**Execise1:**

We have

R = and

=

Entries (diagonal) represents the number of items that user *i* has liked.

Entries () represents the common item that are liked by both user I and J. And also we can see the T matrix is symmetric that indicates the common items between two users i and j or j and i.

**Exercise2:**

We can obtain the similarity of two vectors as cosine similarity.

Item similarity:

. ( Item cosine similarity matrix. Please find Proof below)

Element i , j of cosine similarity matrix represents the similarity between the item i and j. The column vector i and j represents item in R and the similarity matrix gives the similarity of item i and item j.

User similarity:

. ( User cosine similarity matrix. Please find Proof below)

Element i , j of cosine similarity matrix represents the similarity between the item i and j. The column vector i and j represents item in R and the similarity matrix gives the similarity of user i and user j.

Would the same expression hold true if we had user ratings in the scale 1-5 instead of binary 0-1 rating- **The answer is no**

If the ratings are not binary than . And . Will not be obtained. Please find proof below:

**Proof:-**

R =

R =

=

= \*

=

P =

P= (Since for j = 1 to 3 and i = 1 to 4)

=

=

= \*

* =

\*



Similarly

**No** the expression does not hold true if we had user ratings in the scale 1-5 instead of binary 0-1 rating. This is because the square of the rating term between 1 - 5 will not be same as the number and we cannot reach to the above form.

**Exercise 3:**

For user – user filtering

R =

=

For item – item filtering

Let each row of the matrix be represented by the vector

Hence we can rewrite the matrix R as

=

= \*

* =

**Exercise 4**

Top 5 shows having the highest similarity score (User- User Filtering)

FOX 28 News at 10pm Similarity score: 666.482823518

Family Guy Similarity score: 664.956977312

10TV News HD at 11pm Similarity score: 633.120836547

Seinfeld Similarity score: 620.605144256

2009 NCAA Basketball Tournament Similarity score: 588.914140028

Top 5 shows having the highest similarity score (Item - Item Filtering)

Dora, the Explorer Similarity score: 16.2961716029

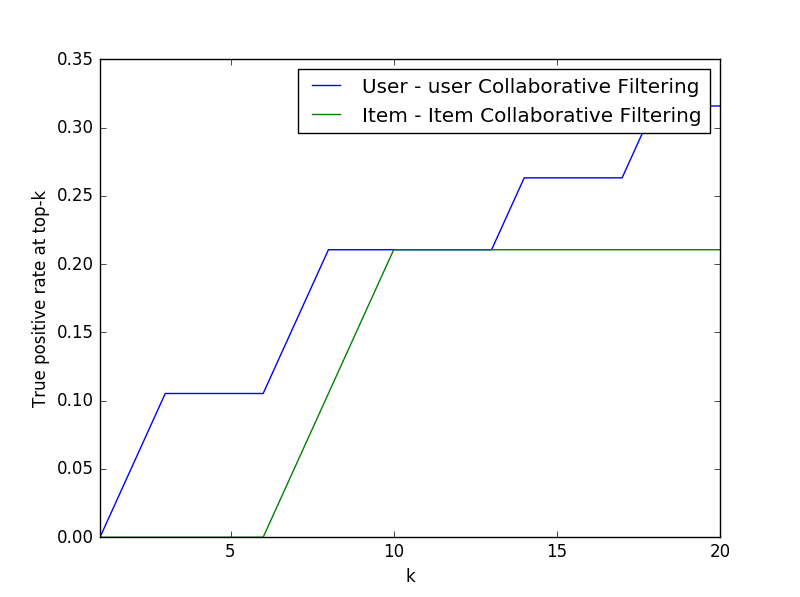
Ni Hao, Kai-Lan Similarity score: 15.7997091805

The Backyardigans Similarity score: 15.6045662247

Wonder Pets! Similarity score: 15.5643700183

Go, Diego, Go! Similarity score: 15.4964616153

True positive rate at top-k (defined above) as a function of k, for k € [1,19], with predictions obtained by the user-user collaborative filtering and item –item collaborative filtering.



Please find **Exercise4.py** for the implementation. Please keep user-shows.txt and shows.txt in working directory.

**Exercise 5**

Please find **Exercise5.py** for the implementation. Please keep user-shows.txt and shows.txt in working directory.

Top-10 recommended TV shows using ItemKNN.

***item\_recommendation.exe --training-file=trng.txt --test-file=u1.test --test-users=u2.test --recommender=ItemKNN --predict-items-number=10 --prediction-file=res.txt***

Top-10 recommended TV shows using WRMF.

***item\_recommendation.exe --training-file=trng.txt --test-file=u1.test --test-users=u2.test --recommender=WRMF --predict-items-number=10 --prediction-file=res.txt***

|  |  |  |  |
| --- | --- | --- | --- |
| **Item-Item** | **User-user** | **ItemKNN** | **WRMF** |
| 145 | 97 | 235 | 49 |
| 97 | 75 | 49 | 78 |
| 36 | 141 | 38 | 193 |
| 75 | 46 | 544 | 209 |
| 156 | 61 | 491 | 281 |
| 174 | 157 | 478 | 196 |
| 206 | 69 | 281 | 208 |
| 64 | 36 | 554 | 223 |
| 141 | 138 | 490 | 220 |
| 146 | 327 | 223 | 490 |

|  |  |
| --- | --- |
| **ShowID** | **ShowName** |
| 36 | SpongeBob SquarePants |
| 38 | Curious George |
| 46 | 2009 NCAA Basketball Tournament |
| 49 | Max and Ruby |
| 61 | NBC 4 at Eleven |
| 64 | Wow Wow Wubbzy |
| 69 | Today |
| 75 | Family Guy |
| 78 | Disney's Mickey Mouse Clubhouse |
| 97 | FOX 28 News at 10pm |
| 138 | 10TV Eyewitness News at 5:00 |
| 141 | 10TV News HD at 11pm |
| 145 | Dora, the Explorer |
| 146 | Go, Diego, Go! |
| 156 | Ni Hao, Kai-Lan |
| 157 | Seinfeld |
| 174 | Wonder Pets! |
| 193 | Handy Manny |
| 196 | Imagination Movers |
| 206 | The Backyardigans |
| 208 | Happy Monster Band |
| 209 | Tasty Time with ZeFronk |
| 220 | My Friends Tigger and Pooh |
| 223 | Little Einsteins |
| 235 | Jack's Big Music Show |
| 281 | Olivia |
| 327 | 10TV Eyewitness News at 6:00 |
| 478 | The NewsHour with Jim Lehrer |
| 490 | Caillou |
| 491 | Clifford the Big Red Dog |
| 544 | Sesame Street |
| 554 | Dragon Tales |