Project 4

March 30, 2018

1 Project 04: Movielens Dataset Analysis

You don't need to limit yourself to the number of rows/cells provided. You can add additional rows in each section to add more lines of code.

Happy coding!

```
In [1]: import pandas as pd
        import matplotlib.pyplot as plt
        import numpy as np
        import seaborn as sn
        import re
        %matplotlib inline
```

```
In [2]: df_movies=pd.read_csv('movies.dat',sep='::',names=['MovieID','Title','Genres'])
```

```
/home/ghanshyam/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:1: ParserWarning: Fa
  """Entry point for launching an IPython kernel.
```

```
In [3]: def autolabel(rects):
            for rect in rects:
                h = rect.get_height()
                ax.text(rect.get_x()+rect.get_width()/2., 1.01*h, '%d'%int(h),
                        ha='center', va='bottom')
```

```
In [4]: df_movies.head()
```

```
Out[4]:    MovieID                               Title                        Genres
        0        1                    Toy Story (1995)   Animation|Children's|Comedy
        1        2                      Jumanji (1995)  Adventure|Children's|Fantasy
        2        3             Grumpier Old Men (1995)                Comedy|Romance
        3        4            Waiting to Exhale (1995)                  Comedy|Drama
        4        5  Father of the Bride Part II (1995)                        Comedy
```

```
In [5]: df_ratings=pd.read_csv('ratings.dat',sep='::',names=['UserID','MovieID','Rating','Timest
```

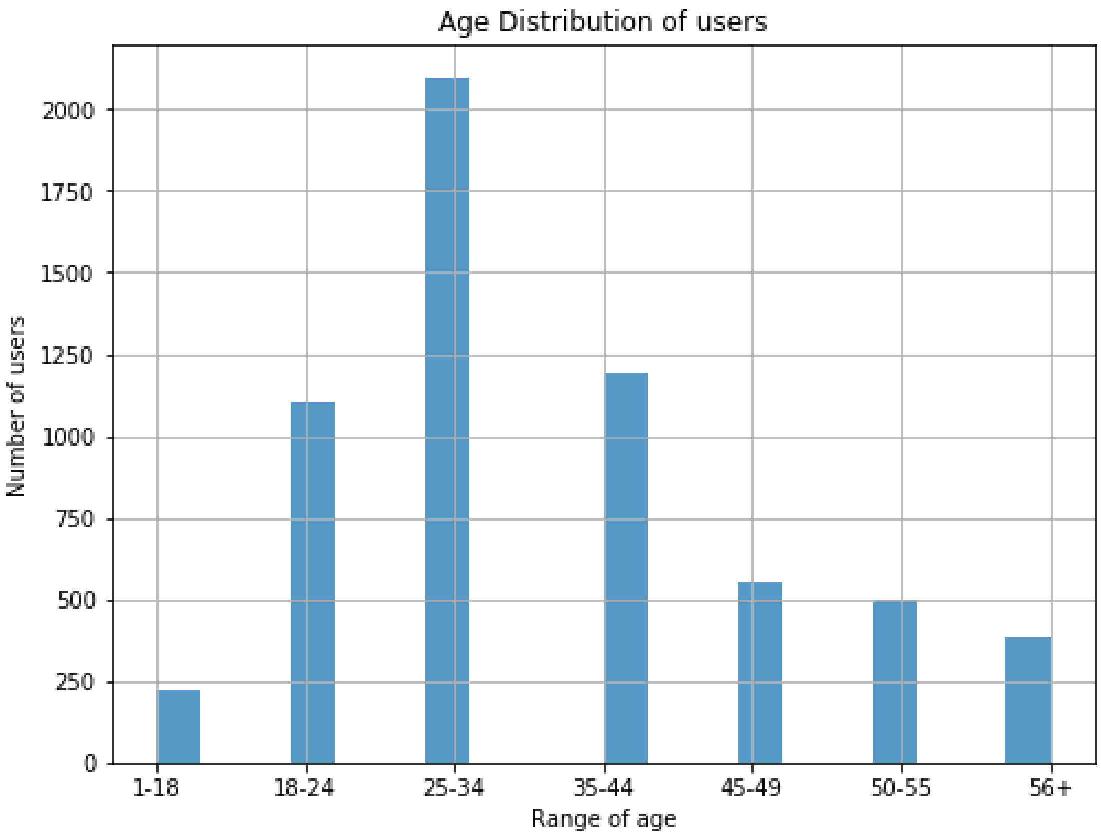
```
/home/ghanshyam/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:1: ParserWarning: Fa
  """Entry point for launching an IPython kernel.
```

```
In [6]: df_ratings.head()

Out[6]:    UserID  MovieID  Rating  Timestamp
        0       1     1193       5  978300760
        1       1      661       3  978302109
        2       1      914       3  978301968
        3       1     3408       4  978300275
        4       1     2355       5  978824291
```

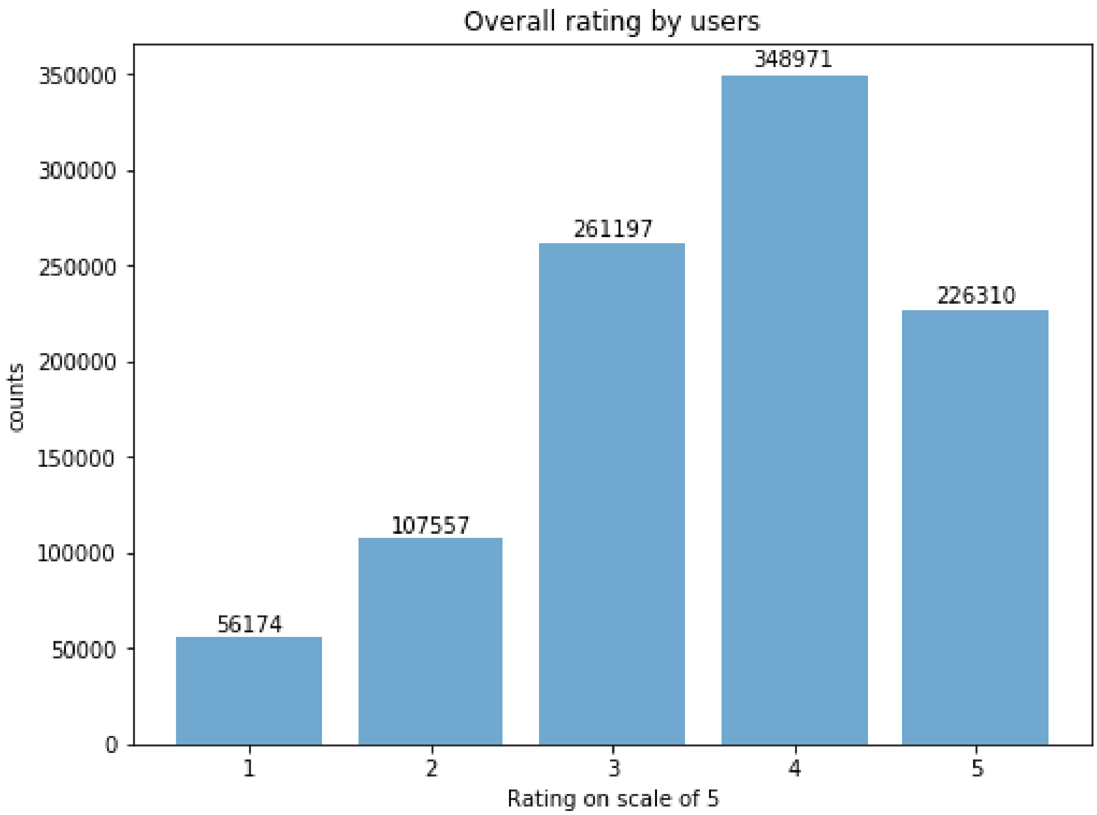
```
In [7]: df_user=pd.read_csv('users.dat',sep="::",names='UserID::Gender::Age::Occupation::Zip-cod

/home/ghanshyam/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:1: ParserWarning: Fa
  """Entry point for launching an IPython kernel.
```

```
In [8]: df_user.head()

Out[8]:    UserID Gender  Age  Occupation Zip-code
        0       1      F    1          10    48067
        1       2      M   56          16    70072
        2       3      M   25          15    55117
        3       4      M   45           7    02460
        4       5      M   25          20    55455
```

```
In [9]: age_dict={1:"1-18",
         18:  "18-24",
         25:  "25-34",
         35:  "35-44",
         45:  "45-49",
         50:  "50-55",
         56:  "56+"}
        ageval=df_user.Age.apply(lambda x:age_dict[x] )
        plt.figure(figsize=(8,6))
        ageval.hist(bins=20,alpha=0.75)
        plt.title('Age Distribution of users')
        plt.xlabel('Range of age')
        plt.ylabel('Number of users')
        plt.show()
```



```
In [10]: fig=plt.figure(figsize=(8,6))
         ax=fig.add_subplot(111)
         s=df_ratings.Rating.value_counts()

         rect=ax.bar(s.index,s,alpha=0.64)
         plt.title('Overall rating by users')
         plt.xlabel('Rating on scale of 5')
         autolabel(rect)
         plt.ylabel('counts')
         plt.show()
```



2 Find and visualize the user rating of the movie "Toy Story"

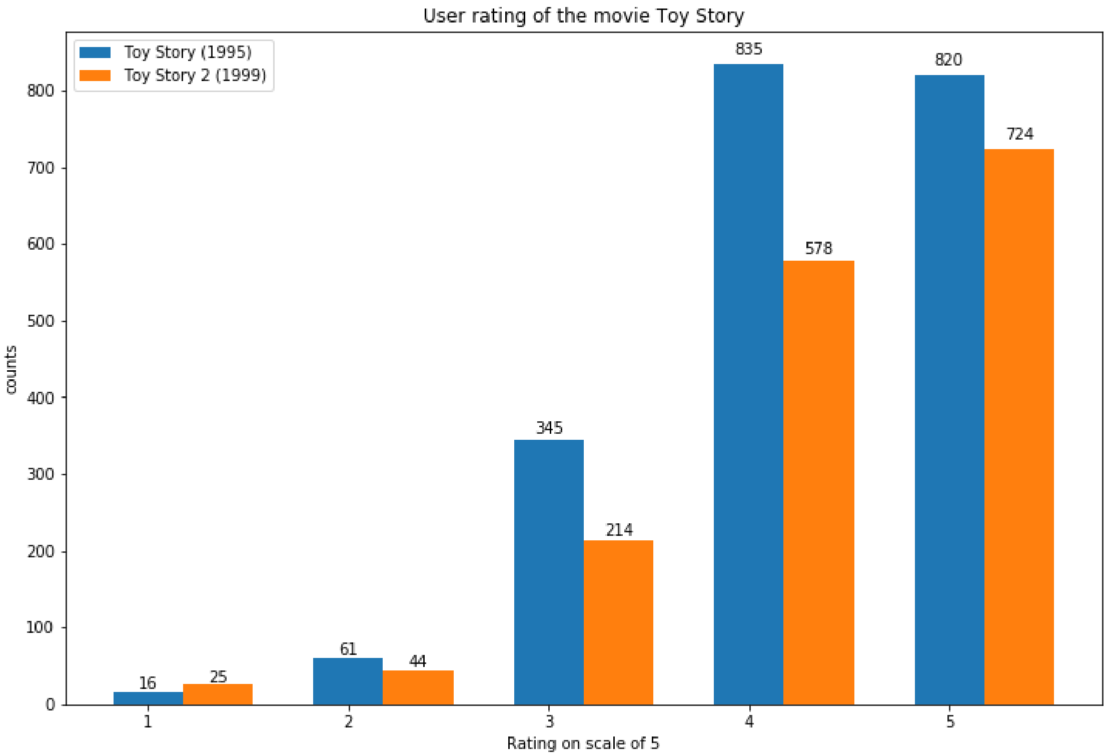
```
In [11]: df_movies_toystory=df_movies[df_movies.Title.apply(lambda x: bool(re.search(r'^toy stor
```

```
In [12]: df_movies_toystory
```

```
Out[12]:       MovieID               Title                       Genres
         0           1     Toy Story (1995)  Animation|Children's|Comedy
         3045     3114   Toy Story 2 (1999)  Animation|Children's|Comedy
```

```
In [13]: fig = plt.figure(figsize=(12,8))
         ax = fig.add_subplot(111)
         bar_width=0.35
         gap=0

         def autolabel(rects):
             for rect in rects:
                 h = rect.get_height()
                 ax.text(rect.get_x()+rect.get_width()/2., 1.01*h, '%d'%int(h),
                         ha='center', va='bottom')
```

```
for movieId,title in zip(df_movies_toystory['MovieID'],df_movies_toystory['Title']):
    df_tmp_ratings=df_ratings[df_ratings['MovieID']==movieId]
    s=df_tmp_ratings.Rating.value_counts()
    #p=s.index.tolist()
    #print('s=',s,'\n dddindex=',p)
    rect=ax.bar(s.index+gap,s,bar_width,label=title)
    autolabel(rect)

    gap+=bar_width
plt.title('User rating of the movie Toy Story')
plt.xlabel('Rating on scale of 5')
plt.ylabel('counts')
plt.legend()
plt.show()
```

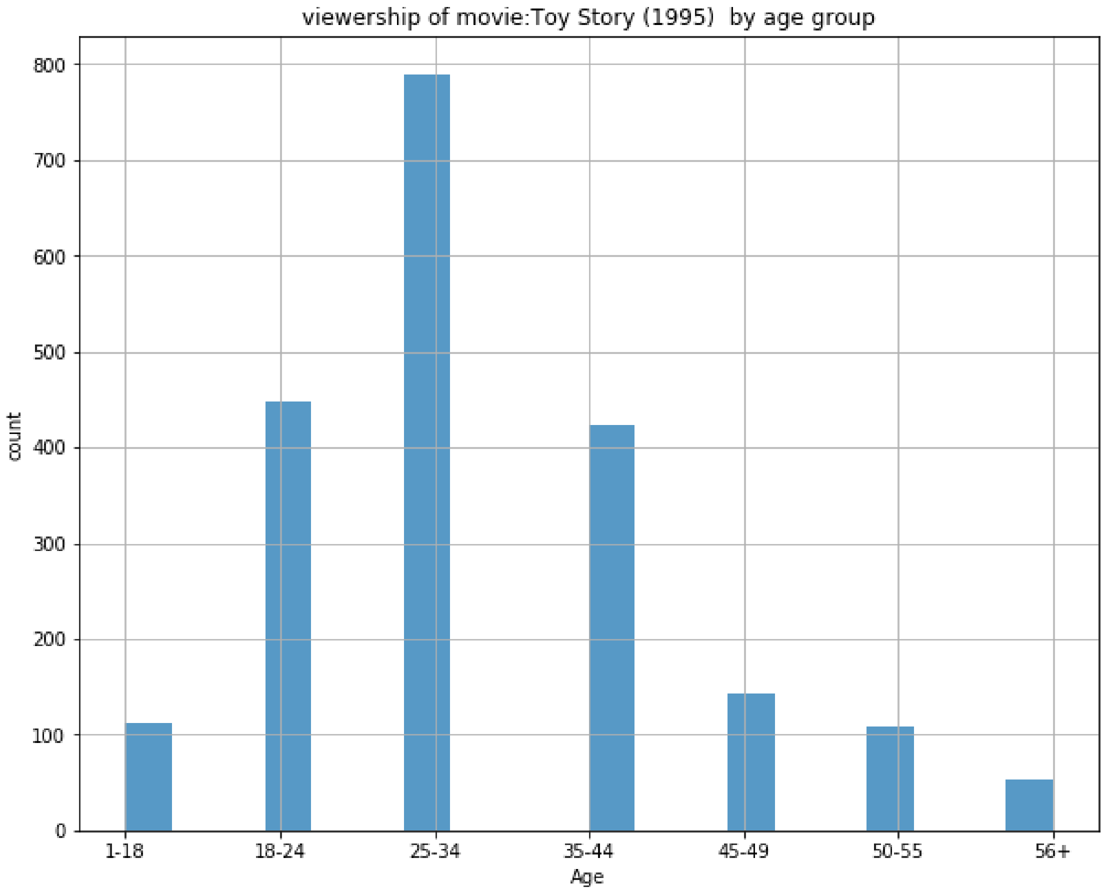


3 Find and visualize the viewership of the movie "Toy Story" by age group

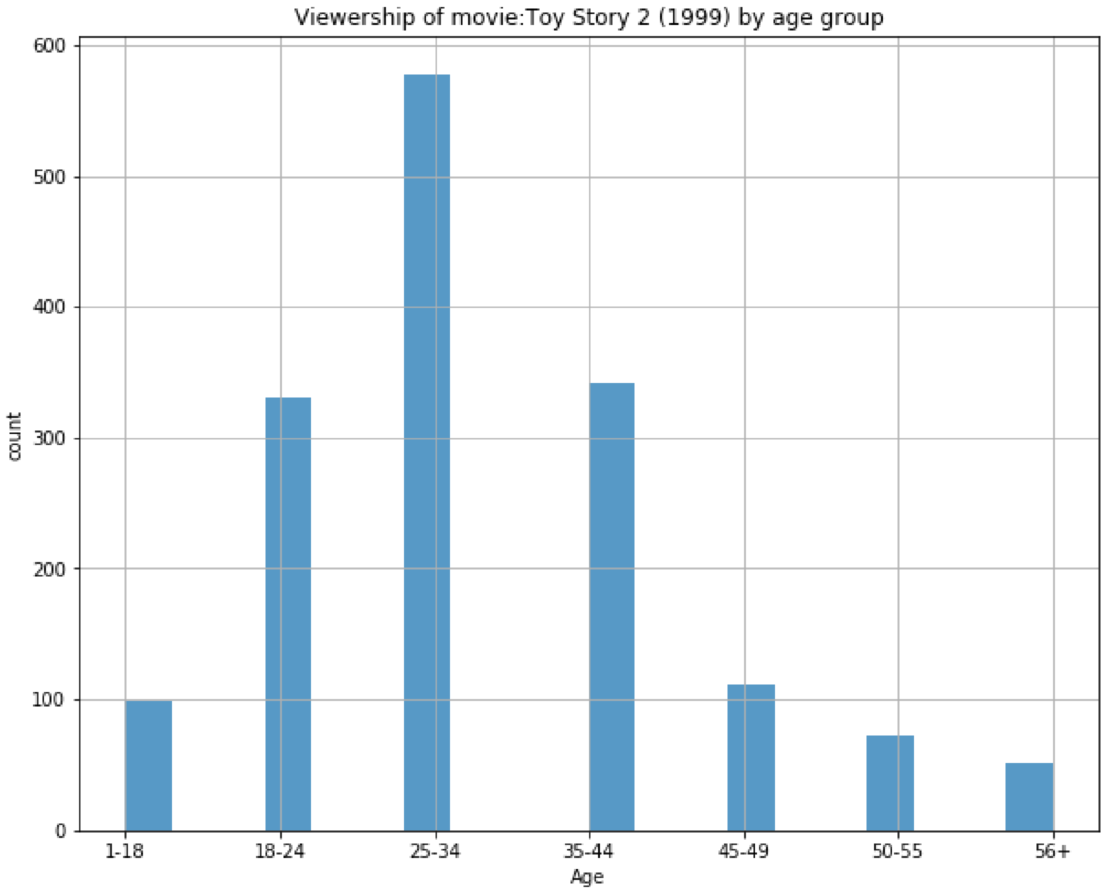
```
In [14]: t1=df_movies_toystory.set_index('MovieID').join(df_ratings.set_index('MovieID'))
         t1['MovieID']=t1.index
         df_movie_age=t1.set_index('UserID').join(df_user.set_index('UserID'))
         df_movie_age.head()
```

```
Out[14]:                      Title                      Genres  Rating  Timestamp  \
         UserID
         1          Toy Story (1995)  Animation|Children's|Comedy       5  978824268
         1        Toy Story 2 (1999)  Animation|Children's|Comedy       4  978302174
         3        Toy Story 2 (1999)  Animation|Children's|Comedy       3  978298103
         6          Toy Story (1995)  Animation|Children's|Comedy       4  978237008
         8          Toy Story (1995)  Animation|Children's|Comedy       4  978233496

                 MovieID Gender  Age  Occupation Zip-code
         UserID
         1             1      F    1          10    48067
         1          3114      F    1          10    48067
         3          3114      M   25          15    55117
         6             1      F   50           9    55117
         8             1      M   25          12    11413
```

```
In [15]: fig=plt.figure(figsize=(10,8))
         ageformovieid_1=df_movie_age.Age[df_movie_age['MovieID']==1]
         ageformovieid_1=ageformovieid_1.apply(lambda x:age_dict[x])
         ageformovieid_1.hist(bins=20,alpha=0.75)

         plt.title('viewership of movie:Toy Story (1995)  by age group')
         plt.ylabel('count')
         plt.xlabel('Age')
         plt.show()
```



```
In [16]: plt.figure(figsize=(10,8))
         ageformovieid_1=df_movie_age.Age[df_movie_age['MovieID']==3114]
         ageformovieid_1=ageformovieid_1.apply(lambda x:age_dict[x])
         ageformovieid_1.hist(bins=20,alpha=0.75)
         plt.title('Viewership of movie:Toy Story 2 (1999) by age group')
         plt.ylabel('count')
         plt.xlabel('Age')
         plt.show()
```



4 Find and visualize the top 25 movies by viewership rating

```
In [17]: df_ratings.head()
```

```
Out[17]:    UserID  MovieID  Rating  Timestamp
         0       1     1193       5  978300760
         1       1      661       3  978302109
         2       1      914       3  978301968
         3       1     3408       4  978300275
         4       1     2355       5  978824291
```

```
In [18]: df_movie_rating=df_ratings[['MovieID','Rating']]
         top25=df_movie_rating.groupby(['MovieID']).mean()['Rating'].nlargest(25)
         top25=pd.DataFrame(top25)
         top25.index
```

```
Out[18]: Int64Index([ 787,  989, 1830, 3172, 3233, 3280, 3382, 3607, 3656, 3881, 3245,
                       53, 2503, 2905, 2019,  318,  858,  745,   50,  527, 1148,  439,
                      557,  578, 1795],
                    dtype='int64', name='MovieID')
```

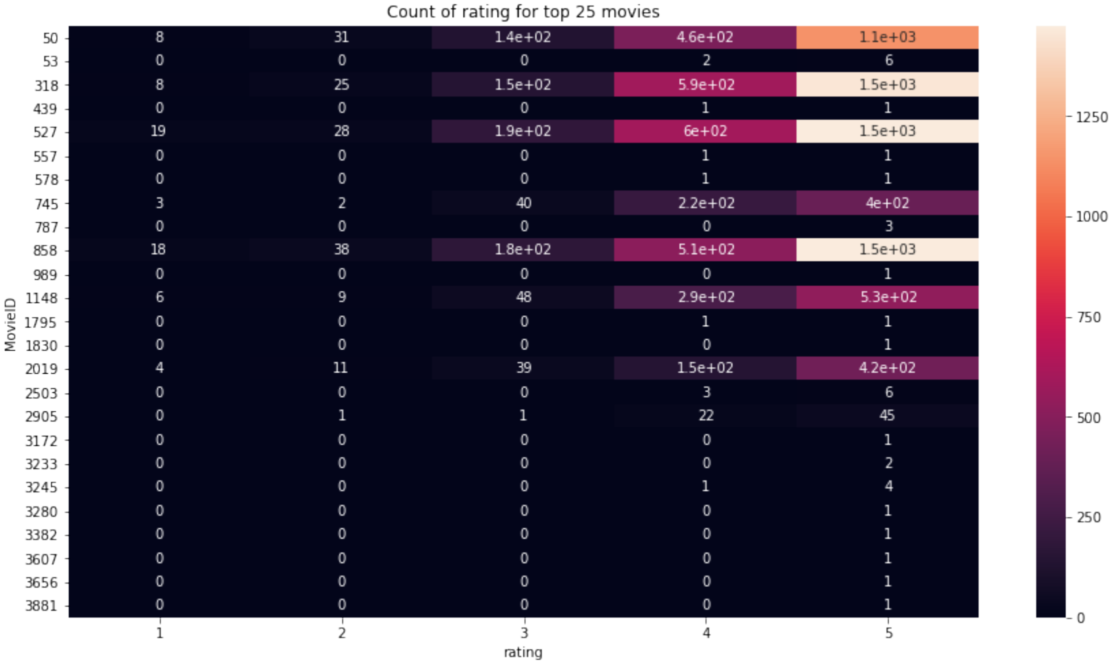
```
In [19]: df_rating_25=df_ratings[df_ratings['MovieID'].isin(top25.index)]
         df_rating_25=df_rating_25[['MovieID','Rating']]
         print('filtered',df_rating_25.shape,'from ',df_ratings.shape)

filtered (10816, 2) from  (1000209, 4)
```

```
In [20]: tmp=df_rating_25.groupby(['MovieID','Rating'])['Rating'].count()
         tmp.head()

Out[20]: MovieID  Rating
         50       1            8
                  2           31
                  3          136
                  4          464
                  5         1144
         Name: Rating, dtype: int64
```

```
In [21]: np_movieid_rating=np.array([list(t) for t in tmp.index])
         df_heatmap=pd.DataFrame({})
         df_heatmap['rating count']=tmp
         df_heatmap['MovieID']=np_movieid_rating[:,0]
         df_heatmap['rating']=np_movieid_rating[:,1]
         df_heatmap.head()

Out[21]:                 rating count  MovieID  rating
         MovieID Rating
         50      1                  8       50       1
                 2                 31       50       2
                 3                136       50       3
                 4                464       50       4
                 5               1144       50       5
```

```
In [22]: hitmap_pivot=df_heatmap.pivot(index='MovieID',columns='rating',values='rating count')
```

```
In [23]: hitmap_pivot=hitmap_pivot.fillna(0)
         plt.figure(figsize=(15,8))
         sn.heatmap(hitmap_pivot,annot=True)
         plt.title('Count of rating for top 25 movies')
         plt.plot()

Out[23]: []
```



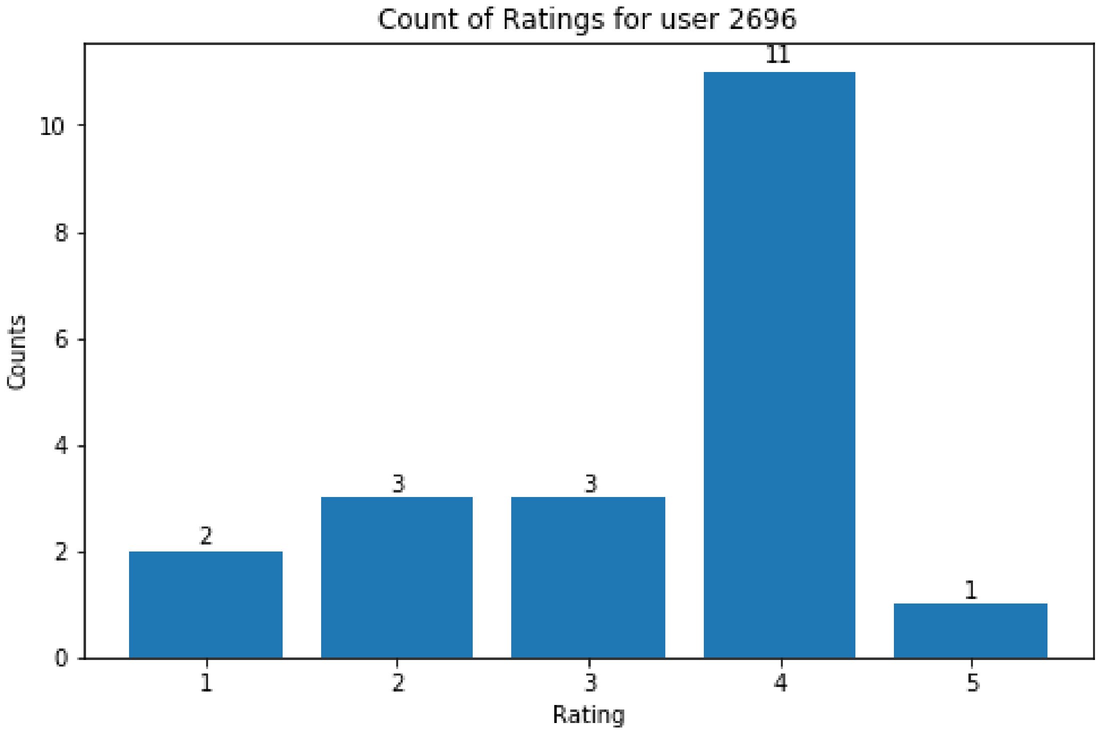
5 Find the rating for a particular user of user id = 2696

```
In [24]: df_ratings_2696=df_ratings[df_ratings['UserID']==2696]
         df_ratings_2696
```

```
Out[24]:         UserID  MovieID  Rating  Timestamp
         440667    2696     1258       4  973308710
         440668    2696     1270       2  973308676
         440669    2696     1617       4  973308842
         440670    2696     1625       4  973308842
         440671    2696     1644       2  973308920
         440672    2696     1645       4  973308904
         440673    2696     1805       4  973308886
         440674    2696     1892       4  973308904
         440675    2696      800       5  973308842
         440676    2696     2338       2  973308920
         440677    2696     1711       4  973308904
         440678    2696     3176       4  973308865
         440679    2696     2389       4  973308710
         440680    2696     1589       3  973308865
         440681    2696     2713       1  973308710
         440682    2696     3386       1  973308842
         440683    2696     1783       4  973308865
         440684    2696      350       3  973308886
```

```
440685     2696     1092        4  973308886
440686     2696     1097        3  973308690
```

In [25]:
```
fig=plt.figure(figsize=(8,5))
ax=fig.add_subplot(1,1,1)
t=df_ratings_2696[['MovieID','Rating']]
p=t['Rating'].value_counts()
rect=ax.bar(p.index,p)
autolabel(rect)
plt.title('Count of Ratings for user 2696')
plt.xlabel('Rating')
plt.ylabel('Counts')
plt.show()
```

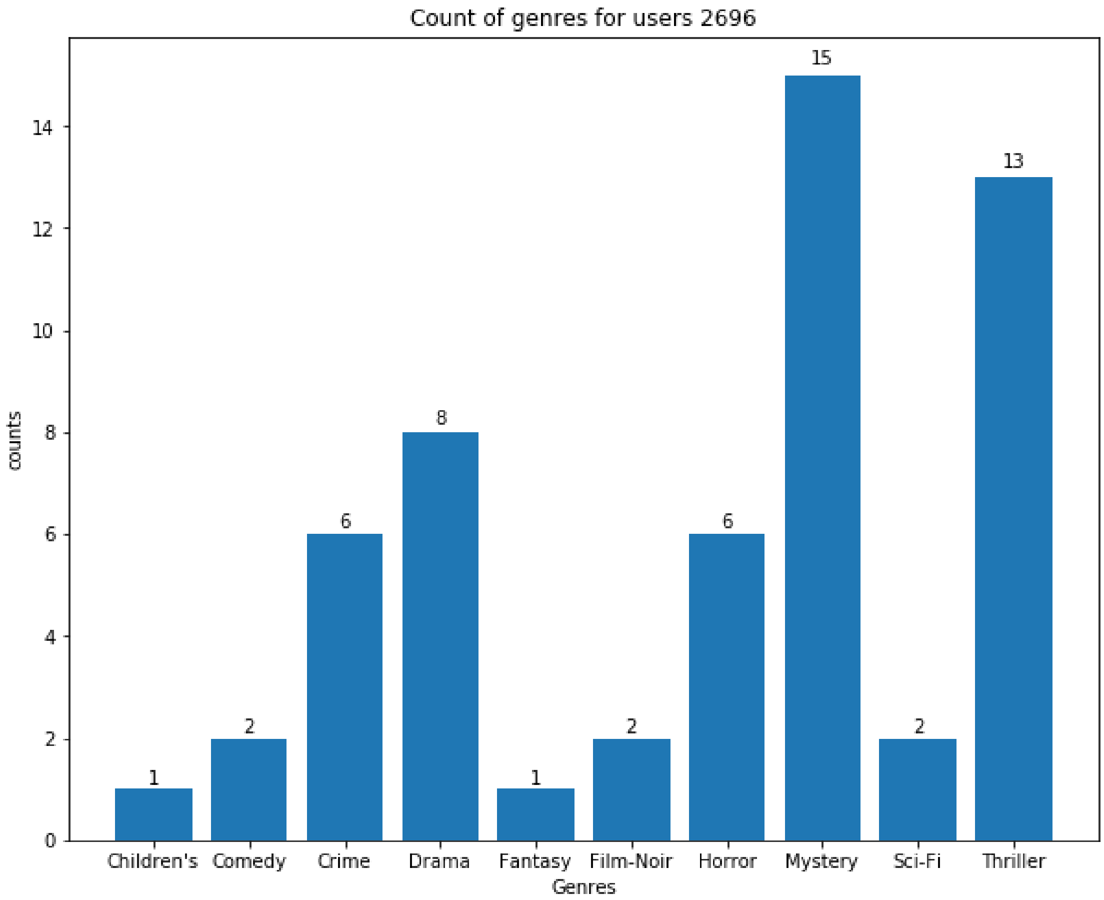


In [26]:
```
df_ratings_2696.head()
```

Out[26]:
```
        UserID  MovieID  Rating  Timestamp
440667    2696     1258       4  973308710
440668    2696     1270       2  973308676
440669    2696     1617       4  973308842
440670    2696     1625       4  973308842
440671    2696     1644       2  973308920
```

In [27]:
```
t=df_movies[df_movies['MovieID'].isin(df_ratings_2696['MovieID'])]
Geners=[]
```

```
for i in t['Genres']:
    for g in i.split('|'):
        Geners.append(g)
Geners=pd.Series(np.array(Geners))
p=Geners.value_counts()
fig=plt.figure(figsize=(10,8))
ax=fig.add_subplot(111)
rect=ax.bar(p.index,p)
autolabel(rect)
plt.title('Count of genres for users 2696')
plt.xlabel('Genres')
plt.ylabel('counts')
plt.show()
```



6 Machine Learning

```
In [98]: from sklearn.neighbors import KNeighborsClassifier
         from sklearn.linear_model import LogisticRegression
         from sklearn.svm import SVC
         import sklearn.cross_validation as cv
         from sklearn import tree

In [99]: model_knn=KNeighborsClassifier(n_neighbors=3)
         model_log=LogisticRegression()
         model_svm=SVC(probability=True)
         model_decisiontree=tree.DecisionTreeClassifier(max_depth=5)
```

prepare data

```
In [100]: df_ratings_500=df_ratings.head(500)

In [101]: #movie id, age, occupation
          df_ratings_500['age']=df_ratings_500['UserID'].map(df_user.set_index('UserID')['Age'])
          df_ratings_500['occupation']=df_ratings_500['UserID'].map(df_user.set_index('UserID')[
          df_ratings_500.head()
          #df_ratings_500.to_csv('df_rating_500.csv')
```

```
/home/ghanshyam/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:2: SettingWithCopyWa
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#

/home/ghanshyam/anaconda3/lib/python3.6/site-packages/ipykernel_launcher.py:3: SettingWithCopyWa
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/stable/indexing.html#
  This is separate from the ipykernel package so we can avoid doing imports until
```

```
Out[101]:    UserID  MovieID  Rating  Timestamp  age  occupation
          0       1     1193       5  978300760    1          10
          1       1      661       3  978302109    1          10
          2       1      914       3  978301968    1          10
          3       1     3408       4  978300275    1          10
          4       1     2355       5  978824291    1          10
```

```
In [102]: x_feature=df_ratings_500[['MovieID','age','occupation']]
          y_target=df_ratings_500[['Rating']]

In [103]: print(x_feature.shape,y_target.shape)
```

```
(500, 3) (500, 1)
```

```
In [104]: x_feature=np.array(x_feature)
          y_target=np.array(y_target).ravel()
```

```
In [105]: x_train,x_test,y_train,y_test=cv.train_test_split(x_feature,y_target)
```

```
In [106]: model_knn.fit(x_train,y_train)
          model_log.fit(x_train,y_train)
          model_svm.fit(x_train,y_train)
          model_decisiontree.fit(x_train,y_train)
```

```
Out[106]: DecisionTreeClassifier(class_weight=None, criterion='gini', max_depth=5,
                      max_features=None, max_leaf_nodes=None,
                      min_impurity_decrease=0.0, min_impurity_split=None,
                      min_samples_leaf=1, min_samples_split=2,
                      min_weight_fraction_leaf=0.0, presort=False, random_state=None,
                      splitter='best')
```

```
In [107]: score_knn=model_knn.score(x_test,y_test)
          score_log=model_log.score(x_test,y_test)
          score_svm=model_svm.score(x_test,y_test)
          score_decision_tree=model_decisiontree.score(x_test,y_test)
          print('score_knn: ',score_knn,'score_log: ',score_log,'score_svm:',score_svm,'decision
```

```
score_knn:  0.184 score_log:  0.4 score_svm: 0.352 decision tree: 0.336
```