PRACTICUM PROBLEMS

2.1 Problem 1

Load the Movielens 100k dataset (ml-100k.zip) into Python using Pandas dataframes. Build a user profile on unscaled data for both users 200 and 15, and calculate the cosine similarity and distance between the user's preferences and the item/movie 95. Which user would a recommender system suggest this movie to?

Answer:

The recommender system will suggest movie 95 (Aladin) to user 200 based on the values of cosine distance obtained which are 0.405 and 0266 for users 200 and 15 respectively.

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In [1]:
```
import numpy as np
import pandas as pd
from sklearn import metrics
```

In [2]:
```
user_cols = ['user_id',
             'age',
             'gender',
             'occupation',
             'zip_code']
users = pd.read_csv(r'E:\Fall16\DM\HW\hw4\ml-100k\u.user',
                    sep='|',
                    names=user_cols)
```

In [7]:
```
rating_cols = ['user_id',
               'movie_id',
               'rating',
               'timestamp']
ratings = pd.read_csv(r'E:\Fall16\DM\HW\hw4\ml-100k\u.data',
                      sep='\t',
                      names=rating_cols)

r=pd.DataFrame(pd.read_table(r'E:\Fall16\DM\HW\hw4\ml-100k\u.data',sep = '\t',names=rating_cols ))
```

In [8]:
```
item_cols = ['movie id',
             'movie title',
```

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In [8]:
```
item_cols = ['movie id',
             'movie title',
             'release date',
             'video release date',
             'IMDb URL',
             'Unknown',
             'Action',
             'Adventure',
             'Animation',
             'Childrens',
             'Comedy',
             'Crime',
             'Documentary',
             'Drama',
             'Fantasy',
             'FilmNoir',
             'Horror',
             'Musical',
             'Mystery',
             'Romance',
             'SciFi',
             'Thriller',
             'War',
             'Western']
items = pd.read_csv(r'E:\Fall16\DM\HW\hw4\ml-100k\u.item',
                    sep='|',
                    names=item_cols,
                    encoding='latin-1')
i=pd.DataFrame(pd.read_table(r'E:\Fall16\DM\HW\hw4\ml-100k\u.item',sep = '|',names=item_cols,encoding='latin-1' ))
```

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In [9]:
```
user200 = r.loc[r['user_id'].isin([200])]
v=user200['movie_id']
v200 =pd.DataFrame(data=v)
#for row in  i,v1
```

In [22]:
```
v2= i.loc[i['movie id'].isin(v200['movie_id'])]
```

In [23]:
```
v3 = v2.iloc[:,5:24]
mean3 = v3.mean(axis=0)
```

In [24]:
```
user2 = r.loc[r['user_id'].isin([15])]
v4=user2['movie_id']
v4 =pd.DataFrame(data=v4)
v4
v5= i.loc[i['movie id'].isin(v4['movie_id'])]
v5
v5 = v5.iloc[:,5:24]
v5.head()
mean5 = v5.mean(axis=0)
```

In [25]:
```
item2 = items[94:95]
feat2 = item2.iloc[:,5:24]
feat2.head()
mean2 = feat2.mean()
```

In [26]:
```
mean200 = mean3.reshape(1,-1)
```

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In [25]:
```
item2 = items[94:95]
feat2 = item2.iloc[:,5:24]
feat2.head()
mean2 = feat2.mean()
```

In [26]:
```
mean200 = mean3.reshape(1,-1)
mean200
```

Out[26]:
```
array([[ 0.        ,  0.36574074,  0.26388889,  0.07407407,  0.19444444,
         0.24074074,  0.0462963 ,  0.00462963,  0.28240741,  0.0462963 ,
         0.00925926,  0.0462963 ,  0.0787037 ,  0.01851852,  0.16666667,
         0.19907407,  0.23148148,  0.0787037 ,  0.01851852]])
```

In [27]:
```
mean15 = mean5.reshape(1,-1)
mean15
```

Out[27]:
```
array([[ 0.        ,  0.21153846,  0.11538462,  0.01923077,  0.06730769,
         0.26923077,  0.05769231,  0.        ,  0.46153846,  0.02884615,
         0.01923077,  0.01923077,  0.01923077,  0.06730769,  0.24038462,
         0.11538462,  0.24038462,  0.09615385,  0.        ]])
```

In [28]:
```
mean95 = mean2.reshape(1,-1)
mean95
```

Out[28]:
```
array([[ 0.,  0.,  0.,  1.,  1.,  1.,  0.,  0.,  0.,  0.,  0.,  0.,  1.,
         0.,  0.,  0.,  0.,  0.,  0.]])
```

In [29]:
```
result = metrics.pairwise.cosine_similarity(mean200,mean95)
result
```

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In [27]:
```
mean15 = mean5.reshape(1,-1)
mean15
```

Out[27]:
```
array([[ 0.        ,  0.21153846,  0.11538462,  0.01923077,  0.06730769,
         0.26923077,  0.05769231,  0.        ,  0.46153846,  0.02884615,
         0.01923077,  0.01923077,  0.01923077,  0.06730769,  0.24038462,
         0.11538462,  0.24038462,  0.09615385,  0.        ]])
```

In [28]:
```
mean95 = mean2.reshape(1,-1)
mean95
```

Out[28]:
```
array([[ 0.,  0.,  0.,  1.,  1.,  1.,  0.,  0.,  0.,  0.,  0.,  0.,  1.,
         0.,  0.,  0.,  0.,  0.,  0.]])
```

In [29]:
```
result = metrics.pairwise.cosine_similarity(mean200,mean95)
result
```

Out[29]:
```
array([[ 0.40572802]])
```

In [30]:
```
result2 = metrics.pairwise.cosine_similarity(mean15,mean95)
result2
```

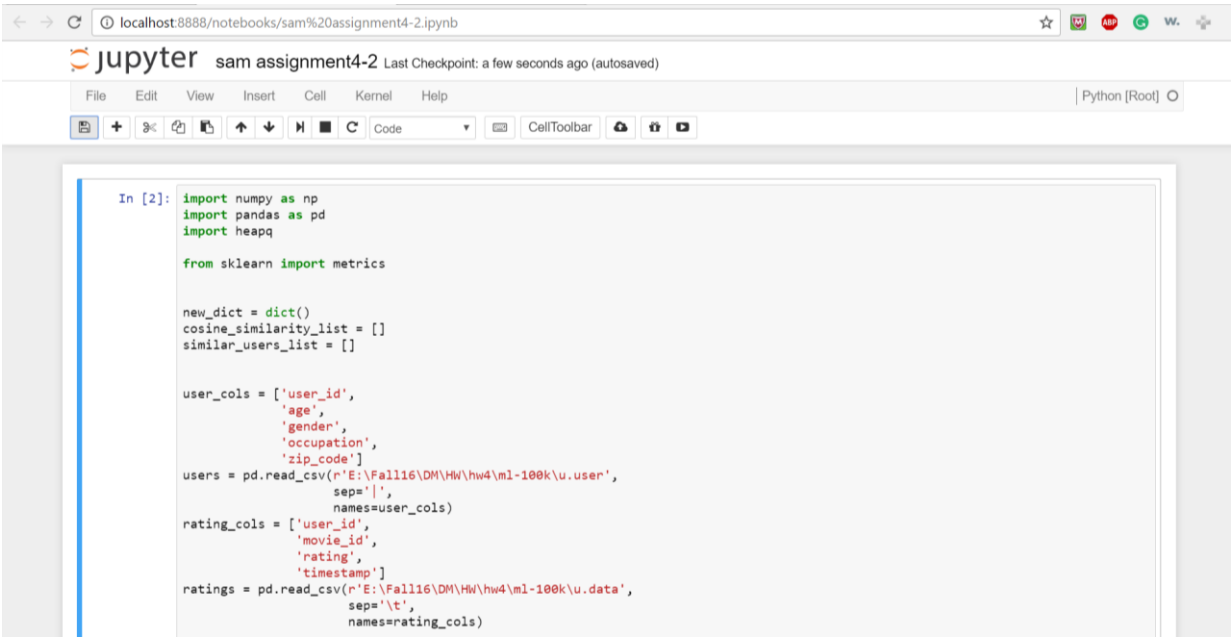
Out[30]:
```
array([[ 0.26612637]])
```

2.2 Problem 2

Load the Movielens 100k dataset (ml-100k.zip) into Python using Pandas dataframes. Convert the ratings data into a utility matrix representation, and find the 10 most similar users for user 1 based on cosine similarity of the user ratings data. Based on the average of of the ratings for item 508 from the similar users, what is the expected rating for this item for user 1?

Answer:

The expected rating for item 508 by user 1 will be 0.2689 ~ 0.27



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```
ratings = pd.read_csv(r'E:\Fall16\DM\HW\hw4\ml-100k\u.data',
                      sep='\t',
                      names=rating_cols)

item_cols = ['movie id',
             'movie title',
             'release date',
             'video release date',
             'IMDb URL',
             'Unknown',
             'Action',
             'Adventure',
             'Animation',
             'Childrens',
             'Comedy',
             'Crime',
             'Documentary',
             'Drama',
             'Fantasy',
             'FilmNoir',
             'Horror',
             'Musical',
             'Mystery',
             'Romance',
             'SciFi',
             'Thriller',
             'War',
             'Western']
items = pd.read_csv(r'E:\Fall16\DM\HW\hw4\ml-100k\u.item',
                    sep='|',
```

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```
items = pd.read_csv(r'E:\Fall16\DM\HW\hw4\ml-100k\u.item',
                    sep='|',
                    names=item_cols,
                    encoding='latin-1')

utility = ratings.pivot(index='user_id',
                        columns='movie_id',
                        values='rating')

user_means = utility.mean(axis=1)

utility_centered = utility - user_means
utility_centered = utility_centered.where((pd.notnull(utility_centered)), 0)

print("Utility")

print(utility_centered)
```

```
935     -0.610294  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
936      0.389706  0.000000  1.203704  0.000000  0.000000  1.364929  0.034739
937      0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
938      0.389706  0.000000  0.000000  0.000000  0.000000  0.000000  0.034739
939      0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
940      0.000000  0.000000  0.000000 -2.333333  0.000000  0.000000  0.034739
941      1.389706  0.000000  0.000000  0.000000  0.000000  0.000000  0.034739
942      0.000000  0.000000  0.000000  0.000000  0.000000  0.000000  0.000000
943      0.000000  1.290323  0.000000  0.000000  0.000000  0.000000  0.000000

           8         9         10    ...   1673  1674  1675  1676  1677  \
```

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```
29       0.00000  0.000000  0.000000  ...    0.0   0.0   0.0   0.0   0.0
30       0.00000  0.000000  0.000000  ...    0.0   0.0   0.0   0.0   0.0
...          ...       ...       ...  ...    ...   ...   ...   ...   ...
914      0.00000  0.000000  0.000000  ...    0.0   0.0   0.0   0.0   0.0
915      0.00000  0.000000  0.000000  ...    0.0   0.0   0.0   0.0   0.0
916      0.00000  0.727273  0.000000  ...    0.0   0.0   0.0   0.0   0.0
917      0.00000  0.727273  0.000000  ...    0.0   0.0   0.0   0.0   0.0
918      0.00000  0.000000  0.000000  ...    0.0   0.0   0.0   0.0   0.0
```

In [3]:

```
user_1 = utility_centered[0:1]

for index, row in utility_centered.iterrows():
    np_row = np.array(row)
    np_row.resize(1, 1682)
    if index != 1:
        list = metrics.pairwise.cosine_similarity(user_1, np_row)
        cosine_similarity_list.append(list)
        new_dict.__setitem__(index, list)

similar_users_top_ten = heapq.nlargest(10, new_dict, key=new_dict.get)
user_columns = ['user_id' , '508']

data =0
for i in similar_users_top_ten:

        print("Item: ", i); print("Cosine Similarity ", new_dict.get(i));
        similar_users_list.append(utility_centered.loc[i, 508])
```

```
Item:  738
Cosine Similarity  [[ 0.29148679]]
```

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Code CellToolbar

```
data =0
for i in similar_users_top_ten:

        print("Item: ", i); print("Cosine Similarity ", new_dict.get(i));
        similar_users_list.append(utility_centered.loc[i, 508])
```

```
Item:  738
Cosine Similarity  [[ 0.29148679]]
Item:  592
Cosine Similarity  [[ 0.27840172]]
Item:  276
Cosine Similarity  [[ 0.26815054]]
Item:  267
Cosine Similarity  [[ 0.26476147]]
Item:  643
Cosine Similarity  [[ 0.2640026]]
Item:  757
Cosine Similarity  [[ 0.26236785]]
Item:  457
Cosine Similarity  [[ 0.26233704]]
Item:  606
Cosine Similarity  [[ 0.26084701]]
Item:  916
Cosine Similarity  [[ 0.25562438]]
Item:  44
Cosine Similarity  [[ 0.2529544]]
```

In [4]:

```
np_array_similar_users = np.array(similar_users_list)

print("Expected rating of user 1 for item 508:")
print(np_array_similar_users.mean())
```

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Code CellToolbar

```
Item:  643
Cosine Similarity  [[ 0.2640026]]
Item:  757
Cosine Similarity  [[ 0.26236785]]
Item:  457
Cosine Similarity  [[ 0.26233704]]
Item:  606
Cosine Similarity  [[ 0.26084701]]
Item:  916
Cosine Similarity  [[ 0.25562438]]
Item:  44
Cosine Similarity  [[ 0.2529544]]
```

In [4]:

```
np_array_similar_users = np.array(similar_users_list)

print("Expected rating of user 1 for item 508:")
print(np_array_similar_users.mean())
```

```
Expected rating of user 1 for item 508:
0.268965517241
```

In [ ]: