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Survey Paper on Movie Recommendation System

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Abstract—Numerous advanced level platforms like Data Mining, Deep Learning, the Internet of Things (IoT), and Machine Learning have emerged due to technological advancements. We use technology almost everywhere we work to meet societal needs. Furthermore, this also has led to the development of new systems. Recommendation systems are becoming increasingly popular in recent years, whether in entertainment, education, or other fields. Previously, users had to decidewhich books to purchase, the movies to watch, what music to listen to, and so on.

Keywords—Filtering, Recommendation System, Recommender.

I. INTRODUCTION

Recommendation Systemsare the information platform that helps users locate items as per their desire among a large number of available options. The primary objective of making a recommendation system is predicting how a specific user would give ratings to a product. This system also helps the user select an optimal option out of numerous possibilities.
Numerous platforms, such as Netflix, YouTube, and Amazon, use recommendation systems to serve their customers better and increase profits. It is still a good research topic because determining what the user wants from available resources is a difficult task, significantly because our preferences change over time. What we buy nowadays is based on recommendations.

For instance, if a user wishes to listen to music, buy a book, or watch a movie, a recommendation system in the background makes recommendations to the user. Based ona user's earlier actions, platforms such as Netflix recommends movies, Spotify recommends music, Amazon, recommends products, LinkedIn recommends jobs, and another social networking site recommends users all rely on a recommendation system. People can easily find out what they want based on their preferences by using these recommendation engines. As a result, developing an effective recommender system is difficult because user preferences change over time.

II. RELATED WORK

Several techniques for making movie recommendations have been extensively researched over the last few decades. Recommendation system works based on ALS algorithm, a method based on weighting, and collaborative filtering technique based on item similarity are all examples. These techniques necessitate prior knowledge of the user-generated movie ratings.For the most part, movie lens datasets are used to evaluate these techniques. Such systems, however, do not work efficiently, and studies are being conducted to make it accurate in terms of its real-time performance. For the most part, movie lens datasets are used to evaluate these techniques.

A. Collaborative-Filtering Recommendation

A widely used algorithm in recommendationsystems is collaborative filtering recommendation. This algorithm model, a user's taste,is based on their previous behavior.

Goldberg et al. [20] were the first to introduce the concept of collaborative filtering in 1991. Collaborative filtering works with an assumption where people who agree on a particular item/product previouslywould also decide on it in the future and will like a similar type of product or item.

2.1 User-Based Collaborative-Filtering

In this method, an assumption is made that the user would enjoy the items also enjoyed by other users who have similar likings for a particular product. Hence, the first step in this method is to identify a user with similar preferences or tastes. When users like similar items, they are considered identical in collaborative filtering. Between u and v, similarity is estimatedusing following formula:

$$suv = \frac{|N(u) \setminus N(v)|}{|N(u) [N(v)|}$$

User/Item	Item A	Item B	Item C	Item D
User A	✓		✓	recommend
User B		✓		
User C	✓		✓	✓

Table 2.1. User-based CF

The above table 2.1 is showsUser-Based Collaborative-Filtering. As per the search history of User A, only User C is considered as the neighbor of User A hence the recommendation made by the system will be for Item D.

2.2 Item-Based Collaborative-Filtering

Item-based method works differently as it assumes that the users would like the items which match the things they had selected previously.

Hence, the first step in this filtering is to list out items similar to previously liked items by a user. The main goal of collaborative filtering based on items is determining how the same two things are. Item CF considers favoured items. The more users with the same name, the more similar they ought to be. Suppose the two user sets: *N(i)* and *N(j)*, enjoy the letters *i* and *j*. The similarity between them can be calculated as:

$$sij = \frac{|N(i) \setminus N(j)|}{|\mathrm{N(i)}\ [\ \mathrm{N(j)}|}$$

User/Item	Item A	Item B	Item C
User A	✓		✓
User B	✓	✓	✓
User C	✓		recommend

Table 2.2. Item-based CF

The above table 2.2 shows theItem-Based CF system. As per the exciting history of every user for an item A, people with a liking or interest in Item A would also like an Item C; hence it is estimated that both Item A and C are same. Whereas if user C also likes item A, it issupposed that user C also wanted Item C.

B.Content-Based Filtering Recommendation

A recommender system based on content tries to predict a user's features or behaviour based on the characteristics of an item to which they respond positively.

Movies	User 1	User 2	User 3	User 4	Action	Comedy
Item 1	1		4	5	Yes	No
Item 2	5	4	1	2	No	Yes
Item 3	4	4		3	Yes	Yes
Item 4	2	2	4	4	No	Yes

Table 2.3. Content-based Filtering

The final two columns are Comedy and Action. Describe the various film genres. Now we can figure out with these given genres the features required to develop for a user based on how they will interact with the films in a specific genre. Once the user preferences are known, we may use the feature vector generated to embed the embedded space recommended based on their preferences. While creating single-user suggestions, content-based filtering does not work with other users' data.

C. KNN Algorithm for Collaborative-Filtering

The KNN algorithm is a method for calculating the KNN algorithm's probability stands for K-Nearest Neighbor.

The central idea of KNN technique is that if a sample's K-most similar neighbors in a feature space all belong to a similar group, this sample will also fall under a similar type. Figure 1 shows that most of the closest neighbors of *W*are in the *X* category, and *W*also falls under the*X* category.

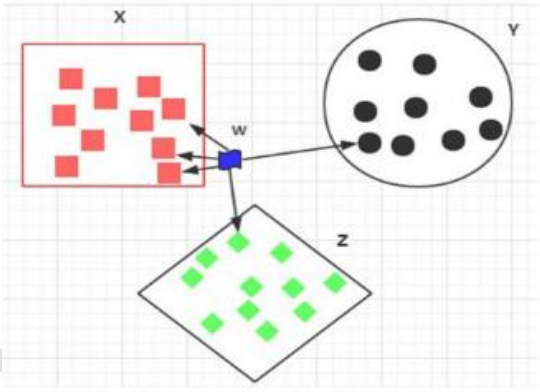

Fig 1:Example of KNN Algorithm

Advantages: It is simple to use and helps handle large amounts of training data.

Disadvantages: Getting a precise estimate of K is problematic because it necessitates computing the distance between each instance and all of the Training examples ahead of time.

III.CHALLENGES

Several issues may arise when using a recommendation system, like Scalability, Data Sparsity, and Cold Start Problem.

3.1 Scalability

A large amount of data is used in collaborative filtering to enhance reliability, hence necessitating many resources. When the data grows exponentially, processing becomes inaccurate and expensive, therefore posing a challenge in Big Data.

3.2 Data Sparsity

A rating matrix or a user has a vast amount of empty state. This is because a maximum of the users is not interested in rating an item, which makes it difficult to find users with the same ratings on the same things. This results in difficulty in finding users who have rated similar items. The recommendation, as a result, becomes difficult with the lack of user information.

3.3 Cold Start Problem

The system requires sufficient users for finding a match. For example, if we wish to find an item or a user who is sameas that of other users, we match it with other items or users available. A new profile at first is empty as he has not rated anything, and the system is not aware of what their taste is, so the system is not aware of what a user likes. It becomes difficult for any system to recommend more items. This is also true for new things, which are yet to be reviewed by any user

as they are unique. Hybrid methods are used for tackling both such issues.

IV. CONCLUSION

Because of the information overload, a recommender system has become increasingly important. We are attempting to develop a new way of enhancing the accuracy of a movie representation in a content-based recommender system. Users will then select from a vast range of movies that the recommendation system would recommend. Because our system works with a collaborative approach, it will produce increasingly detailed results instead of systems based on a content-based approach. Users, when using the content-based recommendation systems, are restricted as such systems do not suggest items out of the box. Such a recommendation system works on individual ratings by the user, which limits the options for further exploration. Whereas the system designed in this article is based on collaborative technique, which estimates the relationship in different clients and as per the rating suggests movies to users with same taste I movies, hence enabling the users to explore more. It is a web application thatallows the users to give a rating to the film and then suggest movies based on other users' ratings.

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