

# CORRELATED MATRIX FACTORIZATION FOR RECOMMENDATION WITH IMPLICIT FEEDBACK

## Abstract:

As a typical latent factor model, Matrix Factorization (MF) has demonstrated its great effectiveness in recommender systems. Users and items are represented in a shared low-dimensional space so that the user preference can be modeled by linearly combining the item factor vector  $V$  using the user-specific coefficients  $U$ . From a generative model perspective,  $U$  and  $V$  are drawn from two independent Gaussian distributions, which is not so faithful to the reality. Items are produced to maximally meet users' requirements, which makes  $U$  and  $V$  strongly correlated. Meanwhile, the linear combination between  $U$  and  $V$  forces a bisection (one-to-one mapping), which thereby neglects the mutual correlation between the latent factors. In this paper, we address the upper drawbacks, and propose a new model, named Correlated Matrix Factorization (CMF). Technically, we apply Canonical Correlation Analysis (CCA) to map  $U$  and  $V$  into a new semantic space. Besides achieving the optimal fitting on the rating matrix, one component in each vector ( $U$  or  $V$ ) is also tightly correlated with every single component in the other. We derive efficient inference and learning algorithms based on variational EM methods. The effectiveness of our proposed model is comprehensively verified on four public data sets. Experimental results show that our approach achieves competitive performance on both prediction accuracy and efficiency compared with the current state of the art.

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