mid senior	Onsite	Please note posting sister company CALCULEXCAL...	Linux, U Boot, Low level drivers, Board suppor...
...	...	...	...	...	...	...	...	...	...	...
9351	Java- Software Engineer 1	SES Corporation	Hanover, MD	<a href="https://www.linkedin.com/jobs/view/java-softwa...">https://www.linkedin.com/jobs/view/java-softwa...</a>	Silver Spring	United States	Associate	Onsite	Years Experience7 yearsEducation RequirementsB...	Java, JSP, Servlet, JEE, RESTful, Apache Tomcat...
9352	KR108SWE1 - Associate Software Engineer - Cleared	NISUS Technologies Corporation	Annapolis Junction, MD	<a href="https://www.linkedin.com/jobs/view/kr108swe1-a...">https://www.linkedin.com/jobs/view/kr108swe1-a...</a>	Silver Spring	United States	Associate	Onsite	opening Software Engineer develop maintain enh...	Software Engineering, Software Development, So...
9358	Beginning Software Engineer (Back End)	Boeing Intelligence & Analytics	Annapolis Junction, MD	<a href="https://www.linkedin.com/jobs/view/beginning-s...">https://www.linkedin.com/jobs/view/beginning-s...</a>	Silver Spring	United States	Associate	Hybrid	Beginning Software Engineer Back End/Why Excit...	Software Development, Java, Spring Boot, Swagg...
9371	Senior Software / Data Engineer	DataTribе	Columbia, MD	<a href="https://www.linkedin.com/jobs/view/senior-soft...">https://www.linkedin.com/jobs/view/senior-soft...</a>	Silver Spring	United States	Mid senior	Remote	want help build next generation network securi...	Data pipelines, ETL, Data analysis, Database t...
9376	Real Time Software Engineer 3	Blackstone Talent Group	Berkeley, MO	<a href="https://www.linkedin.com/jobs/view/real-time-s...">https://www.linkedin.com/jobs/view/real-time-s...</a>	Saint Paul	United States	Mid senior	Onsite	Blackstone Talent Group awardwinning technolog...	Real Time Software Engineer, Computer Engineer...

1897 rows x 10 columns



## FITTING THE DATA INTO THE MODEL

```
#Recommendation based on candidates current/previous occupation
#First we have to import TfidfVectorizer model from scikit-learn present in
the module feature_extraction.text
from sklearn.feature_extraction.text import TfidfVectorizer
#Then we have to create an object of TFIDF Vectorizer to use the tfidf model
tfidfvec = TfidfVectorizer()
#Each job title in the 'job_title' column is tokenized into individual words
or n-grams.
#The TF-IDF vectorizer constructs a vocabulary of all unique tokens (words or
n-grams) observed in the 'job_title' column.
#This vocabulary is built based on the data from job_title column
#The TF-IDF vectorizer calculates the document frequency (DF) of each term in
the vocabulary.
#DF is the number of documents (job titles) in which a term appears.
#The TF-IDF vectorizer computes the inverse document frequency (IDF) for each
term in the vocabulary.
# IDF is calculated as the logarithm of the ratio of the total number of
documents to the document frequency of each term.
#For each job title (document), the TF-IDF vectorizer computes the TF-IDF
score for each term in the vocabulary.
#TF-IDF is calculated as the product of the term frequency (TF) and inverse
document frequency (IDF) for each term in the document.
#The variable tfidf_jobtitles stores the resulting TF-IDF matrix. It is
a matrix representation with 0's , 1's and fractions
#where each row corresponds to a job title, and each column corresponds to a
term in the vocabulary.
#The values in the matrix represent the TF-IDF scores of each term in each
job title.
#The tfidf scores represent the importance of each term/word/n-gram within a
document relative to the entire collection of documents
#The final matrix received as output will be treated as a vector
tfidf_jobtitles = tfidfvec.fit_transform(df['job_title'])
#From the module sklearn.metrics.pairwise present in scikit learn library we
are importing cosine similarity function
from sklearn.metrics.pairwise import cosine_similarity
#To make the recommendation we will have to compute the cosine similarity so
that we can give the recommendation to the candidate based on the job titles
#having the highest similarity scores.
#To compute this cosine similarity of job_titles.
#The dot product of the two vectors(both of which are the tfidf scores
matrix) is divided by the product of their magnitudes which will then give
the cosine similarity
#The cosine similarity is a measure of similarity between two vectors and
ranges from -1 to 1.
```

```

#where 1 indicates that the vectors are identical in direction, 0 indicates
no similarity, and -1 indicates opposite directions.
#The resultant of this similarity variable is a symmentric matrix containing
the similairty scores of the job_titles from job_title column based on the
tfidf scores
#where each element contains the cosine similarity between each document from
vector 1 and vector 2
similarity = cosine_similarity(tfidf_jobtitles, tfidf_jobtitles)
# Creating a pandas series containing all the indices and job_titles from the
column job title
indices = pd.Series(df['job_title'])
#Creating a function to give recommendations to the candidate
#where the candidate only has to enter their job title and the function will
take the cosine similarity by default
def recommendation(title, cosine_sim=similarity):
    try:
        #This line returns the job title given by the user that is similar to
the one in the dataset
        index = indices[indices == title].index[0]
        #Now sorting the similairty scores in descending order in comparision
to the index values computed above
        similarity_scores =
pd.Series(similarity[index]).sort_values(ascending=False)
        #This line gives the top 25 job titles indices having highest
similairty score
        top_25_jobs = list(similarity_scores.iloc[1:25].index)
        #This line gives the job titles associated with the indices computed
above
        recommended_jobs = [list(df['job_title'])[i] for i in top_25_jobs]
        #Returning the job titles
        return recommended_jobs

    except:
        #Returning that no job title has ben found if the job title entered
by the user is not in the dataset
        print("No Job Title is found")
#Giving recommendations to the user
Input='C# Software Engineer'
recommendation(Input)
# Import SequenceMatcher from difflib module
from difflib import SequenceMatcher

# Set input text (assumed to be provided elsewhere)
input_text = Input

# Get the output texts from the recommendation function
output_texts = recommendation(Input)

```

```

# Initialize an empty list to store ground truth
ground_truth = []

# Iterate over each output text
for output in output_texts:
    # Iterate over the characters in the input text
    for i in range(len(input_text)):
        # Check if the character in the input text is present in the output
        # text
        if input_text[i] in output:
            # If a match is found, add the output text to the ground truth
            # list
            ground_truth.append(output)

# Define the similarity threshold
similarity_threshold = 0.6

# Initialize counters for true positives, false positives, and false
# negatives
true_positives = 0
false_positives = 0

# Iterate over each output text
for output in output_texts:
    # Calculate the similarity between the input text and the output text
    # using SequenceMatcher
    similarity = SequenceMatcher(None, input_text, output).ratio()

    # Check if the similarity meets the similarity threshold
    if similarity >= similarity_threshold:
        # Check if the output text is in the ground truth list
        if output in ground_truth:
            # If the output text is in the ground truth list, it's a true
            # positive
            true_positives += 1
        else:
            # If the output text is not in the ground truth list, it's a
            # false positive
            false_positives += 1

# Calculate the number of false negatives
false_negatives = len(ground_truth) - true_positives

# Calculate precision, recall, and F1 score, handling potential division by
# zero
precision = true_positives / (true_positives + false_positives) if
(true_positives + false_positives) > 0 else 0

```

```

recall = true_positives / (true_positives + false_negatives) if
(true_positives + false_negatives) > 0 else 0
f1_score = 2 * (precision * recall) / (precision + recall) if (precision +
recall) > 0 else 0
accuracy = true_positives / len(ground_truth) if len(ground_truth) > 0 else 0

# Print the computed metrics
print("Precision:", precision)
print("Recall:", recall)
print("F1 Score:", f1_score)
print("Accuracy:", accuracy)
#For viewing complete table
from sklearn.feature_extraction.text import TfidfVectorizer
tfidfvec = TfidfVectorizer()
tfidf_jobdescriptions = tfidfvec.fit_transform(df['job_title'])
from sklearn.metrics.pairwise import cosine_similarity
similarity = cosine_similarity(tfidf_jobdescriptions,tfidf_jobdescriptions)
indices = pd.Series(df['job_title'])
def recommendation(title, cosine_sim=similarity):
    try:
        index = indices[indices == title].index[0]
        similarity_scores =
pd.Series(similarity[index]).sort_values(ascending=False)
        top_25_jobs = list(similarity_scores.iloc[1:25].index)
        recommended_jobs =df.iloc[top_25_jobs]
        return recommended_jobs
    except:
        print("No Job Title is found")
#Giving recommendations to the user
Input='C# Software Engineer'
recommendation(Input)

```

```

#Recommendation based on candidates job skills
#First we have to import TfidfVectorizer model from scikit-learn present in
the module feature_extraction.text
from sklearn.feature_extraction.text import TfidfVectorizer
#Then we have to create an object of TFIDF Vectorizer to use the tfidf model
tfidfvec = TfidfVectorizer()
#Each job title in the 'job_skills' column is tokenized into individual words
or n-grams.
#The TF-IDF vectorizer constructs a vocabulary of all unique tokens (words or
n-grams) observed in the 'job_skills' column.
#This vocabulary is built based on the data from job_skills column
#The TF-IDF vectorizer calculates the document frequency (DF) of each term in
the vocabulary.
#DF is the number of documents (job skills) in which a term appears.
#The TF-IDF vectorizer computes the inverse document frequency (IDF) for each
term in the vocabulary.
# IDF is calculated as the logarithm of the ratio of the total number of
documents to the document frequency of each term.
#For each job skill (document), the TF-IDF vectorizer computes the TF-IDF
score for each term in the vocabulary.
#TF-IDF is calculated as the product of the term frequency (TF) and inverse
document frequency (IDF) for each term in the document.
#The variable tfidf_jobskills stores the resulting TF-IDF matrix. It is
a matrix representation with 0's , 1's and fractions
#where each row corresponds to a job skill, and each column corresponds to a
term in the vocabulary.
#The values in the matrix represent the TF-IDF scores of each term in each
job skill.
#The tfidf scores represent the importance of each term/word/n-gram within a
document relative to the entire collection of documents
#The final matrix received as output will be treated as a vector
tfidf_jobskills = tfidfvec.fit_transform(df['job_skills'])
#From the module sklearn.metrics.pairwise present in scikit learn library we
are importing cosine similarity function
from sklearn.metrics.pairwise import cosine_similarity
#To make the recommendation we will have to compute the cosine similarity so
that we can give the recommendation to the candidate based on the job skills
#having the highest similarity scores.
#To compute this cosine similarity of job_skills.
#The dot product of the two vectors(both of which are the tfidf scores
matrix) is divided by the product of their magnitudes which will then give
the cosine similarity
#The cosine similarity is a measure of similarity between two vectors and
ranges from -1 to 1.
#where 1 indicates that the vectors are identical in direction, 0 indicates
no similarity, and -1 indicates opposite directions.

```

```

#The resultant of this similarity variable is a symmentric matrix containing
the similairty scores of the job_skills from job_skills column based on the
tfidf scores
#where each element contains the cosine similarity between each document from
vector 1 and vector 2
similarity = cosine_similarity(tfidf_jobskills, tfidf_jobskills)
# Creating a pandas series containing all the indices and job_skills from the
column job_skills
indices = pd.Series(df['job_skills'])
#Creating a function to give recommendations to the candidate
#where the candidate only has to enter their job skill and the function will
take the cosine similarity by default
def recommendation(title, cosine_sim=similarity):
    try:
        #This line returns the job skills given by the user that is similar
to the one in the dataset
        index = indices[indices == title].index[0]
        #Now sorting the similairty scores in descending order in comparision
to the index values computed above
        similarity_scores =
pd.Series(similarity[index]).sort_values(ascending=False)
        #This line gives the top 25 job_skills indices having highest
similairty score
        top_25_jobs = list(similarity_scores.iloc[1:25].index)
        #This line gives the job titles based on the job_skills associated
with the indices computed above
        recommended_jobs = [list(df['job_title'])[i] for i in top_25_jobs]
        #Returning the job titles based on job skills
        return recommended_jobs
    except:
        #Returning that no job skills has been found if the job skill entered
by the user is not in the dataset
        print("Skill does not match any job title from dataset")
#Giving recommendations to the user
Input='Java, Python, SQL, Node.js, Go, Scala, AWS, GCP, Azure, Kafka, Stream
processing, Agile, Open source frameworks'
recommendation(Input)
#For viewing complete table
from sklearn.feature_extraction.text import TfidfVectorizer
tfidfvec = TfidfVectorizer()
tfidf_jobdescriptions = tfidfvec.fit_transform(df['job_skills'])
from sklearn.metrics.pairwise import cosine_similarity
similarity = cosine_similarity(tfidf_jobdescriptions,tfidf_jobdescriptions)
indices = pd.Series(df['job_skills'])
def recommendation(title, cosine_sim=similarity):
    try:
        index = indices[indices == title].index[0]

```

```

        similarity_scores =
pd.Series(similarity[index]).sort_values(ascending=False)
        top_25_jobs = list(similarity_scores.iloc[1:25].index)
        recommended_jobs =df.iloc[top_25_jobs]
        return recommended_jobs
    except:
        print("Skill does not match any job title from dataset")
#Giving recommendations to the user
Input='Java, Python, SQL, Node.js, Go, Scala, AWS, GCP, Azure, Kafka, Stream
processing, Agile, Open source frameworks'
recommendation(Input)

#Recommendation based on candidates job description
#First we have to import TfidfVectorizer model from scikit-learn present in
the module feature_extraction.text
from sklearn.feature_extraction.text import TfidfVectorizer
#Then we have to create an object of TFIDF Vectorizer to use the tfidf model
tfidfvec = TfidfVectorizer()
#Each job title in the 'job_description' column is tokenized into individual
words or n-grams.
#The TF-IDF vectorizer constructs a vocabulary of all unique tokens (words or
n-grams) observed in the 'job_description' column.
#This vocabulary is built based on the on the data from job_description
column
#The TF-IDF vectorizer calculates the document frequency (DF) of each term in
the vocabulary.
#DF is the number of documents (job descriptions) in which a term appears.
#The TF-IDF vectorizer computes the inverse document frequency (IDF) for each
term in the vocabulary.
# IDF is calculated as the logarithm of the ratio of the total number of
documents to the document frequency of each term.
#For each job description (document), the TF-IDF vectorizer computes the TF-
IDF score for each term in the vocabulary.
#TF-IDF is calculated as the product of the term frequency (TF) and inverse
document frequency (IDF) for each term in the document.
#The variable tfidf_jobdescriptions stores the resulting TF-IDF matrix. It is
a matrix representation with 0's , 1's and fractions
#where each row corresponds to a job description, and each column corresponds
to a term in the vocabulary.

```

```

#The values in the matrix represent the TF-IDF scores of each term in each
job description.
#The tfidf scores represent the importance of each term/word/n-gram within a
documnet relative to the entire collection of documents
#The final matrix recevied as output will treated as a vector
tfidf_jobdescriptions = tfidfvec.fit_transform(df['job_description'])
#From the module sklearn.metrics.pairwise present in scikit learn library we
are importing cosine similarity function
from sklearn.metrics.pairwise import cosine_similarity
#To make the recommendation we will have compute the cosine similarity so
that we can give the recommendation to the candidate based on the job
descriptions
#having the highest similairty scores.
#To compute this cosine similairty of job_descriptions.
#The dot product of the two vectors(both of which are the tfidf scores
matrix) is divided by the product of their magnitudes which will then give
the cosine similarity
#The cosine similarity is a measure of similarity between two vectors and
ranges from -1 to 1.
#where 1 indicates that the vectors are identical in direction, 0 indicates
no similarity, and -1 indicates opposite directions.
#The resultant of this similarity variable is a symmentric matrix containing
the similairty scores of the job_descriptions from job_description column
based on the tfidf scores
#where each element contains the cosine similarity between each document from
vector 1 and vector 2
similarity = cosine_similarity(tfidf_jobdescriptions,tfidf_jobdescriptions)
# Creating a pandas series containing all the indices and job_descriptions
from the column job_description
indices = pd.Series(df['job_description'])
#Creating a function to give recommendations to the candidate
#where the candidate only has to enter their job description and the function
will take the cosine similarity by default
def recommendation(title, cosine_sim=similarity):
    try:
        #This line returns the job descriptions given by the user that is
similar to the one in the dataset
        index = indices[indices == title].index[0]
        #Now sorting the similairty scores in descending order in comparision
to the index values computed above
        similarity_scores =
pd.Series(similarity[index]).sort_values(ascending=False)
        #This line gives the top 25 job_sdescriptions indices having highest
similairty score
        top_25_jobs = list(similarity_scores.iloc[1:25].index)
        #This line gives the job titles based on the job descriptions
associated with the indices computed above
        recommended_jobs =[list(df['job_title'])[i] for i in top_25_jobs]

```



```

        #Returning the job titles based on job description
        return recommended_jobs
    except:
        #Returning that no job description has been found if the job
description entered by the user is not in the dataset
        print("Description does not match any job title from dataset")

#Giving recommendations to the user
Input='E Tech Group joining team means joining group passionate
forwardthinking experts one largest engineering system integration firms
United States providing value clients automation control solutions 25 years
Life Sciences Mission Critical Metals Material Handling Consumer Products
Food Beverage industries national scale allows us help clients develop
implement standardized solutions facilities regardless physical location
local resources available siteWe seeking aC Software Engineerto develop
solutions clients complex automation challenges key member diverse team
professionals developing solutions clients complex automation challengesYou
WillSupport new development projects gather customer requirements perform
analytical programming provide excellent documentationProgram within multiple
languages platforms willingness learn new emerging technologiesWork team
deliver multidiscipline projectsYou HaveBABS degree Engineering Computer
Science related field equivalent educational backgroundA DNA comprised
collaboration teamwork3 years professional experienceStrong written verbal
communication skillsSpecific Programming KnowledgeC requiredC NET development
including WPF desktop applications ASPNET MVC WebAPIC Programmable Logic
Controllers Allen Bradley othersFullstack Web Development including ASPnet
HTML5 CSS Javascript various frontend backend frameworksMicrosoft SQL Server
including database design application integration reporting analytics
maintenanceMES Solution integrationUnity Engine experience plusTechnical
SkillsC C Programmable Logic Controllers Allen Bradley othersBasic database
experience including SQL database designExperience either desktop app web app
mobile app design executionGit version control experience source control
systemsBenefits Perks401k match prompt enrollment E Tech Group employees 100
vested upon entryPrompt enrollment Medical Dental Vision benefitsGenerous
paid time includes paid vacation paid holidays paid family leave sick time
offLearning growth key parts E Tech culture provide training continuing
education day one advance career E Tech associate unlock greatest potential
challenges opportunitiesE Tech Group Equal Opportunity Affirmative Action
Employer Applicants considered employment without regard race color religion
sex age disability military status genetic information gender identity sexual
orientation citizenship status basis prohibited law E Tech Group provide
reasonable accommodations qualified individuals disabilities religious
beliefsShow moreShow less'
recommendation(Input)

```

```

#For viewing complete table
from sklearn.feature_extraction.text import TfidfVectorizer
tfidfvec = TfidfVectorizer()
tfidf_jobdescriptions = tfidfvec.fit_transform(df['job_description'])
from sklearn.metrics.pairwise import cosine_similarity
similarity = cosine_similarity(tfidf_jobdescriptions,tfidf_jobdescriptions)
indices = pd.Series(df['job_description'])
def recommendation(title, cosine_sim=similarity):
    try:
        index = indices[indices == title].index[0]
        similarity_scores =
pd.Series(similarity[index]).sort_values(ascending=False)
        top_25_jobs = list(similarity_scores.iloc[1:25].index)
        recommended_jobs =df.iloc[top_25_jobs]
        return recommended_jobs
    except:
        print("Description does not match any job title from dataset")
#Giving recommendations to the user
Input='E Tech Group joining team means joining group passionate
forwardthinking experts one largest engineering system integration firms
United States providing value clients automation control solutions 25 years
Life Sciences Mission Critical Metals Material Handling Consumer Products
Food Beverage industries national scale allows us help clients develop
implement standardized solutions facilities regardless physical location
local resources available siteWe seeking aC Software Engineerto develop
solutions clients complex automation challenges key member diverse team
professionals developing solutions clients complex automation challengesYou
WillSupport new development projects gather customer requirements perform
analytical programming provide excellent documentationProgram within multiple
languages platforms willingness learn new emerging technologiesWork team
deliver multidiscipline projectsYou HaveBABS degree Engineering Computer
Science related field equivalent educational backgroundA DNA comprised
collaboration teamwork3 years professional experienceStrong written verbal
communication skillsSpecificProgramming KnowledgeC requiredC NET development
including WPF desktop applications ASPNET MVC WebAPIC Programmable Logic
Controllers Allen Bradley othersFullstack Web Development including ASPnet
HTML5 CSS Javascript various frontend backend frameworksMicrosoft SQL Server
including database design application integration reporting analytics
maintenanceMES Solution integrationUnity Engine experience plusTechnical
SkillsC C Programmable Logic Controllers Allen Bradley othersBasic database
experience including SQL database designExperience either desktop app web app
mobile app design executionGit version control experience source control
systemsBenefits Perks401k match prompt enrollment E Tech Group employees 100
vested upon entryPrompt enrollment Medical Dental Vision benefitsGenerous
paid time includes paid vacation paid holidays paid family leave sick time
offLearning growth key parts E Tech culture provide training continuing
education day one advance career E Tech associate unlock greatest potential
challenges opportunitiesE Tech Group Equal Opportunity Affirmative Action

```

Employer Applicants considered employment without regard race color religion sex age disability military status genetic information gender identity sexual orientation citizenship status basis prohibited law E Tech Group provide reasonable accommodations qualified individuals disabilities religious beliefsShow moreShow less'

recommendation(Input)

# Result

```
['C++ Software Engineer',  
'Software Engineer (C)',  
'Software Engineer - C#',  
'Software Engineer (C#)',  
'C#/C++ Software Engineer',  
'Software Engineer 3',  
'Software Engineer I',  
'SOFTWARE ENGINEER',  
'Software Engineer (R&D)',  
'C++Software Engineer',  
'ENGINEER SOFTWARE 3',  
'Software engineer',  
'Software Engineer 1',  
'Software Engineer 2',  
'Software Engineer 4',  
'Software Engineer x 4',  
'Software Engineer / Sr. Software Engineer',  
'Senior Software Engineer C++',  
'Software Engineer Senior',  
'Senior Software Engineer - 1',  
'Software Engineer (Senior)',  
'Senior Software Engineer 1',  
'Senior C++ Software Engineer',  
'Senior Software Engineer']
```



Precision: 1.0

Recall: 0.050724637681159424

F1 Score: 0.09655172413793105

Accuracy: 0.050724637681159424

job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
799 C++ Software Engineer	Stellar Science Ltd Co	Albuquerque, NM	https://www.linkedin.com/jobs/view/428%2B-sof...	Albuquerque	United States	Mid senior	Onsite	Stellar Science seeking several Modern C Softw...	C++, Java, Python, JavaScript, Boost, Eigen, O...
2570 Software Engineer (C)	SilverSearch, Inc.	Union County, NJ	https://www.linkedin.com/jobs/view/software-en...	Bound Brook	United States	Mid senior	Onsite	C Software Engineer position available 6 month...	C, Online Transaction Processing (OLTP), Enser...
3114 Software Engineer - C#	Aureon Consulting	Des Moines Metropolitan Area	https://www.linkedin.com/jobs/view/software-en...	Shelby	United States	Associate	Onsite	excited offer fulltime opportunity one local c...	C#, .NET, SQL, MVC, Xamarin, WPF, LINQ, Azure ...
3512 Software Engineer (C#)	Alamar Biosciences, Inc.	Fremont, CA	https://www.linkedin.com/jobs/view/software-en...	Novato	United States	Mid senior	Onsite	Alamar Biosciences mission transform field pro...	C#, Windows, Jira, .Net, Behavioral diagrams, ...
7598 C#C++ Software Engineer	Infotree Global Solutions	Redmond, WA	https://www.linkedin.com/jobs/view/c23-c%2B%2...	Everett	United States	Mid senior	Onsite	Required Skills3 years experience Software Eng...	Software Engineering, C#, C++, JavaScript, Nod...
497 Software Engineer 3	Teledyne Technologies Incorporated	El Segundo, CA	https://www.linkedin.com/jobs/view/software-en...	Malibu	United States	Mid senior	Hybrid	visionaryTeledyne Technologies Incorporated pr...	Linux, RTOS, C/C++, Memory management, BSP dev...
1961 Software Engineer I	T.D. Williamson	Salt Lake City, UT	https://www.linkedin.com/jobs/view/software-en...	Layton	United States	Associate	Hybrid	TDW put people first means working everyday en...	SQL, Data mining, Data analysis, Software deve...
3088 SOFTWARE ENGINEER	Shell Energy	Houston, TX	https://www.linkedin.com/jobs/view/software-en...	Baytown	United States	Mid senior	Onsite	DescriptionAt Shell Energy, Solutions believe t...	Software Engineering, Debugging, Frontend deve...
4063 Software Engineer (R&D)	CATALOG	Boston, MA	https://www.linkedin.com/jobs/view/software-en...	Beverly	United States	Mid senior	Onsite	CATALOG Bostonbased pioneering startup making ...	Software Engineering, HighPerformance Software...
100 C++Software Engineer	Salt	Manchester Area, United Kingdom	https://uk.linkedin.com/jobs/view/c%2B%2Bsoftw...	Burnley	United Kingdom	Mid senior	Onsite	client super passionate bringing music everyon...	C++, Embedded Systems, Linux, C++ Standard Lib...
1048 ENGINEER SOFTWARE 3	Hill	Newport News, VA	https://www.linkedin.com/jobs/view/engineer-so...	Norfolk	United States	Mid senior	Onsite	Req ID 3502Team E44 NTWCOMMAUTOEntry Newport...	Software development, Systems engineering, Com...
4931 Software engineer	Kalam Consulting, Inc.	Springfield, VA	https://www.linkedin.com/jobs/view/software-en...	Delta	Canada	Mid senior	Onsite	SOFTWARE ENGINEERLOCATION SPRINGFIELD VIRGINIA...	ServiceNow, Glide, Angular, JavaScript, SQL, X...
1195 Software Engineer 1	Captivation	Annapolis Junction, MD	https://www.linkedin.com/jobs/view/software-en...	Maryland	United States	Mid senior	Onsite	Build Something Proud O/Captivation Software b...	Software Engineering, Security Clearance, U.S...
4459 Software Engineer 2	Farfield Systems, Inc.	Fort Meade, MD	https://www.linkedin.com/jobs/view/software-en...	Baltimore	United States	Mid senior	Onsite	Farfield Systems IncAt Farfield committed deli...	Programming languages, Software development, S...
1619 Software Engineer 4	Bqesh Incorporated	San Antonio, TX	https://www.linkedin.com/jobs/view/software-en...	San Antonio	United States	Mid senior	Onsite	Job DescriptionSoftware Engineer Software Dev...	Software Development, JavaScript, SQL, Postgre...
1653 Software Engineer x 4	Atlas Recruitment Group Ltd	Frimley, England, United Kingdom	https://uk.linkedin.com/jobs/view/software-eng...	High Wycombe	United Kingdom	Mid senior	Onsite	Software Engineers x4Aerospace DefenceFrimley ...	.NET/C#, C#, MySQL, Visual Studio, Atlassian...
2559 Software Engineer / Sr. Software Engineer	SSAC Technologies	San Francisco, CA	https://www.linkedin.com/jobs/view/software-en...	Novato	United States	Mid senior	Hybrid	SSC global provider investment financial servi...	C++, C#, ASP.NET, SQL, GH, REST, Microservice...
8875 Senior Software Engineer C++	Rook USA, Inc.	Boulder, CO	https://www.linkedin.com/jobs/view/senior-soft...	Boulder	United States	Associate	Hybrid	Come Create RookHf seeking team driven passio...	Software Engineering, C++, Linux, ObjectOrient...
886 Software Engineer Senior	Kforce Inc	Jacksonville, FL	https://www.linkedin.com/jobs/view/software-en...	Jacksonville	United States	Associate	Onsite	ResponsibilitiesKforce client seeking Software...	Consulting, Project Management, Project Estima...
5795 Senior Software Engineer - 1	Zalis	United States	https://www.linkedin.com/jobs/view/senior-soft...	Smith Center	United States	Mid senior	Onsite	Senior Software EngineerZalis healthcare finan...	Rust, Python, Ruby on Rails, AWS SDK, Postgres...
453 Software Engineer (Senior)	Westinghouse Electric Company	Cranberry Township, PA	https://www.linkedin.com/jobs/view/software-en...	East Liverpool	United States	Associate	Onsite	WTSS Contract OpportunityAre interested part i...	C, C++, SOLID, Object oriented programming, Us...
6138 Senior Software Engineer 1	AMETEK	Leicester, England, United Kingdom	https://uk.linkedin.com/jobs/view/senior-softw...	Derby	United Kingdom	Mid senior	Onsite	Senior Software EngineerTaylor HobsonTaylor Ho...	C#, WPF, OOP, .NET, NUnit, MSTest, Agile, Scrum...
2212 Senior C++ Software Engineer	Oculus Search Partners LLC	Rockaway, NJ	https://www.linkedin.com/jobs/view/senior-c%2B...	Newton	United States	Mid senior	Onsite	Job descriptionSenior C Software Developer Job...	C++, Linux, Conan, GitLab, Jira, OMAKE, UOP, T...
8 Senior Software Engineer	FDS Avionics Corp.	Las Cruces, NM	https://www.linkedin.com/jobs/view/senior-soft...	Las Cruces	United States	Mid senior	Onsite	Please note posting sister company CALCULEYCAL...	Linux, U Boot, Low level drivers, Board suppor...

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['Senior Software Developer - Node.js/Angular',
'Software Engineer - Backend',
'Senior Software Engineer 5',
'Senior Software Engineer, Kora Compute (Remote, US)',
'Mts Software Engineer',
'Software Engineer, Backend (Customer Engineering) Prisma',
'Sr. Backend Software Engineer',
'Full Stack Software Engineer (Orlando)',
'Senior Software Engineer [Planisware]',
'Lead Software Engineer, Full Stack (Java, Python, AWS)',
'Sr. Software Engineer - EPP Product, Cloud (Remote)',
'Intermediate Software Engineer (Backend)',
'Sr. Application Software Engineer',
'Java Software Developer with GCP & Kubernetes',
'Senior Software Engineer - Electrical Engineering Experience',
'Software Engineer - JavaScript',
'Senior Software Engineer [Sonrai Security]',
'Lead Software Engineer, Platform',
'.NET Senior Software Developer (REMOTE)',
'Software Engineer, Async Platform',
'Senior Java Software Developer',
'Software Architect (Top Secret)',
'Sr. Software Engineer - MAMM (Remote)',
'Application/Software Engineers in Austin TX - Permanent / Full time']

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	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
3470	Senior Software Developer - Node.js/Angular	Causeway Technologies	United Kingdom	<a href="https://uk.linkedin.com/jobs/view/senior-softw...">https://uk.linkedin.com/jobs/view/senior-softw...</a>	Blackpool	United Kingdom	Mid senior	Hybrid	Software Developer Nodejs AngularDo want wor...	Node.js, Angular, JS, MongoDB, AWS, Azure, GCP...
2532	Software Engineer - Backend	Databricks	Seattle, WA	<a href="https://www.linkedin.com/jobs/view/software-en-...">https://www.linkedin.com/jobs/view/software-en...</a>	Hollywood	United States	Mid senior	Onsite	PGSDAI Databricks passionate enabling data tea...	Java, Scala, C++, Distributed systems, Cloud 1...
2971	Senior Software Engineer 5	Mainz Brady Group	Portland, OR	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft...</a>	Newberg	United States	Mid senior	Remote	Immediate need FullStack Engineer Remote Contr...	React, JavaScript, React Native, AWS, Azure, G...
7270	Senior Software Engineer, Kora Compute (Remote)	Confluent	Raleigh, NC	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft...</a>	Durham	United States	Mid senior	Remote	Confluent pioneering fundamentally new categor...	Confluent, Data infrastructure, Data in motion...
7912	Mts Software Engineer	Spot by NetApp	Illinois, United States	<a href="https://www.linkedin.com/jobs/view/mts-softwar-...">https://www.linkedin.com/jobs/view/mts-softwar...</a>	Desatur	United States	Mid senior	Onsite	NetAppWere forwardthinking technology people h...	Apache Spark, Kubernetes, Python, Java, Go, No...
2673	Software Engineer, Backend (Customer Engineer...	Palo Alto Networks	Santa Clara, CA	<a href="https://www.linkedin.com/jobs/view/software-en-...">https://www.linkedin.com/jobs/view/software-en...</a>	Santa Clara	United States	Associate	Remote	Company DescriptionOur MissionAt Palo Alto Net...	Software Engineering, Troubleshooting, Debuggi...
4077	Sr. Backend Software Engineer	Topline Pro	Boston, MA	<a href="https://www.linkedin.com/jobs/view/sr-backend-...">https://www.linkedin.com/jobs/view/sr-backend...</a>	Beverly	United States	Mid senior	Onsite	Topline ProWere building AI powered Shopify se...	Python, JavaScript, TypeScript, Node.js, Django...
3510	Full Stack Software Engineer (Orlando)	Listella	Orlando, FL	<a href="https://www.linkedin.com/jobs/view/full-stack-...">https://www.linkedin.com/jobs/view/full-stack...</a>	Novato	United States	Mid senior	Onsite	Analistellas direct buyerreseller real estate ...	React, NextJS, Typescript, Go, Docker, GCP, Ja...
3351	Senior Software Engineer [Planisware]	Parasol	Uxbridge, England, United Kingdom	<a href="https://uk.linkedin.com/jobs/view/senior-softw-...">https://uk.linkedin.com/jobs/view/senior-softw...</a>	Luton	United Kingdom	Mid senior	Remote	Senior Software Engineer Planisware apply expe...	Planisware, System architecture frameworks, Ag...
344	Lead Software Engineer, Full Stack (Java, Pyth...	ClickJobs.io	Madison, WI	<a href="https://www.linkedin.com/jobs/view/lead-softwa-...">https://www.linkedin.com/jobs/view/lead-softwa...</a>	New Garus	United States	Mid senior	Onsite	Center 1 19002 United States America McLean Vi...	Java, Python, AWS, Docker, Kubernetes, JavaScr...
147	Sr. Software Engineer - EPP Product, Cloud (Re...	RemoteWorker US	San Jose, CA	<a href="https://www.linkedin.com/jobs/view/sr-software-...">https://www.linkedin.com/jobs/view/sr-software...</a>	Livermore	United States	Mid senior	Remote	Role looking Sr Software Engineer join growing...	Go (Golang), Scala, Python, Java, C#, Software...
5267	Intermediate Software Engineer (Backend)	Movement Mortgage	Charlotte, NC	<a href="https://www.linkedin.com/jobs/view/intermediat-...">https://www.linkedin.com/jobs/view/intermediat...</a>	North Carolina	United States	Mid senior	Remote	Get Earn Give MovementWere definitely average...	Scala, Python, C#, GraphQL, .NET Core, Azure...
3333	Sr. Application Software Engineer	SpaceX	Brownsville, TX	<a href="https://www.linkedin.com/jobs/view/sr-applikat-...">https://www.linkedin.com/jobs/view/sr-applikat...</a>	Brownsville	United States	Mid senior	Onsite	SpaceX founded belief future humanity explorin...	SpaceX, Python, C# .NET, Go, Scala, Java, Bash...
7809	Java Software Developer with GCP & Kubernetes	Atos	Dallas, TX	<a href="https://www.linkedin.com/jobs/view/java-softwa-...">https://www.linkedin.com/jobs/view/java-softwa...</a>	Arlington	United States	Mid senior	Remote	Focus serverside software engineering backend...	gRPC, REST APIs, NoSQL, microservice architect...
1863	Senior Software Engineer - Electrical Engineer...	Data Society	Washington, DC	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft...</a>	Dunkirk	United States	Mid senior	Remote	Job SummaryThis position Data Society ental v...	Software Engineering, FullStack Development, C...
1373	Software Engineer - JavaScript	BJSS	Leeds, England, United Kingdom	<a href="https://uk.linkedin.com/jobs/view/software-eng-...">https://uk.linkedin.com/jobs/view/software-eng...</a>	York	United Kingdom	Mid senior	Hybrid	UsWere awardwinning innovative tech consultanc...	JavaScript, TypeScript, React JS, Vue JS, Next...
3564	Senior Software Engineer [Sonrai Security]	CareerBeacon	Fredericton, New Brunswick, Canada	<a href="https://ica.linkedin.com/jobs/view/senior-softw-...">https://ica.linkedin.com/jobs/view/senior-softw...</a>	New Brunswick	Canada	Mid senior	Remote	Sonrai pronounced Sonree means data Irish help...	Cloud Engineering, Java, Docker, Kubernetes, L...
6316	Lead Software Engineer, Platform	Headcount	San Mateo, CA	<a href="https://www.linkedin.com/jobs/view/lead-softwa-...">https://www.linkedin.com/jobs/view/lead-softwa...</a>	El Centro	United States	Associate	Onsite	partnering company looking experienced Lead So...	Software development, Cloudbased platforms, Ru...
1187	.NET Senior Software Developer (REMOTE)	GEICO	Chevy Chase, MD	<a href="https://www.linkedin.com/jobs/view/net-senior-...">https://www.linkedin.com/jobs/view/net-senior...</a>	Maryland	United States	Mid senior	Remote	GEICO Technology Solutions journey revolution...	.NET, C#, Visual Studio, SQL Server, ASP.NET...
2141	Software Engineer, Async Platform	Lyft	Seattle, WA	<a href="https://www.linkedin.com/jobs/view/software-en-...">https://www.linkedin.com/jobs/view/software-en...</a>	Bellefontaine	United States	Mid senior	Onsite	Lyft mision improve peoples lives worlds best...	AWS, GCP, Azure, Python, Go, SQS, Kafka, Kines...
1403	Senior Java Software Developer	RJC Group	City of London, England, United Kingdom	<a href="https://uk.linkedin.com/jobs/view/senior-java-...">https://uk.linkedin.com/jobs/view/senior-java...</a>	Basilston	United Kingdom	Mid senior	Hybrid	Software Developer LondonHybrid Java 95000m l...	Java 11+, Kotlin, Scala, Spring Boot, SQL, Kaf...
1612	Software Architect (Top Secret)	Rakner	San Antonio, TX	<a href="https://www.linkedin.com/jobs/view/software-ar-...">https://www.linkedin.com/jobs/view/software-ar...</a>	San Antonio	United States	Mid senior	Onsite	Title Software ArchitectClearance Top Secret S...	Software Architecture, Cloudnative Solutions...
3472	Sr. Software Engineer - MAMM (Remote)	UNFI	Providence, RI	<a href="https://www.linkedin.com/jobs/view/sr-software-...">https://www.linkedin.com/jobs/view/sr-software...</a>	Attleboro	United States	Mid senior	Remote	Job OverviewThe Sr Software Engineer respons...	Manhattan WMS, React.js, JavaScript, Node.js...
6116	Application/Software Engineers in Austin TX - ...	WinningEdge Solutions LLC	Austin, TX	<a href="https://www.linkedin.com/jobs/view/application-...">https://www.linkedin.com/jobs/view/application...</a>	Austin	United States	Mid senior	Onsite	ApplicationSoftware Engineersin Austin TX Perm...	Software Development, Java, C#, Python, GCP, A...



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[
'Software Developer - Intermediate',
'Senior Software Design Engineer',
'Senior Software Engineer| Java & AWS | Hybrid',
'Applications Engineer, Software',
'Mobile Software Engineer in Test',
'Senior Software Developer/Engineer',
'Senior .NET Software Developer',
'Software Developer - On Site Norton, MA',
'Sr. Full Stack Software Developer - Remote Opportunity',
'.NET Software Engineer',
'Senior Developer - Software',
'SENIOR SOFTWARE ENGINEER',
'Sr. Systems Software Engineer',
'Senior Systems Software Engineer',
'Sr. Software Engineer (AWS Cloud/JavaScript/TypeScript, Node And API's)',
'Senior Software Engineer - PHP - Night shift',
'Software Engineer, .NET (Remote in US)',
'Sr Software Developer',
'Senior Software Engineer (GeoSupport)',
'.NET Senior Software Developer (REMOTE)',
'Senior Web Developer/Software Engineer',
'Software Engineering Sr Manager - Evernorth Home-Based Care',
'Staff - Software Developer',
'Software Automation Engineer']
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	job_title	company	job_location	job_link	city_name	country_name	job_level	mode_of_job	job_description	job_skills
4137	Software Developer - Intermediate	PEER Group Inc.	Kitchener, Ontario, Canada	<a href="https://ca.linkedin.com/jobs/view/software-dev-...">https://ca.linkedin.com/jobs/view/software-dev-...</a>	Cambridge	Canada	Mid senior	Hybrid	growWant solve problems industry considered on...	C#, .NET Framework, WCF, REST APIs, XML, Aaync...
1362	Senior Software Design Engineer	Safronics Limited	Leeds, England, United Kingdom	<a href="https://uk.linkedin.com/jobs/view/senior-sofw-...">https://uk.linkedin.com/jobs/view/senior-sofw-...</a>	York	United Kingdom	Mid senior	Onsite	Looking ForRSE Controls subsidiary Safronics ...	Automation, Control Systems, PLC Programming, ...
8896	Senior Software Engineer  Java & AWS   Hybrid	MAS Global Consulting	Columbus, OH	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft-...</a>	Columbus	United States	Mid senior	Onsite	AreYou excel finding daily opportunities grow ...	Java, Spring, Spring Boot, Python 3, AWS Cloud...
2153	Applications Engineer, Software	Luminator Technology Group	Piano, TX	<a href="https://www.linkedin.com/jobs/view/application-...">https://www.linkedin.com/jobs/view/application-...</a>	McKinney	United States	Mid senior	Onsite	DepartmentEngineeringJob StatusFulltimeFLSA St...	.NET, C#, .NET Standard Framework, Azure DevOp...
651	Mobile Software Engineer in Test	Trimble Inc.	Pennsylvania, United States	<a href="https://www.linkedin.com/jobs/view/mobile-soft-...">https://www.linkedin.com/jobs/view/mobile-soft-...</a>	State College	United States	Mid senior	Remote	TitleMobile Software Engineer TestJob Location...	Android app automation, Apptium, Eggplant, Sele...
3819	Senior Software Developer/Engineer	KPI Solutions	Staronville, OH	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft-...</a>	Cincinnati	United States	Associate	Onsite	Kuecker Pulse Integration KPI/Created July 2021...	Software Development, Java, Angular, MS SQL Se...
6575	Senior .NET Software Developer	Capitol Tech Solutions	Sacramento, CA	<a href="https://www.linkedin.com/jobs/view/senior-net-...">https://www.linkedin.com/jobs/view/senior-net-...</a>	Davis	United States	Mid senior	Onsite	Senior .NET Software DeveloperJob DescriptionCa...	.NET, C#, ASP.NET, HTML, CSS, SQL, SQL Server...
3440	Software Developer - On Site Norton, MA	Horizon Beverage	Norton, MA	<a href="https://www.linkedin.com/jobs/view/software-de-...">https://www.linkedin.com/jobs/view/software-de-...</a>	Attleboro	United States	Mid senior	Onsite	Software Developer SiteNorton MAHorizon Bevera...	SQL Server, SQL Programming Language, C#, Visu...
7989	Sr. Full Stack Software Developer - Remote Opp...	IMAGINIT Technologies	Indianapolis, IN	<a href="https://www.linkedin.com/jobs/view/sr-full-sta-...">https://www.linkedin.com/jobs/view/sr-full-sta-...</a>	Indiana	United States	Mid senior	Onsite	Company DescriptionIMAGINIT Technologies divis...	C#, .NET Framework, SQL Server, Azure cloud se...
3330	.NET Software Engineer	LTI Mindtree	Bellevue, WA	<a href="https://www.linkedin.com/jobs/view/net-sofwar-...">https://www.linkedin.com/jobs/view/net-sofwar-...</a>	Lawton	United States	Associate	Hybrid	UsaLTI Mindtree's global technology consulting d...	.NET, C#, ASP.NET MVC, API, XML, Restful, CSS...
84	Senior Developer - Software	Airgas	Lawrenceville, GA	<a href="https://www.linkedin.com/jobs/view/senior-dev-...">https://www.linkedin.com/jobs/view/senior-dev-...</a>	Bethlehem	United States	Mid senior	Onsite	R10027373 Senior Developer Software OpenLocat...	Web development, Mobile development, Angular, ...
922	SENIOR SOFTWARE ENGINEER	Northwest Bank	Bellevue, PA	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft-...</a>	Brighton	United States	Mid senior	Onsite	Software Engineer designs develops supports ap...	Visual Studio, .NET, SQL Server, C#, SQL, Web ...
6816	Sr. Systems Software Engineer	Logix Consulting	Monrovia, CA	<a href="https://www.linkedin.com/jobs/view/sr-systems-...">https://www.linkedin.com/jobs/view/sr-systems-...</a>	Pasadena	United States	Associate	Onsite	client located Monrovia CA seeking Sr Systems ...	Automation Control, Software Development, Pias...
347	Senior Systems Software Engineer	Exact Sciences	Madison, WI	<a href="https://www.linkedin.com/jobs/view/senior-syst-...">https://www.linkedin.com/jobs/view/senior-syst-...</a>	New Glarus	United States	Mid senior	Onsite	Help us change livesAt Exact Sciences helping ...	Software Engineering, Software Design, Softwar...
6119	Sr. Software Engineer (AWS Cloud/JavaScript/TypeScript)	High Alpha	Austin, TX	<a href="https://www.linkedin.com/jobs/view/sr-software-...">https://www.linkedin.com/jobs/view/sr-software-...</a>	Austin	United States	Mid senior	Remote	Hello interested unique opportunity join team ...	NodeJS, Typescript, DynamoDB, AWS Serverless a...
7269	Senior Software Engineer - PHP - Night shift	Intelrad Medical Systems	Indiana, United States	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft-...</a>	Gulford	United States	Mid senior	Onsite	Company DescriptionOver last 20 years Intela...	Software Development, Object Oriented Programm...
7972	Software Engineer, .NET (Remote in US)	Resultant	Indianapolis, IN	<a href="https://www.linkedin.com/jobs/view/software-en-...">https://www.linkedin.com/jobs/view/software-en-...</a>	Indiana	United States	Associate	Remote	Company DescriptionWe passionate team 300 engi...	.NET frameworks, Package managers, IDEs, Relat...
78	Sr Software Developer	Mitsubahi Electric	Suwanee, GA	<a href="https://www.linkedin.com/jobs/view/sr-software-...">https://www.linkedin.com/jobs/view/sr-software-...</a>	Bethlehem	United States	Mid senior	Onsite	essential functions position include limited f...	Software Development, Agile Software Developme...
275	Senior Software Engineer (GeoSupport)	City of New York	Manhattan, NY	<a href="https://www.linkedin.com/jobs/view/senior-soft-...">https://www.linkedin.com/jobs/view/senior-soft-...</a>	Levittown	United States	Mid senior	Onsite	AGENCYThe Department City Planning DCP plans s...	SQL Server, Azure, C#, ASP.NET, MVC, .NET, HTM...
1187	.NET Senior Software Developer (REMOTE)	GEICO	Chevy Chase, MD	<a href="https://www.linkedin.com/jobs/view/net-senior-...">https://www.linkedin.com/jobs/view/net-senior-...</a>	Maryland	United States	Mid senior	Remote	GEICO Technology Solutions journey revolution...	.NET, C#, Visual Studio, SQL Server, ASP.NET, ...
4631	Senior Web Developer/Software Engineer	oFive Solutions	Anaheim, CA	<a href="https://www.linkedin.com/jobs/view/senior-web-...">https://www.linkedin.com/jobs/view/senior-web-...</a>	San Juan Capistrano	United States	Mid senior	Remote	oFive Solutions Inc oFive provides software al...	Java Development Stack, J2EE, JSP, Spring, Hib...
771	Software Engineering Sr Manager - Evernorth Ho...	Evernorth Health Services	Bloomfield, CT	<a href="https://www.linkedin.com/jobs/view/software-en-...">https://www.linkedin.com/jobs/view/software-en-...</a>	Litchfield	United States	Mid senior	Onsite	Evernorth HomeBased Care complete income popul...	Software Engineering, Agile/SAFE, Continuous I...
782	Staff - Software Developer	ElsnerAmper	Metairie, LA	<a href="https://www.linkedin.com/jobs/view/staff-sofw-...">https://www.linkedin.com/jobs/view/staff-sofw-...</a>	New Orleans	United States	Mid senior	Onsite	ElsnerAmper one largest accounting tax busines...	Software Development, C#, ASP.NET, MS SQL Serv...
595	Software Automation Engineer	PDS Tech Commercial, Inc.	Rockford, IL	<a href="https://www.linkedin.com/jobs/view/software-au-...">https://www.linkedin.com/jobs/view/software-au-...</a>	Belvidere	United States	Mid senior	Onsite	PDS Tech Commercial Inc seeking Software Autom...	PLC, Python, Java, Ignition, HMIs, National In...

## **Conclusion**

We were able to successfully implement machine learning concepts to perform the task of recommending jobs to candidates based on their previous job title/job skills/job description. We were able to create a model that uses TD-IDF Vectorizer and Cosine Similarity to provide recommendation to candidates