

Matrix optimizations:-

$$\textcircled{1} \quad |c| = (G_m - UVU^T)^2$$

where  $G_m = \sum_{i=1}^m g_i$

and  $g_i$  is the social trust matrix at time  $i$ .

$U, V$  are variable matrices defined later.

$$\textcircled{2} \quad b_{ij} = e^{-\eta_i [m - g_{ij}^t]}$$

where  $\eta_i$  = decay rate of  $i^{th}$  user.

$g_{ij}^t$  = first time instance

when user  $i$  trusts user  $j$ .

$$\textcircled{3} \quad a = \left[ (b \cdot G_m) \times (V \times U^T)^T + (b \cdot G_m)^T \times (V^T \times U^T)^T \right]$$

social trust matrix  
at time  $i$ .

$U, V$  are variable matrices defined  
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when user  $i$  trusts  
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$$a = \left[ (b \cdot G_m) \times (V \times U^T)^T + (b \cdot G_m)^T \times (V^T \times U^T)^T \right]$$

$[.]$  = dot product of matrices  
 $[X]$  = Matrix multiplication

$$B = U^T \times (b \cdot G_m) \times U$$

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②

⑥

$$A = B I$$

$$tmp1[i] = U[i]^T \times U[i]$$

$$tmp2 = reshaped tmp1 [ (n) \times (d) \times (d) ] \rightarrow (n) \times (d \times d)$$

$$tmp3 = (b \times tmp2) \cdot reshaped ([d, d])$$

$$tmp4 = (b^T \times tmp2) \cdot reshaped ([d, d])$$

$$A[i] + = V \times tmp3[i] \times V^T + V^T \times tmp4[i] \times V$$

varied in our model

$\Rightarrow$  a variable that is

$$C + = V$$

$$C + = (V^T U[i]^T \times U[i]) \times tmp3[i]$$

where  $d = \overline{m}$  of facets  
features

$$tmp3[i] = [ (b[i]) \times tmp2 ] \cdot reshaped ([d, d])$$

$$tmp2 = reshaped tmp1 [ (n) \times (d) \times (d) ] \rightarrow (n) \times (d \times d)$$

$$tmp1[i] = U[i]^T \times U[i]$$

⑤

$$C + = \gamma V$$

$\gamma \Rightarrow$  a variable that is varied in our model

$$A = \beta I$$

$\beta \Rightarrow$  fixed variable

$$tmp1[i] = U[i]^T \times U[i]$$

$$tmp2 = \text{reshaped } tmp1 \text{ } [ (n) \times (d) \times (d) \rightarrow (n) \times (d \times d) ]$$

$$tmp3 = (b \times tmp2) \text{ reshaped } [ d, d ]$$

$$tmp4 = (b^T \times tmp2) \text{ reshaped } [ d, d ]$$

$$A[i] + = V \times tmp3[i] \times V^T + V^T \times tmp4[i] \times V$$

Dimensions of matrices :-

$$C \Rightarrow n \times n$$

$$b \Rightarrow n \times n$$

$$a(i) \Rightarrow d \times 1$$

$$A(i) \Rightarrow d \times d$$

$$B \Rightarrow d \times d$$

$$C \Rightarrow d \times d$$

$$g \Rightarrow n \times n$$

$$g \Rightarrow n \times n$$

$$n \Rightarrow n \times n$$

$$i = [1, n]$$

$$j = [1, n]$$

$$U \Rightarrow n \times d$$

$$V \Rightarrow d \times d$$

Predicted trust matrix :-

$$G' = U V U^T$$

$n = \#$  of users.  
 $m =$  time till which trust matrices are known.  
 $d = \#$  of facet features