Recommender System Documentation Notebook

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A brief Walkthrough:

The Dataset that was provided i.e. movie.json contains product reviews and metadata from Amazon. This dataset includes reviews (ratings, text, helpfulness votes), product metadata (descriptions, category information, price, brand, and image features), and links (also viewed/also bought graphs).

The first approach here is to study the dataset and build a basic recommender system which is *Item-based*.

The dataset on further exploration on Amazon's official site, brief us what each columns relate the information to i.e.:

- __reviewerID - ID of the reviewer, e.g. A2SUAM1J3GNN3B
- __asin - ID of the product, e.g. 0000013714
- __reviewerName - name of the reviewer
- __helpful - helpfulness rating of the review, e.g. 2/3
- __reviewText - text of the review
- __overall - rating of the product
- __summary - summary of the review
- __unixReviewTime - time of the review (unix time)
- __reviewTime - time of the review (raw)

A sample review of this movie. json file is as below:

> { "reviewerID": "A2SUAM1J3GNN3B", "asin": "0000013714", "reviewerName": "J. McDonald", "helpful": [2, 3], "reviewText": "I bought this for my husband who plays the piano. He is having a wonderful time playing these old hymns. The music is at times hard to read because we think the book was published for singing from more than playing from. Great purchase though!", "overall": 5.0, "summary": "Heavenly Highway Hymns", "unixReviewTime": 1252800000, "reviewTime": "09 13, 2009" }

Building the Code:

We have used standard numpy and pandas for implmentations. Read the JSON file in this way:

```
json_movie=pd.read_json('movie.json') filter_json_movie = json_movie[['reviewerID','asin','overall']]
filter_json_movie.to_csv('movies.csv',index=False)
```

But somehow in my given configuartions of Laptop, this was taking more than 5 mins to execute so I managed to extract it CSV on another machine and further we use this CSV file for entire implemenation.

Note: Only JSON to CSV is converted once, if we are changing dataset, then JSON to CSV is needed and uncomment that from the code.

After reading the movie.csv file, we create a data frame that gives number of rating and mean overall score foreach product.

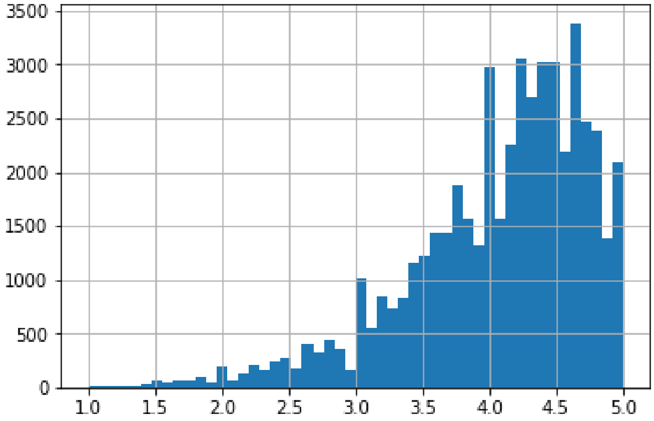
```
ratings = pd.DataFrame(df.groupby('asin')['overall'].mean()) ratings['number_of_ratings'] = df.groupby('asin')
['overall'].count()
```

Using some matlab graph libraries just on initial stages, and futher exploring data as below:

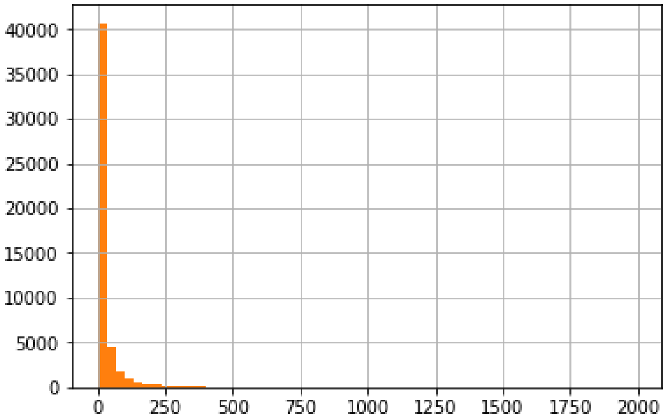
```
ratings['overall'].hist(bins=50)

ratings['number_of_ratings'].hist(bins=60)

sns.jointplot(x='overall', y='number_of_ratings',
data=ratings)

movie_matrix = pd.pivot_table(train,
index='reviewerID', columns='asin',
values='overall',aggfunc=np.mean)
```

We obtain three graphs which tells us a lot about this dataset.

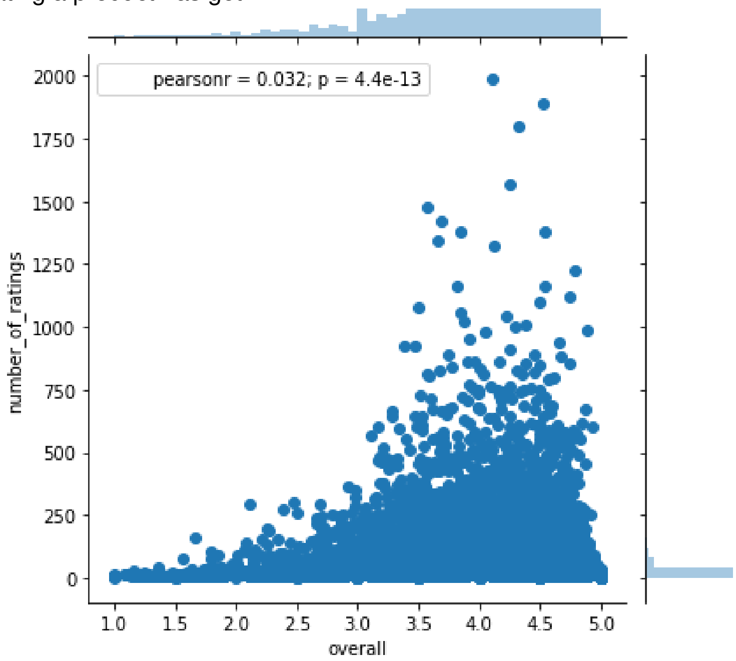
Average Rating that all the user have given:



Overall ratings that users have given:



No. of ratings vs. Average rating a product has got:



Here, we observe that the based on the number of ratings a product has got, shows more consistent rating it has got. Based on this observation, we can observe that products below 250 are less sparse and majorly are rated between 2.0 to 5.0. It is also possible that a product has got rating 5.0 but just by one person. Hence, just ratings are meaning less.

Data Filtering Approach : (In adjunct with Mansoor Abbas Ali [UTA ID])

> So on observation we want to focus on products that has got more no. of ratings,even it has less ratings. Our focus is on Recommendations, so we set some threshold value, to see what performance we get with different thresholds.

First Appraoch - Item based Recommendation System

In this approach we are calculating Pivot table after the filtered data. And then we split the data in to 80% train and 20% test.

```
df_Filtered = df_Merged[df_Merged.totalReviewers >= 180]

movie_matrix = pd.pivot_table(df_Filtered, index='reviewerID_x', columns='asin', values='overall_x')

train, test = train_test_split(movie_matrix, test_size=0.2)
```

On getting the top 10 products which have got more no of ratings by the user:

asin overall number_of_ratings

B003EYVXV4 4.108816 1985

B001KVZ6HK 4.524364 1888

B009934S5M 4.317601 1801

B0059XTU1S 4.254777 1570

B005LAIHXQ 3.565541 1480

B005LAIIMG 3.691063 1421

B00AF6B22E 3.843705 1382

B00FZM8Z7I 4.546512 1376

B00H83EUL2 3.665175 1341

B002VPE1AW 4.115385 1326

We see that product "B003EYVXV4" has got highest no. of ratings.

So this gives us hint, that why don't we predict predictions of items for other users which are similar to this top 10 products.

Running the Code:

1. In the folder, there are two files, Assignment3.py and Recommender.py.

    > Excute first main.py and after it Recommender.py to get expected MAE.

2. After running main.py two CSV Files are generated based on givn data set as Train.csv and Test.csv.
3. These two files are used in Recommender.py as input to train Item-based Recommender System and test it with the test.csv data set.

Note: During the execution an warning will be displayed. This can be ignored. Its a warning that indicates non-scalar multiplcations.

```
{Warning (from warnings module): File "C:\ProgramData\Anaconda3\lib\site-packages\numpy
\lib\function_base.py", line 3175 c = cov(x, y, rowvar) RuntimeWarning: Degrees of freedom <= 0 for slice
Warning (from warnings module): File "C:\ProgramData\Anaconda3\lib\site-packages\numpy
\lib\function_base.py", line 3109 c *= 1. / np.float64(fact) RuntimeWarning: divide by zero encountered in
double_scalars}
```