

Collaborative Filtering

based on user similarity

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Task

Several users already rated an item

One user haven't rated it yet

→ Will he like it ?

Task

Several users already rated an item

One user haven't rated it yet

→ Will he like it ?

Goal : Predict his rating for this item

How : Similarity between users

Main issue

How to measure the similarity?

Efficiency of the algorithm ?


Algorithm

message #	Ken	Lee	Meg	Nan
1	1	4	2	2
2	5	2	4	4
3			3	
4	2	5		5
5	4	1		1
6	?	2	5	?

Figure 5: a sample matrix of ratings.

Step 1: Sample matrix

Algorithm



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3			3	
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5	4	1		1
6	?	2	5	?

Figure 5: a sample matrix of ratings.

Step 1: Sample matrix

$$\begin{aligned}
 r_{KL} &= \frac{\text{Cov}(K, L)}{\sigma_K \sigma_L} \\
 &= \frac{\sum_i (K_i - \bar{K})(L_i - \bar{L})}{\sqrt{\sum_i (K_i - \bar{K})^2} \sqrt{\sum_i (L_i - \bar{L})^2}} \\
 &= \frac{-2 - 2 - 2 - 2}{\sqrt{10} \sqrt{10}} = -0.8
 \end{aligned}$$

Step 2: Define the covariance matrix

Algorithm

↓

message #	Ken	Lee	Meg	Nan
1	1	4	2	2
2	5	2	4	4
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5	4	1		1
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↑ ↑

Figure 5: a sample matrix of ratings.

Step 1: Sample matrix

1	-0.8	0.6	0
-0.8	1	-0.5	0.6
0.6	-0.5	1	0.3
0	0.6	0.3	1

$$\begin{aligned}
 r_{KL} &= \frac{\text{Cov}(K, L)}{\sigma_K \sigma_L} \\
 &= \frac{\sum_i (K_i - \bar{K})(L_i - \bar{L})}{\sqrt{\sum_i (K_i - \bar{K})^2} \sqrt{\sum_i (L_i - \bar{L})^2}} \\
 &= \frac{-2 - 2 - 2 - 2}{\sqrt{10} \sqrt{10}} = -0.8
 \end{aligned}$$

Step 2: Define the covariance matrix

$$\begin{aligned}
 K_{6\text{pred}} &= \bar{K} + \frac{\sum_J (J_6 - \bar{J}) r_{KJ}}{\sum_J |r_{KJ}|} = \\
 &= 3 + \frac{2r_{KM} - r_{KL}}{|r_{KM}| + |r_{KL}|} = 3 + \frac{2 - (-.8)}{|1| + |-.8|} = 4.56
 \end{aligned}$$

Step 3: Define the rating based on the others users weighted rating

Introduction to the dataset

Dataset: MovieLens data set

collected by the GroupLens Research Project at the University of Minnesota

<http://grouplens.org/node/73>

User	Movie	Grade
1	1	4
2	1	1
3	2	5

Extraction from the dataset

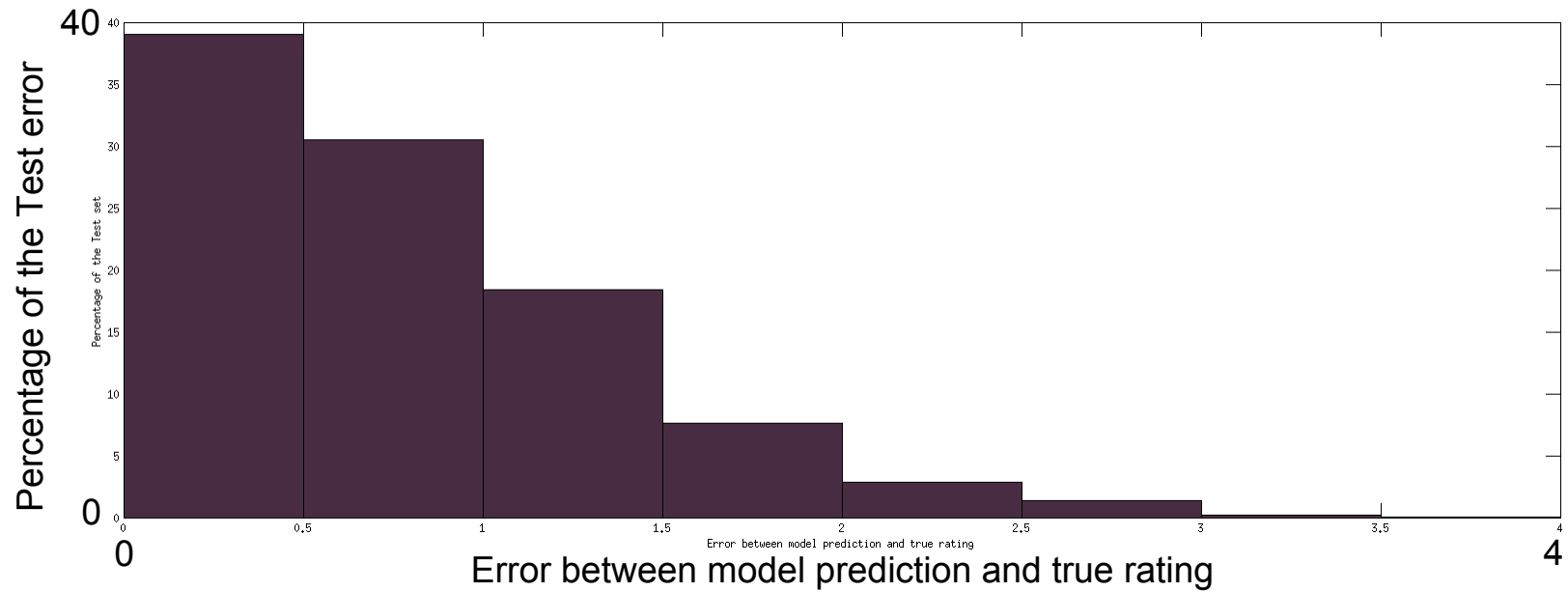
943 users

1682 movies

Grades from 1 to 5

100 000 ratings

Histogram



Questions