Video Recommendation System in Internet Era

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Abstract. With the development of Internet technology, mining and analyzing a large number of network data has become a hot issue in the industry. Recommendation system can help solve the problem of information overload and provide accurate and fast recommendation information for users. This paper mainly summarizes the current popular recommendation methods, analyzes and compares the meaning of the popular recommendation algorithms. Finally, the application of recommendation algorithm in video industry is introduced.

Keywords: Recommendation System, Video Industry, Recommendation Algorithm

1. Introduction

With the continuous growth of data scale in the Internet, users can obtain more abundant data information through various ways. However, the problem of information overload has become a new difficulty. As a tool for filtering information, recommender system can effectively solve the problem of information overload and provide personalized content to satisfy the demands of users. According to the user's interests, behavior characteristics and other personal information, the recommender system formulates targeted recommendation strategies, and provides personalized services to satisfy the demands of different users as far as possible, so that they can quickly and accurately obtain the information they need in the massive information. At present, recommender system has become a hot issue of academic attention and research, and has a wide range of applications in social network, video music recommendation and other fields [1-2].

It can be seen that the research of recommendation system has very important practical significance. In addition, it has attracted more and more attention from the academic circles in theory, and has gradually formed an independent discipline. In this paper, the concept, definition and main recommendation algorithms of personalized recommendation system are reviewed. Finally, the application of recommendation algorithm in video industry is introduced.

2. Recommendation System

Resnick first proposed the concept of recommendation system in 1997 [3]. Recommendation system is a system that assists users in decision-making in daily activities. It can automatically recommend items of interest to users by inputting user's historical behavior data. The recommendation system can not only use the basic personal information, browsing records and purchase records of users, but also collect the information of users' visit records and visiting time to establish user profiles for users, and
recommend products that meet their needs to users through their preferences.

A recommendation system is mainly composed of user modeling module, recommendation algorithm module and recommendation object modeling module [4]. Firstly, the system collects the user's interest preferences and behavior characteristics to establish a user model; then, according to the specific recommendation algorithm of the system, the information of the recommended object model is matched with the user model; finally, the information matching the user's interest is recommended to the user. The implementation steps of the recommendation system are shown in the figure 1.

![Fig 1. The implementation steps of the recommendation system](image)

3. Recommendation Algorithm
Recommendation algorithm determines the performance of the recommendation system and is the core part of the recommendation system. The classification diagram of recommended algorithm is shown as Fig 2.

![Fig 2. The classification diagram of recommended algorithm](image)

3.1 Collaborative Filtering Recommendation Algorithm
Collaborative filtering recommendation algorithm is a popular and widely used recommendation algorithm, which greatly promotes the development of recommendation system. Its core idea is to use the preferences of the same user groups as the target users to recommend [5].

There are two kinds of recommendation algorithms: one is based on user, the other is based on item. The main idea of user based recommendation is to find the preference degree of all users for the project through the historical data of all users, find the neighbor user group similar to the interest
preference of the target user through calculation, and finally recommend to the target user according to the historical preference information of the neighbor user group. The basic principle of item based recommendation is to calculate the similarity between items, and then find the nearest neighbor of an item that has not been scored. According to the user's score on the nearest neighbor, the score of the corresponding item that is not scored is predicted. Finally, the top predicted item is fed back to the user.

Unlike the content-based recommendation algorithm which relies too much on the content of information object, collaborative filtering algorithm can achieve recommendation without relying on content. In addition, collaborative filtering algorithm can also carry out associative recommendation to provide users with novel information. Therefore, its application field is more extensive. However, collaborative filtering algorithm also has some problems that are difficult to overcome, such as the cold start problem [6]. When a new user appears in the recommendation system, the user does not give a score for any information object, so the recommendation system cannot obtain its information needs and provide recommendations for it.

3.2 Recommendation Algorithm Based on Association Rules
The core idea of association rule-based recommendation algorithm is to find frequent itemsets satisfying certain support degree from a large number of data, and then find strong association rules from them according to the confidence degree. Finally, users can be recommended what they may be interested in according to the rules. By using the data in the user transaction database, the association rules analyze the relationship between the products purchased by users each time, and generate the user's purchase mode. When users purchase again, they can make relevant recommendations and realize cross selling. The disadvantage of this algorithm is that it needs to scan the data set for many times when searching for frequent items, which has a large amount of calculation and takes a long time [7]. Although it can be calculated offline, it has little impact on the performance of the recommendation system, but it will still bring some inconvenience; due to the use of user data, there are inevitably problems of cold start and sparsity; there is the problem that hot projects are easily over recommended.

3.3 Content-Based Recommendation Algorithm
The theoretical basis of content-based recommendation algorithm mainly comes from the field of information acquisition. The basic principle of this method is to obtain the user's interest description according to the object that the user has selected, then compare the characteristics of the recommended object with the user's interest, and finally push the recommended object with similar comparison result to the user [8]. The steps of content-based recommendation using this algorithm are as follows.
1. Establish the recommended object model: according to the characteristics of each project, the keyword set is formulated, the project is evaluated with the set, and the corresponding description file is generated.
2. Establishing user interest model: tracking user's information and behavior, obtaining user's characteristics and generating user's description file through the system's explicit or implicit way.
3. Get the matching degree for recommendation: by calculating the similarity between the recommended object model and user interest model, the higher the similarity is, the higher the matching degree is. Finally, the recommendation is made according to the matching degree.

The content-based recommendation system only needs to obtain the description file of the user and the recommended object, and does not need the user's rating on the object. Therefore, it can solve the cold start problem of new objects, and there will be no sparsity of rating information. However, this method is not suitable for multimedia resources such as pictures and videos, because there is no effective method to extract the features of these resources.

3.4 Hybrid Recommendation Algorithm
The system based on hybrid recommendation algorithm is another hot spot in the research of
recommendation system. It refers to the combination of various recommendation algorithms to make up for each other's shortcomings, so as to improve the performance of the recommendation system [9]. Although there are many mixed recommendation methods in theory, not every method is effective in a specific problem. Therefore, how to mix two or more methods, generating more effective recommendation is also an important research direction in recommendation system. Hybrid recommendation techniques can overcome most of the limitations of traditional recommendation methods and combine them to obtain better recommendation results.

The recommendation system uses the interaction between users and projects as the basis to discover users' preferences to achieve the recommendation function. However, when the amount of data between users and projects increases, the scoring matrix between users and projects will become more and more sparse. Collaborative filtering method faces the problem of data sparsity, while content-based recommendation method can only capture features of shallow model, and artificial design features have great impact on shallow model, which will greatly limit the scalability and recommendation effect of the method. Although the hybrid recommendation method can effectively solve the above problems, it still faces severe challenges in the face of multimodal auxiliary information.

3.5 Application of Recommendation System in Video Industry

At the same time, the application status of recommendation system in video industry is introduced. In the video industry, many products use personalized recommendation function, and have made some achievements, such as Tencent video, Youku and other companies. Youku video has launched the personalized recommendation function in the early stage, and the quality of the video pushed to users is high, which has received positive feedback from many users. Youku adopts the content-based method, but this algorithm has the problem of high coincidence between the recommended content and the content watched by users, so the recommendation quality needs to be improved. Iqiyi also provides personalized recommendation service, which obtains users' video browsing records and daily behaviors through big data, and constructs user interest model, so as to achieve the recommendation effect of thousands of people and thousands of faces. In particular, iqiyi with the help of Baidu, personalized recommendation technology is more mature, the recommendation effect has been further improved. In addition to video software, personalized recommendation technology is also used in content products, such as Douban, the largest community product in China. Douban provides users with a lot of evaluation tags in the system. Users can select the corresponding tags to evaluate the viewing content when watching movies or books. The system analyzes user preferences through the tags selected by users, and classifies videos according to tags. Through the calculation of recommendation algorithm, it recommends movies or books with higher matching degree with tags to users.

4. Summary

This paper introduces the concept of recommendation system and several popular recommendation algorithms. Meanwhile, the application status of recommendation system in video industry is introduced. Although personalized recommendation technology has entered the mature stage, it still faces great challenges, such as data sparsity, cold start, real-time big data processing, diversity, recommendation system effect evaluation, and so on. In recent years, with the gradual maturity and development of artificial intelligence related technologies, the application of deep learning technology to recommendation field is the future research hotspot and direction of recommendation system [10].

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