Untitled2

May 16, 2020

[1]:
```
#import libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

%matplotlib inline


# machine learning
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC, LinearSVC
from sklearn.ensemble import RandomForestClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.naive_bayes import GaussianNB
from sklearn.linear_model import Perceptron
from sklearn.linear_model import SGDClassifier
from sklearn.tree import DecisionTreeClassifier
```

[2]:
```
# Import Movies Dataset
dfMovies = pd.read_csv("movies.dat",sep="::
 ↪",names=["MovieID","Title","Genres"],engine='python')
dfMovies.head()
```

[2]:
```
   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
```

[39]:
```
# Import Ratings Dataset
dfRatings = pd.read_csv("ratings.dat",sep="::
 ↪",names=["UserID","MovieID","Rating","Timestamp"],engine='python')
dfRatings.head()
```

```
[39]:    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
```

```
[5]: # Import Ratings Dataset
     dfUsers = pd.read_csv("users.dat",sep="::
      ↪",names=["UserID","Gender","Age","Occupation","Zip-code"],engine='python')
     dfUsers.head()
```

```
[5]:    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
```

```
[6]: dfMovies.shape
```

```
[6]: (3883, 3)
```

```
[7]: dfRatings.shape
```

```
[7]: (1000209, 4)
```

```
[8]: dfMovieRatings = dfMovies.merge(dfRatings,on='MovieID',how='inner')
     dfMovieRatings.head()
```

```
[8]:    MovieID             Title                        Genres  UserID  Rating  \
     0        1  Toy Story (1995)  Animation|Children's|Comedy       1       5
     1        1  Toy Story (1995)  Animation|Children's|Comedy       6       4
     2        1  Toy Story (1995)  Animation|Children's|Comedy       8       4
     3        1  Toy Story (1995)  Animation|Children's|Comedy       9       5
     4        1  Toy Story (1995)  Animation|Children's|Comedy      10       5

        Timestamp
     0  978824268
     1  978237008
     2  978233496
     3  978225952
     4  978226474
```

```
[9]: # to check whether merging does not changes any dataset
     dfMovieRatings.shape
```

[9]:
```
(1000209, 6)
```

[10]:
```
#Create a new dataset [Master]
dfMaster = dfMovieRatings.merge(dfUsers,on="UserID",how='inner')
dfMaster.head()
```

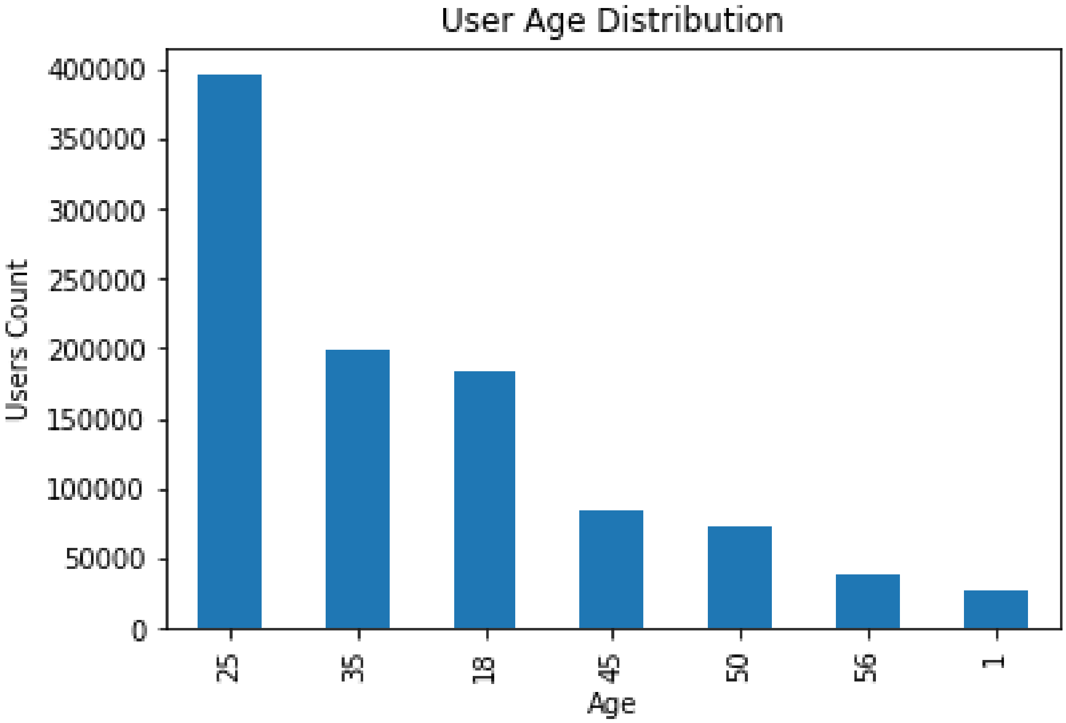
[10]:
```
   MovieID                                       Title  \
0        1                            Toy Story (1995)
1       48                           Pocahontas (1995)
2      150                            Apollo 13 (1995)
3      260  Star Wars: Episode IV - A New Hope (1977)
4      527                     Schindler's List (1993)

                                Genres  UserID  Rating  Timestamp Gender  \
0          Animation|Children's|Comedy       1       5  978824268      F
1  Animation|Children's|Musical|Romance       1       5  978824351      F
2                                Drama       1       5  978301777      F
3       Action|Adventure|Fantasy|Sci-Fi       1       4  978300760      F
4                            Drama|War       1       5  978824195      F

   Age  Occupation Zip-code
0    1          10    48067
1    1          10    48067
2    1          10    48067
3    1          10    48067
4    1          10    48067
```

[11]:
```
dfMaster.to_csv("Master.csv")
```

[12]:
```
# Users with Different Age Groups
dfMaster['Age'].value_counts()
```

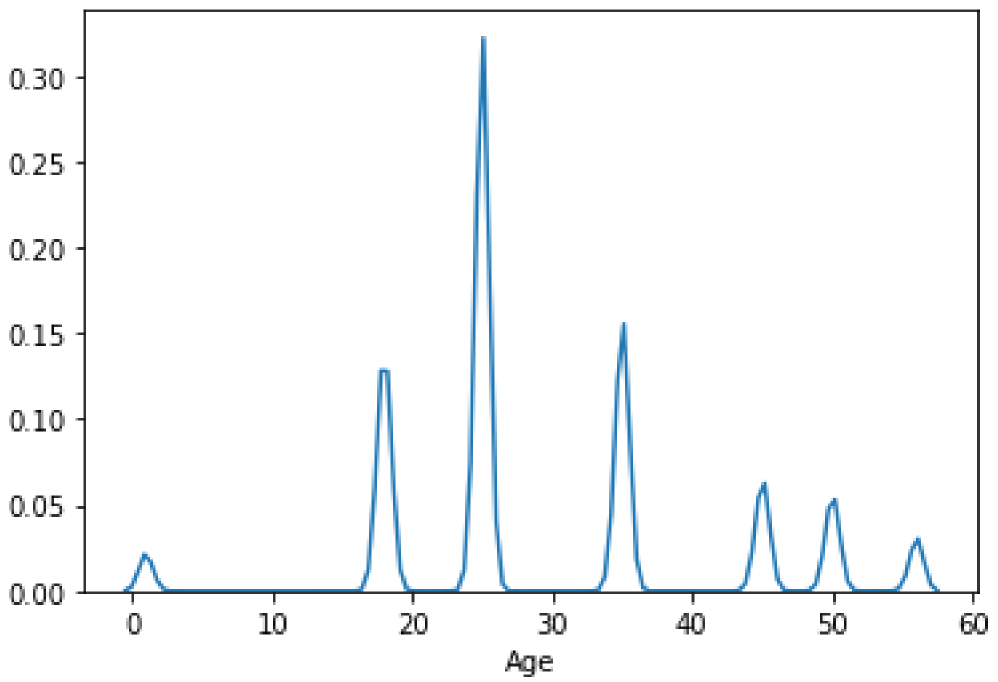
[12]:
```
25    395556
35    199003
18    183536
45     83633
50     72490
56     38780
1      27211
Name: Age, dtype: int64
```

[13]:
```
# Plot for users with different age groups
dfMaster['Age'].value_counts().plot(kind='bar')
plt.xlabel("Age")
plt.title("User Age Distribution")
plt.ylabel('Users Count')
plt.show()
```



[70]:
```
import seaborn as sns
sns.distplot(dfMaster["Age"], hist=False)
# We can observe from both the plots that maximum user fall in the age group of␣
↪20 to 30.
```

[70]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f8c36c24e10>
```



```
[14]: # User rating of the movie "Toy Story"
      toystoryRating = dfMaster[dfMaster['Title'].str.contains('Toy Story') == True]
      toystoryRating
```

```
[14]:          MovieID               Title                       Genres  UserID  \
      0              1    Toy Story (1995)  Animation|Children's|Comedy       1
      50          3114  Toy Story 2 (1999)  Animation|Children's|Comedy       1
      53             1    Toy Story (1995)  Animation|Children's|Comedy       6
      124            1    Toy Story (1995)  Animation|Children's|Comedy       8
      263            1    Toy Story (1995)  Animation|Children's|Comedy       9
      …          …                 …                          …     …
      998988      3114  Toy Story 2 (1999)  Animation|Children's|Comedy    3023
      999027      3114  Toy Story 2 (1999)  Animation|Children's|Comedy    5800
      999486      3114  Toy Story 2 (1999)  Animation|Children's|Comedy    2189
      999869      3114  Toy Story 2 (1999)  Animation|Children's|Comedy     159
      1000192     3114  Toy Story 2 (1999)  Animation|Children's|Comedy    5727

               Rating  Timestamp Gender  Age  Occupation Zip-code
      0             5  978824268      F    1          10    48067
      50            4  978302174      F    1          10    48067
      53            4  978237008      F   50           9    55117
      124           4  978233496      M   25          12    11413
      263           5  978225952      M   25          17    61614
      …         …        …    …  …         …      …
      998988        4  970471948      F   25           7    92108
```

```
999027         5  958015250      M   35           18     90804
999486         4  974607816      M    1           10     60148
999869         4  989966944      F   45            0     37922
1000192        5  958492554      M   25            4     92843

[3662 rows x 10 columns]
```

[15]:

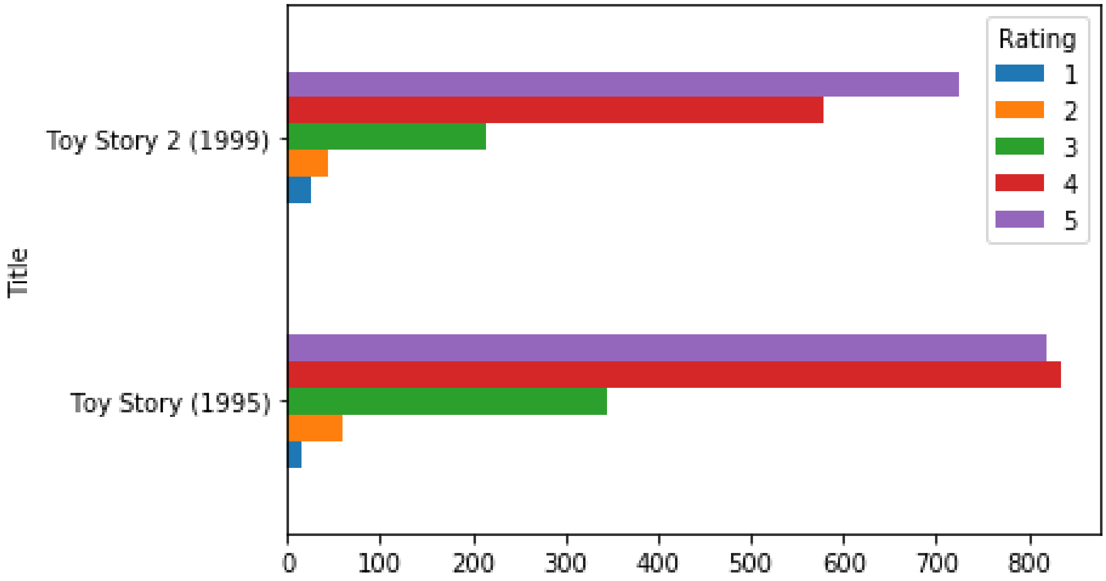
```
toystoryRating.groupby(["Title","Rating"]).size()
```

[15]:

```
Title                Rating
Toy Story (1995)     1          16
                     2          61
                     3         345
                     4         835
                     5         820
Toy Story 2 (1999)   1          25
                     2          44
                     3         214
                     4         578
                     5         724
dtype: int64
```

[16]:

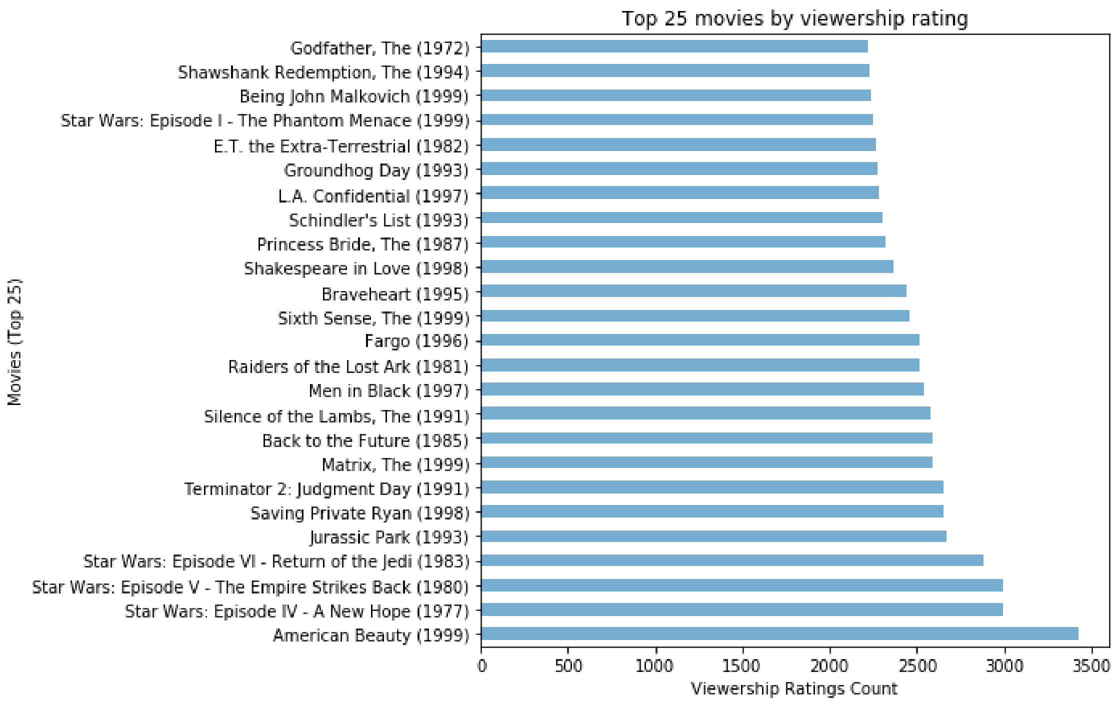
```
toystoryRating.groupby(["Title","Rating"]).size().unstack().
 ↪plot(kind='barh',stacked=False,legend=True)
plt.show()
```



```
[17]: #Top 25 movies by viewership rating
      dfTop25 = dfMaster.groupby('Title').size().sort_values(ascending=False)[:25]
      dfTop25
```

```
[17]: Title
      American Beauty (1999)                                   3428
      Star Wars: Episode IV - A New Hope (1977)                2991
      Star Wars: Episode V - The Empire Strikes Back (1980)    2990
      Star Wars: Episode VI - Return of the Jedi (1983)        2883
      Jurassic Park (1993)                                     2672
      Saving Private Ryan (1998)                               2653
      Terminator 2: Judgment Day (1991)                        2649
      Matrix, The (1999)                                       2590
      Back to the Future (1985)                                2583
      Silence of the Lambs, The (1991)                         2578
      Men in Black (1997)                                      2538
      Raiders of the Lost Ark (1981)                           2514
      Fargo (1996)                                             2513
      Sixth Sense, The (1999)                                  2459
      Braveheart (1995)                                        2443
      Shakespeare in Love (1998)                               2369
      Princess Bride, The (1987)                               2318
      Schindler's List (1993)                                  2304
      L.A. Confidential (1997)                                 2288
      Groundhog Day (1993)                                     2278
      E.T. the Extra-Terrestrial (1982)                        2269
      Star Wars: Episode I - The Phantom Menace (1999)         2250
      Being John Malkovich (1999)                              2241
      Shawshank Redemption, The (1994)                         2227
      Godfather, The (1972)                                    2223
      dtype: int64
```

```
[18]: dfTop25.plot(kind='barh',alpha=0.6,figsize=(7,7))
      plt.xlabel("Viewership Ratings Count")
      plt.ylabel("Movies (Top 25)")
      plt.title("Top 25 movies by viewership rating")
      plt.show()
```



[19]:
```
# Finding the ratings for all the movies reviewed by for a particular user of user id = 2696
userId = 2696
userRatingById = dfMaster[dfMaster["UserID"] == userId]
userRatingById
```

[19]:
```
        MovieID                                           Title  \
991035      350                                  Client, The (1994)
991036      800                                   Lone Star (1996)
991037     1092                              Basic Instinct (1992)
991038     1097                   E.T. the Extra-Terrestrial (1982)
991039     1258                                 Shining, The (1980)
991040     1270                          Back to the Future (1985)
991041     1589                                    Cop Land (1997)
991042     1617                           L.A. Confidential (1997)
991043     1625                                    Game, The (1997)
991044     1644              I Know What You Did Last Summer (1997)
991045     1645                         Devil's Advocate, The (1997)
991046     1711  Midnight in the Garden of Good and Evil (1997)
991047     1783                                    Palmetto (1998)
991048     1805                                 Wild Things (1998)
991049     1892                          Perfect Murder, A (1998)
991050     2338         I Still Know What You Did Last Summer (1998)
991051     2389                                      Psycho (1998)
```

```
991052     2713                            Lake Placid (1999)
991053     3176               Talented Mr. Ripley, The (1999)
991054     3386                                    JFK (1991)

                                  Genres  UserID  Rating  Timestamp Gender  \
991035            Drama|Mystery|Thriller    2696       3  973308886      M
991036                     Drama|Mystery    2696       5  973308842      M
991037                  Mystery|Thriller    2696       4  973308886      M
991038   Children's|Drama|Fantasy|Sci-Fi    2696       3  973308690      M
991039                            Horror    2696       4  973308710      M
991040                     Comedy|Sci-Fi    2696       2  973308676      M
991041               Crime|Drama|Mystery    2696       3  973308865      M
991042  Crime|Film-Noir|Mystery|Thriller    2696       4  973308842      M
991043                  Mystery|Thriller    2696       4  973308842      M
991044           Horror|Mystery|Thriller    2696       2  973308920      M
991045     Crime|Horror|Mystery|Thriller    2696       4  973308904      M
991046        Comedy|Crime|Drama|Mystery    2696       4  973308904      M
991047        Film-Noir|Mystery|Thriller    2696       4  973308865      M
991048      Crime|Drama|Mystery|Thriller    2696       4  973308886      M
991049                  Mystery|Thriller    2696       4  973308904      M
991050           Horror|Mystery|Thriller    2696       2  973308920      M
991051             Crime|Horror|Thriller    2696       4  973308710      M
991052                   Horror|Thriller    2696       1  973308710      M
991053            Drama|Mystery|Thriller    2696       4  973308865      M
991054                     Drama|Mystery    2696       1  973308842      M

        Age  Occupation Zip-code
991035   25           7    24210
991036   25           7    24210
991037   25           7    24210
991038   25           7    24210
991039   25           7    24210
991040   25           7    24210
991041   25           7    24210
991042   25           7    24210
991043   25           7    24210
991044   25           7    24210
991045   25           7    24210
991046   25           7    24210
991047   25           7    24210
991048   25           7    24210
991049   25           7    24210
991050   25           7    24210
991051   25           7    24210
991052   25           7    24210
991053   25           7    24210
991054   25           7    24210
```

[20]:

```
# Feature Engineering
# Find out all the unique genres
# dfGenres = dfMaster[]
dfGenres = dfMaster['Genres'].str.split("|")
```

[21]:

```
dfGenres
```

[21]:

```
0                        [Animation, Children's, Comedy]
1              [Animation, Children's, Musical, Romance]
2                                                [Drama]
3                   [Action, Adventure, Fantasy, Sci-Fi]
4                                           [Drama, War]
                              …
1000204                               [Drama, Thriller]
1000205                       [Comedy, Horror, Thriller]
1000206                               [Comedy, Romance]
1000207                              [Action, Thriller]
1000208                                 [Action, Drama]
Name: Genres, Length: 1000209, dtype: object
```

[23]:

```
listGenres = set()
for genre in dfGenres:
    listGenres = listGenres.union(set(genre))
# All Unique genres
listGenres
```

[23]:

```
{'Action',
 'Adventure',
 'Animation',
 "Children's",
 'Comedy',
 'Crime',
 'Documentary',
 'Drama',
 'Fantasy',
 'Film-Noir',
 'Horror',
 'Musical',
 'Mystery',
 'Romance',
 'Sci-Fi',
 'Thriller',
 'War',
 'Western'}
```

[25]:

```
# Create a separate column for each genre category with a one-hot encoding ( 1␣
↪and 0) whether
```

```
# or not the movie belongs to that genre.
ratingsOneHot = dfMaster['Genres'].str.get_dummies("|")
```

[26]:
```
ratingsOneHot.head()
```

[26]:
```
   Action  Adventure  Animation  Children's  Comedy  Crime  Documentary  \
0       0          0          1           1       1      0            0
1       0          0          1           1       0      0            0
2       0          0          0           0       0      0            0
3       1          1          0           0       0      0            0
4       0          0          0           0       0      0            0

   Drama  Fantasy  Film-Noir  Horror  Musical  Mystery  Romance  Sci-Fi  \
0      0        0          0       0        0        0        0       0
1      0        0          0       0        1        0        1       0
2      1        0          0       0        0        0        0       0
3      0        1          0       0        0        0        0       1
4      1        0          0       0        0        0        0       0

   Thriller  War  Western
0         0    0        0
1         0    0        0
2         0    0        0
3         0    0        0
4         0    1        0
```

[27]:
```
dfMaster = pd.concat([dfMaster,ratingsOneHot],axis=1)
```

[28]:
```
dfMaster.head()
```

[28]:
```
   MovieID                                      Title  \
0        1                           Toy Story (1995)
1       48                          Pocahontas (1995)
2      150                           Apollo 13 (1995)
3      260  Star Wars: Episode IV - A New Hope (1977)
4      527                    Schindler's List (1993)

                                 Genres  UserID  Rating  Timestamp Gender  \
0           Animation|Children's|Comedy       1       5  978824268      F
1  Animation|Children's|Musical|Romance       1       5  978824351      F
2                                 Drama       1       5  978301777      F
3      Action|Adventure|Fantasy|Sci-Fi       1       4  978300760      F
4                             Drama|War       1       5  978824195      F

   Age  Occupation Zip-code  …  Fantasy  Film-Noir  Horror  Musical  \
0    1          10    48067  …        0          0       0        0
1    1          10    48067  …        0          0       0        1
```

```
2    1           10     48067  …         0           0        0         0
3    1           10     48067  …         1           0        0         0
4    1           10     48067  …         0           0        0         0

   Mystery  Romance  Sci-Fi  Thriller  War  Western
0        0        0       0         0    0        0
1        0        1       0         0    0        0
2        0        0       0         0    0        0
3        0        0       1         0    0        0
4        0        0       0         0    1        0

[5 rows x 28 columns]
```

```
[29]: dfMaster.columns
```

```
[29]: Index(['MovieID', 'Title', 'Genres', 'UserID', 'Rating', 'Timestamp', 'Gender',
             'Age', 'Occupation', 'Zip-code', 'Action', 'Adventure', 'Animation',
             'Children's', 'Comedy', 'Crime', 'Documentary', 'Drama', 'Fantasy',
             'Film-Noir', 'Horror', 'Musical', 'Mystery', 'Romance', 'Sci-Fi',
             'Thriller', 'War', 'Western'],
            dtype='object')
```

```
[30]: dfMaster.to_csv("Final_Master.csv")
```

```
[31]: # Determining the features affecting the ratings of any particular movie.
      dfMaster[["title","Year"]] = dfMaster.Title.str.extract("(.)\s\((.
       ↪\d+)",expand=True)
```

```
[32]: dfMaster = dfMaster.drop(columns=["title"])
      dfMaster.head()
```

```
[32]:    MovieID                                      Title  \
      0        1                           Toy Story (1995)
      1       48                          Pocahontas (1995)
      2      150                           Apollo 13 (1995)
      3      260  Star Wars: Episode IV - A New Hope (1977)
      4      527                    Schindler's List (1993)

                                   Genres  UserID  Rating  Timestamp Gender  \
      0           Animation|Children's|Comedy       1       5  978824268      F
      1  Animation|Children's|Musical|Romance       1       5  978824351      F
      2                                Drama       1       5  978301777      F
      3       Action|Adventure|Fantasy|Sci-Fi       1       4  978300760      F
      4                            Drama|War       1       5  978824195      F

         Age  Occupation Zip-code  …  Film-Noir  Horror  Musical  Mystery  \
      0    1          10    48067  …          0       0        0        0
```

```
1    1          10    48067  …          0        0        1        0
2    1          10    48067  …          0        0        0        0
3    1          10    48067  …          0        0        0        0
4    1          10    48067  …          0        0        0        0

   Romance  Sci-Fi  Thriller  War  Western  Year
0        0       0         0    0        0  1995
1        1       0         0    0        0  1995
2        0       0         0    0        0  1995
3        0       1         0    0        0  1977
4        0       0         0    1        0  1993

[5 rows x 29 columns]
```

[33]:

```
dfMaster.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1000209 entries, 0 to 1000208
Data columns (total 29 columns):
 #   Column       Non-Null Count    Dtype
---  ------       --------------    -----
 0   MovieID      1000209 non-null  int64
 1   Title        1000209 non-null  object
 2   Genres       1000209 non-null  object
 3   UserID       1000209 non-null  int64
 4   Rating       1000209 non-null  int64
 5   Timestamp    1000209 non-null  int64
 6   Gender       1000209 non-null  object
 7   Age          1000209 non-null  int64
 8   Occupation   1000209 non-null  int64
 9   Zip-code     1000209 non-null  object
 10  Action       1000209 non-null  int64
 11  Adventure    1000209 non-null  int64
 12  Animation    1000209 non-null  int64
 13  Children's   1000209 non-null  int64
 14  Comedy       1000209 non-null  int64
 15  Crime        1000209 non-null  int64
 16  Documentary  1000209 non-null  int64
 17  Drama        1000209 non-null  int64
 18  Fantasy      1000209 non-null  int64
 19  Film-Noir    1000209 non-null  int64
 20  Horror       1000209 non-null  int64
 21  Musical      1000209 non-null  int64
 22  Mystery      1000209 non-null  int64
 23  Romance      1000209 non-null  int64
 24  Sci-Fi       1000209 non-null  int64
 25  Thriller     1000209 non-null  int64
 26  War          1000209 non-null  int64
 27  Western      1000209 non-null  int64
 28  Year         1000209 non-null  object
dtypes: int64(24), object(5)
memory usage: 228.9+ MB
```

[34]:
```
dfMaster['Year'] = dfMaster.Year.astype(int)
dfMaster['Movie_Age'] = 2000 - dfMaster.Year
dfMaster.head()
```

[34]:
```
   MovieID                                      Title  \
0        1                           Toy Story (1995)
1       48                          Pocahontas (1995)
2      150                           Apollo 13 (1995)
3      260  Star Wars: Episode IV - A New Hope (1977)
4      527                    Schindler's List (1993)

                                 Genres  UserID  Rating  Timestamp Gender  \
0           Animation|Children's|Comedy       1       5  978824268      F
1  Animation|Children's|Musical|Romance       1       5  978824351      F
2                                 Drama       1       5  978301777      F
3      Action|Adventure|Fantasy|Sci-Fi       1       4  978300760      F
4                             Drama|War       1       5  978824195      F

   Age  Occupation Zip-code  …  Horror  Musical  Mystery  Romance  Sci-Fi  \
0    1          10    48067  …       0        0        0        0       0
1    1          10    48067  …       0        1        0        1       0
2    1          10    48067  …       0        0        0        0       0
3    1          10    48067  …       0        0        0        0       1
4    1          10    48067  …       0        0        0        0       0

   Thriller  War  Western  Year  Movie_Age
0         0    0        0  1995          5
1         0    0        0  1995          5
2         0    0        0  1995          5
3         0    0        0  1977         23
4         0    1        0  1993          7

[5 rows x 30 columns]
```

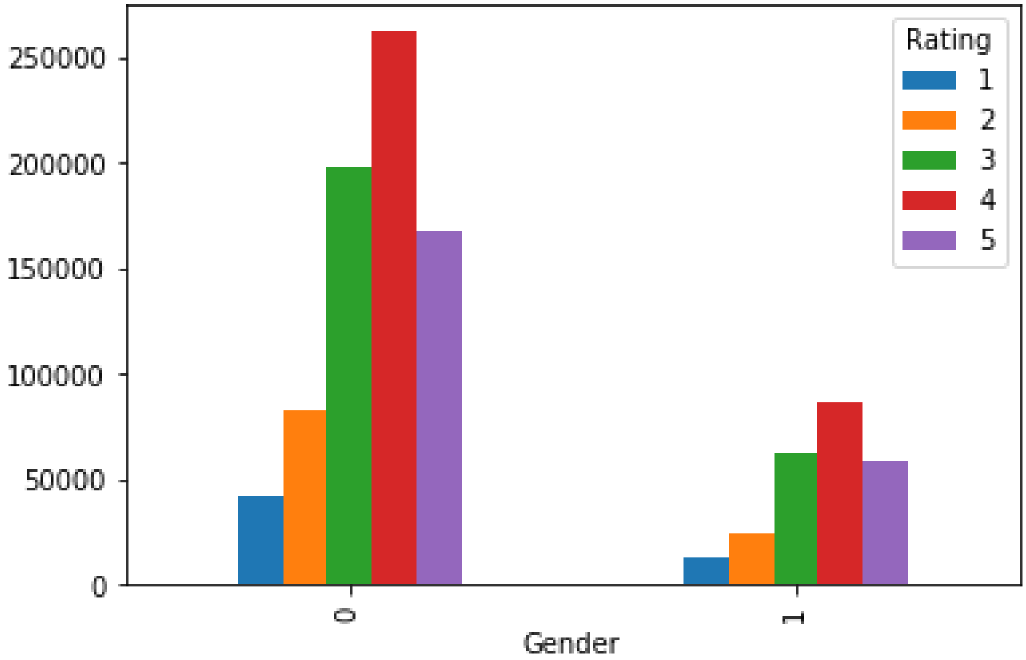
[35]:
```
dfMaster['Gender'] = dfMaster.Gender.str.replace('F','1')
dfMaster['Gender'] = dfMaster.Gender.str.replace('M','0')
dfMaster['Gender'] = dfMaster.Gender.astype(int)
dfMaster.head()
```

[35]:
```
   MovieID                                      Title  \
0        1                           Toy Story (1995)
```

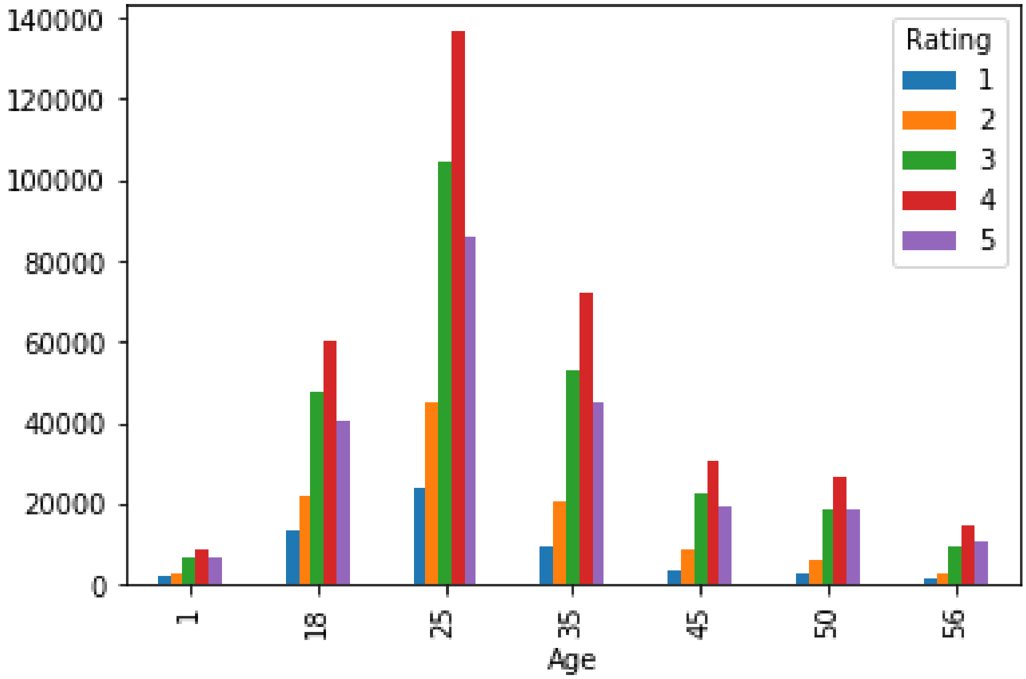
```
1       48                         Pocahontas (1995)
2      150                          Apollo 13 (1995)
3      260  Star Wars: Episode IV - A New Hope (1977)
4      527                    Schindler's List (1993)

                                Genres  UserID  Rating  Timestamp  Gender  \
0          Animation|Children's|Comedy       1       5  978824268       1
1  Animation|Children's|Musical|Romance       1       5  978824351       1
2                                Drama       1       5  978301777       1
3       Action|Adventure|Fantasy|Sci-Fi       1       4  978300760       1
4                            Drama|War       1       5  978824195       1

   Age  Occupation Zip-code  …  Horror  Musical  Mystery  Romance  Sci-Fi  \
0    1          10    48067  …       0        0        0        0       0
1    1          10    48067  …       0        1        0        1       0
2    1          10    48067  …       0        0        0        0       0
3    1          10    48067  …       0        0        0        0       1
4    1          10    48067  …       0        0        0        0       0

   Thriller  War  Western  Year  Movie_Age
0         0    0        0  1995          5
1         0    0        0  1995          5
2         0    0        0  1995          5
3         0    0        0  1977         23
4         0    1        0  1993          7

[5 rows x 30 columns]
```

[37]:

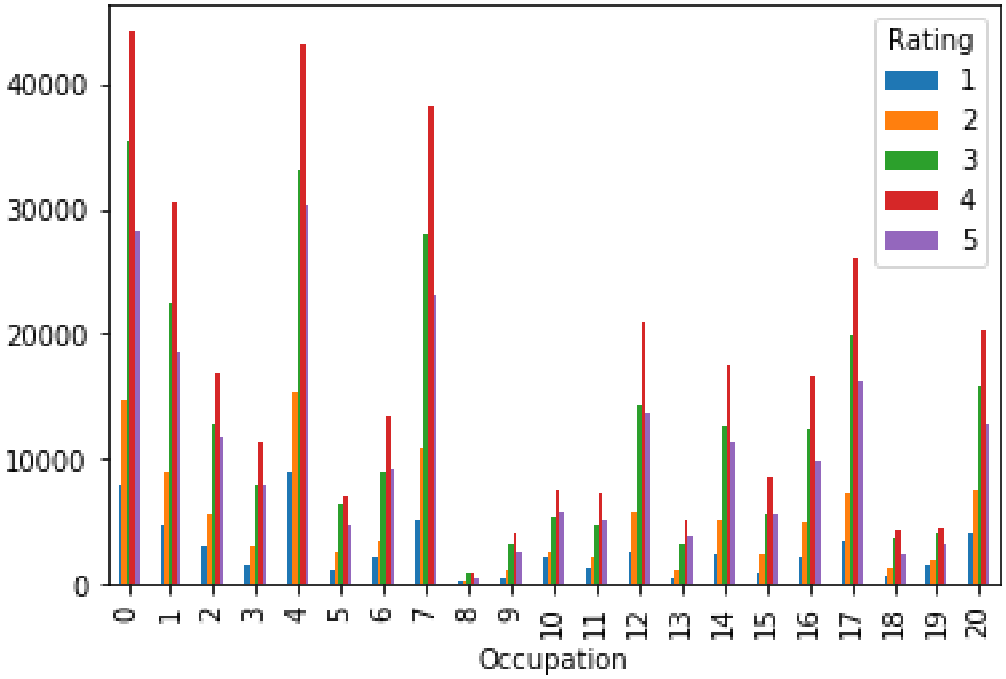
```
dfMaster.groupby(["Gender","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



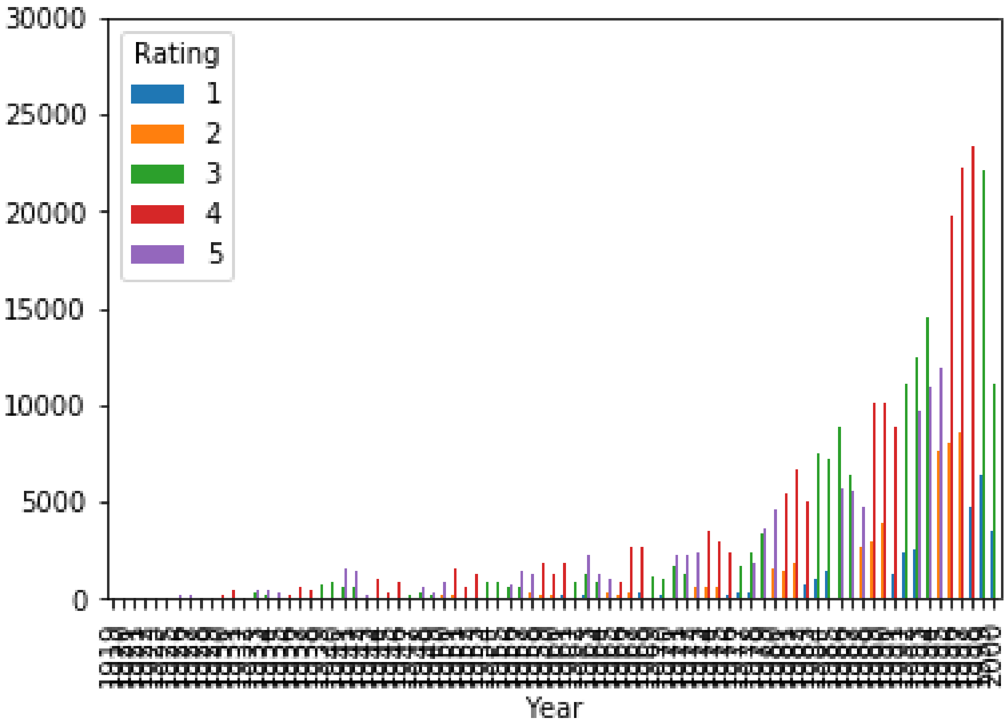
[40]:
```
dfMaster.groupby(["Age","Rating"]).size().unstack().
↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



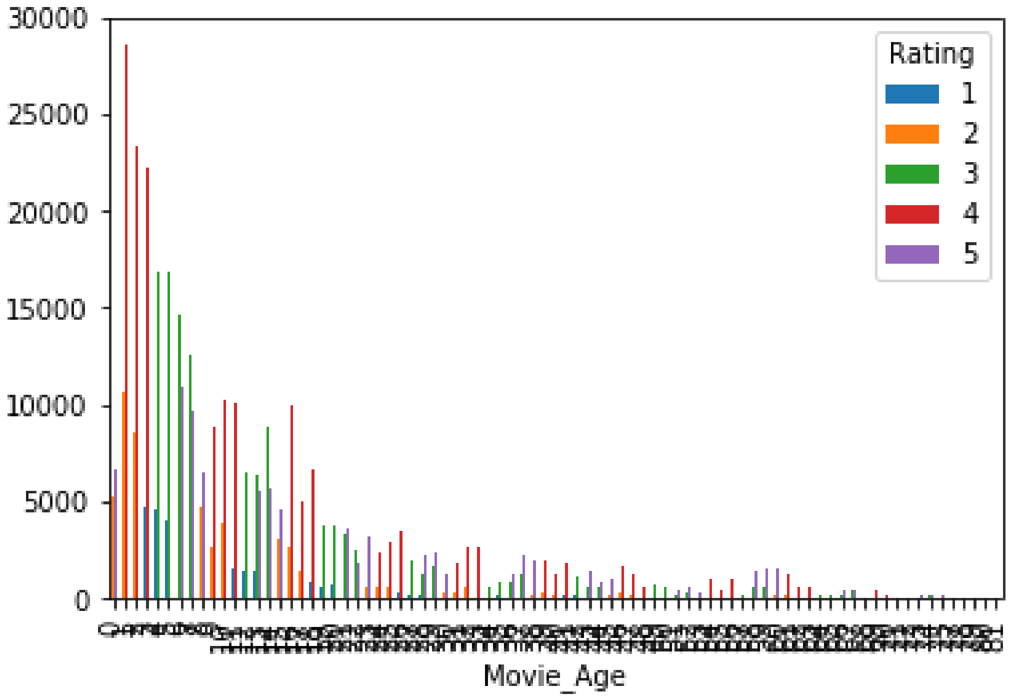
[41]:
```
dfMaster.groupby(["Occupation","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



[42]:
```
dfMaster.groupby(["Year","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



```
[43]: dfMaster.groupby(["Movie_Age","Rating"]).size().unstack().
       ↪plot(kind='bar',stacked=False,legend=True)
      plt.show()
```



[44]:
```
# Develop an appropriate model to predict the movie ratings
#First 500 extracted records
first_500 = dfMaster[:1000]
first_500
```

[44]:
```
     MovieID                                       Title  \
0          1                            Toy Story (1995)
1         48                           Pocahontas (1995)
2        150                            Apollo 13 (1995)
3        260  Star Wars: Episode IV - A New Hope (1977)
4        527                     Schindler's List (1993)
..       …                                         …
995     2384                 Babe: Pig in the City (1998)
996     2391                       Simple Plan, A (1998)
997     2394                  Prince of Egypt, The (1998)
998     2402           Rambo: First Blood Part II (1985)
999     2404                           Rambo III (1988)

                              Genres  UserID  Rating  Timestamp  Gender  \
0        Animation|Children's|Comedy       1       5  978824268       1
1  Animation|Children's|Musical|Romance    1       5  978824351       1
2                              Drama       1       5  978301777       1
3       Action|Adventure|Fantasy|Sci-Fi    1       4  978300760       1
4                          Drama|War       1       5  978824195       1
```

```
..                                     …     …     …        …     …
995                    Children's|Comedy      18        2  978155233        1
996                       Crime|Thriller      18        1  978155685        1
997                    Animation|Musical      18        4  978154907        1
998                           Action|War      18        2  978153894        1
999                           Action|War      18        2  978153977        1

     Age  Occupation Zip-code   … Horror  Musical  Mystery  Romance  Sci-Fi   \
0      1          10    48067   …      0        0        0        0       0
1      1          10    48067   …      0        1        0        1       0
2      1          10    48067   …      0        0        0        0       0
3      1          10    48067   …      0        0        0        0       1
4      1          10    48067   …      0        0        0        0       0
..    …         …      …  …     …      …      …      …     …
995   18           3    95825   …      0        0        0        0       0
996   18           3    95825   …      0        0        0        0       0
997   18           3    95825   …      0        1        0        0       0
998   18           3    95825   …      0        0        0        0       0
999   18           3    95825   …      0        0        0        0       0

     Thriller  War  Western  Year  Movie_Age
0           0    0        0  1995          5
1           0    0        0  1995          5
2           0    0        0  1995          5
3           0    0        0  1977         23
4           0    1        0  1993          7
..        …  …      …   …        …
995         0    0        0  1998          2
996         1    0        0  1998          2
997         0    0        0  1998          2
998         0    1        0  1985         15
999         0    1        0  1988         12

[1000 rows x 30 columns]
```

[46]:

```python
#Use the following features:movie id,age,occupation
features = first_500[['MovieID','Age','Occupation']].values
#Use rating as label
labels = first_500[['Rating']].values
features
```

[46]:

```
array([[   1,    1,   10],
       [  48,    1,   10],
       [ 150,    1,   10],
       …,
       [2394,   18,    3],
       [2402,   18,    3],
        [2404,   18,    3]], dtype=int64)
```

[47]:
```
labels
```

[47]:
```
array([[5],
       [5],
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        [2]], dtype=int64)
```

```
[48]: #Create train and test data set
      train, test, train_labels, test_labels =␣
       ↪train_test_split(features,labels,test_size=0.33,random_state=42)
      train
```

```
[48]: array([[3035,   35,    1],
             [1393,   25,   17],
             [3198,   35,    1],
             …,
             [1073,   18,    3],
             [ 784,   35,    1],
             [2802,   50,    9]], dtype=int64)
```

```
[49]: test
```

```
[49]: array([[1265,   35,    1],
             [3408,   35,    1],
             [3447,   35,    1],
             [2423,   35,    1],
             [ 539,   35,    1],
             [2657,   35,    1],
             [2109,   35,    1],
             [1247,   35,    1],
             [1064,   18,    3],
             [ 105,   25,   12],
             [ 421,   18,    3],
             [1035,   50,    9],
             [2140,   35,    1],
             [2140,   18,    3],
             [2000,   18,    3],
             [1527,   18,    3],
             [ 508,   25,   17],
             [1275,   18,    3],
             [3704,   35,    1],
             [1653,   25,   17],
             [1380,   35,    1],
             [1027,   25,   12],
             [   7,   35,    1],
             [1282,   35,    1],
             [2006,   25,   12],
             [2712,   25,   12],
             [2506,   50,    9],
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[3]], dtype=int64)
```

[52]:

```
# Logistic Regression

logreg = LogisticRegression()
logreg.fit(train, train_labels)
Y_pred = logreg.predict(test)
acc_log = round(logreg.score(train, train_labels) * 100, 2)
acc_log
```

```
/usr/local/lib/python3.7/site-packages/sklearn/utils/validation.py:760:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  y = column_or_1d(y, warn=True)
/usr/local/lib/python3.7/site-packages/sklearn/linear_model/_logistic.py:940:
ConvergenceWarning: lbfgs failed to converge (status=1):
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max_iter) or scale the data as shown in:
    https://scikit-learn.org/stable/modules/preprocessing.html
Please also refer to the documentation for alternative solver options:
    https://scikit-learn.org/stable/modules/linear_model.html#logistic-
regression
  extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG)
```

[52]:

```
36.72
```

[58]:

```
# Support Vector Machines

svc = SVC()
svc.fit(train, train_labels)
Y_pred = svc.predict(test)
acc_svc = round(svc.score(train, train_labels) * 200, 2)
acc_svc
```

```
/usr/local/lib/python3.7/site-packages/sklearn/utils/validation.py:760:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  y = column_or_1d(y, warn=True)
```

[58]: 77.61

[59]:
```
# K Nearest Neighbors Classifier

knn = KNeighborsClassifier(n_neighbors = 3)
knn.fit(train, train_labels)
Y_pred = knn.predict(test)
acc_knn = round(knn.score(train, train_labels) * 100, 2)
acc_knn
```

```
/usr/local/lib/python3.7/site-packages/ipykernel_launcher.py:4:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  after removing the cwd from sys.path.
```

[59]: 59.7

[60]:
```
# Gaussian Naive Bayes

gaussian = GaussianNB()
gaussian.fit(train, train_labels)
Y_pred = gaussian.predict(test)
acc_gaussian = round(gaussian.score(train, train_labels) * 100, 2)
acc_gaussian
```

```
/usr/local/lib/python3.7/site-packages/sklearn/naive_bayes.py:206:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  y = column_or_1d(y, warn=True)
```

[60]: 39.55

[61]:
```
# Decision Tree

decision_tree = DecisionTreeClassifier()
decision_tree.fit(train, train_labels)
Y_pred = decision_tree.predict(test)
acc_decision_tree = round(decision_tree.score(train, train_labels) * 100, 2)
acc_decision_tree
```

[61]: 100.0

[62]:
```
# Random Forest

random_forest = RandomForestClassifier(n_estimators=100)
random_forest.fit(train, train_labels)
```

```
Y_pred = random_forest.predict(test)
random_forest.score(train, train_labels)
acc_random_forest = round(random_forest.score(train, train_labels) * 100, 2)
acc_random_forest
```

```
/usr/local/lib/python3.7/site-packages/ipykernel_launcher.py:4:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples,), for example using
ravel().
  after removing the cwd from sys.path.
```

[62]:
```
100.0
```

[64]:
```
# Perceptron

perceptron = Perceptron()
perceptron.fit(train, train_labels)
Y_pred = perceptron.predict(test)
acc_perceptron = round(perceptron.score(train, train_labels) * 100, 2)
acc_perceptron
```

```
/usr/local/lib/python3.7/site-packages/sklearn/utils/validation.py:760:
DataConversionWarning: A column-vector y was passed when a 1d array was
expected. Please change the shape of y to (n_samples, ), for example using
ravel().
  y = column_or_1d(y, warn=True)
```

[64]:
```
34.33
```

[67]:
```
models = pd.DataFrame({
    'Model': ['Support Vector Machines', 'KNN', 'Logistic Regression',
              'Random Forest', 'Naive Bayes', 'Perceptron',
              'Decision Tree'],
    'Score': [acc_svc, acc_knn, acc_log,
              acc_random_forest, acc_gaussian, acc_perceptron,␣
 ↪acc_decision_tree]})
models.sort_values(by='Score', ascending=False)
```

[67]:
```
                     Model   Score
3            Random Forest  100.00
6            Decision Tree  100.00
0  Support Vector Machines   77.61
1                      KNN   59.70
4              Naive Bayes   39.55
2      Logistic Regression   36.72
5               Perceptron   34.33
```

[ ]: