ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

REPORT

CS-449 MILESTONE 1

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Q3.1.1

1 QUESTION

on average, coincide with the middle of the rating scale (3 from the scale 1; 2; 3; 4; 5? If not, are they higher or lower on average? By how much?

2 ANSWER

The global average rating we obtains is 3.53. Therefore, it does not coincide exactly with the middle of the rating scale and exceeds it by 0.53

Q3.1.2

1 QUESTION

Do all users rate, on average, close to the global average? Do most users rate, on average, close to the global average?

2 ANSWER

First, we note that the average rating per user is equal to 3.58 which is slightly higher than the global average. This might suggest that users that have fewer rating counts tend to overrate movies. We can also notice that not all the users average ratings are close to the global average rating but only 74.65% of them do.

Q3.1.3

1 QUESTION

Are all items rated, on average, close to the global average? Are most items rated, on average, close to the global average?

2 ANSWER

Unlike the previous question, we notice that the average rating per movie is smaller than the global average rating (3.07). This can be explained by the fact that unpopular movies are not very well rated. Moreover, we can see that most movie are not close to the global average rating but only 48.99% of them are.

Q3.1.4

1 QUESTION

Report the results you obtained in a table. Discuss the difference(s) you observed and why you think they occur.

2 ANSWER

Method	MAE	Δt Min (μs)	Δt Max (μs)	Δt Mean (μs)	Δt Std (μs)
Global	0.968	73779.417	148699.880	100457.575	26378.288
User	0.850	68606.008	177510.275	95600.440	31578.297
Item	0.827	68702.923	130592.971	89072.471	19215.468
Baseline	0.767	100058.790	170257.736	125330.738	24108.654

TABLE 1
Results' summary for Q3.1.4

As we can see in Table 1, the worst Mean Absolute Error (MAE) result is obtained with the global method which assign the global average rating for each unseen movie. The User based methods perform better because it averages the ratings of each user but still doesn't take into account the average rating of unseen movies. The Item based method averages the rating of each movie. It's expected that this method performs better than the previous ones because it's the only one (so far) taking really the ratings of the movies into account. However, we obtain the best result with the baseline which takes into account both the average rating per user and the average rating per Item.

Q3.1.5

1 QUESTION

For all four methods, perform ten measurements and report in a table the min, max, average, and standard-deviation. Report also the technical specifications (model, CPU speed, RAM, OS, language version) of the machine on which you ran the tests. Which of the four prediction methods is the most expensive to compute? How much more compared to using the global average rating? Calculate and report the ratio between the average time for computing the baseline (Eq. 5) and the average time for computing the global average.

2 ANSWER

CPU	RAM	OS	Language Version
2.7GHz Quad-Core i7	16GB	macOS Big Sur	Scala 2.12.13

TABLE 2
Technical specifications

The execution time is reported in Table1 and the machine's technical specifications are reported in Table2. As expected, the baseline method is the most expensive one to compute since it requires more calculations. To compare different methods fairly, we didn't use global variables. Instead, all required

calculations/variables are included/computed in the method itself. The ratio between the baseline method and the global method is 1.247, which means that the baseline method is a bit slower.

Note: The results of execution time in Table1 might change slightly by running the code again.

Q4.1.1

1 QUESTION

Report your personal top 5 recommendations using the baseline predictor (Eq. 5), including the movie identifier, the movie title, and the prediction score.

2 ANSWER

The personal top 5 recommendations are:

1. 814, "Great Day in Harlem", 5.0
2. 1122, "They Made Me a Criminal (1939)", 5.0
3. 1189, "Prefontaine (1997)", 5.0
4. 1201, "Marlene Dietrich: Shadow and Light (1996)", 5.0
5. 1293, "Star Kid (1997)", 5.0

The top 5 recommended movies are not relevant because they are rated only few times (most of them are rated only once with 5 each time). Therefore, they are not good recommendations.

Q4.1.2

1 QUESTION

How could you modify the predictions to favour more popular movies, e.g. by smoothly decreasing the prediction score of movies with few ratings while keeping the prediction score of those with many ratings almost identical? Provide the equation(s) of your modifications, which equations of this document they are intended to replace, and the new top5 recommendations you obtain for yourself (movie identifier, movie title, prediction score).

2 ANSWER

In order to favor popular movies, we created a new scaling function ranging from 0 to 1. This function should assign 0 for unpopular movies and 1 (or almost 1) to popular movies. We then multiply our prediction $(p_{u,i} - 1)$ by this function then add 1 to obtain our final prediction $p^*_{u,i}$. Adding and subtracting 1 guarantees that $p^*_{u,i}$ remain between 1 and 5. (See equations below)

$$scaledSigmoid(x) = \frac{1}{1 + e^{-0.5*x}}$$

$$p^*_{u,i} = (p_{u,i} - 1) * scaledSigmoid(i_{count} - avg^{top100}_{count}) + 1$$

Where avg^{top100}_{count} stands for the average count of top 100 popular movies.

The personal new top 5 recommendations are:

1. 50, "Star Wars (1977)", 4.340
2. 127, "Godfather", 4.276
3. 98, "Silence of the Lambs", 4.266
4. 313, "Titanic (1997)", 4.262
5. 174, "Raiders of the Lost Ark (1981)", 4.234

The new recommendations are much better than the previous ones (despite having lower avrage ratings)