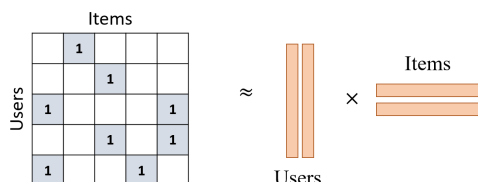
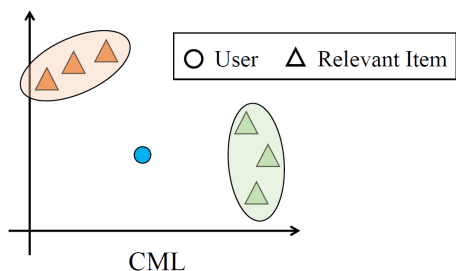


Background

Matrix Factorization (MF)



- MF is based on inner product operation, which **violates triangle inequality**
- Previous work:** Metric learning-based method [WWW17]
 - Project users and items into a low-dimensional metric space



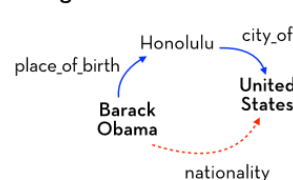
Limitation?

- User is projected to a single point
- Not easy to modeling **intensity** and **heterogeneity** of user-item relationship

Approach

- Adopt **"Translation mechanism"**

Knowledge Base

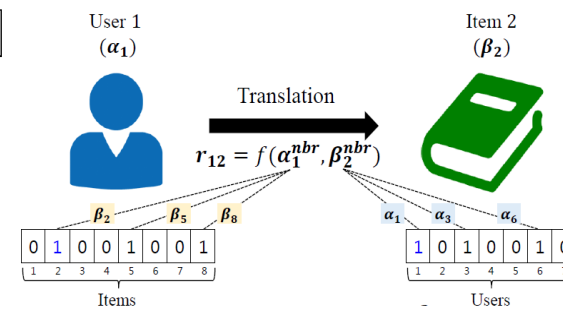
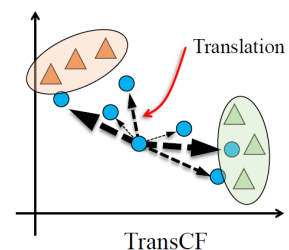


Example

- (Barack_Obama, place_of_birth, Honolulu)

$$\text{Barack_Obama} + \text{place_of_birth} \approx \text{Honolulu}$$

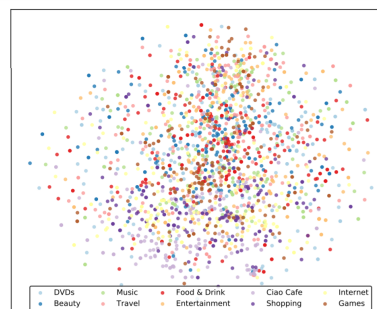
Translation vector



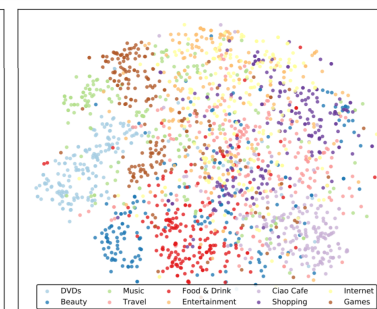
Evaluation

$$\|\alpha_u - \beta_i\|_2^2 > \|\alpha_u + r_{ui} - \beta_i\|_2^2$$

	Rating						
	1-4	5	6	7	8	9	10
BookCr.	55.3%	52.7%	55.2%	56.1%	57.2%	58.4%	58.8%
Acc.	3.8%	10.3%	7.9%	17.0%	24.5%	17.3%	19.2%
Portion							
Flixster	0.5-2.5	3.0	3.5	4.0	4.5	5.0	
Acc.	19.6%	19.9%	19.9%	22.2%	25.7%	27.2%	
Portion	17.3%	17.0%	16.8%	19.6%	10.1%	19.2%	



(a) Visualization of r_{ui}^{CML}



(b) Visualization of $r_{ui}^{TransCF}$