Agenda

- Recsys data prep for Content-based
- Regression using Content Based Data
- Collaborative Filtering
  - MF from Scratch
  - Using library
- Metric for Evaluating Recommendations

mid	Animation	Fantasy	Comedy	...
1	1	1	0	
2	0	1	1	
:				
1000				

optimization equation

Loss =

Optimize $\min_{U_i, I_j} \sum_{i,j} \left(A_{ij} - U_i I_j \right)^2$

S.t. $A_{ij} \neq Null$

SGD to find value of U_i and I_j

Step1: Initialize matrix U and Matrix I randomly Dim = K

Step2: Take derivative of loop and update U and I

$$L = \left(A_{ij} - U_i I_j \right)^2$$

$$\frac{\partial L}{\partial y} = (A_{ij} - U_i I_j)^2$$

$$\frac{\partial L}{\partial U_i} = 2(A_{ij} - U_i I_j) \times \left(\frac{\partial A_{ij}}{\partial U_i} - \frac{\partial (U_i I_j)}{\partial U_i}\right)$$

$$= 2(\gamma) \times (0 - 1 \times I_j)$$

$$\frac{\partial L}{\partial U_i} = -2(\gamma) I_j$$

$$\frac{\partial L}{\partial I_j} = -2(\gamma) U_i$$

Learning rate $= \alpha$

$$\theta = \theta - \alpha \frac{\partial L}{\partial \theta}$$

$$U_i = U_i - \alpha 2(\gamma) I_j$$

$$= U_i - \alpha(\gamma) I_j$$

Metric for Evaluating Recommendations

User : Nina

Overlap = intersection (recsys, positive) / Total +ve interaction

= 3/4 = 75%

Precision @ K

What is K-precision?

- K-Precision is a metric used to evaluate the quality of recommendations provided by recommendation systems.
- It assesses how many of the top-K recommended items are relevant to the user's preferences.
- A higher K-Precision value indicates better recommendation quality.

$$\text{P@K} = \frac{\sum \text{Relevant items in top K recommendations}}{\sum \text{Items in top K recommendations}}$$

$k = 10$

$$\frac{\text{relevant items in 10 rec}}{\text{total item in } K}$$