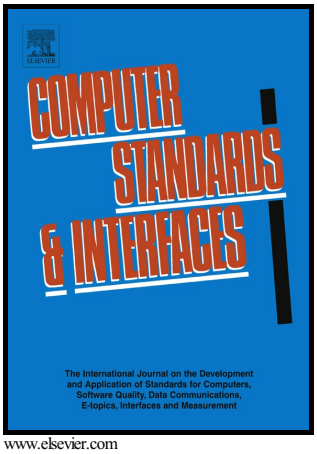
A dynamic multi-level collaborative filtering method for improved recommendations

Nikolaos Polatidis, Christos K. Georgiadis



www.elsevier.com

PII: S0920-5489(16)30144-1
DOI: http://dx.doi.org/10.1016/j.csi.2016.10.014
Reference: CSI3160

To appear in: *Computer Standards & Interfaces*

Received date: 9 August 2016
Revised date: 25 October 2016
Accepted date: 25 October 2016

Cite this article as: Nikolaos Polatidis and Christos K. Georgiadis, A dynamic multi-level collaborative filtering method for improved recommendations *Computer Standards & Interfaces,* http://dx.doi.org/10.1016/j.csi.2016.10.014

A dynamic multi-level collaborative filtering method for improved recommendations

Nikolaos Polatidis* and Christos K. Georgiadis

Department of Applied Informatics, University of Macedonia, 54006, Thessaloniki, Greece

Abstract One of the most used approaches for providing recommendations in various online environments such as e-commerce is collaborative filtering. Although, this is a simple method for recommending items or services, accuracy and quality problems still exist. Thus, we propose a dynamic multi-level collaborative filtering method that improves the quality of the recommendations. The proposed method is based on positive and negative adjustments and can be used in different domains that utilize collaborative filtering to increase the quality of the user experience. Furthermore, the effectiveness of the proposed method is shown by providing an extensive experimental evaluation based on three real datasets and by comparisons to alternative methods.

Keywords: Collaborative Filtering, Similarity, Dynamic Multi-level, Recommender Systems

* Corresponding author. Tel: +30 2310891810 Email: npolatidis@uom.edu.gr

Email Addresses (Nikolaos Polatidis: npolatidis@uom.edu.gr, Christos K. Georgiadis: geor@uom.edu.gr)

1. Introduction

Recommender systems are decision support systems found on the web in order to assist users about item or service selection, thus aiming to solve the information overload problem [1,2]. Moreover, collaborative filtering is the most widely used method for providing personalized recommendations in online environments such as e-commerce [3–7]. In collaborative filtering systems, a database of user ratings is used and the generated recommendations are based on how much a user will like an unrated item according to his previous common rating history with other users. Thus, the recommendation process is based on an assumption about previous rating agreements, assuming that this agreement will be maintained in the future. Additionally, the ratings are used to create an n *x* m matrix with user ids, item ids and ratings, with an example of such a matrix shown in table 1. This sample database has four users and four items with values from 1 to 5, while a ,-, denotes that a rating has not been submitted yet for the particular item. The matrix is used as input when one of the users is requesting a recommendation and in order for a recommendation to be generated the degree of similarity between the user who makes the request and the other users' needs to be predicted using a similarity function such as the Pearson Correlation Similarity (PCC), which is defined in Eq. 1. At the next step a user neighborhood is created and it consists of users having the highest degree of similarity with the user who made the request. Finally, a prediction is generated after computing the average values of the nearest neighborhood ratings about an item, resulting in a recommendation list of items with the highest predicted rating values [5,6,8].