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SAHRAOUI KHARROUBI

YOUCEF DAHMANI

OMAR NOUALI

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Improving collaborative recommendation based on item weight link prediction

Sahraoui KHARROUBI[1,*], **Youcef DAHMANI**[1], **Omar NOUALI**[2]
[1]department of Computer Science, Faculty of Mathematics and Computer Science ,
Ibn Khaldoun University, Tiaret, ALGERIA
[2]Basic Software Laboratory, C.E.R.I.S.T., Ben Aknoun, Algiers, AlGERIA,

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Abstract: There is a continuous information overload on the Web. The problem treated is how to have relevant items (documents, products, services, etc.) at time and without difficulty. Filtering system also called recommender systems are widely used to recommend items to users by similarity process such as Amazon, MovieLens, Cdnow, etc. In the literature, to predict a link in a bipartite network, most methods are based either on a binary history (like, dislike) or on the common neighbourhood of the active user. In this paper, we modelled the recommender system by a weighted bipartite network. The bipartite topology offers a bidirectional reasoning item side and user side, which preserve the information shared between the nodes. To make such a prediction, we seek to determine the shares of items shared between users. In the first step, we accumulate the shares of the users towards the items and in the second step, the shares of the items towards the users. The idea is to exploit the item-user connectivity to predict nonexistent links based on existing links. Therefore, the information is propagated linearly and without loss between nodes in the network. We focused on the item through a dual projection that combines the sharing of quotas between users and items. Empirical tests on real data sets (Amazon-Books, MovieLens 1M, Yelp2018, Yahoo! Songs) showed satisfactory results.

Key words: Information propagation, recommender systems, ranking, item-user, weighted network

1. Introduction

In a few years, 95% of purchases will be made online. Access to relevant items (documents, movies, hotels, etc.) becomes more difficult because, despite their availability, they are lost in the mass [1]. Recommendation systems have been widely used by companies to recommend relevant items to users by employing a similarity process. Large companies and websites such as Netflix, Amazon, Facebook, YouTube, Twitter, etc. integrate the techniques of recommendation in their servers. The methods of recommendation systems can be mainly classified into three approaches [2]: the content-based approach which compares the content of the user profile with the content of the item; the collaborative approach which depends on the feedback of neighbour's ratings; and the hybrid approach which aims at objectively combining the two methods. The collaborative approach is the most widely used and effective in many areas [3, 4]. However, finding the nearest neighbours is the critical phase of the collaborative approach. In addition, providing high-quality recommendations to users with a minimum of common feedback is a major challenge for recommendation systems [5, 6]. Currently, several in-depth studies are focused on modelling using bipartite networks [7, 8]. The structure of bipartite networks is perfectly adapted as a theoretical and practical model for several systems in the real world. The recommen-

*Correspondence: sahraoui.kharroubi@univ-tiaret.dz