Utilizing Association Rules for Improving the Performance of Collaborative Filtering

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ABSTRACT

Internet technology has rapidly grown during the last decades. Presently, users are faced with a great amount of information and they need help to find appropriate items in the shortest possible time. Recommender systems were introduced to overcome this problem of overloaded information. They recommend items of interest to users based on their expressed preferences. Major e-commerce companies try to use this technology to increase their sales. Collaborative Filtering is the most promising technique in recommender systems. It provides personalized recommendations according to user preferences. But one of the problems of Collaborative Filtering is cold-start. The authors provide a novel approach for solving this problem through using the attributes of items in order to recommend items to more people for improving e-business activities. The experimental results show that the proposed method performs better than existing methods in terms of the number of generated recommendations and their quality.

Keywords: Association Rules, Cold-Start, Collaborative Filtering, Content-Based Filtering, E-Commerce, Knowledge-Based Filtering, Recommender Systems

1. INTRODUCTION

Nowadays, many Web sites provide personalized information and services to users. This technique is sometimes used for solving the problem of information overload. In order to understand the needs of users, it tries to obtain useful information about a user by analyzing his/her behavior in the past and generate the appropriate content of the site according to the user’s favorites. These steps are required in the personalization process and help Web sites to adapt themselves with each individual. In other words, personalization is a technique of providing users with what they want without the need for being explicitly asked. This technique improves the interaction between the user and the Web sites.

Recommender systems are introduced as personalization systems that address the issue of information overload by providing personalized suggestions (Schafer et al., 2001; Forsati et al., 2010; Prassas et al., 2001). They are useful for both customers and businesses by providing
suggestions in most e-commerce applications (Vozalis & Margaritis, 2003).

This paper first describes recommender systems and three different methods widely used in such systems. The challenges involved in designing and implementing such systems are then discussed. Afterwards, we focus more on one of the problems of collaborative filtering method called cold start. We present an algorithm for solving this problem and then present our experimental results for the evaluation of the proposed method. Finally, we conclude the paper and give some directions for future research.

2. RECOMMENDER SYSTEMS

Nowadays, mass of information is increasing faster than our power of processing information. This information is generated as result of producing new books, articles, issues, and so on every year. The largest e-commerce companies offer millions of items for sale. This is a challenge for users, because it is difficult for them to select their required items among the great mass of items. As a result, there is a need for automated recommendation methods. Recommender systems have emerged for this purpose. They include methods for finding important information and knowledge from large datasets with minimal user involvement (Shaw et al., 2009; Schiaffino & Amandi, 2009; Shani et al., 2005).

Recommender systems have recently gained more attention because of their importance for e-commerce applications (Lin, 2000). They tend to understand users’ interests, using their history of buying behavior and suggest items that might interest them (Shaw et al., 2009).

There are different definitions for recommender systems. A recommender system is defined as an information system that is able to analyze past behaviors and present recommendations for current problems. In the other hand, recommender systems use methods predicting thinking of users, to recognize the most appropriate and nearest item to his/her favorite and then suggest that item to him. In fact, these systems simulate the process that we utilize in our routine life and execute it automatically. Since, in our routine life, we try to find someone nearest to our favorite and ask them about our choices. Many of e-commerce companies use this method and use such services for retaining existing customers and also finding new customers. Hitherto, very different presentation and selling services are being introduced to customers. Presentation personalization systems and item recommendation systems are examples that many e-commerce companies use in order to retain existing customers and find new ones (Akbari, 2008).

It should be mentioned that the cost of satisfying customers and prod them to buy again from the site is much lower than the cost and difficulty of finding a new customer. Moreover, satisfying each customer results in free propagation of the site and obtaining new customers. Therefore, managers beside their policies for finding new customers, have specific attention to retain their old and current customers. Therefore, Customer Relationship Management (CRM) strategy is one of the ways that managers utilize in order to present better services to customers. The core idea of CRM activities is two-fold; first, understanding what is profitable for a customer, and second, trying to retain profitable customers (Liu et al., 2009).

As we have mentioned before, recommender systems can be employed in most domains of e-commerce and can be useful in transactions for both merchants and customers (Vozalis & Margaritis, 2003). These systems increase sales of e-commerce in three ways:

Converting browsers into buyers: most of the times, users look over the site without buying any item. Because they cannot find items they need. Recommender systems help users by making them able to easily find items they wish to purchase. Suggesting appropriate and useful recommendations to users makes them buy items. As a result, the amount of sale will be increased.
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