

**A REPORT ON
PROJECT BASED LEARNING - II**

MOVIE RECOMMENDATION SYSTEM

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY,
PUNE IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE AWARD OF THE DEGREE

OF

SECOND YEAR COMPUTER ENGINEERING

SUBMITTED BY

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**INTERNATIONAL INSTITUTE OF INFORMATION
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**SAVITRIBAI PHULE PUNE UNIVERSITY
2022-2023**



CERTIFICATE

This is to certify that the project report entitles

“MOVIE RECOMMENDATION SYSTEM ”

Submitted
by

ARANAV MAHALPURE PRN No : 72215975H

is a bonafide student of this institute and the work has been carried out by him/her under the supervision of **Prof. Raksha Naidu** and it is approved for the partial fulfillment of the requirement of Savitribai Phule Pune University, for the award of the degree of **Second Year of Engineering**(Computer Engineering).

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NAME OF THE STUDENT

ARANAV MAHALPURE

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LIST OF ABBREVIATIONS

ABBREVIATION	ILLUSTRATION
www	World Wide Web
ML	Machine learning
HTML	Hypertext Mark-up Language
CSS	Cascading Style Sheets
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secured
DNS	Domain Name System

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1. Introduction

1.1 Relevance of the Project

A recommendation system or recommendation engine is a model used for information filtering where it tries to predict the preferences of a user and provide suggestions based on these preferences. These systems have become increasingly popular nowadays and are widely used today in areas such as movies, music, books, videos, clothing, restaurants, food, places and other utilities. These systems collect information about a user's preferences and behavior , and then use this information to improve their suggestions in the future.

Movies are a part and parcel of life. There are different types of movies like some for entertainment, some for educational purposes, some are animated movies for children, and some are horror movies or action films. Movies can be easily differentiated through their genres like comedy, thriller, animation, action etc. Other way to distinguish among movies can be either by releasing year, language, director etc. Watching movies online, there are a number of movies to search in my most liked movies . Movie Recommendation Systems helps us to search our preferred movies among all of these different types of movies and hence reduce the trouble of spending a lot of time searching our likely movies. So, it requires that the movie recommendation system should be very reliable and should provide us with the recommendation of movies which are exactly same or most matched with our preferences.

A large number of companies are making use of recommendation systems to increase user interaction and enrich a user's shopping experience. Recommendation systems have several benefits, the most important being customer satisfaction and revenue. Movie Recommendation system is very powerful and important system. But, due to the problems associated with pure collaborative approach, movie recommendation systems also suffers with poor recommendation quality and scalability issues.

1.2 Problem Statement:

The goal of the project is to recommend a movie to the user.

Providing related content out of relevant and irrelevant collection of items to users of

online service providers.

Objective of the Projects

- Improving the Accuracy of the recommendation system Improve the Quality of the movie Recommendation system Improving the Scalability.
- Enhancing the user experience.

1.3 Scope of the Project

The objective of this project is to provide accurate movie recommendations to users. The goal of the project is to improve the quality of movie recommendation system, such as accuracy, quality and scalability of system than the pure approaches. This is done using Hybrid approach by combining content based filtering and collaborative filtering, To eradicate the overload of the data, recommendation system is used as information filtering tool in social networking sites .Hence, there is a huge scope of exploration in this field for improving scalability, accuracy and quality of movie recommendation systems Movie Recommendation system is very powerful and important system. But, due to the problems associated with pure collaborative approach, movie recommendation systems also suffers with poor recommendation quality and scalability issues.

1.4 Methodology for Movie Recommendation

The hybrid approach proposed an integrative method by merging fuzzy k-means clustering method and genetic algorithm based weighted similarity measure to construct a movie recommendation system. The proposed movie recommendation system gives finer similarity metrics and quality than the existing Movie recommendation system but the computation time which is taken by the proposed recommendation system is more than the existing recommendation system. This problem can be fixed by taking the clustered data points as an input dataset

The proposed approach is for improving the scalability and quality of the movie recommendation system . unifying Content-Based Filtering and Collaborative Filtering, so that the approaches can be profited from each other. For computing similarity between the different movies in the given dataset efficiently and in

least time and to reduce computation time of the movie recommender engine I used cosine similarity measure.

Agile Methodology:

- 1. Collecting the data sets:** Collecting all the required data set from Kagglewebsite.in this project require movie.csv, ratings.csv, users.csv.
- 2. Data Analysis:** make sure that that the collected data sets are correct and analysing the data in the csv files. i.e. checking whether all the column Fields are present in the data sets.
- 3. Algorithms:** in our project we have only two algorithms one is cosine similarity and other is single valued decomposition are used to build the machine learning recommendation model.
- 4. Training and Testing the model:** once the implementation of algorithm is completed . we have to train the model to get the result. We have tested it several times the model is recommend different set of movies to different users.
- 5. Improvements in the project:** In the later stage we can implement different algorithms and methods for better recommendation.

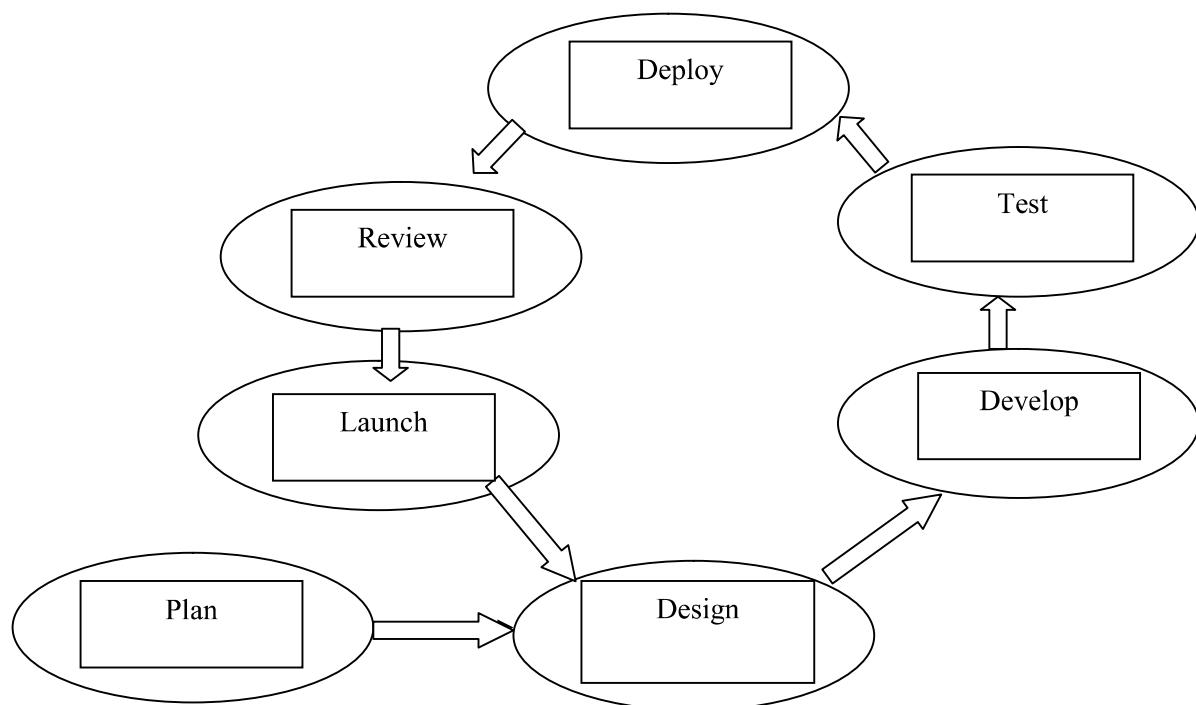


Fig 1.4:- Agile Methodology

1.5 Abstract

This analysis mainly focuses on the domain of Machine Learning example of Movie Recommendation System with a approach of finding the similarity scores between the two contents in the content based filtering. It helps us in finding the distance between the two vectors and their angle by the help of the cosine similarity formula and their magnitude of relative scores. In this model, we have considered two texts and plotted them in the form of a graph from where we have plotted the points taking two-dimension plane of x-y plane only. We have taken in consideration two fields (i.e.) in x-plane we have considered the word London of the text whereas in y-plane we have considered Paris word of the texts. This model analysis the points to find the two texts similarity scores by using Python shell and distance between two vector model approach more effectively and precisely.

In today computer world we have lots of stuff on our Internet sources to watch and see but every single stuff available not matches with our liking. We sometimes get the feed of the videos, vies, news, clothing etc. which is not according to our liking and interest. It makes the customer interest in the application lowest and he/she further doesn't want to get through the same application again. The need for the hour is to develop some code which can tell at a beginner level the matching pattern of the customer trend and recommend him with the best item of his interest level. This will help us in making the customer experience satisfactory and able to achieve good ratings and popularity as well.

Many of the recommendation systems we are seeing today in our environment such as in the YouTube for example if I see lots of news regarding the GK and Current Affairs then it offers me the related videos according to it with different subscribers. It gains popularity by application rating and at the same time enhances the customer experience. This policy of recommendation system is really helpful in giving optimum results to an application profitability and to make the organisation more connected.

We can also see the recommendation work in online food applications such as Zomato, Food Panda and Swiggy which offers their customers the food restaurants which supplies their taste food. They learn upon the behaviour of the customer from the previous orders and tries to impress them with the latest add-ons of their favourite cuisines and stuffs.

It is been investigated from decade towards our needs that most of the ML implementation algorithms and other aspects are been governed by the recommendation engines to compute the similarity scores. This research paper takes upon the consideration a graph based model, which is quite affordable and easy to understand by software developer ,where we have taken two Texts A and B and try to find out the distance between these two words of texts “London” and “Paris” on X-axis and Y-axis respectively.

2. LITERATURE SURVEY

SR NO	Name of the Author	Paper Name	Published Journal and year	Review	Keywords
1.	Hirdesh Shivhare, Anshul Gupta and Shalki Sharma	“Recommender system using fuzzy c-means clustering and genetic algorithm based weighted similarity measure”	IEEE International Conference on Computer, Communication and Control. (2015)	<p>Used combinatorial approach by combining fuzzy c-means clustering and genetic algorithm based weighted similarity measure to develop recommender system and provide optimal similarity measures and similarity metrics with movie lens dataset. The proposed recommender system can be used in all collaborative filtering systems and does not even require any hybrid model to get implemented with</p>	fuzzy c-means clustering and genetic algorithm based weighted similarity

2.	Manoj Kumar, D.K. Yadav, Ankur Singh and Vijay Kr. Gupta	“A Movie Recommender System: MOVREC”	International Journal of Computer Applications (0975 – 8887) Volume 124 – No.3 (2015)	This paper discuss about recommendations of the movies. A movie recommendation is important in our social life due to its strength in providing enhanced entertainment. Such a system can suggest a set of movies to users based on their interest, or the popularities of the movies. A recommendation system is used for the purpose of suggesting items to purchase or to see. They direct users towards those items which can meet their needs through cutting down large database of Information. A recommender system, or a recommendation system (sometimes replacing 'system' with a synonym such as platform or engine), is a subclass of information filtering system that seeks to predict the "rating" or "preference" a user would give to an	Filtering, Recommendation System, Recommender
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				item[1][2]. They are primarily used in commercial applications. MOVREC also help users to find the movies of their choices based on the movie experience of other users in efficient and effective manner without wasting much time in useless browsing	
3.	RyuRi Kim, Ye Jeong Kwak, HyeonJeong Mo, Mucheol Kim, Seungmin Rho,Ka Lok Man, Woon Kian Chong	“Trustworthy Movie Recommender System with Correct Assessment and Emotion Evaluation”	Proceedings of the International MultiConference of Engineers and Computer Scientists Vol II.(2015)	This paper proposes the movie recommender system for providing trustworthy movie ratings. Most of the movie recommender systems do not consider the unfair rating problem but the emotion evaluation. Then our approach performs the correct assessment against unfair rating. Furthermore we should analyze the review comments from twitter and emotion evaluations of users. As a result, it is possible to provide the movie candidates which are adjusting to users' intentions in a timely manner.	Deep Learning, Recommendation System, Review Senti ment Analysis

4.	Debadrita Roy, Arnab Kundu	"Design of Movie Recommendation System by Means of Collaborative Filtering",	International Journal of Emerging Technology and Advanced Engineering, Volume 3, Issue 4. (2013)	For looking favorable movies online, we will make use of movie recommendation systems, that are extra dependable, when you consider that searching of preferred films would require more and more time which one can „t have the funds to waste. In this paper, to improve the quality of a movie recommendation system, a deep learning-based approach is presented to find out what exactly was being talked about in the user's review and the sentiments that people are expressing	Deep Learning, Recommendation System, Review, Senti ment Analysis
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Table 2.1:- LITERATURE SURVEY

3. System Requirements Specification

This chapter involves both the hardware and software requirements needed for the project and detailed explanation of the specifications.

3.1 Hardware Requirements

- A PC with Windows/Linux OS
- Processor with 1.7-2.4GHz speed
- Minimum of 8gb RAM

3.2 Software Specification

Jupyter Notebook

Streamlit package

PyCharm Editor

Python libraries

3.3 Software Requirements

3.3.1 Streamlit :

Streamlit is a promising open-source Python library, which enables developers to build attractive user interfaces in no time. Streamlit is the easiest way especially for people with no front-end knowledge to put their code into a web application: No front-end (html, js, css) experience or knowledge is required.

3.3.2 Python libraries:

For the computation and analysis we need certain python libraries which are used to perform analytics. Packages such as SKlearn, Numpy, pandas, request,pickle,streamlit framework, etc are needed.

SyKtlearn: It features various classification, regression and clustering algorithms

including support vector machines, random forests, gradient boosting, k-means and DBSCAN, and is designed to interoperate with the Python numerical and scientific libraries NumPy and SciPy.

NumPy: NumPy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays. It is the fundamental package for scientific computing with Python.

Pandas: Pandas is one of the most widely used python libraries in data science. It provides high-performance, easy to use structures and data analysis tools. Unlike NumPy library which provides objects for multi-dimensional arrays, Pandas provides in-memory 2d table object called Data frame.

4. System Analysis and Design

4.1 System Architecture of Proposed System:

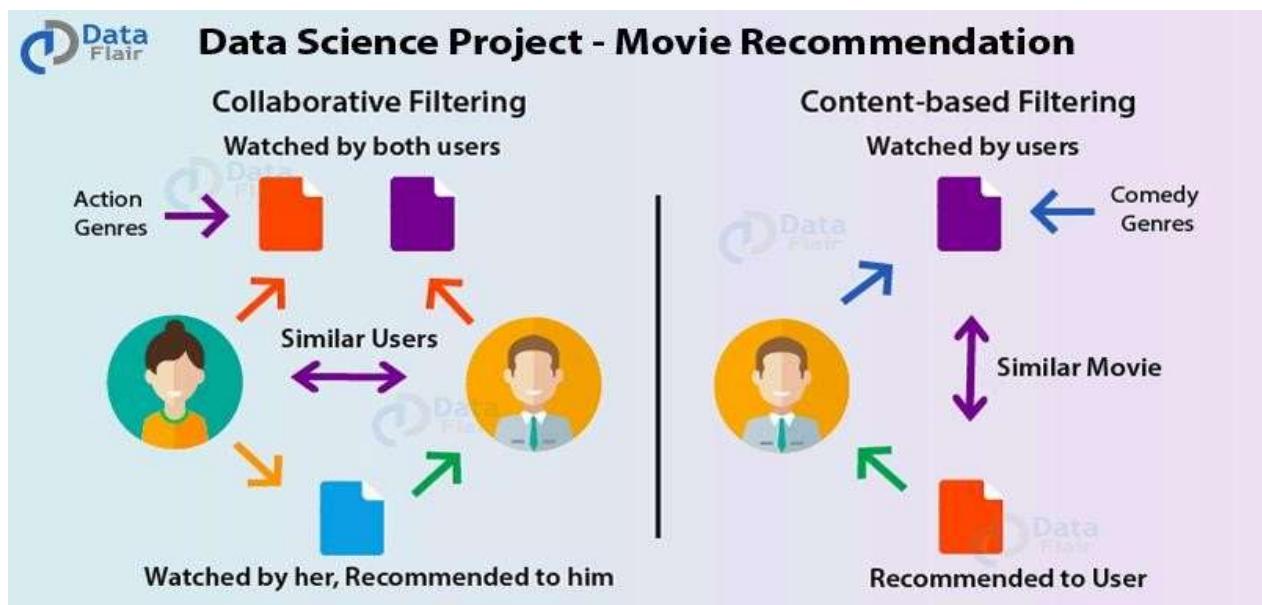


Fig 4.1 :- Architecture for hybrid approach

For each different individual use different list of movies are recommended ,as user search his/her most favourite Movie will recommend the set of movies to the particular user by combining the both the set of movie based on the user the hybrid model will recommend the single list of movie to the user.

Three different types of Machine Learning methods are as follows-

1.) Data Extraction and Cleaning

This is been used to extract and clean the data by using scripting languages such as Python, Shell Scripting etc. Here we extract and filter the useful data of movies datasets according to our need.

2.) Build ML Model

Once we will extract and clean data will start building up the model with tools such as Tensor Flow, Azure ML etc. We build our movie recommendation engine here which would be in form of a Python script.

3.) Build Software Infrastructure

Here we have to build ML components such as a product for the users by using the ML algorithms in the form of a software by using JavaScript. A little knowledge of cloud infrastructure such as AWS (Amazon Web Services) and to collaborate with people a little knowledge of GitHub is also known.

Users- They are the one who uses these services or acts as the consumer.

Items-Here these are the different sets of movies which are been recommended in a sort of zig-zag manner according to our previous searches

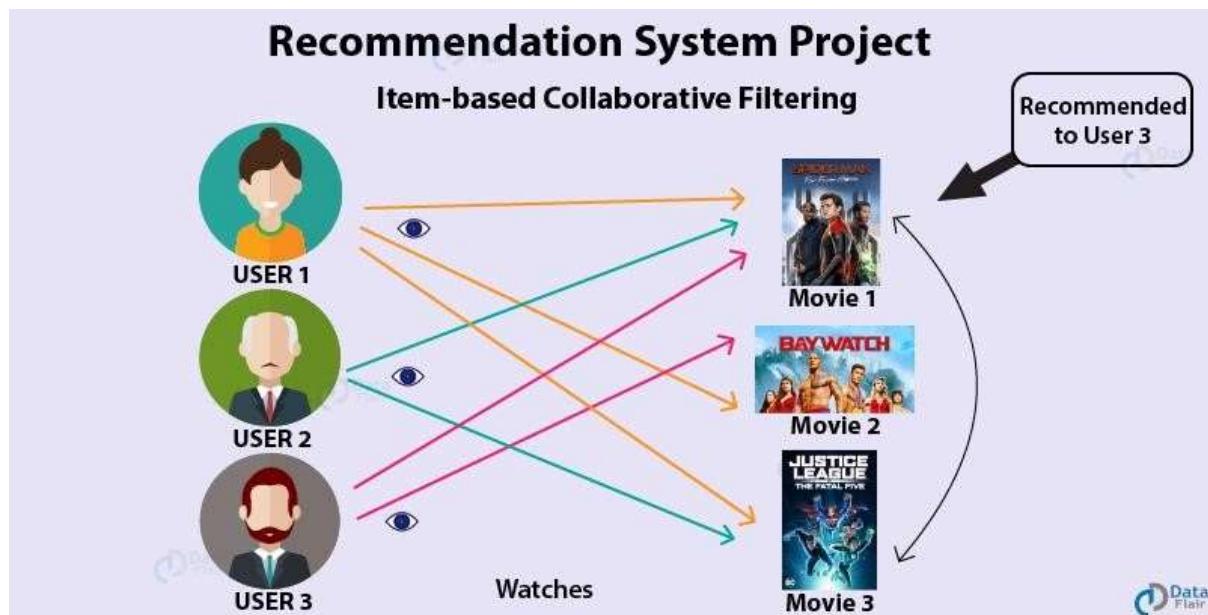


Fig 4.2:- Architecture of Recommendation

Three ways of performing the filtering are as follows-

Trending based filtering- Here the movies are been classified by the ratings and the stuff that is been liked by a majority of the population.

Content based filtering-Here the similar articles are been recommended to the user according to his previous content search.

Collaborative based filtering-Here the two similar user likings act as a recommender to each other. Like, we two users watch comedy movies so if a new comedy stuff appears and is watched by A user it will also be recommended to user B.

A recommender system, or a recommendation system (sometimes replacing 'system' with a synonym such as platform or engine), is a subclass of information filtering system that seeks to predict the "rating" or "preference" a user would give to an item. They are primarily used in commercial applications. Recommender systems are utilized in a variety of areas and are most commonly recognized as playlist generators for video and music services.

like Netflix, YouTube and Spotify, product recommenders for services such as Amazon, or content recommenders for social media platforms such as Facebook and Twitter. These systems can operate using a single input, like music, or multiple inputs within and across platforms like news, books, and search queries. There are also popular recommender systems for specific topics like restaurants and online dating. Recommender systems have also been developed to explore research articles and experts, collaborators, and financial services. These both are the recommendation engines that recommend us the movies and other related stuff based on our previous searches and watched experience.

IMPLEMENTATION OF CODING DIAGRAM

Step1: Read CSV file of dataset.

Step2: Select features of datasets

Step3: Create a column in DF which contains all selected features

Step 4: Create count matrix from this new combined column

Step5: Compute the cosine similarity based on count matrix

Step6: Get index of this movie from title

Step7: We will get the list of similar movies in descending order of similarity score

Step8: Lastly, Print title of first 8 movies

5. System Design

5.1 System architecture

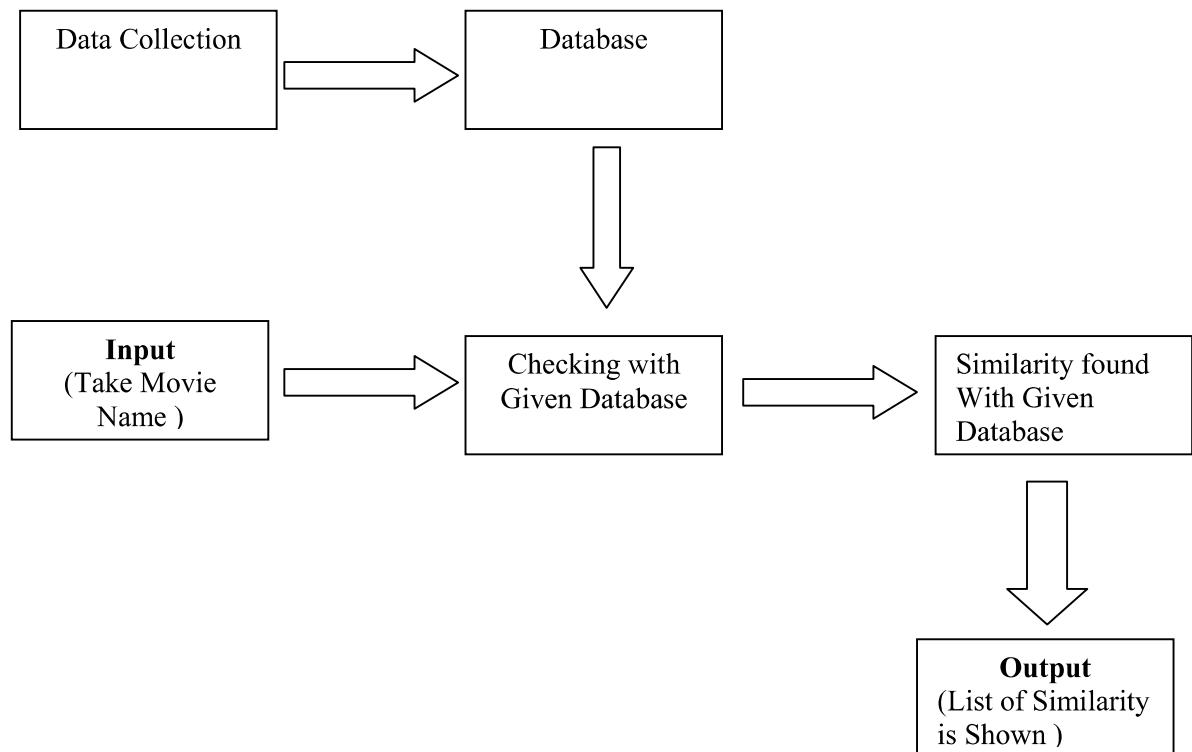


Fig 5.1 :- System architecture

5.2 Use case Diagram

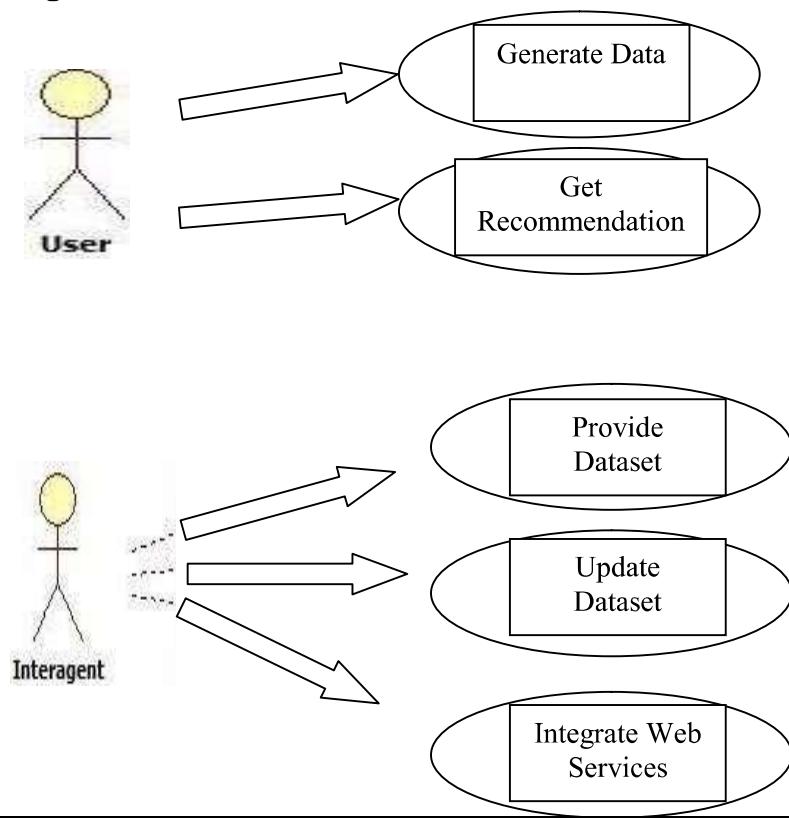


Fig 5.2 :-Use case Diagram

5.3 Data Flow Diagram

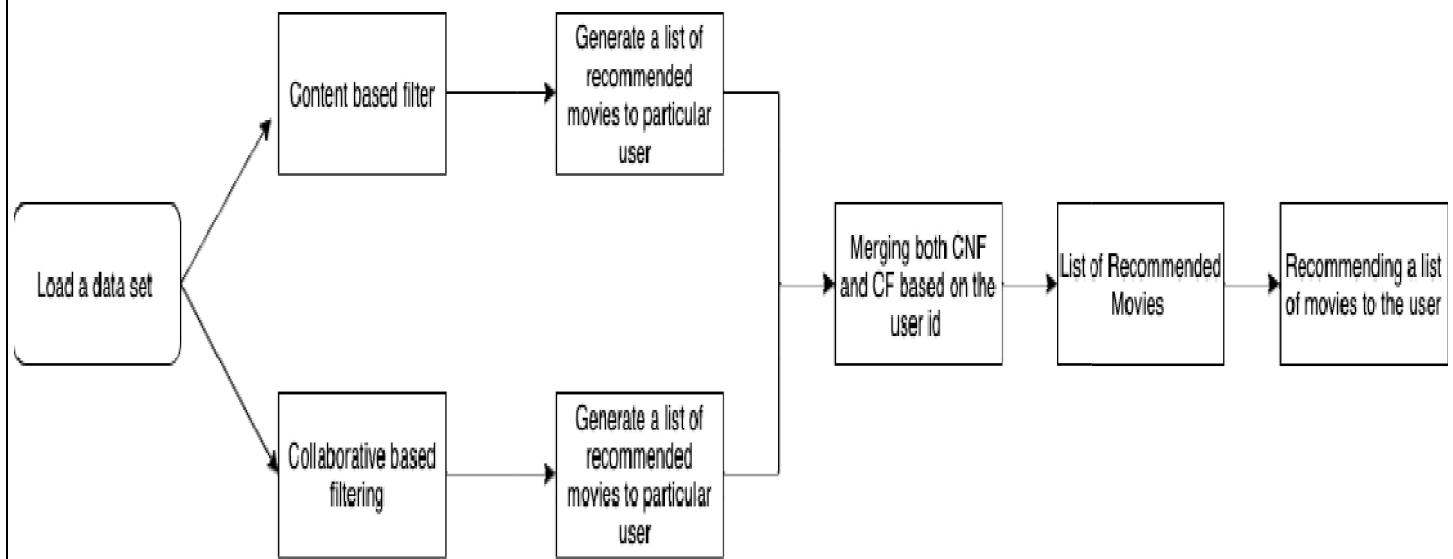


Fig 5.3 :- Data Flow Diagram

6. Project Plan

6.1 Project Schedule

6.1.1 Project Task Set

- Identification of problem statement
- Analysis of problem statement
- Planning and distribution of work
- Literature survey
- Designing and modelling
- Implementation
- Testing

6.1.2 Timeline Chart

Sr. No.	Week	Activity
1	2 nd Week of February, 2023	Introduction to topic with Domain
2	3 rd Week of February, 2023	
3	4 th Week of February, 2023	Introduction, Problem Statement
4	1 st Week of March, 2023	Finalization of Project Domain and Title
5	2 nd Week of March, 2023	Problem Statement, Literature Review
6	3 rd Week of March, 2023	
7	4 th Week of March, 2023	Requirements Gathering
8	5 th Week of March, 2023	First Presentation about progress of project work
9	1 st Week of April, 2023	Design
10	2 nd Week of April, 2023	
11	3 rd Week of April, 2023	Coding
12	4 th Week of April, 2023	
13	1 st Week of May, 2023	Final Presentations Of Project Work

14	2 nd Week of May, 2023	Submission of Project Report
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Table 6.1.2 :- Timeline chart

6.1.3 Task Network2

SR NO.	TASK	START DATE	END DATE	DAYS TO COMPLETE
1	Exploring different domains	06-02-2023	13-02-2023	8
2	Project idea	14-02-2023	25-02-2023	12
3	Finalizing Domain	28-02-2023	04-03-2023	5
4	Finding research papers	06-03-2023	09-03-2023	4
5	Going through papers	10-03-2023	15-03-2023	6
6	Literature Review	16-03-2023	18-03-2023	3
7	Presentation	27-03-2023	31-03-2023	5
8	Domain study	01-04-2023	11-04-2023	11
9	Finding Information	12-04-2023	19-04-2023	8
10	Implementation	20-04-2023	28-04-2023	9
11	Testing	29-04-2023	03-05-2023	5

Table 6.1.3 :- Task Network

7. Team Organization

7.1 Team Structure

I am working alone. I identified a problem statement that resonates with my own experiences as well as those of many other students. After careful consideration, I decided that the domain of Machine learning would be ideal for my project, as it offers high availability(algorithms) and flexibility (methods).

8. Implementation

8.1 TOOLS AND TECHNOLOGIES USED

- **Streamlit**

Streamlit is a promising open-source Python library, which enables developers to build attractive user interfaces in no time. Streamlit is the easiest way especially for people with no front-end knowledge to put their code into a web application: No front-end (html, js, css) experience or knowledge is required.

- **Python**

Python caters to complex AI and ML modules, making it ideal for ML and AI-driven applications. And because of its simplicity and flexibility, Python enables programmers to increase their confidence and productivity, while leveraging these technologies

- **GIT/GITHUB**

Git is a version control system that lets you manage and keep track of your source code history. GitHub is a cloud-based hosting service that lets you manage Git repositories. If you have open-source projects that use Git, then GitHub is designed to help you better manage them.

- **Streamlit Cloud**

Streamlit's Community Cloud is an open and free platform for the community to deploy, discover, and share Streamlit apps and code with each other. If you're just getting started and have not yet built your first Streamlit app, check out the main Get started page first.

8.2 ALGORITHM DETAILS

- It gives the results of similar movies related to my applied set of movies.
- It is confined of providing the results with the help of cosine similarity formula and count vectorizer.
- It provides the output of movies with the help of datasets governed through csv files.
- Not confined to provide advance hybrid string matching elements solutions and responses.
- To find out the related content of the user in a given set of collection and to his interest feed.
- Providing the accurate and most confined results by using the distance between two vectors model and graph plotting examples.
- Using the cosine similarity formula for finding the similarity scores/matching of the two texts more accurately.
- By providing accurate results by the usage of movies datasets by TMDB in the existing project work.

Classifying the users interest movies and recommend them to their searches fast by help of libraries and software as pip, panda etc.

- Keyword-Based Vector-Space Model: The researchers used this model with basic TF-IDF weighing technique to represent a research paper as a vector of weights, where each weight indicates the degree of association between a research paper and a term or keyword.
- Item Representation: The items (research papers) are represented by a set of features (also called attributes or properties). These attributes are: title of the paper, abstract, keywords, research area, ID of the paper, and the authors. The abstract represents the research paper when the frequency of a term in the research paper is being determined. Recommender systems are software applications that provide or suggest items to intended users. These systems use filtering techniques to provide recommendations. The major ones of these techniques are collaborative-based filtering technique, content-based technique, and hybrid algorithm. The motivation came as a result of the need to integrate recommendation feature in digital libraries in order to

- reduce information overload. Content-based technique is adopted because of its suitability in domains or situations where items are more than the users. TF-IDF (Term Frequency Inverse Document Frequency) and cosine similarity were used to determine how relevant or similar a research paper is to a user's query or profile of interest. Research papers and user's query were represented as vectors of weights using Keyword-based Vector Space model. The weights indicate the degree of association between a research paper and a user's query. This paper also presents an algorithm to provide or suggest recommendations based on users' query. The algorithm employs both TF-IDF weighing scheme and cosine similarity measure. Based on the result or output of the system, integrating recommendation feature in digital libraries will help library users to find most relevant research papers to their needs
- Step 1: Install Python
- If you do not have Python installed on your computer.
- Install the latest version of Python from Web.
- Step 2: Download the pip package manager for Python
- Once you have installed Python from the instructions above.
- We need to install some libraries which we are going to use in our workshop. We will install Numpy, Matplotlib and Pandas to work with our datasets.
- pip is a package management system used to install and manage software packages written in Python.
- Right Click the following link and select Save Link As
- (Save Target As):<https://bootstrap.pypa.io/get-pip.py>
- Go to the folder where you saved this file. In windows explorer use Shift + Right Click and then select Open command window here to open command prompt in this directory. Then run the following command:

```
python get -pip.py
```
- Step 3: Install Libraries
- Open Command Prompt.
- Run the following command to install necessary libraries.
- ```
pip install numpy matplotlib pandas scikit-learn streamlit
```

If the installation completes without any errors, you are all set!

## 9. Software Checking

### 9.1 Screenshots

Website link <https://aranavmahalpure-movie-recommendation-system--app-bofu8x.streamlit.app/>

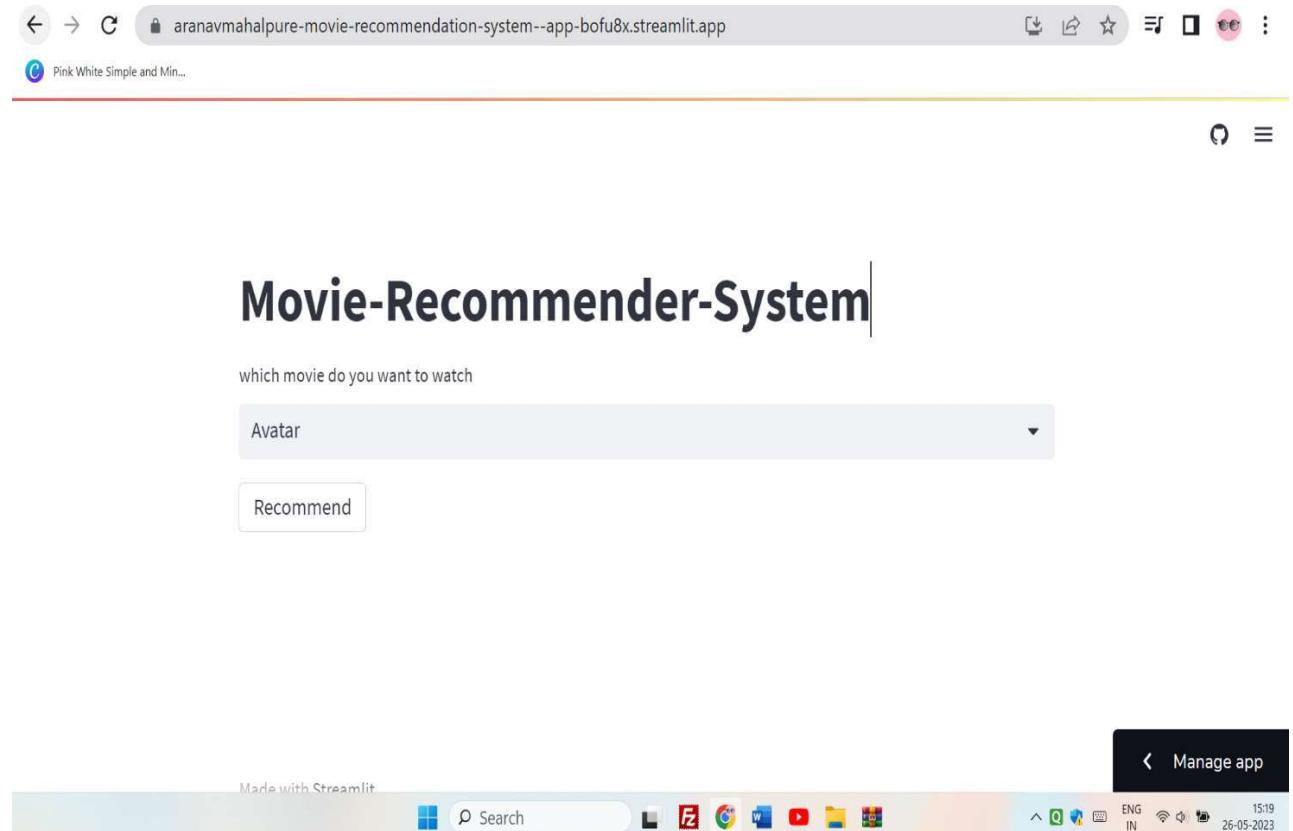


Fig 9.1.1:- Homepage

- Note: Type the name of your favourite Movie and click on Recommend Button

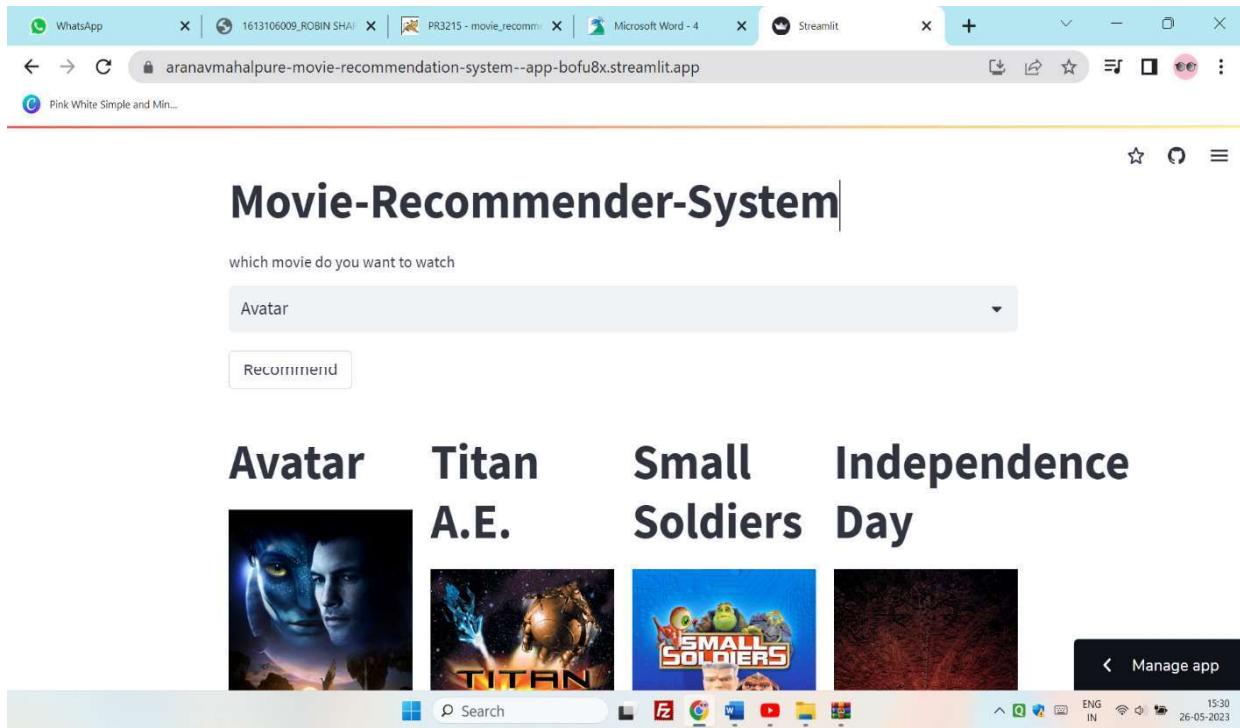


Fig 9.1.2:- Result Pages

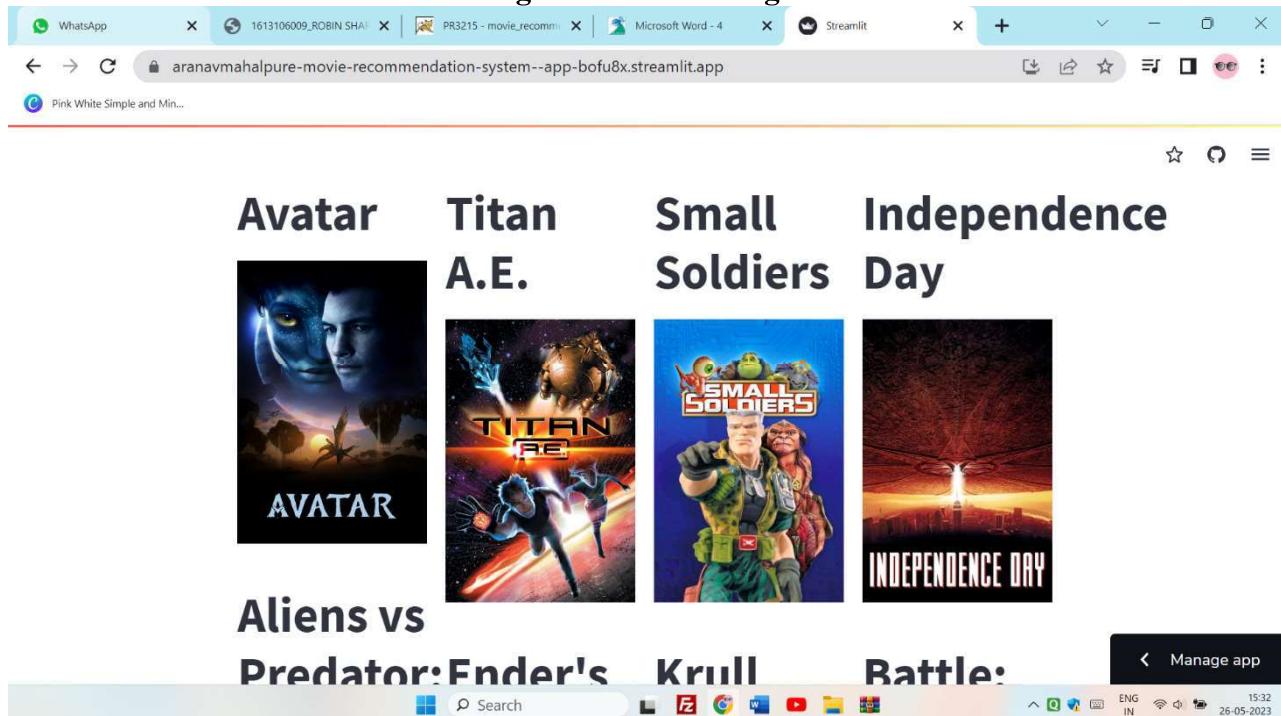
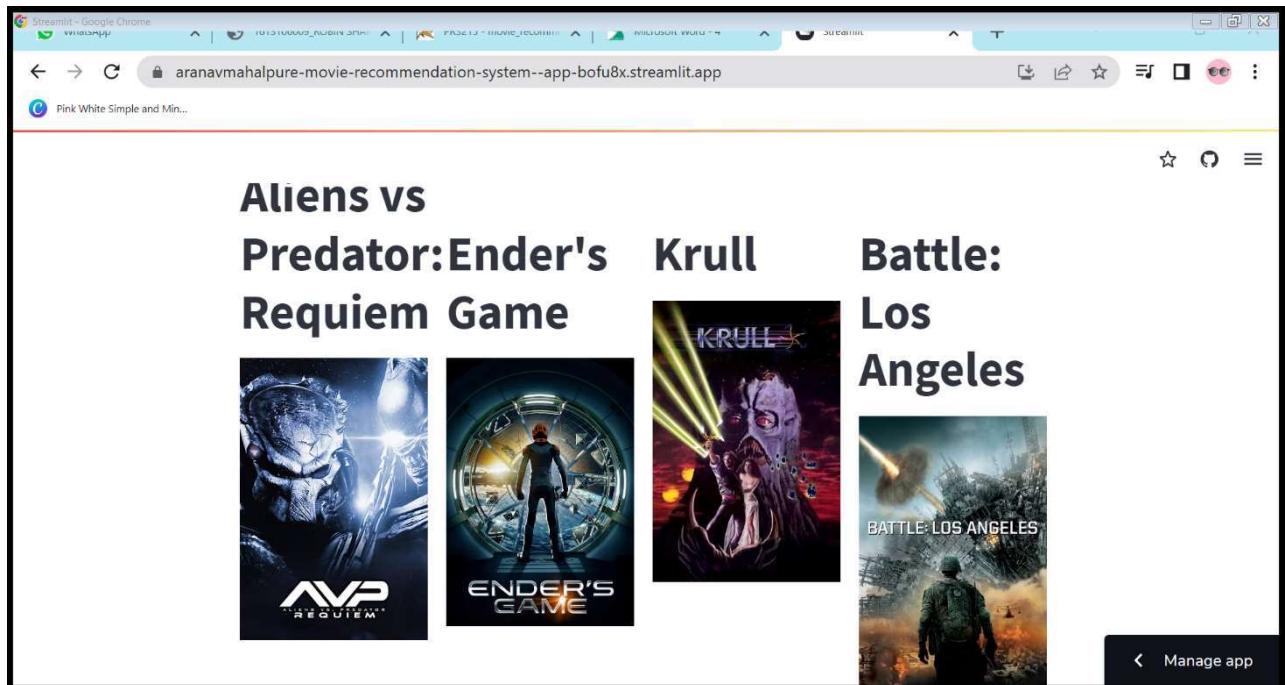


Fig 9.1.3:- Result Pages



**Fig 9.1.4:- Result Pages**

## **9.2 Outcomes**

Since my project is movie recommendation system .one can develop a movie recommendation system by using either content based or collaborative filtering or combining both.

In my project I have developed a approach content filtering. in content based filtering the user likes only such kind of movie will recommended to the user.

Advantages: it is easy to design and it takes less time to compute

Dis-advantages: the model can only make recommendations based on existing interests of the user. In other words, the model has limited ability to expand on the users' existing interests.

## **10. Conclusion / Future Enhancement**

- In this project I have implemented and learn the following things such as- Building a Movie Recommendation System
- To find the Similarity Scores and Indexes.
- Compute Distance Between Two Vectors
- Cosine Similarity

Research paper recommender systems help library me in finding or getting most relevant research papers over a large volume of research papers in a digital library. This paper adopted content-based filtering technique to provide recommendations to the intended users. Based on the results of the system, integrating recommendation features in digital libraries would be useful to library users. The solution to this problem came as a result of the availability of the contents describing the items and users' profile of interest. Content-based techniques are independent of the users ratings but depend on these contents. This paper also presents an algorithm to provide or suggest recommendations based on the users' query. The algorithm employs both TF-IDF weighing and cosine similarity measure. The next step of my future work is to adopt hybrid algorithm to see how the combination of collaborative and content-based filtering techniques can give me a better recommendation compared to the adopted technique in this paper.

The content-based technique is adopted or considered here for the design of the recommender system for digital libraries. Content-based technique is suitable in situations or domains where items are more than users.

Library users do experience difficulties in getting or finding favourite digital objects (e.g. research papers) from a large collection of digital objects in digital libraries.

### **Applications**

- ✓ Netflix, YouTube, Tinder, and Amazon are all examples of recommender systems in use. The systems entice users with relevant suggestions based on the choices they make. Recommender systems can also enhance experiences for: News Websites.
- ✓ Amazon.com. Amazon.com uses item-to-item collaborative filtering recommendations on most pages of their website and e-mail campaigns.

## **11. References**

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