

# Collaborative Metric Learning (CML) (3/3)

## Prediction

$$\hat{x}_{ui} = -d(\mathbf{x}_u, \mathbf{x}_i)$$

## Training Objective

WARP Loss with Cov. Reg.

$$\mathcal{L}(\boldsymbol{\theta}) = \mathcal{L}_m(\boldsymbol{\theta}) + \lambda\Omega(\boldsymbol{\theta}) \quad \text{s.t.} \quad \|\mathbf{x}_*\| \leq 1.$$

$$\mathcal{L}_m(\boldsymbol{\theta}) = \sum_{(i,j) \in \mathcal{S}} \sum_{(u,k) \notin \mathcal{S}} w_{ij} [m + d(\mathbf{x}_u, \mathbf{x}_i)^2 - d(\mathbf{x}_u, \mathbf{x}_j)^2]_+,$$

## Pros & Cons

- + Benefits from *similarity propagation*  $\rightarrow$  user-user & item-item similarities automatically learned
- + Interpretability
- + LSH possible
- Metric space geometry must suit the latent geometry