Exploiting Homophily Effect for Trust Prediction

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Motivations
The available explicit trust relations are extremely sparse.

Existing Trust Predictors include supervised methods and unsupervised methods.

Homophily is one of the important theories that explain why trust relations are established.

Existence of Homophily
Two product review data sets: Epinions and Ciao

Are users with trust relations more similar in terms of their ratings than those without?
- The answer is affirmative via hypothesis testing

Are users with higher similarity more likely to establish trust relations than those with lower similarity?
- The answer is affirmative via hypothesis testing

Modeling Trust
Properties of trust include
- Correlation with user preference
- Transitivity, composability and asymmetry
- Multi-perspectives (mTrust) and evolution (eTrust)

Assume that $u_i$ is a $k$-dimensional vector representing the preference of $u_i$, the trust relation from $u_i$ to $u_j$ is modeled as,

$$G_j \approx u_i^T H u_j$$

The proposed model can capture the above properties of trust and can be naturally formulated as the following low-rank matrix factorization problem,

$$\min_{U,V} \| G - U^T H U \|_F^2 + \alpha \| U \|_F^2 + \beta \| V \|_F^2$$

s.t. $U \geq 0, V \geq 0$

Our Framework - hTrust
We define $\zeta(i,j)$ as the homophily coefficient between $u_i$ and $u_j$.
- $\zeta(i,j) \in [0,1]$, $\zeta(i,j) = \zeta(j,i)$
- The larger $\zeta(i,j)$ is, the more a likely trust relation is established between $u_i$ and $u_j$.

Homophily regularization is thus defined as,

$$\min \sum_{i,j} \sum_{i,j} \zeta(i,j) \| u_i - u_j \|_2^2$$

hTrust is to solve the following problem,

$$\min_{U,V} \| G - U^T H U \|_F^2 + \alpha \| U \|_F^2 + \beta \| V \|_F^2 + \frac{1}{2} \sum_{i,j} \zeta(i,j) \| u_i - u_j \|_2^2$$

s.t. $U \geq 0, V \geq 0$

Experiments
Experimental Settings

Comparison of Different Trust Predictors

Impact of Homophily Regularization

Impact of Homophily Coefficient

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