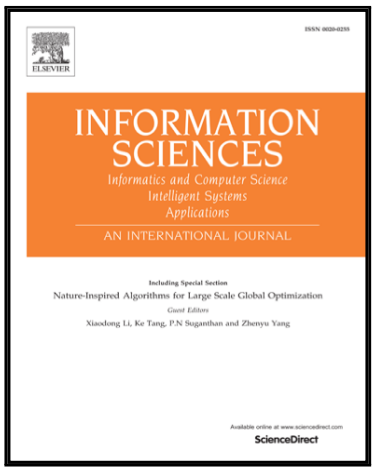

Deep Hybrid Recommender Systems via Exploiting Document Context and Statistics of Items

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Deep Hybrid Recommender Systems via Exploiting Document Context and Statistics of Items☆

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Abstract

The sparsity of user-to-item rating data is one of the major obstacles to achieving high rating prediction accuracy of model-based collaborative filtering (CF) recommender systems. To overcome the obstacle, researchers proposed hybrid methods for recommender systems that exploit auxiliary information together with rating data. In particular, document modeling-based hybrid methods were recently proposed that additionally utilize description documents of items such as reviews, abstracts, or synopses in order to improve the rating prediction accuracy. However, they still have two following limitations on further improvements: 1) They ignore *contextual information* such as word order or surrounding words of a word because their document modeling methods use bag-of-words model. 2) They do not explicitly consider *Gaussian noise* differently in modeling latent factors of items based on description documents together with ratings although Gaussian noise depend on *statistics of items*.

In this paper, we propose a robust document context-aware hybrid method, which integrates convolutional neural network (CNN) into probabilistic matrix factorization (PMF) with the statistics of items to both capture contextual in-

☆A preliminary version of the paper, "Convolutional Matrix Factorization for Document Context-Aware Recommendation", appeared in Proc. ACM RecSys 2016. However, this submission has been substantially extended from the previous paper and contains new and major-value added technical contribution and experimental contribution in comparison with the conference publication.

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