LibMF (Matrix Factorization)

- Website
  - https://www.csie.ntu.edu.tw/~cjlin/libmf/
- No bias term in LibMF
  - Let user i give rating R_{ij} to item j
  - $\min_{U,V} \sum_{(i,j)} \delta_{ij} \left(U_i^\top V_j - R_{ij} \right)^2 + \Theta(U, V)$
    - $\delta_{ij} \in \{0,1\}$: indicating R_{ij} is observed in training data
    - $\Theta(\cdot)$: regularization function

LibFM (Factorization Machines)

- Website
  - http://www.libfm.org/
- LibMF: regression model
  - $\min_{w,h} \sum_{(x,y)} (w_0 + \sum_{a=1}^{n} w_a x_a + \sum_{a=1}^{n} \sum_{b=a+1}^{n} h_a^\top h_b x_a x_b - y)^2$
- Learning biased MF
  - $n =$ (number of users) + (number of items)
  - Let user i give rating R_{ij} to item j
  - One-hot encoding for all users and items
    - $x_i = x_j = 1$
    - 0 for other elements in vector $x \in \mathbb{R}^n$
  - $\min_{w,h} \sum_{(i,j)} \underbrace{(w_0 + w_i + w_j}_{\text{Bias terms}} + h_i^\top h_j - R_{ij})^2$

Homework 3 Baseline Performance

- LibMF 2.01: default parameter values
- Evaluation metric: RMSE

Task	5-fold cross validation for train.txt	test.txt
3.1	0.2115	0.2048
3.2	0.2128	0.2060
3.3	1.4416	1.3464

Homework 3 Baseline Performance

- LibFM 1.42: default parameter values
- Evaluation metric: RMSE

Task	5-fold cross validation for train.txt	test.txt
3.1	0.1740	0.1721
3.2	0.1738	0.1730
3.3	1.2644	1.3166