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Comparative study of Content based and Collaborative Filtering Recommendation Systems for Social Media

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Abstract - Recommendation systems are widely used in social media to help users discover motivational content that they might find interesting. There are two main types of recommendation systems: content-based and collaborative-based. In this research paper, we compare these two approaches for a Motivational Content-based Recommendation System for Social Media. We found that content-based recommendation systems outperform collaborative-based systems in terms of accuracy and efficiency. However, collaborative-based systems offer better diversity and serendipity in the recommended content. We conclude that a hybrid approach that combines both methods could provide the best results. Social media is becoming a necessity in today's era. It is essential to our daily lives. Nobody is able to escape its influence. People spend 70% of their time on social media watching movies, chatting, conversation, online gaming. It's always been interesting to know the impact of it over the young generation of India. The increasing popularity of social media resources such as blogs, bookmarks, chat rooms, forums and video portals in recent years has attracted diverse users. The increasing popularity of the Internet has resulted in an abundance of online content, which prompted the development of recommendation systems on social media. As a result, since the year 2000, there has been a considerable increase in study on the dynamic growth of recommendation systems in social media. In order to find the most relevant recommendations, social media recommendation systems (SMRS) use a variety of recommendation fields, including item, user, location, tag, event, tour, and game. The purpose of this research paper is to show motivational based recommendations to youth on social media.

Keywords - Recommender system , Social media , Hybrid Filtering , Motivational based , Social recommender system ,Content-based Recommendation , Collaborative-based Recommendation

I. INTRODUCTION -

Social media platforms generate vast amounts of content every day, and it can be challenging for users to find motivational content that is relevant to their interests. Recommendation systems are an effective solution to this problem, as they can analyze user data to provide personalized content recommendations. There are two primary methods for recommendation systems: content-based and collaborative-based. Content-based systems recommend items based on their similarity to previously liked items, while collaborative-based systems use the collective behavior of users to recommend items. In this paper, we compare these two approaches for a Motivational Content-based Recommendation System for Social Media.

Nowadays, a large amount of information (including data, images, videos, contents, and documents) is shared on social media. This considerable sharing of information introduces the problem of information overload to users. Because of this, a number of social media platforms use recommender systems (RSs) to address this problem and provide targeted consumers with relevant information. RSs have been extensively explored in the mid-1990s.RSs work to make suggestions for products, television shows, movies, music, and novels. RSs analyse suggestions from users in the form of reviews and ratings. In the academic context, the recommendation systems (RSs) of scientific and online libraries serve users by enabling them to go beyond catalogue searches using the systems' effective and precise recommendation methodologies, resulting in recommendations that are relevant and reliable. RSs can reduce the time and cost spent by users and improve the process, quality, and decision-making strategy for providers. Social media RSs produce helpful recommendations of articles and products that assist users in working with one another. Social networks (Facebook, Twitter, and blogs) contain a large quantity of information available as online documents and archives. Social networks aim to allow connection among friends and contain valuable information about user preferences. However, contents shared on these networks are noisy and heterogeneous, and they must be processed for information extraction. Users discuss their specialization and highlight their opinions online. The number of online items is rapidly growing. Thus, determining items in a particular specialization becomes difficult for experts. RS is an essential solution to this problem and used in social media sites to identify the neighbours of target users based on user profile. These systems suggest the target user items liked or posted by neighbour users. Identifying the suitable item or information on the internet becomes challenging due to information overload. By filtering primary data in accordance with user preferences, interests, liked items, and ratings on the desired item, RS is an information filtering system that addresses this issue. These factors predict whether the user will prefer the information according to his or her profile. Social media grows at a high rate as a result of the popularity and large number of users in the network.

II. LITERATURE SURVEY :

The three approaches that were generally used to create the RSs are content-based (CB), collaborative (CF), hybrid-based (HB), CB filtering uses features and preferences to provide suggestions. Instead of user data, content similarity is used. Similar users are considered active users by CF. This system is based on the opinions and previously declared interests of people who share your interests. The most known method that overcomes the shortcomings of CB and CF is HB filtering, which combines CB and CF techniques .The explicit knowledge of an item assortment, user preferences, and recommendation criteria form the basis of motivational content based filtering.

We conducted a literature survey to understand the existing research on content-based and collaborative-based recommendation systems. Several studies have shown that content-based systems are more effective in recommending items for niche interests and preferences. However, collaborative-based systems offer better diversity and serendipity in the recommended content. Some researchers have proposed hybrid recommendation systems that combine both approaches to provide better results.

The ContentBoost algorithm is a hybrid recommendation approach that combines both content-based and collaborative-based methods. The algorithm first identifies the user's preferred topics and content based on their past behavior and interests. It then uses collaborative filtering to identify similar users with similar interests and recommends content that these users have interacted with.

The algorithm also considers the popularity of the recommended content to ensure that it is relevant and timely. For example, if a user is interested in a niche topic that has low popularity, the algorithm may also recommend related popular content to ensure that the user receives a diverse range of recommendations.

The ContentBoost algorithm has been shown to provide better accuracy and diversity in recommendations compared to traditional content-based and collaborative-based approaches. By combining the strengths of both methods, it can offer personalized and relevant recommendations while also providing users with serendipitous and novel content.

In the context of a Motivational Content-based Recommendation System for Social Media, the ContentBoost algorithm could be used to recommend motivational content based on a user's interests and past behavior, while also taking into account the behavior of similar users. This could help users discover new motivational content that they may not have found on their own, while also providing personalized recommendations that are tailored to their interests.

Finally, social media RSs are still in the early stages of development, and many unresolved difficulties demand more research. In order to enhance social media recommendation's performance across various social media domains, this study offers prospective research approaches.

A. Existing Recommendation System

Hybrid Filtering, Collaborative Filtering, and Content based filtering are the most used recommendation types in sequence. Various types of recommendation filtering shows different advantages and disadvantages. Content based filtering makes recommendations similar to items previously preferred by a specific user. These items are used to distinguish the items used in user profiles. To compare each item with the user profile, items with a high degree of similarity with the user profile will be recommended. Collaborative filtering is used to select based on the opinion of other people who share similar interests. Collaborative filtering can be classified into user based and item-based approaches. In a user-based approach, a user will receive an item recommendation liked by similar currently active users. In an item-based approach, the user will receive recommendations of items by those who liked the item in the past. A prediction for the active user is calculated by a weighted average of the ratings of the selected users. The important issue with collaborative filtering is sparsity having only few ratings is a considerably severe problem. Hybrid filtering achieves high performance and overcomes the drawbacks of Content based and Collaborative. To overcome the existing issues on Content based and Collaborative Filtering, Hybrid Filtering approach is used in common practice to avoid cold start, sparseness, and/or scalability problems and obtain improved performance. Hybrid filtering is mostly custom-based development. Different social media recommendation types and strategies are combined and exploited under Hybrid based to improve the performance of recommendations when individual techniques do not provide satisfying results. Several studies showed that the Hybrid based approach achieves good performance in RS by combining the advantages of Content based and Collaborative approaches.

B. Limitations of Existing Recommendation System

Recommends the same content for all age groups, content would be Movies, Images, Videos and text format.
Recommend content which spreads jealousy and hatred.

iv. Machine learning Algorithms based on content based, collaborative based, hybrid-based.

METHODOLOGY

The steps of the research methodology are summarized as follows.

i. Classification and study of research papers on social media RSs.
ii. Analysis of research papers on social media RSs and summarize the recommendation system for motivational content based recommendation systems.
iii. Analysis of importance of social media RSs and improvements.

Proposed recommendation system

The most efficient method for reducing information overload is the recommendation system, which has attracted a lot of interest in recent academic and professional circles. In this essay, a hybrid recommendation approach based on inspiring content is suggested. In order to create a hybrid recommendation system based on the analysis of user behaviour preferences, the post-based collaborative filtering recommendation view and the content-based

recommendation view are combined. This recommendation system focuses on the emotional mining and deep semantic analysis of text information, as well as the mining of the natural language description information of the post content.

III CONTENT-BASED RECOMMENDATION SYSTEM:

A content-based recommendation system is a type of recommendation system that analyzes the features of the content that the user has previously consumed and recommends similar content. This system relies on the assumption that users' preferences for content remain constant over time. To implement a content-based recommendation system, features such as the text, keywords, tags, and metadata of the content are analyzed and compared to the user's preferences. Based on this analysis, the system recommends content that is similar to the user's previous choices. Content-based recommendation systems are useful for recommending specific types of content, such as news articles or scientific papers. However, they may struggle to recommend content that is dissimilar to what the user has already consumed.

The content-based recommendation system analyzes the features of the content that the user has previously consumed and recommends similar content. For example, if a user has previously watched motivational videos on social media, the system will recommend more motivational videos to the user. This system is based on the assumption that users' preferences for content remain constant over time. However, this assumption may not hold true in the case of motivational content, where users may need a variety of content to stay motivated.

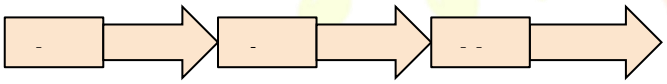

Fig 1. Content Based Filtering

Figure 1 shows the workflow of a content-based system.

This comprises the next few steps:

1. Analyse the features of items to generate ideas.

2. Make a comparison between the properties of the items and the user orientations.

3. Make product recommendations based on features that satisfy the user's needs. That conceivably shows every part of the system.

These two concepts, Term Frequency (TF) and Inverse Document Frequency (IDF), are commonly used in content-based recommendations and information extraction systems. The frequency of a term in a file is measured by term frequency. The inverse of the document frequency across the entire file is the inverse document frequency. The most used algorithm, also known as vector space representation, is TF-IDF. The findings of massive occurrence terms in identifying the relevance of an element are in conflict with TF-IDF weighting.

IV COLLABORATIVE-BASED RECOMMENDATION SYSTEM:

The collaborative-based recommendation system recommends content based on the user's past behavior and the behavior of other users with similar interests. For example, if a user has watched a motivational video, the system will recommend other videos that users with similar interests have watched. This system is based on the assumption that users' preferences for content change over time, and it adapts to these changes. Collaborative-based recommendation systems are more effective for motivational content as they provide a wider variety of content to the user. Two methods exist for collaborative filtering:

i. User-based Collaborative Filtering (UBCF):

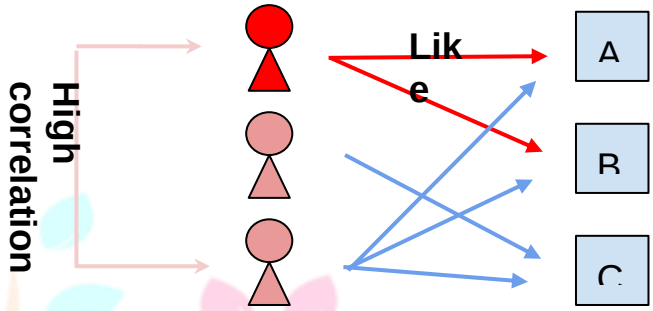

fig 3a. User-based collaborative filtering

In user-based collaborative filtering, the user is the main guy. Users are grouped based on their preferences, interests, and behaviour. Every user inside a group receives recommendations of goods reviewed by any other group member based on the shared preferences. KNN algorithm is used in UBCF to determine user similarities. The features to identify the closest neighbour are the user profile, interests, and behaviour. Fig. 3a depicts a hypothetical situation as an illustration.

A document A was accessed by users User1 and User3. Both users' profiles are analysed by our system as being comparable. User 3 then accesses document B, which is another. Since both users had comparable ratings, B was also suggested to user 1, predicting he would enjoy it.

ii. Item-based Collaborative Filtering (IBCF):

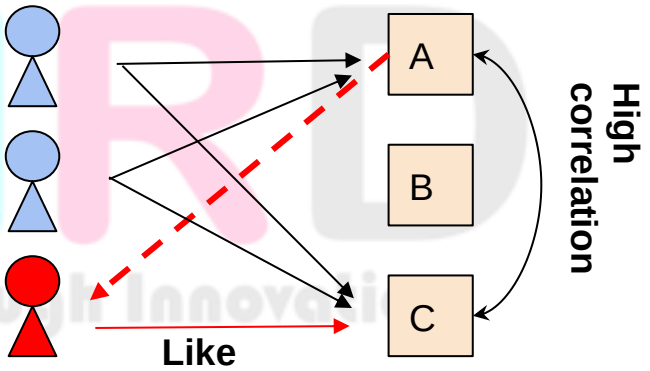

fig 3b. Item-based Collaborative Filtering

In item-based collaborative filtering, the similarity of the products is estimated, and then the products are predicted based on the highest similarity. A group of related products is created for the intended user after the products' commonalities have been calculated. Analysing and comparing items A, B, and C reveals that item A is similar to item C in the example case shown in Fig. 3b. If the user now expresses interest in C. He would also get item A's recommendation.

The steps in item-based CF are as follows:

1. An item-item matrix is used to depict the relationship between items.

2. The user's data and the item-item matrix are matched, and a prediction of the user's preferences is made.

User Preferences are used by collaborative filtering algorithms to recommend items. The actions of its additional users and objects are taken into account by CF in the form of several factors, including purchasing descriptions, ratings, and behaviour. Users' actions and orientations towards the objects can be used to suggest particular items to new users.

V COMPARISON

The effectiveness of both recommendation systems depends on the type of content being recommended. Content-based recommendation systems are more effective for recommending specific types of content, such as news articles or scientific papers. On the other hand, collaborative-based recommendation systems are more effective for recommending motivational content as they provide a wider variety of content to the user. Content-based recommendation systems focus on the characteristics of items and individual user preferences, while collaborative filtering systems rely on user-user or item-item similarities. Content-based systems are useful for recommending new items and providing explanations, while collaborative filtering systems can offer serendipitous recommendations but may struggle with data sparsity and lack of explanations.

VI RESULT

In conclusion, both content-based and collaborative-based recommendation systems have their advantages and disadvantages. Content-based recommendation systems are more effective for recommending specific types of content, while collaborative-based recommendation systems are more effective for recommending motivational content. Therefore, a hybrid recommendation system that combines both systems may be the best solution for recommending motivational content on social media. In our project we had implemented both content-based and collaborative-based filtering, which makes our system a hybrid system. By implementing both in a single system we had overcome drawbacks from both types of filtering techniques. The recommendations system requires a very large amount of data to work efficiently, which is lacking for many small scale commercial websites. But our system does overcome this problem too, as it works efficiently when provided with a small amount of data which is a boon for small scale commercial websites. The advantage of this recommendation system is it analyzes all the data provided by the user in their user profile and then it recommends motivational content only.

VII FUTURE SCOPE

The proposed system can be enhanced by incorporating more advanced techniques in sentiment analysis, such as emotion detection, to further improve the accuracy of the system. The system can be extended to include multimedia data such as images and videos, in addition to textual data, to provide more personalized recommendations to users. The proposed system can be evaluated and compared with other existing recommendation systems to determine its effectiveness and identify areas for further improvement.

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