LRMF (ALS) EXPLAINED - ADVANCED 2

Goal

Find a vector $x_u \in \mathbb{R}^f$ for each user u, and a vector $y_i \in \mathbb{R}^f$ for each item i, thus $p_{ui} = x_u^T y_i$

Plain Text

The vectors strive to map users and items into a common latent factor space where they can be directly compared.

Cost Function

$$\min_{x_*, y_*} \sum_{u,i} c_{ui}(p_{ui} - x_u^T y_i)^2 + \lambda(\sum_u |x_u|^2 + \sum_i |y_i|^2)$$

Research Paper: Y. Hu, Y.Koren, and C.Volinsky. Collaborative Filtering for Implicit Feedback Datasets in IEEE International Conference on Data Mining (ICDM 2008), pages 263-272, 2008

LRMF (ALS) EXPLAINED - ADVANCED 3

Algorithm: alternating-least-squares (als)

alternate between recomputing user-factors and item-factors.

Step 1. recomputing all user factors X

$$x_u = (Y^T C^u Y + \lambda I)^{-1} Y^T C^u p(u)$$
$$where\ Y^T C^u Y = Y^T Y + Y^T (C^u - I) Y$$

Step 2. recomputing all item factors Y

$$y_i = (X^T C^i X + \lambda I)^{-1} X^T C^i p(i)$$

Step 3. Iterate over `step 1` and `step 2`, till stablize

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