Trust Aware Recommendation Systems

Stages

- Why trust aware recommendation systems?
  - Cold Start.
  - Attacks.
- Next?
  - Identify Core Ideas/Papers
  - Understanding Ideas
  - Which is better?

Identifying Core Ideas

- Referenced in text books on trust aware recommendations.
- Citations.

Understanding Ideas

Co-factorization Methods:
SoRec

$$\min \sum_{i=1}^{n} \sum_{u_k \in \mathcal{F}_i} (\mathbf{S}_{ik} - \mathbf{U}_i^\top \mathbf{Z}_k)^2,$$

$$\min_{\mathbf{U},\mathbf{V},\mathbf{Z}} \|\mathbf{W} \odot (\mathbf{R} - \mathbf{U}^\top \mathbf{V})\|_F^2 + \alpha \sum_{i=1}^{n} \sum_{u_k \in \mathcal{F}_i} (\mathbf{S}_{ik} - \mathbf{U}_i^\top \mathbf{Z}_k)^2 + \lambda(\|\mathbf{U}\|_F^2 + \|\mathbf{V}\|_F^2 + \|\mathbf{Z}\|_F^2),$$

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$$\min \sum_{i=1}^{n} \sum_{u_k \in \mathcal{F}_i} (\mathbf{S}_{ik} - \mathbf{U}_i^\top \mathbf{H} \mathbf{U}_k)^2.$$

$$\min_{\mathbf{U},\mathbf{V},\mathbf{Z}} \|\mathbf{W} \odot (\mathbf{R} - \mathbf{U}^\top \mathbf{V})\|_F^2 + \alpha \sum_{i=1}^{n} \sum_{u_k \in \mathcal{F}_i} (\mathbf{S}_{ik} - \mathbf{U}_i^\top \mathbf{H} \mathbf{U}_k)^2 + \lambda(\|\mathbf{U}\|_F^2 + \|\mathbf{V}\|_F^2 + \|\mathbf{H}\|_F^2).$$

Understanding Ideas

Ensemble Methods:
STE

$$\hat{\mathbf{R}}_{ij} = \mathbf{u}_i^\top \mathbf{v}_j + \beta \sum_{u_k \in \mathcal{F}_i} \mathbf{S}_{ik} \mathbf{U}_k^\top \mathbf{V}_j,$$

$$\min_{\mathbf{U},\mathbf{V}} \|\mathbf{W} \odot ((\mathbf{R} - \mathbf{U}^\top \mathbf{V}) - \beta \mathbf{S}\mathbf{U}^\top \mathbf{V}))\|_F^2 + \lambda(\|\mathbf{U}\|_F^2 + \|\mathbf{V}\|_F^2).$$

Regularization Methods:
SocialMF

$$\min \sum_{i=1}^{n} (\mathbf{U}_i - \sum_{u_k \in \mathcal{F}_i} \mathbf{S}_{ik} \mathbf{U}_k)^2,$$

$$\min_{\mathbf{U},\mathbf{V}} \|\mathbf{W} \odot (\mathbf{R} - \mathbf{U}^\top \mathbf{V})\|_F^2 + \alpha \sum_{i=1}^{n} (\mathbf{U}_i - \sum_{u_k \in \mathcal{F}_i} \mathbf{S}_{ik} \mathbf{U}_k)^2 + \lambda(\|\mathbf{U}\|_F^2 + \|\mathbf{V}\|_F^2).$$

Problems Faced

Implementation

SoRec

$$\min \sum_{i=1}^{n} \sum_{u_k \in \mathcal{F}_i} (\mathbf{S}_{ik} - \mathbf{U}_i^{\top} \mathbf{Z}_k)^2,$$

$$\min_{\mathbf{U},\mathbf{V},\mathbf{Z}} \|\mathbf{W} \odot (\mathbf{R} - \mathbf{U}^{\top}\mathbf{V})\|_F^2 + \alpha \sum_{i=1}^{n} \sum_{u_k \in \mathcal{F}_i} (\mathbf{S}_{ik} - \mathbf{U}_i^{\top} \mathbf{Z}_k)^2 + \lambda(\|\mathbf{U}\|_F^2 + \|\mathbf{V}\|_F^2 + \|\mathbf{Z}\|_F^2),$$

Problems Faced

Implementation

SoRec

$$\mathcal{L}(R, C, U, V, Z) =$$
$$\frac{1}{2}\sum_{i=1}^{m}\sum_{j=1}^{n} I_{ij}^{R}(r_{ij}-g(U_i^T V_j))^2+\frac{\lambda_C}{2}\sum_{i=1}^{m}\sum_{k=1}^{m} I_{ik}^{C}(c_{ik}^{*}-g(U_i^T Z_k))^2$$
$$+\frac{\lambda_U}{2}\|U\|_F^2+\frac{\lambda_V}{2}\|V\|_F^2+\frac{\lambda_Z}{2}\|Z\|_F^2, \qquad (9)$$

logistic function $g(x) = 1/(1+\exp(-x))$,

$f(x) = (x-1)/(R_{max}-1)$.

Going Forward

Thanks!

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