Evaluation Metrics for Recommender Systems

Installing and Importing Important Libraries like Surprise and recmetrics apart from Numpy and Pandas

```
import matplotlib.pyplot as plt
import numpy as np
import pandas as pd
!pip install surprise
import surprise
from surprise import SVD, Dataset, Reader
from surprise.model_selection import train_test_split
!pip install recmetrics
import recmetrics
```

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```

Importing CSV files for analysis. This data contains user's ratings of movies, as well as movie genre tag.

```
ratings = pd.read_csv('/content/ratings.csv')
ratings = ratings.query('rating >=3')
ratings.reset_index(drop=True, inplace=True)
```

```
ratings.head()
```

	userId	movieId	rating	timestamp
0	1	296	5.0	1147880044
1	1	306	3.5	1147868817
2	1	307	5.0	1147868828
3	1	665	5.0	1147878820
4	1	899	3.5	1147868510

```
#only consider ratings from users who have rated over n movies
n=1000
users = ratings["userId"].value_counts()
users = users[users>n].index.tolist()
```

```
ratings = ratings.query('userId in @users')
print(ratings.shape)
ratings.head(3)
```

```
(81874, 4)
```

	userId	movieId	rating	timestamp
19897	187	1	3.5	1277374478
19898	187	2	3.5	1277374864
19899	187	3	3.0	1277839361

```
rated_movies = ratings["movieId"].tolist()

movies = pd.read_csv('/content/movies.csv')
movies = movies.query('movieId in @rated_movies')
movies.set_index("movieId", inplace=True, drop=True)

movies = movies["genres"].str.split("|", expand=True)
movies.reset_index(inplace=True)
movies = pd.melt(movies, id_vars='movieId', value_vars=[0, 1, 2, 3, 4, 5, 6, 7, 8, 9])

movies.drop_duplicates("movieId", inplace=True)
movies.set_index('movieId', inplace=True)

movies = pd.get_dummies(movies.value)
movies.head()
```

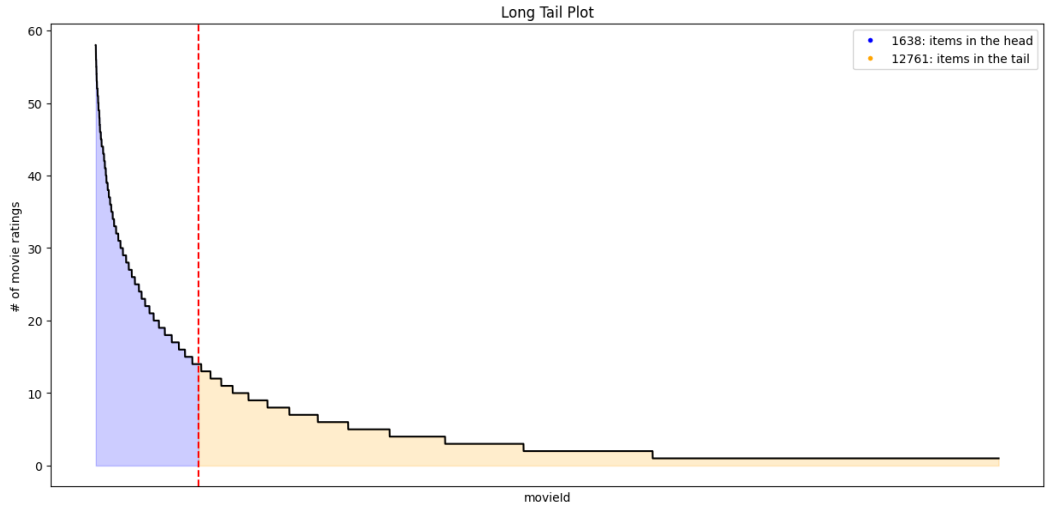
e	Animation	Children	Comedy	Crime	Documentary	Drama	Fantasy	Film-Noir	Horror	Musical	Myster
1	0	0	0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	0	0	0	
)	0	0	1	0	0	0	0	0	0	0	
)	0	0	1	0	0	0	0	0	0	0	
)	0	0	1	0	0	0	0	0	0	0	

Long Tail Plot

This plot is used to explore popularity patterns in user-item interaction data such as clicks, ratings, or purchases. Typically, only a small percentage of items have a high volume of interactions, and this is referred to as the “head”. Most items are in the “long tail”, but they only make up a small percentage of interactions.

```
fig = plt.figure(figsize=(15, 7))
recmetrics.long_tail_plot(df=ratings,
             item_id_column="movieId",
             interaction_type="movie ratings",
             percentage=0.5,
             x_labels=False)
```

```
/usr/local/lib/python3.10/dist-packages/seaborn/_decorators.py:36: FutureWarning: Pass the fol
  warnings.warn(
/usr/local/lib/python3.10/dist-packages/recmetrics/plots.py:60: FutureWarning: The frame.apper
  head = head.append(tail.head(1))
```




```
reader = Reader(rating_scale=(0, 5))
data = surprise.Dataset.load_from_df(ratings[['userId', 'movieId', 'rating']], reader)
```

```
trainset, testset = train_test_split(data, test_size=0.25)
```

SVD reduces the dimensionality reduction and gets us important latent features which can almost approximate all values in the utility matrix (including null values). Already available values in the utility matrix can be used to evaluate the predictions and tune the parameters/weights in the latent features (if matrix factorization used) or help us to pick the number of latent features from the SVD decomposition. Once number of latent features to be picked are decided, we can populate the null values and use these predicted ratings of a user for movie to recommend the movie with highest predicted rating to that particular user.

```
algo = SVD()
algo.fit(trainset)
```

```
<surprise.prediction_algorithms.matrix_factorization.SVD at 0x7f9c65a104c0>
```

Making Predictions based on the model created above

```
test = algo.test(testset)
test = pd.DataFrame(test)
test.drop("details", inplace=True, axis=1)
test.columns = ['userId', 'movieId', 'actual', 'cf_predictions']
test.head()
```

	userId	movieId	actual	cf_predictions
0	5114	91542	3.0	3.699022
1	2403	69604	3.5	3.666884
2	1652	99114	4.0	4.346246
3	7248	1361	4.0	3.791791

Evaluate model with MSE and RMSE

```
print("MSE: ", recmetrics.mse(test.actual, test.cf_predictions))
print("RMSE: ", recmetrics.rmse(test.actual, test.cf_predictions))
```

```
MSE:  0.30261220628201635
RMSE:  0.5501019962534369
```

Double-click (or enter) to edit

✓ 0s completed at 1:20 PM