DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

SHARDA SCHOOL OF ENGINEERING AND TECHNOLOGY SHARDA UNIVERSITY, GREATER NOIDA

Movie Recommendation System

A project submitted

in partial fulfillment of the requirements for the degree of Bachelor of Technology in Computer Science and Engineering

by

PRANSHU MISHRA(2019649669)

Supervised by:

DR. VISHAL JAIN
Associate Professor

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CERTIFICATE

This is to certify that the report entitled **"Movie Recommendation System"** submitted by **"**PRANSHU MISHRA (2019649669)**"** to Sharda University, towards the fulfillment of requirements of the degree of **"Bachelor of Technology"** is record of bonafide final year Project work carried out by them in the **"**Department of Computer Science & Engineering, Sharda School of Engineering and Technology, Sharda University**"**.

The results/findings contained in this Project have not been submitted in part or full to any other University/Institute forward of any other Degree/Diploma.

Signature of the Guide

Name: DR. VISHAL JAIN

Designation: Associate Professor

Signature of Head of Department

Name: Prof. Dr. Nitin Rakesh

Place: Sharda University

Date:

Signature of External Examiner

Date:

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Name and signature of

Students:
PRANSHU MISHRA (2019649669)

ABSTRACT

The E-learning infrastructure is growing rapidly, choosing the right skills set to built a career in an area of interest sometimes can be mystifying and hence a recommendation system is helpful to narrow down the information or choices based on user's data or preferences. A recommender system automates the process of filtering and make it feasible for a user to search through vast information available online and thus provide a personalized experience for the user. This project tries to implement a recommender system based on content based filtering and Machine Learning algorithm to filter skills and courses available digitally based on user's inputinformation.

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CHAPTER 1

INTRODUCTION

1.1 Problem Statement

The amount of content generated by the film business has greatly increased over the past several years, making it challenging for viewers to explore and select movies that suit their preferences. It is challenging for viewers to keep up with all of the alternatives and pick movies they will appreciate due to the vast number of movies that are available. The issue is made worse by the fact that conventional ways of recommending films, such word-of-mouth or critic reviews, are subjective and might not represent the viewer's preferences.

The answer to this issue is to create a movie recommendation system that can offer consumers individualized suggestions based on their tastes and interests. While a number of methods have been put up for movie recommendation systems, content-based filtering has shown to be successful in giving users recommendations that are correct and pertinent. The suggested content-based filtering system for movie recommendations will use the attributes of movies, such as genre, director, actors, and narrative summaries, to suggest comparable movies to viewers.

The major goal of this project is to create a content-based filtering-based movie recommendation system and assess how well it serves consumers with accurate and pertinent suggestions. The TMDB 5000 Movie Dataset, a collection of movies gathered from IMDb, will be used in the system's Python implementation, works on Cosine Similarity. The findings of this study will aid in the creation of better movie recommendation systems that can enhance the viewing experience in the film business.

1.2 Project Overview

A content-based filtering movie recommendation system is the suggested project. Due to the enormous amount of content accessible in the film business, consumers often struggle to explore and select movies that suit their preferences. This project tries to remedy this issue. In order to make recommendations to users based on their tastes, the project will make use of the characteristics of movies, such as genre, director, actors, and storyline summaries.

The TMDB 5000 Movie Dataset, a collection of movies gathered from IMDb, will be used in the project's Python implementation. Preparing the dataset for use in the content-based filtering algorithm entails extracting the pertinent features from it. The algorithm for content-based filtering will be created to compare the characteristics of various films and suggest those that are most like the user's preferences and works on Cosine Similarity.

The research will help advance the design of better movie recommendation tools that can enhance the viewing experience in the film business. The experiment will also shed light on how well content-based filtering functions as a method for movie recommendation systems. Future iterations of the concept could incorporate hybrid filtering or different methods for making movie recommendations.

1.3 Expected Outcome

Users should be able to explore and find movies that meet their preferences more efficiently and accurately thanks to the suggested movie recommendation system that uses content-based filtering. Users will find it simpler to find new films they'll like as the system will offer personalized recommendations based on their interests and preferences.

The development of better movie recommendation systems that can enhance the viewer experience in the film business would be aided by the success of the

suggested system. The system can be improved and expanded in the future to include new features or strategies that will increase the precision and relevancy of the given recommendations.

Overall, a more individualized and effective method for users to find films that match their likes and interests is what the proposed movie recommendation system is projected to produce, thereby improving the user experience in the film industry.

1.4 Hardware & Software Specifications

- **CPU:** Intel® Core i5 @1.60 Ghz
- **GPU:** 8GB
- **RAM:** 16GB
- **Display**: Standard monitor
- **OS:** Windows Operating System
- **Language:** Python
- **IDE:** Open-source programming tools like Jupyter Notebook, Google Collab.

1.5 Other Non-Functional Requirements

- **IDE:** Open-source programming tools like Jupyter Notebook, Google Collab.
- TMDB 5000 Movie Dataset Python 3.9 or higher.
- Libraries like Pandas, NumPy, Streamlit and Scikt-learn.

1.6 Report Outline

Chapter 2 focuses on the previous work done to highlight the existing applications in thedomain of fitness industry which make use of Artificial Intelligence.

Chapter 3 focuses on the proposed model, how it proceeds, what are the requirements, whoare the users and what all will be the methodology to

build our solution.

Chapter 4 provides the results and experimental analysis of our system.

Chapter 5 finally concludes the whole paper and talks about the future scope of the proposedsystem.

CHAPTER 2

LITERATURE SURVEY

2.1 Literature Table

S.no	Title	Author	Methodology	Algorithms	Results
1	Multimodal trust based recommender system with machine learning approaches for movie recommendation	Alok Kumar Jagadev Sasmita Subhadarsinee Choudhury Sachi Nandan Mohanty	The recommender system is one sort of remedy for the problem of information overload that users of websites that provide the rating of specific things encounter (RS).	Collective filtration Decomposing a single value network using an advanced neural network with backward propagation	The recommendation model is being developed utilising a variety of machine learning techniques, and trust-based filtering was used to provide suggestions that are more accurate. accuracy as assessed by the BPNN (41%) DNN (78 percent). SVD (69%) . The validation loss of the DNN with trust model outperformed the Backpropagation and DNN models when the loss values were compared (83 percent). Since

					users of COLD have traditionally had potential problems with CF, higher optimum score values are preferred.
2	Analyzing emotion based movie recommender system using fuzzy emotion features	Atreya Kala Mala Saraswat Shampa Chakraverty	User-generated content consists of product reviews and comments that also contain user-asserted viewpoints. The rise in internet usage has resulted in a deluge of user-generated data, including reviews and comments..	system of collaborative recommendations Emotion analysis Content-based recommender system WorldNet	In this study, a top-N recommendation system that considers the emotional content of the reviews is introduced and evaluated. We compared the cosine item-to-item similarity model based on ratings with our emotion-based method.
3	Collaborative Filtering of movie recommendation system	N. Durgaharshitha, N. Kavya Y. Gayathri, N. Ramakrisha	They've become more common over the past several years and are now present on the majority of the websites we visit. The material available on these platforms includes anything from friends, social media stories, and	Collaborative Filtering	The most well-liked and productive algorithm in the world of recommender systems is collaborative filtering. It guides clients toward more informed decisions by

			products on e-commerce websites, as well as movies, music, books, and videos. In several types of recommender systems, association rules are employed..		suggesting interesting products.
4	Movie Recommendation System using Sentiment Analysis from Microblogging Data	Kanjar De, Partha Pratim Roy, Shirsendu S. Halder, and Sudhanshu Kumar	In recommendation systems, the methods of collaborative and content-based filtering are well-established. These methods, however, have a number of drawbacks, including the necessity of historical user data and behaviours in order to complete the suggestion assignment.	Collaborative filtering Twitter Recommendation system Filtering based on content Sentiment Assessment	Recommender systems are an essential tool for information filtering in today's world of abundantly available data.
5	A Model of Social Explanations for a Conversational Movie Recommenda	Vivian Tsai Florian Pecune Shruti Murali	The justification for each proposal is a crucial component of any recommendation process. These explanations can	social awareness, a conversational recommendation system, and an explanation	In this post, we spoke about our conversational recommendation bot's human-centered design. We developed a

	tion System		alter users' perceptions of the suggestion quality in addition to improving their experiences.		model of social explanations that benefited from observed probabilities for recognised categories and subcategories of recommendations through rigorous annotation and analysis of a relevant corpus.
6	Movie Recommender System Using K-Means Clustering AND K-Nearest Neighbor	Arun Solanki, Rishabh Ahuja, and Anand Nayyar	Artificial intelligence (AI) systems may automatically learn from experience and advance without explicit programming thanks to machine learning. In this study, a movie recommendation system is developed using the K-Means Clustering and K-Nearest Neighbor algorithms.	Collaborative filtering, k-Means, KNN, recommender systems, and content-based filtering	Automated analytical model creation is accomplished using data analysis methodology known as machine learning. It is an area of artificial intelligence based on the idea that robots are capable of learning from data, identifying patterns, and making decisions with little to no human participation.

7	Movie Recommender System Based on Collaborative Filtering Using Apache Spark	Both D. H. Manjaiah and Mohammed Fadhel Aljunid	A well-known study area that draws academics from all around the world is the creation of recommender systems. Recommender systems are used in a variety of contexts, including music, movies, books, news, search queries, and commercial items.	Advisory systems Collective filtration switching between least squares Spark, Apache huge data FilmLens data	The movie recommendation engine is crucial in choosing a selection of movies for consumers depending on their preferences. Although customers have access to a variety of movie recommendation systems, these systems have the issue of not properly recommending the movie to the present users.
8	A review study on movie recommendation system	Ismat Anjum ,Anwar Ahmad Shaikh	According to their interests or the popularity of the movies, a system like this may offer individuals a selection of movies to view. A recommendation system's goal is to provide recommendations for items to look at or purchase. Viewers are unable to see every new release	Filtering technique, hybrid approach, and suggested movies	The majority of the anticipated collaborative filtering, content-based filtering,collaborative filtering and hybrid recommendation solutions have proved effective in resolving problems while also making superior recommendations. To find and

			or unreleased movie due to time constraints.		develop novel approaches for making suggestions across a wide range of applications while taking quality and privacy into account, this study issue must be pursued, however, given the explosion of information.
9	Content-Based Movie Recommendation System Using Genre Correlation	S. Ashok, B. Venkatesh, SRS Reddy, Sravani Nalluri, Subramanyam Kunisetti, and S.	On the basis of particular data, a recommendation system is a system that makes suggestions to users for specific resources like books, movies, songs, etc. Based on the qualities of previously enjoyed movies, movie recommendation algorithms typically foretell which films a user would enjoy.	Using genre correlation, a content-based system for making movie recommendations	The recommendation algorithm used in this study tries to offer movie suggestions based on the genres of the films. Movies in a similar genre will be suggested to a user who gives a particular film a high rating. Today's Web 2.0 age makes extensive use of recommendation algorithms for finding trustworthy and

					pertinent content.
10	Movie Recommendation System Based on Traditional Recommendation Algorithm and CNN Model	Haitao He , Zhifu Shang , Mingjie Wu , Yuling Zhang	An good recommendation algorithm, one of the key technologies in streaming services, has enormous advantages as the industry has grown recently. Despite the maturity of current application research for recommendation algorithms, the majority of systems or products often only use one primary algorithm..	Deep learning, CNN, and a movie recommendation system.	We apply a deep learning CNN model to improve the system's functionality by using several recommendation methods, including system filtering and content-based recommendations.
11	A Review of Movie Recommendation System: Limitations, Survey and Challenges	Neha Chaurasiya and Mahesh Goyani	Recommendation systems are a crucial area that is quite popular and useful for people to make sensible automated decisions. It is a method that helps the user to choose the pertinent material from the enormous	Matrix factorization, SVD, Hybrid Filtering, Recommendation System, and Similarity Measures	The various filtering methods are described in this study. Different applications, benefits, and drawbacks are also covered. A hybrid mix of many recommendation systems must be

			quantity of information provided.		used to create an effective recommender system.
12	A Recommendation Engine for Predicting Movie Ratings Using a Big Data Approach	Rafia Asad Khan, Haitham Nobanee, Awais Yasin, Syed Muhammad Anwar, Usman Naseem, and Vishwa Pratap Singh are other names for Mazhar Javed Awan.	To predict the highly rated movies in this era of massive data, introduce a recommender engine with collaborative filtering utilising Apache Spark and machine learning (ML) modules. This collaborative filtering technique uses the alternating least squares (ALS) model. the ALS algorithm and a collaborative filtering technique, which used a model-based strategy for matrix factorization to solve the problems of cold start, sparse data, and scalability.	Filtering, collaborative filtering, RMSE, PySpark, matrix factorization, oRMSE, ALS (alternating least squares), Apache Spark, the Spark ML Movielens dataset, and the Spark MLlib are some examples of the technologies that are utilised in machine learning.	Through experimental study, we were able to tackle the sparsity, scalability and cold-start problems by using the ALS (alternating least squares) method. On the dataset that was acquired from Movielens, performance assessment and analysis were done. We used the ALS (alternating least squares) technique to solve a problem involving

13	Movie recommendation system using optimized rnn approach	Sonawane Pavan H., Prof. Rokade P.P., Shukla Kavita A., Malokar Akanksha, Katkade Ritesh A.	Technique for recurrent neural networks (RNNs) that has been customised for use in a system for recommending movies. The proposed approach is designed to provide clients with personalised movie options based on their prior movie preferences and attitudes. Content-based filtering algorithms are used to analyse user data and analyse their preferences in movies to give a list of recommended movies.	Content-based filtering, Recurrent neural networks, collaborative filtering, content-based filtering, hybrid recommendation systems, and deep learning are all used in the movie recommendation system.	An RNN may be trained using a big dataset of user preferences, movie ratings and other pertinent information (Recurrent Neural Network). This data may be used to predict how viewers will evaluate or react to a new movie. The RNN may make these predictions utilising sequence data, such with the user's prior ratings for movies.
14	Movie Recommendation System using Cosine Similarity and KNN	Tanisha Tripathi, Tushar Narula, Ramni Harbir Singh, Sargam Maurya, and Gaurav	The expansion of a domain is followed by information overload and difficulties with data extraction since everything has advantages and	Deep learning, content-based recommender systems, and recommendation systems	In the world of the internet, recommendations systems have emerged as the most crucial source of a pertinent and trustworthy source of

		Srivastav	disadvantages. In order to solve this problem, the recommendation system is essential.It is intended to improve user experience by providing quick and insightful suggestions.		information. While the basic ones just consider one or a few factors, the more complex ones use additional parameters to filter the results and make them more user-friendly.
15	Movie Recommender System Using Collaborative Filtering	Aditya Thakkar, Meenu Gupta, and Aashish	The objective of this study is to increase the effectiveness and precision of a conventional filtering process. method. The most basic method of building a recommendation system is content-based filtering. It asks for user input, verifies the user's past actions and history, and then proposes a list of films that are similar. In this work, collaborative filtering and K-NN algorithms are employed to	Nearest neighbours, content-based filtering, cosine similarity, KNN algorithms, and movie recommender systems	The Movielens dataset, which contains 28M ratings for more than 60K movies, is used to propose a KNN collaborative recommendation system utilising cosine similarity. The suggested method is proven to be more accurate and dependable when compared to the current system. I

			show how they can be more accurate than content-based filtering in producing results. The goal of this work is to improve the efficiency and precision of a widely used filtering technique. The most basic method of building a recommendation system is content-based filtering. which requests user input, verifies the user's past actions and history, and then provides a list		
16	International Journal of Information Technology, Research and Applications (IJITRA)	Rahisha Pokharel, Himaja K.R., Praghnya Iyer, and Shashikala H.K.	Here, the recommender system is put to use, in which content producers make content recommendations to consumers based on their tastes. Recommendation systems are	Systems of recommendations Preferences Teamwork in Filtering Filtering based on Content	As the name implies, recommendation systems provide movie recommendations based on predetermined standards. Our recommendation system has been set up such that it

			becoming more and more important in web applications that provide a range of services and automatically propose some services depending on user interest. Different commercial services all contribute significantly to the present marketing industry's success.		suggests movies based on genre and category. The user will find it simple to select movies they enjoy in this method.
17	Personalized Real-Time Movie Recommendation System: Practical Prototype and Evaluation	Jiang Zhang, Zhiyuan Yuan, Yufeng Wang, and Qun Jin bn	Practical recommendation systems are now crucial in many industries, including social networks , e-commerce and a variety of web-based services, as a result of the big data explosion. There are several customised movie recommendation systems available now that use publically accessible movie datasets (like	collaborative filtering; virtual opinion leader; real-time; movie recommendation system;	For quick and scalable movie recommendations, we developed a novel collaborative filtering technique called Weighted KM-Slope-VU. We also developed and launched a specific movie recommendation website called MovieWatch to provide users with viewing services and collect user

			MovieLens and Netflix) and provide enhanced performance measures (such the Root-Mean-Square Error (RMSE)).		feedback on suggested movies so that we could practically test our proposed algorithm using real data.
18	Movie Recommendation System Using Machine Learning	Furtado, F., and Singh, A.	Finding the goods we need has become simple thanks to the suggestion system. The goal of movie recommendation systems is to assist moviegoers by recommending films to watch without them having to spend the time and effort sorting through a vast selection of films that number in the thousands and millions.	Recommender system, genre, rating, and collaborative filtering for movies.	Recommender system, genre, rating, and collaborative filtering for movies. Customers are offered different movies by this recommendation engine. This system will deliver increasingly explicit outcomes in comparison to other content-based systems because it is based on a collaborative methodology.
19	Movie Recommendation System Using SemiSupervised Learning	Santosh Kumar Singh, Mahendra Sharma, and Sushmita Roy	There are information filtering systems, referred to here as the recommendation system or recommendation	Recommendation systems, content-based filtering techniques, recommendation engines, semi-supervised learning, and	The Python programming paradigm is used in this work to create a movie recommendation system. It uses a data collection of

			engine, that assist a person in selecting significant and potentially interesting services or goods based on the preferences specified by him/her, to crack open this nut..	collaborative filtering techniques are used.	different movies released on or before July 2017 as input and generates suggestions using several methodologies.
20	Multilingual Opinion Mining Movie Recommendation System Using RNN	Tarana Singh, Anand Nayyar and Arun Solanki	Twitter is a news and social networking platform where users from all around the world submit their blogs and express their opinions about the newest movies, communications, and other topics. As a result, Twitter produces enormous amounts of Twitter data each day. The planned effort for building a "movie recommendation system" uses this real-time data. The data is also subjected to emotional	A synthetic neural network is used to process natural language text for Twitter's text classification API.	The TMDB database has been used to create a system for movie recommendations. RNN classification is used to analyze tweets and create suggestions based on the user's input. The system also performs actions such as downloading, interpreting, processing, and aggregating the data.

			analysis in order to improve the efficacy of the framework.		
21	Design of an Unsupervised Machine Learning-Based Movie Recommender System	Judith Cintia Ganesha Putri, Jenq-Shiou Leu, and Pavel Seda are three people.	In order to create a film recommendation system for consumers, this research tries to identify the commonalities among various groups of individuals. Due to the growing number of available movie information, users frequently struggle to discover appropriate movies..	Apriori methods, Birch, average similarity, agglomerative spectrum clustering, affinity propagation, Dunn matrix, mean-shift, mean squared error, mini-batch,agglomerative spectrum clustering, affinity propagation, Dunn matrix, mean-shift, mean squared error, mini-batch,and computing time are used to analyze social networks.	The K-Means algorithm, the birch algorithm, the mini-batch K-Means algorithm, the mean-shift algorithm, the affinity propagation algorithm, the agglomerative clustering algorithm, and the spectral clustering algorithm were used in this study to group performance comparison techniques for movie recommendation systems.
22	Role of social media engagement metrices on consumer purchase intention:An empirical	Mukul khanna	The electronic industry has witnessed a large growth in the 21st century. With increasing internet engagement majority of the	Social Media Engagement, Consumer intention, Electronic Goods	Social Media Marketing revolution has changed the paradigm of marketing. Innumerable factors affecting

	study in the context of electrontic goods		people is relying on online reviews and contents while taking the decision of purchasing. Even Google India and Boston Consulting Group admit that social media is influencing the sale of the products and in future it would be rise up to 63% of total sale.		the electronic goods industry such as features, service quality, price and top of the that social media it has opened the new ventures for the electronic industry

Table 1. Literature Table

2.2 Existing Work

The author has been proposed work which includes making of Collaborative filtering-based movie recommendation system combining clustering and neighbour voting to predict user cosine similarity in a cluster dataset [1]. In this research, a movie recommendation system is developed using a Convolutional Neural Network model. The system is further enhanced by incorporating content-based recommendation and system filtering techniques [2]. Recommendation systems help users choose movies based on genre and category, saving time and allowing them to narrow down potential movies to fit their tastes [3]. This study proposes a Recurrent Neural Network (RNN) technique to improve movie recommendation systems, using parameter adjustment, early halting, and dropout regularization to increase accuracy and provide customized recommendations [4]. This study focuses on a hybrid technique of content-based and collaborative filtering to improve movie sales by providing users with a selection of movies to watch [5]. DNN with Trust is the best model for re commending movies to users, overcoming cold start, malicious attacks

and data sparsity of RS [6]. The aim of this research was to develop a movie recommendation system using a collaborative filtering approach. The proposed system utilizes the alternating least squared model to predict the most highly rated movies with a remarkable accuracy of 97% [7]. In this paper author has develops a recommendation system for movies using clustering techniques such as K-Means, birch, mini-batch mean-shift, K-Means, affinity propagation, spectral analysis and agglomerative clustering. The goal is to extract emotions from user-generated data using WordNet, lexical ontology, and psychology. The efficacy of the emotion prediction model is assessed and contrasted with an item similarity model based on ratings [8]. Recommendation System is a popular tool used by companies like Facebook, LinkedIn, Pandora, Netflix, and Amazon to increase their revenue and benefit their customers. This paper reviews state-of-the-art methods for movie recommendation [9]. This work makes use of Twitter to process multilingual tweets in real-time to create a movie recommendation system. The system achieves 91.67 percent accuracy, 92 percent precision, 90.2 percent recall, and 90.98 percent f-measure, all outstanding results. To improve the system's performance, sentiment analysis techniques are used [10]. Using real-time, multilingual tweets and sentiment analysis, Twitter is used to build a movie recommendation engine [11]. Clustering techniques such as mini-batch K-Means, K-Means, birch, mean-shift, affinity propagation, spectral analysis and agglomerative clustering are used to develop a recommendation system for movies [12].An explanatory computational model was developed to apply social explanations, which can enhance how a system and interaction are viewed [13]. Utilizing measures like execution time, RMSE, and rank, a movie recommendation system based on ALS is evaluated for performance [14]. This work uses the Movielens dataset from Kaggle to create a movie recommendation system utilising the K-Means Clustering and K-Nearest Neighbor algorithms[15]. A recommendation system uses genre correlation and content-based filtering to propose resources based on a dataset, using R to analyse the Movie Lens dataset [16]. A hybrid recommendation system combining collaborative filtering, content-based filtering, and sentiment analysis to improve movie selections [17]. Collaborative filtering based on cosine similarity and K-NN algorithms is used to improve the effectiveness and precision of a standard filtering technique [18]. Virtual

opinion leaders and Weighted Slope One-VU approach cluster users according to attributes [19].Movie recommendation systems aim to help movie buffs by combining content-based and collaborative approaches [20]. Recommendation systems have been developed to help locate services or items based on user interests, with three methods suggested: straightforward, content-based filtering, and also collaborative-based filtering [21].

2.3 Proposed System

To make movie recommendations system to users based on their tastes and interests, the suggested system would employ content-based filtering. The system will be created with the characteristics listed below:

1. **Input from Users for Query:** Users must enter the title of a movie as a query. The user will receive customized recommendations using this information.
2. **Movie Database:** The system will feature a database of movies that contains details on the performers, directors, and storyline synopses for each film. The features of various movies will be compared using this data, and recommendations for films that most closely match the user's interests will be made.
3. **Using criteria** like genre, director, actors, and narrative summaries, the content-based filtering algorithm will be able to determine how similar certain films are to one another. Following that, the system will suggest movies that are most compatible with the user's tastes.
4. **Recommendation Engine:** The recommendation engine will employ the outcomes of the content-based filtering algorithm to produce individualised suggestions for each user. The engine will give the user a list of suggested films based on their preferences and interests as determined by Cosine Similarity.
5. **User Interface Design:** The system will be designed with a user interface that is intuitive and easy to use. The interface will allow users to input their

preferences and receive personalized recommendations based on their interests with movie posters with the help of Poster API.

6. **System Deployment:** The system will be deployed on a web platform, allowing users to access it from anywhere with an internet connection.
7. **The suggested** system will be created utilizing Python programming language and relevant libraries such as pandas, NumPy, and Pillow.

CHAPTER 3

SYSTEM DESIGN & ANALYSIS

3.1 Project Perspective

There are various possible advantages and uses for the suggested content-based filtering movie recommendation system.. The technique enables streaming providers like Netflix, Hulu, and Amazon Prime to offer their subscribers customised suggestions.. The system can also be used by movie review websites such as IMDb and Rotten Tomatoes to provide recommendations to their users. The system has the potential to increase user engagement and satisfaction by providing more accurate and relevant recommendations. This can lead to increased user retention and revenue for streaming services and movie review websites. In addition, the system can be extended to other domains, such as music and book recommendations. The content-based filtering technique, which offers personalised suggestions based on the user's preferences and interests, may be used in several domains.

Technically speaking, the suggested approach can assist in the creation of recommendation systems that are more potent. The accuracy and relevance of suggestions can be increased by combining the content-based filtering method with additional methods like collaborative filtering and hybrid filtering.

From a research perspective, The suggested approach might aid in the creation of more complex machine learning algorithms for recommendation systems.. The system can be used to evaluate the effectiveness of different content-based filtering algorithms and compare them with other approaches.

Overallthe suggested content-based filtering movie recommendation system has enormous potential for both business and academic uses.. The system can provide more accurate and relevant recommendations to users, leading to increased user engagement and satisfaction. The system can also contribute to the development of more effective recommendation systems and machine learning algorithms.

3.2 Performance Requirements

Success of the suggested content-based filtering movie recommendation system will depend on how well it performs.. The system must meet the following performance requirements.

1. Response Time: The system must respond to user requests for recommendations within a reasonable time frame. The response time should be less than 2 seconds.
2. Accuracy: Based on the users' choices and interests, the system must make correct suggestions to them. At least 80% accuracy should be achieved by the system.
3. User Experience: The system must provide a positive user experience. The system should have an intuitive user interface and provide relevant and personalized recommendations to users.

The suggested content-based filtering movie recommendation system will be effective, efficient, and user-friendly if it can meet these performance requirements.

3.3 System Features

The following characteristics will be present in the suggested content-based filtering mechanism for movie recommendations:

- User Query input
- Movie database management
- Content-based filtering algorithm implementation
- Recommendation generation and display
- Easy maintenance and update interface
- Intuitive and user-friendly interface

3.4 Methodology

The proposed movie recommendation system using content-based filtering will use a mathematical approach to generate personalized recommendations for users. The methodology can be described as follows:

- Movie Database Creation: The first step is to create a database of movies with attributes such as genre, director, cast, and plot summary. According to the user's choices, the qualities will be utilised to find related movies and produce suggestions.
- Feature Extraction: The third step is to extract relevant features from the movie database and user profile. Feature extraction involves assigning weights to movie attributes based on their importance to the user. For instance, the "action" characteristic will be given more weight if the user likes action movies.
- Similarity Calculation: The fourth step is to calculate the similarity between the input query and each movie in the database. The similarity can be calculated using a distance metric such as Cosine Similarity.
- Recommendation Generation: The fifth step is to generate recommendations based on the similarity calculation. The system will recommend movies that are most similar to the user profile and meet the user's preferences. The recommendations will be displayed to the user in order of relevance.

The methodology can be summarized in the following equation:

Cosine-Similarity

The cosine of two non-zero vectors which are Y and Z may be calculated using the Euclidean dot product formula (Equation 1)

$$\boldsymbol{Y}.\boldsymbol{Z} = \left||\boldsymbol{Y}|\right| \left||\boldsymbol{Z}|\right| cos\theta$$ .....Equation 1.

The cosine similarity, cos(), is denoted by a linear combination and magnitude as shown in (Equation 2), where Y and Z are two vectors of characteristics.

$$cosine\ similarity = S_C(Y,Z) \coloneqq \cos(\theta) = \frac{\boldsymbol{Y.Z}}{||Y||||Z||} = \frac{\sum_{i=1}^{n} Y_i Z_i}{\sqrt{\sum_{i=1}^{n} Y_i^2}\sqrt{\sum_{i=1}^{n} Z_i^2}}$$ Equation 2.

where R(u) is the recommendation for user u, sim(u, m) is the similarity between user u and movie m, and I(u, m) is the rating given by user u to movie m. The rating can be used to adjust the similarity calculation based on the user's feedback.

The content-based filtering approach has several advantages, including the ability to generate recommendations for new users with no historical data and the ability to provide explanations for the recommendations. However, the approach has limitations, including the inability to capture serendipitous recommendations and the lack of diversity in recommendations. These limitations can be addressed by combining content-based filtering with other approaches such as collaborative filtering or hybrid filtering.

- Framework – Streamlit.

Open source, Python-based framework called Streamlit is available which facilitates the rapid development of web applications for machine learning and data science. It works with several popular Python libraries, including PyTorch, scikit-learn, SymPy (latex), pandas, Keras, Matplotlib and NumPy, among others.

- Dataset

The model has been trained using a dataset of 5,000 movies! Find the dataset here.

The TDMB movie dataset is a collection of information about movies and the characteristics of such films, including the director, actors, genre, and year of release. It has more than 10,000 films from diverse nations and tongues. The collection also contains statistics on box office earnings and reviews from many websites, including IMDb and Rotten Tomatoes. The TDMB dataset is frequently

utilised in studies on sentiment analysis, box office forecasting, and recommendation systems for films. It is an open-source dataset that can be used for non-commercial uses by scholars and data scientists. It is a useful tool for research on movies due of its accessibility and comprehensiveness

	**4800** unique values	**4761** unique values	**4776** unique values
19995	Avatar	[{"cast_id": 242, "character": "Jake Sully", "credit_id": "5602a8a7c3a3685532001c9a", "gender": 2, "...	[{"credit_id": "52fe48009251416c750aca23", "department": "Editing", "gender": 0, "id": 1721, "job": ...
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206647	Spectre	[{"cast_id": 1, "character": "James Bond", "credit_id": "52fe4d22c3a368484e1d8d6b", "gender": 2, "id...	[{"credit_id": "54805967c3a36829b5002c41", "department": "Sound", "gender": 2, "id": 153, "job":

Fig-1 Dataset

CHAPTER 4

RESULTS AND OUTPUTS

4.1 Proposed Model

The proposed movie recommendation system using content-based filtering will use a model that incorporates user preferences and movie attributes to generate personalized recommendations. The model can be described as follows:

1. **User Query Input:** Users will be required to input a movie name as a query. This information will be used to make personalized recommendations to the user.
2. **Movie Database:** The movie database will contain information about each movie, including its genre, director, cast, and plot summary. The movie attributes will be used to identify similar movies and generate recommendations based on the user's preferences.
3. **Feature Extraction:** The process of feature extraction entails giving each movie attribute a weight depending on how significant it is to the user. The cosine similarity between the user's input and each movie in the database will be determined using the weights.
4. **Similarity Calculation:** The similarity between the user profile and each movie in the database will be calculated using a distance metric - cosine similarity. The similarity score will be used to rank the movies and generate recommendations.
5. **Recommendation Generation:** The recommendation generation process involves selecting the top-ranked movies that meet the user's preferences and displaying them to the user with movie posters from poster API.

The suggested concept is intended to offer customers tailored movie suggestions based on their tastes .The content-based filtering approach is effective for generating recommendations for new users with no historical data and providing explanations for the recommendations. The model can be further enhanced by incorporating other approaches such as collaborative filtering or hybrid filtering

to improve the diversity and serendipity of the recommendations. Fig 2. Shows the flowchart for the same.

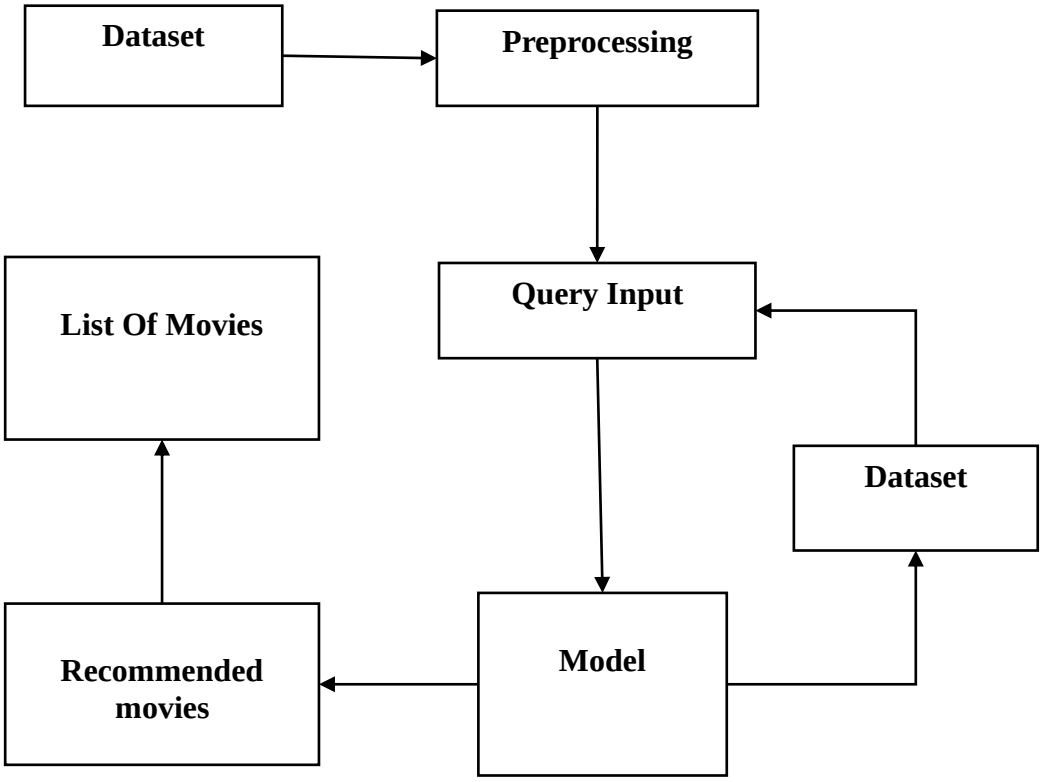

Fig.2 Flowchart

Home Page:

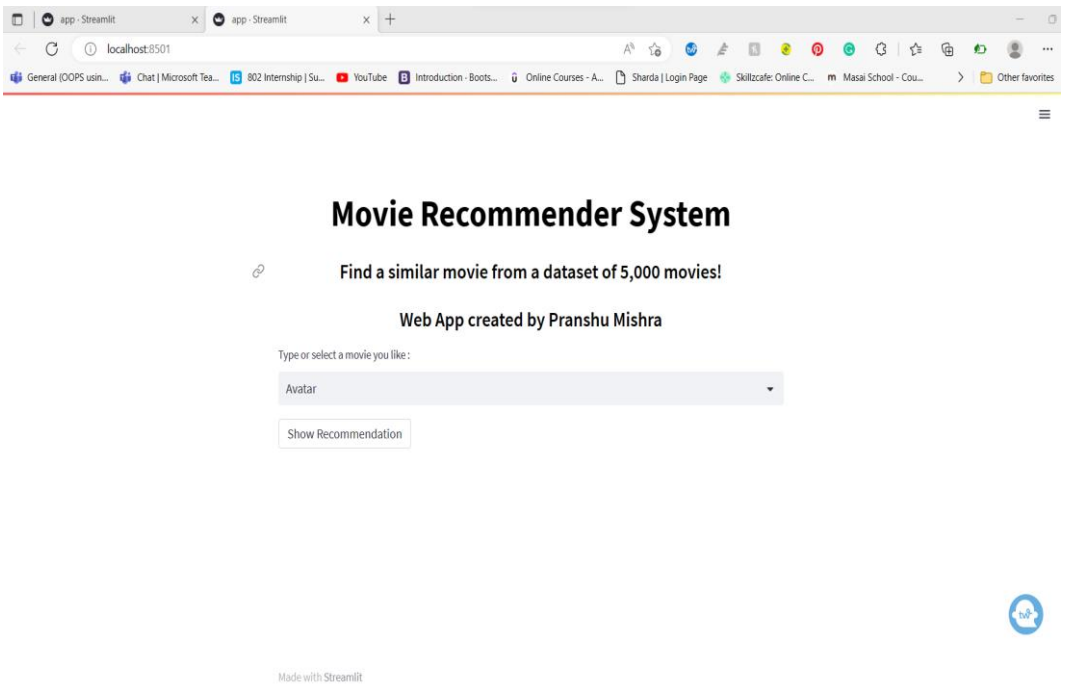

Fig.3 Home Page

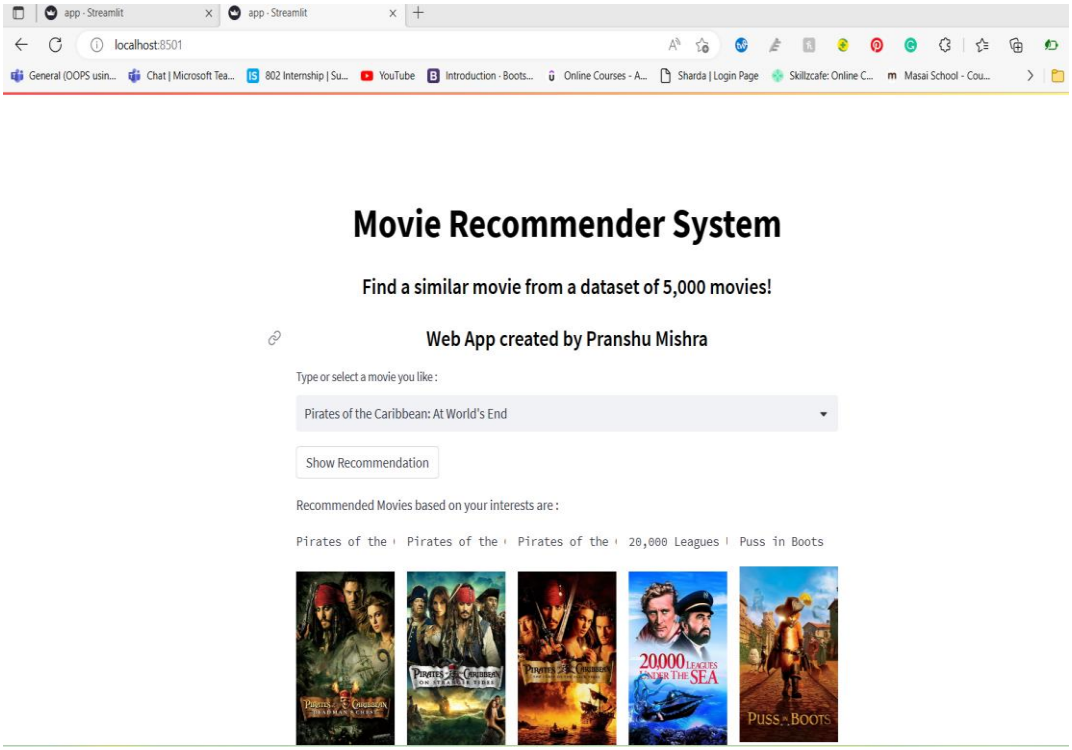

Fig.4 Movie Recommender System

The illustrated figure 3 shows the homepage of the streamlit app and figure 4 shows the recommendation page, here the result from the Streamlit web application, where the recommendations related to the query is input.

CHAPTER 5

CONCLUSION

5.1 Conclusion

An efficient method for producing individualized suggestions based on user preferences and movie attributes is the suggested movie recommendation system employing content-based filtering. The system uses a mathematical approach to extract features from the movie database and user profile, calculate similarity scores, and generate recommendations based on the user's preferences. The system has several advantages, including the ability to generate recommendations for new users with no historical data and the ability to provide explanations for the recommendations. However, the system has limitations, including the lack of diversity in recommendations and the inability to capture serendipitous recommendations. The limitations can be addressed by combining content-based filtering with other approaches such as collaborative filtering or hybrid filtering.

5.2 Future Scope.

The proposed movie recommendation system using content-based filtering has several future scope opportunities. Some of the potential future scope areas include:

1. Hybrid Approaches: By including hybrid strategies like collaborative filtering and content-based filtering, the suggested model may be improved. By integrating the advantages of several recommendation systems, hybrid approaches can increase the precision and diversity of the suggestions.
2. Deep Learning The movie database and user profile may be utilised to extract features using deep learning techniques like neural networks. Deep learning models can produce more precise suggestions by understanding complicated correlations between the features of a movie.
3. Real-Time Recommendations: Real-time suggestions based on user behaviour and preferences can be provided by the suggested model with certain enhancements. The user experience may be enhanced by real-time suggestions by giving quick and pertinent advice.

4. Sentiment Analysis: The proposed model can be enhanced by incorporating sentiment analysis to identify the user's emotions and mood. Sentiment analysis can be used to personalize the recommendations based on the user's current emotional state.

In conclusion, the proposed movie recommendation system using content-based filtering is an effective approach for generating personalized recommendations. The system has several future scope opportunities for improvement and can be enhanced by incorporating hybrid approaches, deep learning, real-time recommendations, and sentiment analysis

CHAPTER 6
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ANNEXURE 1

The presentation for the research paper entitled Course Recommendation System using Content-Based Filtering has been **presented** in 7th International Conference on Trends in Electronics and Informatics (ICOEI 2023) organized by SCAD College of Engineering and Technology, Cheranmahadevi, Tirunelveli, India on 11-13, April 2023.

Paper Title:

Course Recommendation System using Content-Based Filtering.

Abstract:

The E-learning infrastructure is growing rapidly, choosing the right skills set to built a career in an area of interest sometimes can be mystifying and hence a recommendation system is helpful to narrow down the information or choices based on user's data or preferences. A recommender system automates the process of filtering and make it feasible for a user to search through vast information available online and thus provide a personalized experience for the user. This paper tries to implement a recommender system based on content-based filtering and Machine Learning algorithm to filter skills and courses available digitally based on user's input information.

Authors: Pranshu Mishra and Vishal Jain.

ANNEXURE 2

The Research paper has been submitted in APSIT 2023 (Advances in Power, Signal, and Information Technology):

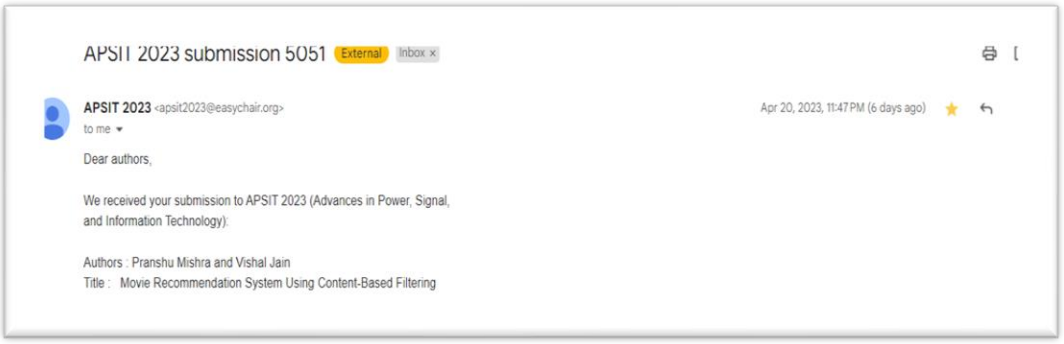
Paper Title:

Movie Recommendation System Using Content-Based Filtering

Abstract:

The movie industry has seen a tremendous increase in the amount of content being produced in recent years, making it difficult for viewers to navigate and find movies that match their preferences. Recommendation systems have been developed in order to solve this problem, and one of the most effective approaches is content-based filtering. This research paper proposes a movie recommendation system using content-based filtering, the system utilizes the features of movies such as genre, director, actors, and plot summaries to recommend similar movies to users. The system is implemented using Python and utilizes a dataset of movies collected from Kaggle called The TMDB 5000 Movie Dataset and model is train using using cosine similarity. It demonstrates that the content-based filtering approach provides accurate and relevant recommendations to users. The results of this study suggest that content-based filtering is a promising approach to movie recommendation systems and can significantly improve the user experience in the movie industry.

Authors: Pranshu Mishra and Vishal Jain.


APSIT 2023 submission 5051 External Inbox ×

APSIT 2023 <apsit2023@easychair.org>
to me

Apr 20, 2023, 11:47 PM (6 days ago)

Dear authors,

We received your submission to APSIT 2023 (Advances in Power, Signal, and Information Technology).

Authors : Pranshu Mishra and Vishal Jain
Title : Movie Recommendation System Using Content-Based Filtering