

## Import necessary Python libraries

In [1]:

```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

## Data Acquisition

In [2]:

```
users=pd.read_csv('users.dat', delimiter='::', engine='python', names=['UserID', 'Gender', 'Age', 'Occupation', 'Zip-code'])
ratings=pd.read_csv('ratings.dat', delimiter='::', engine='python', names=['UserID', 'MovieID', 'Ratings', 'Timestamp'])
movies=pd.read_csv('movies.dat', delimiter='::', engine='python', names=['MovieID', 'Title', 'Genres'])
```

## Data Wrangling

In [3]:

```
users_ratings=pd.merge(users,ratings,on='UserID',)
users_ratings_movies=pd.merge(users_ratings,movies,on='MovieID')
users_ratings_movies.head()
```

Out[3]:

	UserID	Gender	Age	Occupation	Zip-code	MovieID	Ratings	Timestamp	Title	Genre
0	1	F	1	10	48067	1193	5	978300760	One Flew Over the Cuckoo's Nest (1975)	Drama
1	2	M	56	16	70072	1193	5	978298413	One Flew Over the Cuckoo's Nest (1975)	Drama
2	12	M	25	12	32793	1193	4	978220179	One Flew Over the Cuckoo's Nest (1975)	Drama
3	15	M	25	7	22903	1193	4	978199279	One Flew Over the Cuckoo's Nest (1975)	Drama
4	17	M	50	1	95350	1193	5	978158471	One Flew Over the Cuckoo's Nest (1975)	Drama

Create a new dataset with following attributes : MovieID Title UserID Age Gender Occupation Rating.

In [4]:

```
Master_Data=users_ratings_movies[['MovieID','Title','UserID','Age','Gender','Occupation',
'Ratings']]
Master_Data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1000209 entries, 0 to 1000208
Data columns (total 7 columns):
MovieID      1000209 non-null int64
Title        1000209 non-null object
UserID       1000209 non-null int64
Age          1000209 non-null int64
Gender       1000209 non-null object
Occupation   1000209 non-null int64
Ratings      1000209 non-null int64
dtypes: int64(5), object(2)
memory usage: 61.0+ MB
```

## Exploratory Data Analysis(EDA)

### Visualize user age distribution

In [6]:

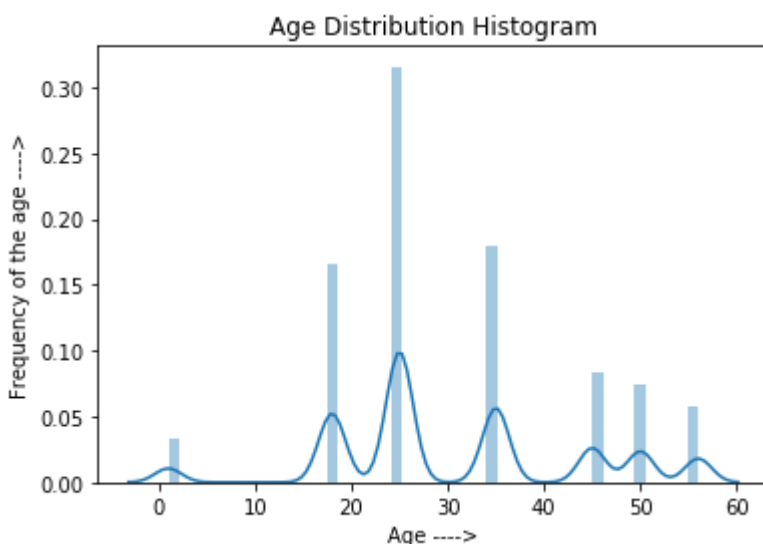
```
sns.distplot(users.Age, kde=True)
plt.title('Age Distribution Histogram')
plt.xlabel('Age ---->')
plt.ylabel('Frequency of the age ---->')
```

F:\Anaconda\lib\site-packages\scipy\stats\stats.py:1713: FutureWarning: Using a non-tuple sequence for multidimensional indexing is deprecated; use `arr[tuple(seq)]` instead of `arr[seq]`. In the future this will be interpreted as an array index, `arr[np.array(seq)]`, which will result either in an error or a different result.

```
return np.add.reduce(sorted[indexer] * weights, axis=axis) / sumval
```

Out[6]:

```
Text(0, 0.5, 'Frequency of the age ---->')
```

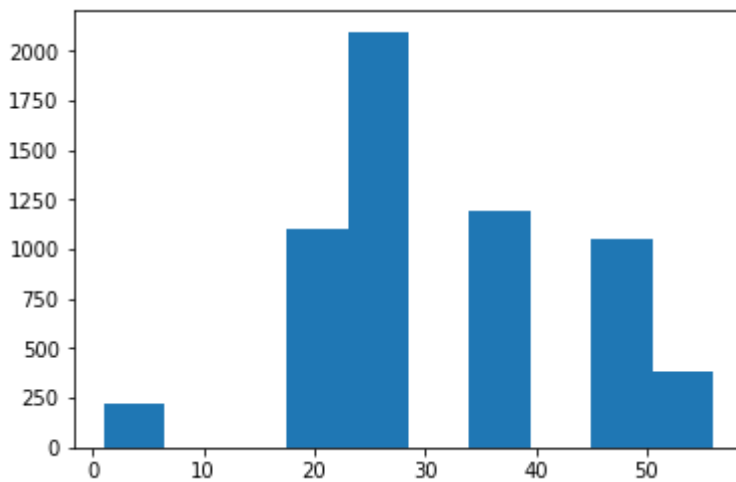


In [7]:

```
plt.hist(users['Age'])
```

Out[7]:

```
(array([ 222.,    0.,    0., 1103., 2096.,    0., 1193.,    0., 1046.,
        380.]),
 array([ 1. ,  6.5, 12. , 17.5, 23. , 28.5, 34. , 39.5, 45. , 50.5, 56.
        ]),
 <a list of 10 Patch objects>)
```



### Visualize overall rating by users

In [15]:

```
ratings['Ratings'].value_counts(ascending=True)
```

Out[15]:

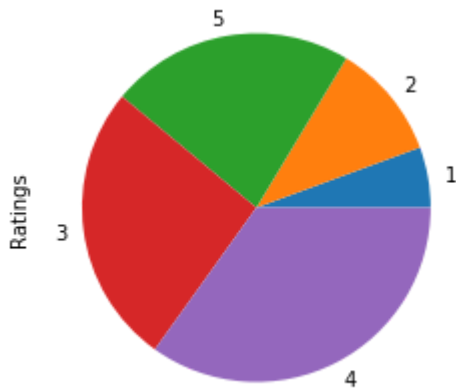
```
1    56174
2   107557
5   226310
3   261197
4   348971
Name: Ratings, dtype: int64
```

In [16]:

```
ratings['Ratings'].value_counts(ascending=True).plot(kind='pie')
```

Out[16]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x1d5197c32e8>

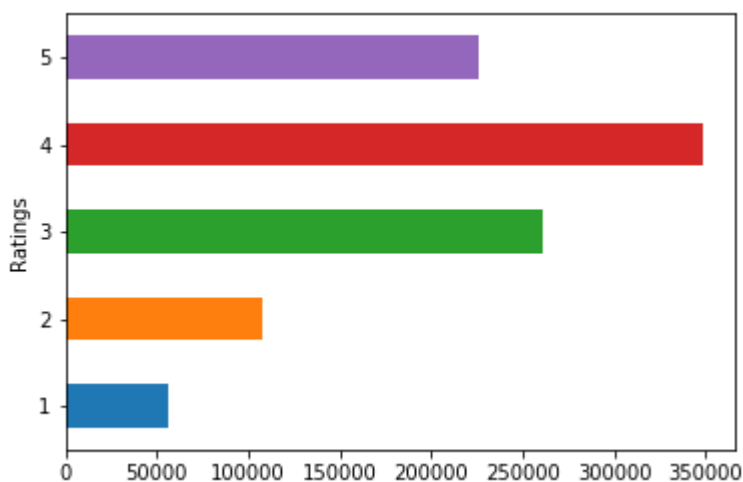


In [9]:

```
Master_Data.groupby('Ratings')['UserID'].count().plot(kind='barh')
```

Out[9]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x1d5198215f8>



**Find and visualize the user rating of the movie “Toy Story (1995)”**

In [13]:

```
Master_Data[Master_Data.Title == 'Toy Story (1995)'].groupby(by=Master_Data.Ratings).count()['UserID']
```

Out[13]:

Ratings

1 16

2 61

3 345

4 835

5 820

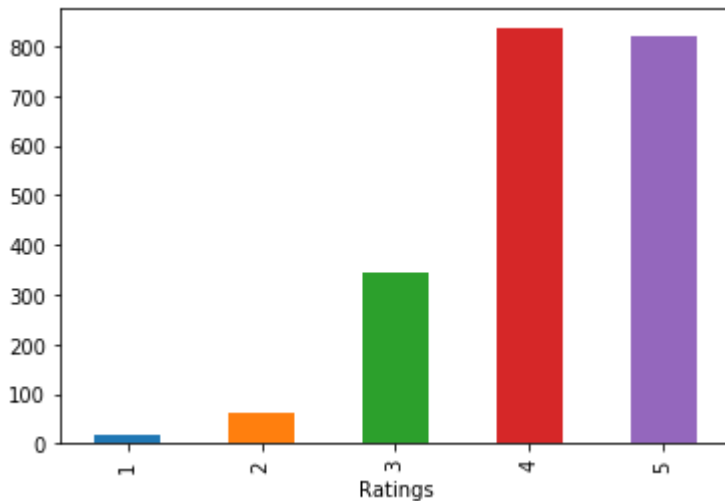
Name: UserID, dtype: int64

In [14]:

```
Master_Data[Master_Data.Title == 'Toy Story (1995)'].groupby(by=Master_Data.Ratings).count()['UserID'].plot(kind = 'bar')
```

Out[14]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x1d5197d93c8>

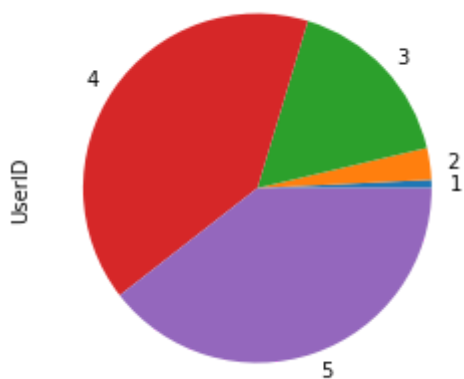


In [11]:

```
Master_Data[Master_Data.Title == 'Toy Story (1995)'].groupby(by=Master_Data.Ratings).count()['UserID'].plot(kind = 'pie')
```

Out[11]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x1d5197f7eb8>



**Find the viewership of the movie “Toy Story” by age group**

In [61]:

```
viewership=user_movie_ratings_req[['Age', 'Ratings']][user_movie_ratings_req['MovieID']=1].sort_values(by=['Age'])
viewership.Age.value_counts().sort_index()
```

Out[61]:

1	112
18	448
25	790
35	423
45	143
50	108
56	53

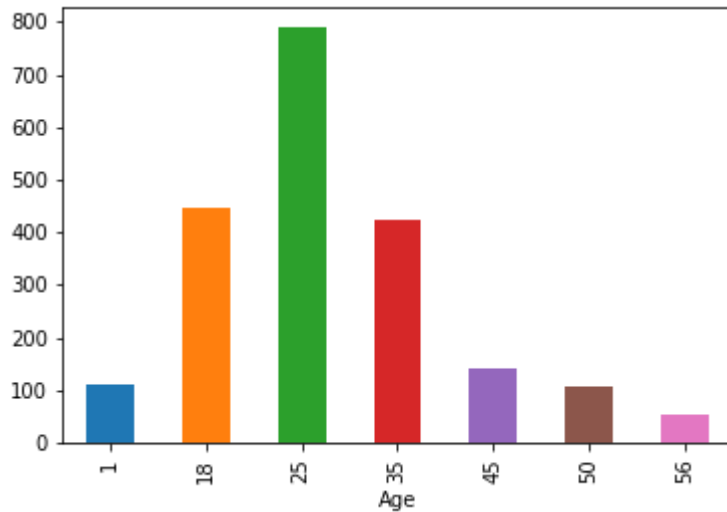
Name: Age, dtype: int64

In [64]:

```
Master_Data[Master_Data.Title == 'Toy Story (1995)'].groupby(by=Master_Data.Age).count  
(')['UserID'].plot(kind = 'bar')
```

Out[64]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x271d7520470>

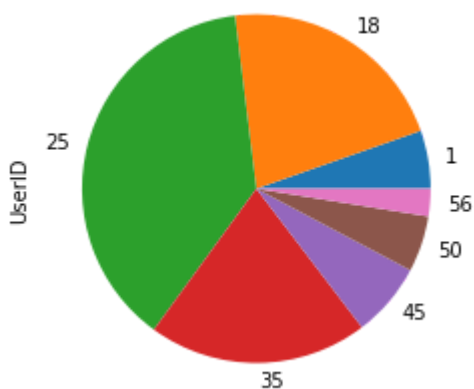


In [12]:

```
Master_Data[Master_Data.Title == 'Toy Story (1995)'].groupby(by=Master_Data.Age).count  
(')['UserID'].plot(kind = 'pie')
```

Out[12]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x1d5197e8898>



**Find the top 25 movies by viewership rating**



In [21]:

```
#Master_Data["MovieID"].value_counts().head(25)
Master_Data.groupby("MovieID").Ratings.count().nlargest(25)
```

Out[21]:

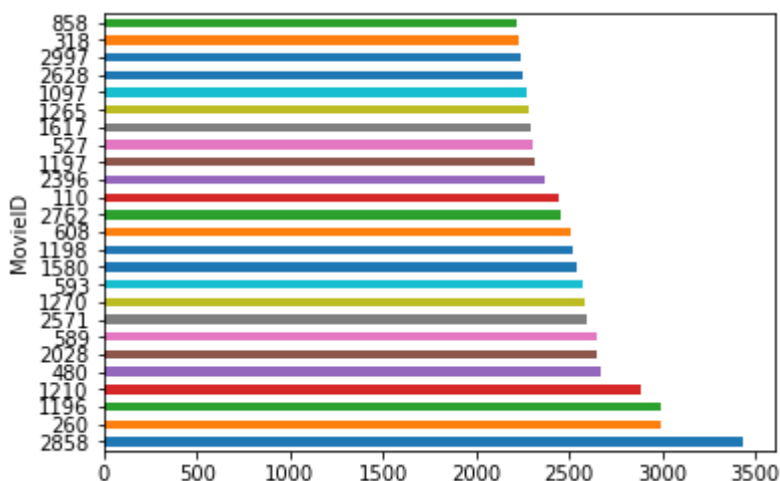
```
MovieID
2858    3428
260     2991
1196    2990
1210    2883
480     2672
2028    2653
589     2649
2571    2590
1270    2583
593     2578
1580    2538
1198    2514
608     2513
2762    2459
110     2443
2396    2369
1197    2318
527     2304
1617    2288
1265    2278
1097    2269
2628    2250
2997    2241
318     2227
858     2223
Name: Ratings, dtype: int64
```

In [22]:

```
Master_Data.groupby("MovieID").Ratings.count().nlargest(25).plot(kind = "barh")
```

Out[22]:

```
<matplotlib.axes._subplots.AxesSubplot at 0xd519726ac8>
```



**Find and visualize the rating for a particular user of user id =2696**

In [24]:

```
Master_Data[Master_Data['UserID']==2696].groupby('Ratings')['MovieID'].count()
```

Out[24]:

Ratings

1 2

2 3

3 3

4 11

5 1

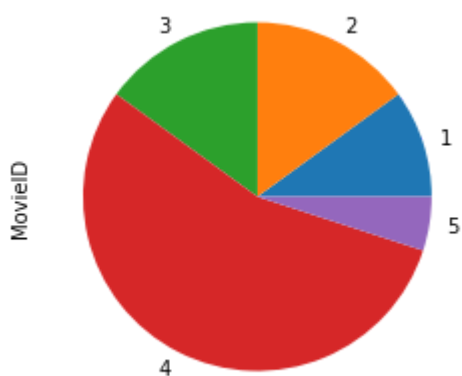
Name: MovieID, dtype: int64

In [25]:

```
Master_Data[Master_Data['UserID']==2696].groupby('Ratings')['MovieID'].count().plot(kind = "pie")
```

Out[25]:

&lt;matplotlib.axes.\_subplots.AxesSubplot at 0x1d5196b9518&gt;

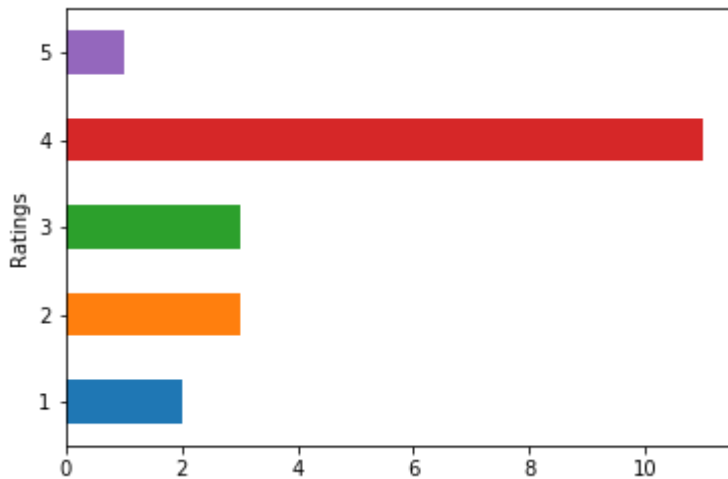


In [26]:

```
Master_Data[Master_Data['UserID']==2696].groupby('Ratings')['MovieID'].count().plot(kind = "barh")
```

Out[26]:

<matplotlib.axes.\_subplots.AxesSubplot at 0x1d5196a8dd8>



## Perform machine learning on first 500 extracted records

**Features : MovieID, Age, Occupation & Label : Ratings**

In [5]:

```
ML_DataModel = Master_Data.head(500).iloc[:,[0,3,5,6]]  
features = ML_DataModel.iloc[:,[0,1,2]].values  
label = ML_DataModel.iloc[:,3].values  
# Multi-Classification  
# KNN algorithm
```

In [7]:

```
ML_DataModel.Ratings.unique()
```

Out[7]:

```
array([5, 4, 3, 2, 1], dtype=int64)
```

## Multi-classification : K-NN Algorithm

In [81]:

```
# Determine the random state for generalization
from sklearn.model_selection import train_test_split
from sklearn.neighbors import KNeighborsClassifier
for i in range(1,1000209):

    X_train,X_test,y_train,y_test = train_test_split(features,
                                                    label,
                                                    test_size=0.2,
                                                    random_state= i)

    model = KNeighborsClassifier()
    model.fit(X_train,y_train)
    training_score = model.score(X_train,y_train)
    testing_score = model.score(X_test,y_test)
    if testing_score > training_score:
        print("Training Score is {} Testing Score is {} in Random state {}".format(trai
ning_score,testing_score,i))
```

Training Score is 0.55 Testing Score is 0.56 in Random state 343  
Training Score is 0.525 Testing Score is 0.55 in Random state 400  
Training Score is 0.5275 Testing Score is 0.53 in Random state 411  
Training Score is 0.535 Testing Score is 0.55 in Random state 466  
Training Score is 0.545 Testing Score is 0.55 in Random state 552  
Training Score is 0.535 Testing Score is 0.55 in Random state 660  
Training Score is 0.4825 Testing Score is 0.56 in Random state 1244  
Training Score is 0.5375 Testing Score is 0.55 in Random state 1569  
Training Score is 0.535 Testing Score is 0.58 in Random state 1884  
Training Score is 0.5425 Testing Score is 0.55 in Random state 1922  
Training Score is 0.485 Testing Score is 0.52 in Random state 1924  
Training Score is 0.555 Testing Score is 0.56 in Random state 2072  
Training Score is 0.5375 Testing Score is 0.58 in Random state 2414  
Training Score is 0.5075 Testing Score is 0.52 in Random state 2427  
Training Score is 0.5475 Testing Score is 0.58 in Random state 2480  
Training Score is 0.535 Testing Score is 0.56 in Random state 2584  
Training Score is 0.5225 Testing Score is 0.58 in Random state 2684  
Training Score is 0.5225 Testing Score is 0.54 in Random state 3138  
Training Score is 0.545 Testing Score is 0.56 in Random state 3153  
Training Score is 0.535 Testing Score is 0.54 in Random state 3160  
Training Score is 0.5225 Testing Score is 0.58 in Random state 3566  
Training Score is 0.495 Testing Score is 0.5 in Random state 3596  
Training Score is 0.5125 Testing Score is 0.56 in Random state 3599  
Training Score is 0.5325 Testing Score is 0.55 in Random state 3685  
Training Score is 0.525 Testing Score is 0.54 in Random state 4240  
Training Score is 0.5475 Testing Score is 0.57 in Random state 4285  
Training Score is 0.5075 Testing Score is 0.51 in Random state 4371  
Training Score is 0.5375 Testing Score is 0.55 in Random state 4478  
Training Score is 0.51 Testing Score is 0.52 in Random state 4701  
Training Score is 0.495 Testing Score is 0.52 in Random state 4947  
Training Score is 0.5175 Testing Score is 0.52 in Random state 5012  
Training Score is 0.5375 Testing Score is 0.58 in Random state 5070  
Training Score is 0.4725 Testing Score is 0.5 in Random state 5119  
Training Score is 0.5125 Testing Score is 0.52 in Random state 5125  
Training Score is 0.535 Testing Score is 0.59 in Random state 5539  
Training Score is 0.5425 Testing Score is 0.57 in Random state 6117  
Training Score is 0.5375 Testing Score is 0.56 in Random state 6182  
Training Score is 0.4975 Testing Score is 0.52 in Random state 6333  
Training Score is 0.555 Testing Score is 0.56 in Random state 7093  
Training Score is 0.54 Testing Score is 0.55 in Random state 7111  
Training Score is 0.53 Testing Score is 0.54 in Random state 7141  
Training Score is 0.5575 Testing Score is 0.56 in Random state 7561  
Training Score is 0.55 Testing Score is 0.56 in Random state 8062  
Training Score is 0.5225 Testing Score is 0.53 in Random state 8155  
Training Score is 0.5175 Testing Score is 0.54 in Random state 8426  
Training Score is 0.495 Testing Score is 0.53 in Random state 8487  
Training Score is 0.485 Testing Score is 0.5 in Random state 8538  
Training Score is 0.5325 Testing Score is 0.55 in Random state 8825  
Training Score is 0.515 Testing Score is 0.52 in Random state 8851  
Training Score is 0.535 Testing Score is 0.55 in Random state 9014  
Training Score is 0.55 Testing Score is 0.56 in Random state 9079  
Training Score is 0.4975 Testing Score is 0.51 in Random state 9461  
Training Score is 0.5375 Testing Score is 0.55 in Random state 9699  
Training Score is 0.555 Testing Score is 0.56 in Random state 10088  
Training Score is 0.5525 Testing Score is 0.6 in Random state 10430  
Training Score is 0.5275 Testing Score is 0.57 in Random state 10511  
Training Score is 0.49 Testing Score is 0.5 in Random state 10650  
Training Score is 0.495 Testing Score is 0.52 in Random state 11074  
Training Score is 0.5175 Testing Score is 0.52 in Random state 11529  
Training Score is 0.5575 Testing Score is 0.57 in Random state 11806  
Training Score is 0.4925 Testing Score is 0.51 in Random state 11856

Training Score is 0.545 Testing Score is 0.55 in Random state 12133  
Training Score is 0.545 Testing Score is 0.55 in Random state 12177  
Training Score is 0.5425 Testing Score is 0.56 in Random state 12427  
Training Score is 0.5475 Testing Score is 0.55 in Random state 12571  
Training Score is 0.5275 Testing Score is 0.55 in Random state 12607  
Training Score is 0.5475 Testing Score is 0.59 in Random state 12723  
Training Score is 0.49 Testing Score is 0.53 in Random state 13312  
Training Score is 0.4925 Testing Score is 0.51 in Random state 13494  
Training Score is 0.5225 Testing Score is 0.53 in Random state 13555  
Training Score is 0.5075 Testing Score is 0.52 in Random state 13791  
Training Score is 0.535 Testing Score is 0.57 in Random state 14355  
Training Score is 0.5275 Testing Score is 0.53 in Random state 14429  
Training Score is 0.49 Testing Score is 0.5 in Random state 14432  
Training Score is 0.545 Testing Score is 0.57 in Random state 14889  
Training Score is 0.535 Testing Score is 0.54 in Random state 15029  
Training Score is 0.5525 Testing Score is 0.59 in Random state 15063  
Training Score is 0.5325 Testing Score is 0.6 in Random state 15313  
Training Score is 0.51 Testing Score is 0.53 in Random state 15363  
Training Score is 0.5275 Testing Score is 0.57 in Random state 15570  
Training Score is 0.5325 Testing Score is 0.54 in Random state 15701  
Training Score is 0.5525 Testing Score is 0.58 in Random state 16088  
Training Score is 0.525 Testing Score is 0.57 in Random state 16285  
Training Score is 0.5475 Testing Score is 0.55 in Random state 16404  
Training Score is 0.5375 Testing Score is 0.54 in Random state 16531  
Training Score is 0.5275 Testing Score is 0.61 in Random state 16675  
Training Score is 0.545 Testing Score is 0.56 in Random state 16742  
Training Score is 0.5175 Testing Score is 0.52 in Random state 17086  
Training Score is 0.535 Testing Score is 0.54 in Random state 17272  
Training Score is 0.49 Testing Score is 0.5 in Random state 17381  
Training Score is 0.5375 Testing Score is 0.57 in Random state 17541  
Training Score is 0.55 Testing Score is 0.57 in Random state 17603  
Training Score is 0.52 Testing Score is 0.54 in Random state 17973  
Training Score is 0.5175 Testing Score is 0.54 in Random state 18085  
Training Score is 0.5225 Testing Score is 0.53 in Random state 18237  
Training Score is 0.54 Testing Score is 0.55 in Random state 18734  
Training Score is 0.545 Testing Score is 0.55 in Random state 18758  
Training Score is 0.535 Testing Score is 0.55 in Random state 18808  
Training Score is 0.535 Testing Score is 0.55 in Random state 18996  
Training Score is 0.53 Testing Score is 0.54 in Random state 19360  
Training Score is 0.5275 Testing Score is 0.54 in Random state 19431  
Training Score is 0.5325 Testing Score is 0.54 in Random state 19489  
Training Score is 0.5275 Testing Score is 0.57 in Random state 19767  
Training Score is 0.54 Testing Score is 0.56 in Random state 20286  
Training Score is 0.555 Testing Score is 0.57 in Random state 20401  
Training Score is 0.535 Testing Score is 0.54 in Random state 20583  
Training Score is 0.555 Testing Score is 0.56 in Random state 20816  
Training Score is 0.55 Testing Score is 0.56 in Random state 21038  
Training Score is 0.4975 Testing Score is 0.51 in Random state 21223  
Training Score is 0.5325 Testing Score is 0.58 in Random state 21389  
Training Score is 0.5325 Testing Score is 0.54 in Random state 21593  
Training Score is 0.545 Testing Score is 0.58 in Random state 21679  
Training Score is 0.52 Testing Score is 0.53 in Random state 21770  
Training Score is 0.5125 Testing Score is 0.58 in Random state 22115  
Training Score is 0.5 Testing Score is 0.54 in Random state 22208  
Training Score is 0.475 Testing Score is 0.53 in Random state 22508  
Training Score is 0.52 Testing Score is 0.56 in Random state 22659  
Training Score is 0.4825 Testing Score is 0.53 in Random state 23964  
Training Score is 0.4925 Testing Score is 0.54 in Random state 24035  
Training Score is 0.525 Testing Score is 0.55 in Random state 24134  
Training Score is 0.4825 Testing Score is 0.49 in Random state 24388  
Training Score is 0.535 Testing Score is 0.55 in Random state 24408

Training Score is 0.5375 Testing Score is 0.55 in Random state 24453  
Training Score is 0.565 Testing Score is 0.57 in Random state 24545  
Training Score is 0.5225 Testing Score is 0.53 in Random state 24911  
Training Score is 0.555 Testing Score is 0.56 in Random state 25144  
Training Score is 0.51 Testing Score is 0.52 in Random state 25251  
Training Score is 0.5125 Testing Score is 0.53 in Random state 25397  
Training Score is 0.5375 Testing Score is 0.54 in Random state 25453  
Training Score is 0.54 Testing Score is 0.56 in Random state 25588  
Training Score is 0.555 Testing Score is 0.57 in Random state 25665  
Training Score is 0.56 Testing Score is 0.57 in Random state 25704  
Training Score is 0.5325 Testing Score is 0.57 in Random state 25790  
Training Score is 0.4975 Testing Score is 0.56 in Random state 25951  
Training Score is 0.5375 Testing Score is 0.54 in Random state 25990  
Training Score is 0.5425 Testing Score is 0.55 in Random state 26225  
Training Score is 0.5475 Testing Score is 0.55 in Random state 26251  
Training Score is 0.535 Testing Score is 0.54 in Random state 26372  
Training Score is 0.515 Testing Score is 0.52 in Random state 26649  
Training Score is 0.5475 Testing Score is 0.55 in Random state 26833  
Training Score is 0.4725 Testing Score is 0.48 in Random state 27161  
Training Score is 0.5425 Testing Score is 0.57 in Random state 27817  
Training Score is 0.4975 Testing Score is 0.52 in Random state 28069  
Training Score is 0.545 Testing Score is 0.55 in Random state 28206  
Training Score is 0.515 Testing Score is 0.52 in Random state 28321  
Training Score is 0.5425 Testing Score is 0.56 in Random state 28343  
Training Score is 0.5375 Testing Score is 0.56 in Random state 28388  
Training Score is 0.5425 Testing Score is 0.56 in Random state 28847  
Training Score is 0.545 Testing Score is 0.55 in Random state 29259  
Training Score is 0.5525 Testing Score is 0.56 in Random state 29964  
Training Score is 0.535 Testing Score is 0.56 in Random state 30351  
Training Score is 0.5325 Testing Score is 0.54 in Random state 30381  
Training Score is 0.4975 Testing Score is 0.5 in Random state 30789  
Training Score is 0.5275 Testing Score is 0.53 in Random state 30902  
Training Score is 0.4975 Testing Score is 0.51 in Random state 31000  
Training Score is 0.5375 Testing Score is 0.54 in Random state 31101  
Training Score is 0.5225 Testing Score is 0.53 in Random state 31181  
Training Score is 0.525 Testing Score is 0.54 in Random state 31299  
Training Score is 0.515 Testing Score is 0.52 in Random state 31703  
Training Score is 0.5425 Testing Score is 0.57 in Random state 31736  
Training Score is 0.5475 Testing Score is 0.57 in Random state 31831  
Training Score is 0.5325 Testing Score is 0.55 in Random state 32147  
Training Score is 0.485 Testing Score is 0.53 in Random state 32185  
Training Score is 0.5375 Testing Score is 0.55 in Random state 32344  
Training Score is 0.51 Testing Score is 0.53 in Random state 32511  
Training Score is 0.5325 Testing Score is 0.56 in Random state 32920  
Training Score is 0.5075 Testing Score is 0.54 in Random state 33051  
Training Score is 0.545 Testing Score is 0.56 in Random state 33246  
Training Score is 0.5325 Testing Score is 0.54 in Random state 33346  
Training Score is 0.52 Testing Score is 0.53 in Random state 33486  
Training Score is 0.555 Testing Score is 0.56 in Random state 33675  
Training Score is 0.505 Testing Score is 0.52 in Random state 33751  
Training Score is 0.495 Testing Score is 0.53 in Random state 33818  
Training Score is 0.51 Testing Score is 0.52 in Random state 34075  
Training Score is 0.5175 Testing Score is 0.54 in Random state 34261  
Training Score is 0.545 Testing Score is 0.56 in Random state 34398  
Training Score is 0.4975 Testing Score is 0.5 in Random state 34425  
Training Score is 0.495 Testing Score is 0.51 in Random state 34492  
Training Score is 0.545 Testing Score is 0.57 in Random state 34732  
Training Score is 0.5325 Testing Score is 0.54 in Random state 34745  
Training Score is 0.54 Testing Score is 0.55 in Random state 34813  
Training Score is 0.525 Testing Score is 0.54 in Random state 34883  
Training Score is 0.5725 Testing Score is 0.59 in Random state 35141



Training Score is 0.5 Testing Score is 0.53 in Random state 35341  
Training Score is 0.525 Testing Score is 0.53 in Random state 35342  
Training Score is 0.5125 Testing Score is 0.52 in Random state 35591  
Training Score is 0.525 Testing Score is 0.53 in Random state 35635  
Training Score is 0.5325 Testing Score is 0.54 in Random state 35764  
Training Score is 0.51 Testing Score is 0.53 in Random state 35904  
Training Score is 0.54 Testing Score is 0.57 in Random state 36079  
Training Score is 0.5375 Testing Score is 0.58 in Random state 36140  
Training Score is 0.535 Testing Score is 0.54 in Random state 36192  
Training Score is 0.545 Testing Score is 0.56 in Random state 36261  
Training Score is 0.5525 Testing Score is 0.56 in Random state 36340  
Training Score is 0.4925 Testing Score is 0.5 in Random state 36357  
Training Score is 0.5275 Testing Score is 0.53 in Random state 36679  
Training Score is 0.5375 Testing Score is 0.56 in Random state 36983  
Training Score is 0.535 Testing Score is 0.56 in Random state 37014  
Training Score is 0.525 Testing Score is 0.56 in Random state 37031  
Training Score is 0.5425 Testing Score is 0.56 in Random state 37101  
Training Score is 0.52 Testing Score is 0.53 in Random state 37109  
Training Score is 0.5275 Testing Score is 0.54 in Random state 37200  
Training Score is 0.5475 Testing Score is 0.56 in Random state 37422  
Training Score is 0.5375 Testing Score is 0.54 in Random state 37433  
Training Score is 0.52 Testing Score is 0.54 in Random state 37853  
Training Score is 0.5425 Testing Score is 0.59 in Random state 37918  
Training Score is 0.5425 Testing Score is 0.55 in Random state 38388  
Training Score is 0.515 Testing Score is 0.55 in Random state 38441  
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Training Score is 0.5375 Testing Score is 0.54 in Random state 103602  
Training Score is 0.535 Testing Score is 0.54 in Random state 103955  
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Training Score is 0.495 Testing Score is 0.52 in Random state 111853  
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Training Score is 0.5325 Testing Score is 0.61 in Random state 112175  
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Training Score is 0.5475 Testing Score is 0.57 in Random state 114288  
Training Score is 0.5125 Testing Score is 0.52 in Random state 114662  
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Training Score is 0.4925 Testing Score is 0.51 in Random state 114786  
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Training Score is 0.505 Testing Score is 0.52 in Random state 116529  
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Training Score is 0.535 Testing Score is 0.55 in Random state 155856  
Training Score is 0.5025 Testing Score is 0.52 in Random state 156174

```

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-
KeyboardInterrupt                                Traceback (most recent call las
t)
<ipython-input-81-e155a9a7142b> in <module>
    10     model.fit(X_train,y_train)
    11     training_score = model.score(X_train,y_train)
--> 12     testing_score = model.score(X_test,y_test)
    13     if testing_score > training_score:
    14         print("Training Score is {} Testing Score is {} in Random
state {}".format(training_score,testing_score,i))

F:\Anaconda\lib\site-packages\sklearn\base.py in score(self, X, y, sample_
weight)
    286         """
    287         from .metrics import accuracy_score
--> 288         return accuracy_score(y, self.predict(X), sample_weight=sa
mple_weight)
    289
    290

F:\Anaconda\lib\site-packages\sklearn\neighbors\classification.py in predi
ct(self, X)
    147         X = check_array(X, accept_sparse='csr')
    148
--> 149         neigh_dist, neigh_ind = self.kneighbors(X)
    150         classes_ = self.classes_
    151         _y = self._y

F:\Anaconda\lib\site-packages\sklearn\neighbors\base.py in kneighbors(sel
f, X, n_neighbors, return_distance)
    453         delayed_query(
    454             self._tree, X[s], n_neighbors, return_distanc
e)
--> 455         for s in gen_even_slices(X.shape[0], n_jobs)
    456             )
    457         else:

F:\Anaconda\lib\site-packages\sklearn\externals\joblib\parallel.py in __ca
ll__(self, iterable)
    915         # remaining jobs.
    916         self._iterating = False
--> 917         if self.dispatch_one_batch(iterator):
    918             self._iterating = self._original_iterator is not N
one
    919

F:\Anaconda\lib\site-packages\sklearn\externals\joblib\parallel.py in disp
atch_one_batch(self, iterator)
    757         return False
    758         else:
--> 759             self._dispatch(tasks)
    760             return True
    761

F:\Anaconda\lib\site-packages\sklearn\externals\joblib\parallel.py in _dis
patch(self, batch)
    714         with self._lock:
    715             job_idx = len(self._jobs)
--> 716             job = self._backend.apply_async(batch, callback=cb)
    717             # A job can complete so quickly than its callback is

```

```

718             # called before we get here, causing self._jobs to

F:\Anaconda\lib\site-packages\sklearn\externals\joblib\_parallel_backends.
py in apply_async(self, func, callback)
    180     def apply_async(self, func, callback=None):
    181         """Schedule a func to be run"""
--> 182         result = ImmediateResult(func)
    183         if callback:
    184             callback(result)

F:\Anaconda\lib\site-packages\sklearn\externals\joblib\_parallel_backends.
py in __init__(self, batch)
    547         # Don't delay the application, to avoid keeping the input
    548         # arguments in memory
--> 549         self.results = batch()
    550
    551     def get(self):

F:\Anaconda\lib\site-packages\sklearn\externals\joblib\parallel.py in __ca
ll__(self)
    223         with parallel_backend(self._backend, n_jobs=self._n_jobs):
    224             return [func(*args, **kwargs)
--> 225                     for func, args, kwargs in self.items]
    226
    227     def __len__(self):

F:\Anaconda\lib\site-packages\sklearn\externals\joblib\parallel.py in <lis
tcomp>(.0)
    223         with parallel_backend(self._backend, n_jobs=self._n_jobs):
    224             return [func(*args, **kwargs)
--> 225                     for func, args, kwargs in self.items]
    226
    227     def __len__(self):

F:\Anaconda\lib\site-packages\sklearn\neighbors\base.py in _tree_query_par
allel_helper(tree, data, n_neighbors, return_distance)
    290     under PyPy.
    291     """
--> 292     return tree.query(data, n_neighbors, return_distance)
    293
    294

```

**KeyboardInterrupt:**

In [ ]:

```
# Training Score is 0.5425 Testing Score is 0.62 in Random state 80599
```

In [21]:

```

# Create Train Test Split
from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test = train_test_split(features,
                                                label,
                                                test_size = 0.2,
                                                random_state=80599)

```

In [32]:

```
# Identify which k value gives generalized
from sklearn.neighbors import KNeighborsClassifier
from sklearn import metrics
k_range=range(1,401)
#k_range=range(40,60)
scores={}
score_list=[]
for k in k_range:
    knn = KNeighborsClassifier(n_neighbors= k)
    knn.fit(X_train,y_train)
    y_pred=knn.predict(X_test)
    scores[k]=metrics.accuracy_score(y_test,y_pred)
    score_list.append(metrics.accuracy_score(y_test,y_pred))
print(max(score_list))
```





[illegible]

file:///C:/Users/Piu/Downloads/Project 1-Movielens Case Study.html

[illegible]

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In [35]:

Out[35]:

```
Text(0, 0.5, 'Testing accuracy')
```



In [36]:

```
# For k value as 6, the testing accuracy value is 0.65.
```

In [43]:

```
# Create final model based on the discovered k value
from sklearn.neighbors import KNeighborsClassifier
knn_model = KNeighborsClassifier(n_neighbors= 6)
knn_model.fit(X_train,y_train)
```

Out[43]:

```
KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',
                    metric_params=None, n_jobs=None, n_neighbors=6, p=2,
                    weights='uniform')
```

In [44]:

```
y_pred = knn_model.predict(X_test)
print(metrics.accuracy_score(y_test, y_pred))
```

0.65

In [45]:

```
# Check Generalization
print(knn_model.score(X_train,y_train))
print(knn_model.score(X_test,y_test))
```

0.5425

0.65

In [61]:

```
# Check user input model prediction
movie_id = float(input("enter moviId: "))
age = float(input("enter age: "))
occupation = float(input("enter occupation: "))
features_input = np.array([[movie_id,age,occupation]])
#print(features_input)
rating_out = knn_model.predict(features_input)
print("Rating of your given input is",rating_out)
```

enter moviId: 23

enter age: 25

enter occupation: 20

Rating of your given input is [5]

In [ ]: