

# Week 11 - Lab Session Results

March 11, 2025

## Hybrid Recommender System

### Exercise 1

In this exercise, we are going to try out different methods, that can be used to combine rankings from multiple models.

Below you can see a toy dataframe with the scores of how likely a user will like 5 different items estimated with 2 different models:

- Model 1: rating predictions from a collaborative filtering model
- Model 2: cosine similarities from a content-based model

#### 1.1

Rank the 5 items according to the scores from model 1 and 2 respectively (higher score is better in both models).

```
model1_rank item_id
1          I5
2          I4
3          I3
4          I2
5          I1
model2_rank item_id
1          I4
2          I1
3          I2
4          I5
5          I3
```

#### 1.2

Normalize the scores from the 2 models (by subtracting the mean and dividing with the standard deviation) and compute a combined rank using the **Weighted Sum** method with  $\alpha = \beta = 1$ . Round the results to 3 decimal points.

```
weighted_sum rank item_id
1.977        1      I4
0.573        2      I5
-0.540       3      I2
```

-0.561	4	I1
-1.449	5	I3

### 1.3

Merge the ranking from the 2 models using the **Borda Fuse** method.

bordafuse_rank	item_id
1	I4
2	I5
3	I1
3	I2
5	I3

### 1.4

Merge the ranking from the 2 models using the **Reciprocal Rank Fusion** method with  $k = 0$ .

RRF_rank	item_id
1	I4
2	I5
3	I1
4	I2
5	I3

## Exercise 2

In this exercise, we are going to predict the rating of a single user-item pair using a hybrid method, where we use the user profiles from a content-based method as input to a collaborative filtering (neighborhood-based) method.

Download and load the provided dataframe containing content-based user profiles of the user with reviewerID A25C2M3QF9G70Q and all users that have rated the item with asin B00EYZY6LQ.

### 2.1

Compute the cosine similarities between user A25C2M3QF9G70Q and the other users based on their user profiles. What are the similarities and what are the ratings given by these users on item B00EYZY6LQ?

	similarity	rating
A1F7YU605RU432	0.085	5.0
A1R1BFJCMWX0Y3	0.187	3.0
A1UQBFCERIP7VJ	0.098	5.0
A22CW0ZHY3NJH8	0.263	3.0
A2LW5ALOKQ9P1M	0.225	4.0
A2PD27UKAD3Q00	0.076	5.0
A2WW57XX2UVLM6	0.058	4.0
A2ZY49IDE6TY5I	0.805	4.0
A39WWMBA0299ZF	0.081	5.0

A3M6TSEV71537G	0.028	5.0
A3S3R88HA0HZG3	0.041	4.0
A914TQVHI872U	0.202	5.0
AOEUN9718KVRD	0.164	3.0

## 2.2

Predict the rating for user A25C2M3QF9G70Q on item B00EYZY6LQ based on the ratings from the 3 most similar users, using a weighted (by similarity) average. What is the prediction (round it to 2 decimal points)?

Predicted rating: 3.8