Survey on Hybrid Recommendation System

Jinal S. Chauhan

Parul university, Waghodiya, limda,Baroda.

Abstract: *Recommender systems are used by an increasing number of e-commerce websites to help the customers to find suitable products from a large database. The overwhelming amount of data necessitates mechanisms for efficient information filtering. Recommendation systems (RS) serve the right item to the user in an automated fashion to satisfy long term objective. Major task of the recommender system is to present recommendations to users. Hybrid recommendation uses multiple techniques together.*

Keywords: *Recommendation system, collaborative filtering, content-based filtering, Hybrid filtering, Hybrid recommendation system.*

I.   INTRODUCTION

Recommendation systems are a subclass of information filtering system that seek to predict the 'rating' or 'preference' that a user would give to an item. Recommender systems work from a specific type of information filtering system technique that attempts to recommend information items (movies, TV program/show/episode, music, books, news, images, web pages, scientific literature etc.) or social elements (e.g. people, events or groups) that are likely to be of interest to the user [1].

Recommender systems have changed the way people find products, information, and even other people. They study patterns of behaviour to know what someone will prefer from among a collection of things he has never experienced.

Recommendation systems are classified into 3 approaches i.e collaborative, content based or knowledge-based method to have a better recommendation. Each recommendation systems have some strategy to recommend better, the most useful strategies are listed below.
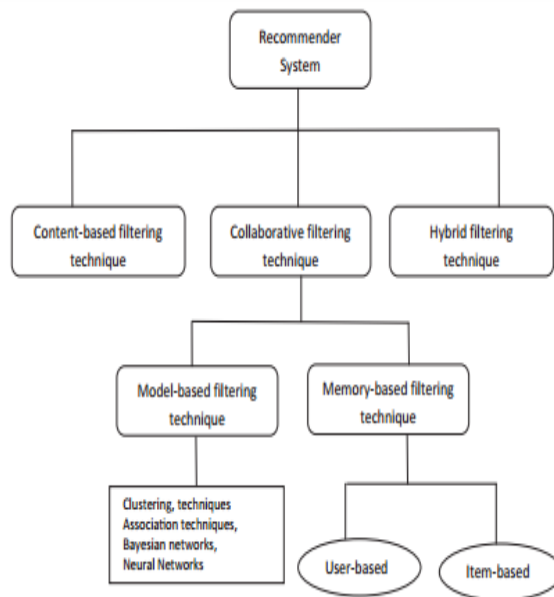

Fig 1: Recommendation system [2]

A.   Content-based filtering:

Content-based filtering methods are based on a description of the item and a profile of the user's preference [3]. In a content-based recommender system, keywords are used to describe the items and a user profile is built to indicate the type of item this user likes.

In   the   recommendation   process,   the   engine   compares   the   items   that

were already positively rated by the user with the items he didn't rate and looks for similarities. Those items that are mostly similar to the positively rated ones, will be recommended to the user.
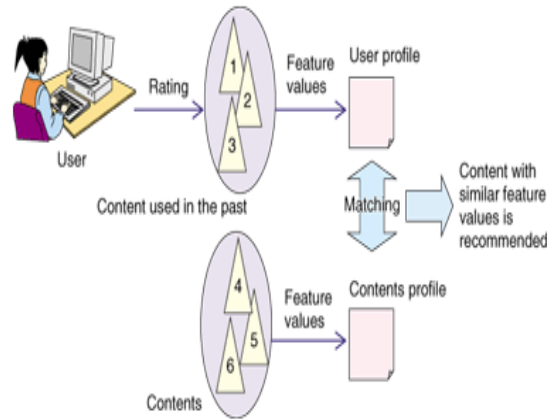

Fig 2: Content-based filtering

Movies	Green Lantern	Source Code	American Pie	Hangover 2
Ratings	8	7	9	10

Fig 3: The movies the user has watched

Movies	Comedy	Violance	Horror	Explicit Content
American Pie	10	3	1	9
Scary Movie	8	8	4	9
Saw	2	10	10	7
...	...	...	...	...

Fig 4: The movies list

Figure 3 shows an example of a user profile with the movies he/she has watched and the ratings the user made. Figure 4 shows the list of movies and their attribute-values. A content based recommender system would find out movies from the list (Figure 4) that the user has already watched and positively rated. Then, it would compare those movies with the rest of the movies from the list (Figure 4) and look for similarities. Similar movies would be recommended the user.

B. **collaborative filtering:**

Collaborative Filtering (CF) approach – recommendations were given by others who have similar tastes in the past, but who already experienced an item yet unknown to the current user.Collaborative filtering systems require users to express opinions on items. They collect opinions and recommend items based on people's opinions similarity. Those who agree most are the contributors. If two users have same or almost same rated items in common, then they have similar tastes. Such users build a group or a so called neighbourhood. A user gets recommendations to those items that he/she hasn't rated before, but that were already positively rated by users in his/her neighbourhood.

Movies Users	Titanic	Gladiator	Black Swan	The Fighter	TRON: Legacy
A	8	7	9	10	-
B	9	7	9	9	10
C	9	8	9	8	9

Fig 5: Collaborative recommender system example

Figure 5 show that all three users rate the movies positively and with similar marks. That means that they have similar taste and build a neighbourhood. The user A hasn't rated the movie "TRON: Legacy", which probably mean that he hasn't watched it yet. As the movie was positively rated by the other users, he will get this item recommended. As opposed to simpler recommender systems where recommendations base on the most rated item and the most popular item methods, collaborative recommender systems care about the taste of user. The taste is considered to be constant or at least change slowly.

C. Hybrid filtering:

Hybrid approaches can be implemented in several ways: by making content-based and collaborative-based predictions separately and then combining them; by adding content-based capabilities to a collaborative-based approach (and vice versa); or by unifying the approaches into one model. A hybrid recommender system is one that combines multiple techniques together to achieve some synergy between them.

Collaborative: The system generates recommendations using only information about rating profiles for different users. Collaborative systems locate peer users with a rating history similar to the current user and generate recommendations using this neighbourhood.

Content-based: The system generates recommendations from two sources: the features associated with products and the ratings that a user has given them. Content-based recommenders treat recommendation as a user-specific classification problem and learn a classifier for the user's likes and dislikes based on product features.

Demographic: A demographic recommender provides recommendations based on a demographic profile of the user. Recommended products can be produced for different demographic niches, by combining the ratings of users in those niches.

Knowledge-based: A knowledge-based recommender suggests products based on inferences about a user's needs and preferences. This knowledge will sometimes contain explicit functional knowledge about how certain product features meet user needs [4][5].

II. HYDRIDE RECOMMENDER SYSTEM METHOD

- **Weighted:** The score of different recommendation components are combined numerically.

- **Switching:** The system chooses among recommendation components and applies the selected one.
- **Mixed:** Recommendations from different recommenders are presented together.
- **Feature Combination:** Features derived from different knowledge sources are combined together and given to a single recommendation algorithm.
- **Feature Augmentation:** One recommendation technique is used to compute a feature or set of features, which is then part of the input to the next technique.
- **Cascade:** Recommenders are given strict priority, with the lower priority ones breaking ties in the scoring of the higher ones.
- **Meta-level:** One recommendation technique is applied and produces some sort of model, which is then the input used by the next technique [4].

III. CHALLENGES AND ISSUES

Cold-start:
It's difficult to give recommendations to new users as his profile is almost empty and he hasn't rated any items yet so his taste is unknown to the system. This is called the cold start problem. In some recommender systems this problem is solved with survey when creating a profile. Items can also have a cold-start when they are new in the system and haven't been rated before. Both of these problems can be also solved with hybrid approaches.

Gray Sheep:
Gray sheep problem means where user doesn't consistently agree or disagree to the group of the people and due to this reason for such user recommendation seems to be difficult [8].

Trust:
The voices of people with a short history may not be that relevant as the voices of those who have rich history in their profiles. The issue of trust arises towards evaluations of a certain customer. The problem could be solved by distribution of priorities to the users.

Data-Sparsity:
Sparsity is the problem of lack of information. Suppose we have a huge amount of users and items but user have rated only few items. If a user has evaluated only few items then it's difficult to determine the taste of the user. So, to overcome this we use collaborative and hybrid approach to create neighbourhoods of users based on their profiles [6].

Scalability:
Due to increase of numbers of users and items, the system needs more resources for processing information and forming recommendations. Majority of resources is consumed with the purpose of determining users with similar tastes, and goods with similar descriptions. This problem is also solved by the combination of various types of filters and physical improvement of systems [6].

Privacy:
Privacy has been the most important problem. In order to receive the most accurate and correct recommendation, the system must acquire the most amount of information possible about the user, including demographic data, and data about the location of a particular user. Naturally, the question of reliability, security and confidentiality of the given information arises. Many online shops offer effective protection of privacy of the users by utilizing specialized algorithms and programs [7].

IV. CONCLUSION

Recommender systems open new opportunities of retrieving personalized information on the Internet. It also helps to alleviate the problem of information overload which is a very common phenomenon with information retrieval systems and enables users to have access to products and services which are not readily available to users on the system.

REFERENCES

[1] Diego Campo, Miquel Sonsona, Jose-Miguel Pulido "A hybrid recommender combining user, item and interaction data".
[2] F.O. Isinkaye, Y.O. Folajimi, B.A. Ojokoh "Recommendation systems: Principles, methods and evaluation".
[3] Peter, Brusilovsky, "The Adaptive Web", 2007.
[4] Robin Burke, "Hybrid Web Recommender Systems", Springer-2007.
[5] Alexander Felfernig and Robin Burke, "Constraint-based Recommender Systems: Technologies and Research Issues, Proceedings of the ACM International Conference on Electronic Commerce", ICEC-2008.
[6] Jaimeel Shah, Lokesh Sahu "A Survey of Various Hybrid based Recommendation Method", IJARCSSE-2014.
[7] Daniar Asanov, "Algorithms and Methods in Recommender Systems".

[8] S. Jung, J. Kim, and J. L. Herlocker, "Applying collaborative filtering for efficient document search", IEEE-2004.