Book Recommendation Based on Community Detection

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Abstract. In many recommendation systems, the ‘best bet’ recommendations are shown, but the predicted rating values are not. This is usually referred to as a top-N recommendation task, where the goal of the recommendation system is to find a few specific items which are supposed to be most appealing to the user. While providing academic library services, recommending books for readers is a significant work for constructing personal learning environment. As behaviors in social networks and internet tend to be in groups and the behavior trends are influenced much by the influential entities. In this paper, we firstly propose methods for detecting communities with similar interesting by selecting influential entities. And then propose the recommendation algorithms based on the community detection. At last, by implementation the methods in the real world dataset, our methods perform better than the traditional collaborative algorithms in precision and recall.

Keywords: Top-N, Community Detection, Influence, recommendation.

1 Introduction

Recommendation systems play an important role in several domains as they provide users with potential interesting recommendations with catalogs of available information, products and services. Recommendations can rely either on static information about the content of the available catalogs [1], or on a posteriori analysis of past behavior through collaborative filtering approaches (CF) [2].

Top-N recommendation is an important sub problem and researched over the years, various algorithms for top-N recommendation have been developed [3]. The conventional top-N recommendation algorithms primarily focus on utilizing user-item correlation such as purchasing, watching and borrowing to generate recommendations. Such algorithms can be categorized into two classes: CF methods [4, 5] and model-based methods [6, 7]. CF methods typically build neighborhood for each user/item by considering the similarities of the patterns among users/items, and then recommend new items from the neighborhood. Model-based methods learn to explain the user-item correlation patterns using a specific model.

Typical CF-based recommendation systems associate a user with a group of like-minded users based on their preferences over all the items, and then recommends to the user those items enjoyed by others in the group. Many clustering CF models
utilize user clusters [8], item clusters [9], or co-clusters [10] to design CF algorithms. And personal influence [11, 12] is also considered for promoting the accuracy of CF methods.

In this paper, we focus on how to recommend books for readers in academy libraries based on the borrowing records. While we are considering the patterns or motivations in students’ borrowing behaviors, we consider the influential students who have read a lot and share books actively may influence the others in when to borrow and what to borrow. Based on the above assumption, we propose our methods based on community detection and influential entities selection.

In this paper, we introduce community detection to cluster the users and select appropriate neighbors to recommend books. Our main contributions are as follows:

- We propose three community detection methods by constructing the weighted reader-reader similarity network and considering the influential nodes;
- We propose three approaches for recommending books for readers by the community detection with considering the time factor;
- We experimentally demonstrate that the accuracy of our algorithms in the real world dataset.

The rest of this paper is organized as follows. Section 2 describes the methods for detecting community by constructing the weighted reader-reader similarity network and considering the influence of the node. Section 3 presents three different approaches for recommending books with considering the time property of borrowing records. Section 4 gives out the experiment and its results. Finally, Section 5 concludes the paper and outlines future research avenues.

2 Community Detection

In this section, we first describe how to construct the reader-reader similarity network based on the borrowing records. And then propose three methods for the community detection.

2.1 Construct the Reader-Reader Similarity Network

Academy libraries are the most important education resource for students and teachers. The borrowing history records the user, the borrowed books and the borrowing time.

The similarity between user $u$ and user $v$ is computed as follows:

$$sim(u, v) = \frac{|I_u \cap I_v|}{|I_u \cup I_v|}$$  \hspace{1cm} (1)