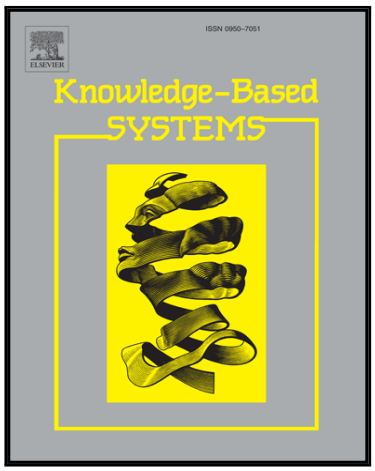

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Matrix Factorization for Recommendation with Explicit and Implicit Feedback

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Abstract

Matrix factorization (MF) methods have proven as efficient and scalable approaches for collaborative filtering problems. Numerous existing MF methods rely heavily on explicit feedback. Typically, these data types may be extremely sparse; therefore, these methods can perform poorly. In order to address these challenges, we propose a latent factor model based on probabilistic MF, by incorporating implicit feedback as complementary information. Specifically, the explicit and implicit feedback matrices are decomposed into a shared subspace simultaneously. Then, the latent factor vectors are jointly optimized using a gradient descent algorithm. The experimental results using the MovieLens datasets demonstrate that the proposed algorithm outperforms the baselines.

Keywords: collaborative filtering, probabilistic matrix factorization, matrix co-factorization, implicit feedback

1. Introduction

With the explosive growth in information, it has become increasingly difficult for users to find information of interest. Personalized recommendation is an effective tool for solving this problem. It determines user preferences by analyzing their historical behavior data, and then recommends items that may be of interest to these users. Collaborative filtering (CF) has become a popular approach for implementing a recommender system owing to its effectiveness and scalability. Two collaborative filtering approaches exist: memory-based and model-based methods. Matrix factorization (MF) is a typical model-based method that has obtained excellent results in the Netflix prize problem [1]. Despite this success, typical MF methods rely mainly on explicit feedback; that is, explicit ratings. Typically, these data types may be extremely sparse, which can result in poor recommendation performance. In order to alleviate the data scarcity and cold start problems, researchers have attempted to enhance recommender systems by incorporating different complementary information, such as implicit feedback. Compared to explicit feedback, implicit feedback, such as browsing, purchase, and click-through history, is easier to collect and

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