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A Review on Personalized Product Recommendation in Social Commerce

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Abstract: Recommender systems or recommendation systems are a subclass of information filtering system that seek to predict the 'rating' or 'preference' that user would give to an item. These systems are best known for their use in e-commerce websites where they use input about a customer's interest to generate a list of recommended items. Many applications use only the items that customers purchase and explicitly rate to represent their interests, but can also use other attributes, including items viewed, demographic data, subject interests, and favorite artists. A variety of techniques have been proposed for performing recommendation, including content-based, collaborative, and hybrid techniques.

Keywords: Recommender Systems, Information filtering, E-commerce, User preferences, Content-based recommenders, Collaborative recommenders, Hybrid recommenders.

INTRODUCTION

A social structure consisting of social actors and dyadic ties between these actors are called Social Networks. These set of social actors consist of individuals or organizations and have some common taste of interests which acts as ties between them. Websites that allow users to build connections and relationships to other users are called Online social networks (OSNs). Social networks basically emerged from social psychology, statistics, sociology and graph theory. Social networks do not store information on user's personal computer rather than store information remotely on database. They can be used to find people with similar interests and ideas, keep in touch with friends, make new contacts.

An Ego Network is a sub graph consisting of an ego and its neighbors. Ego is an individual focal node. Ego can be a person, groups or organizations. Ego networks consist of a central node which is called as ego and the other nodes that are called as alters. Ego is directly connected to these alters with the ties. In an ego network each alter has his own ego network and all ego networks incorporate to form Social network.

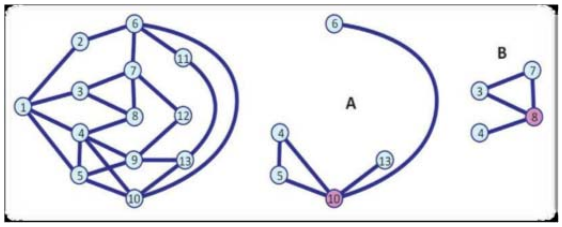

Figure 1.1 Represents a Complete Network.
1.1 (A) Ego network for node 10.
1.1 (B) Ego network for node 8.

Neighborhoods are the collection of ego and all nodes to whom ego has a connection. In social network analysis, neighborhood includes all of the ties among all of the actors to whom ego has a direct connection or can say neighborhood term define as always away one step that is it include only that ego and alters which are directly adjacent.We use these Social networks to keep a record of all the people, their preferences, things or peers that influence their preferences and thus they form a database on which we run our recommender systems to determine what new items would keep the users interested and wanting for more. These networks depend on social relations and social influences.Social influence defined as when one person's opinions, emotions or behavior are affected by others. There are many forms of social influence that can be seen in socialization, conformity, obedience, leadership, peer pressure, sales, persuasion and marketing. In 1958, Herbert Kelman, psychologist in Harvard, identified three main categories of social influence.

- Compliance: when someone shows that they are following your decisions or pretending to be with you but inside they just listen to themselves and follow what they find right. They keep their dissenting opinions private.
- Identification: a person who is liked, respected and famous in their respective field or profession and people are influenced by them, such as famous celebrities.
- Internalization: when people agree both publicly as well as privately and accept a belief or behavior.

RECOMMENDER SYSTEMS

Although the roots of recommender systems can be traced back to the extensive work in the cognitive science, presented by E. Rich , approximation theory by M.J Powell, information retrieval by G. Salton , recommender systems rose up as an independent research area in the middle of 1990 at that time recommendation problems came into focus by the researchers and considering the fact that recommendation system are very important in terms of information filtering for the user's interest and it explicitly depends on the ratings structure that is how ratings are predicted and used[1,2,3].

With time, topic of recommender systems and collaborative filtering, machine learning, and information retrieval researches gained increasing interest among human-computer interactions. This interest produced a number of recommender systems for different domains, such as Ringo system for music presented by Shardanand and Maes, the BellCore Video Recommender for movies, and Jester system for jokes presented by Goldberg *et. al.*[4,8].

In the late 1990s, recommender system were made feasible to be used commercially with the famous example being Amazon.com. which is based on purchase history of how many items bought by the user and type of items user is interested in, browsing history that is searched item and these items must be of user's taste and the items a user is currently viewing, they recommend items for the user to consider purchasing. Main idea behind implementing this recommender technology is to increase sales volume because there is possibility that customer may purchase an item if it is suggested to them by recommender system and might not seek it out otherwise. The toolbox of recommender techniques has also grown over time.

TYPES OF RECOMMENDER SYSTEMS

Collaborative Recommender System

Collaborative Recommendation based upon predicting which items the current user of the system will most probably like or be interested in, on the basis of utilizing information about the past behavior or the opinions of an existing user community. Such systems are widely spread for industrial use today, in particular as a tool in online retail sites for particular customer to customize the content according to the need of that particular customer and to promote and increase the sale of additional items so as to get benefits. But there are some limitations that this system faces:

New User Problem- In this collaborative system to make accurate recommendations to particular user we must have some user's preference data so that prediction can be made from that data and recommend some items to that user, but the problem comes when the newly registered user wants recommendation ,in that case we are not available with the friend network of that user so as to make recommendations, in that case we can't recommend any product to that newly registered user as we are at the dumb state having no information about the user. Several Techniques have been proposed to address this problem. Most of them use hybrid recommendation approach.

New Item Problem- New items are added to every system on regular basis. Collaborative system depends upon user's preferences to make any recommendation about product. Until new item is rated by a wide number of users, the recommender system would not be able to recommend it to other users who have not rated this item yet. This problem can be addressed using hybrid recommendation approaches.

Introduction of new user or new item also called cold start problem.

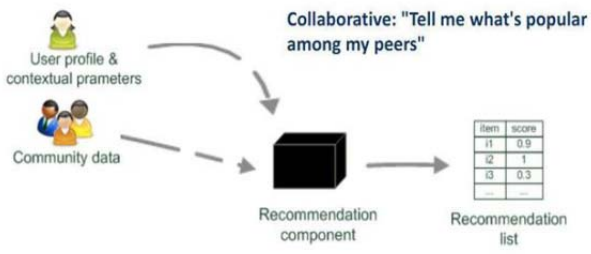

Figure 1.2- Collaborative Recommendations [5]

Content-based Recommendation Systems-

Content based recommendation methods are based on a profile of the user's preference regarding items and on a description of the item. In a content-based recommender system, to describe the items keywords are used and information is attached about the item which can be parsed by the computer automatically and a user profile is built to indicate the type of item this user likes. In other words, these algorithms try to recommend items that are similar to those that a user liked in the past or is examining in the present or we can say searching in the search box must be the item of user's interest. In this process various candidate items are compared with items previously rated by the user and the best-matching items are recommended. This approach has its roots in information retrieval and information filtering research.

This system also faces the limitations that collaborative systems do i.e. The cold-start problems. Plus it has its own limitations too.

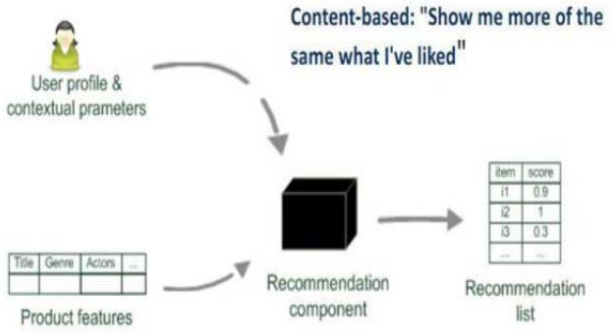

Figure 1.3 -Content based recommendation [6]

Hybrid recommendation Systems

These recommender systems are the answer to all the problems that above mentioned recommender systems face. Collaborative filtering utilizes a specific type of information to derive recommendation for the user. It uses ratings of the items by all the users that is ratings of the user model and community data and all ratings are combined together to calculate the rating prediction of the items those are not rated yet by the particular user. Whereas in content-based approaches, recommendation depends on the product or item feature or we can say information provided for that particular item that can be parsed easily and automatically by the computer in the form of text document of user. Hybrid approach helps to overcome certain limitations of content-based and collaborative systems [9,10,11]. Hybrid approaches can be implemented in several ways:

a. By deriving content based prediction and deriving collaborative based predictions separately and then combining them to make recommendations.
b. By adding content-based capabilities to a collaborative-based approach.
c. By adding collaborative capabilities to content based approach.
d. By unifying the approaches into one model and calculate prediction.

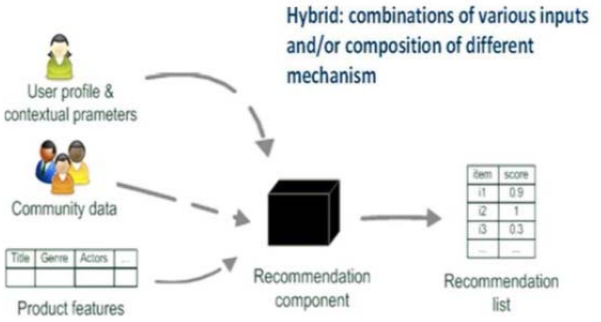

Figure 1.4- Hybrid Recommender System [7]

CONCLUSION

In this review paper, we have explained various types of recommender systems and have concluded that Hybrid recommender system is the best of all because it uses the positive features of both collaborative and content based systems and overcomes their limitations. Hybrid recommenders readily meet the needs of today's customers and facilitate their online shopping experiences.

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