Project 3-Movielens Case Study

December 31, 2022

** Movielens Case Study **

DESCRIPTION

Background of Problem Statement :

The GroupLens Research Project is a research group in the Department of Computer Science and Engineering at the University of Minnesota. Members of the GroupLens Research Project are involved in many research projects related to the fields of information filtering, collaborative filtering, and recommender systems. The project is led by professors John Riedl and Joseph Konstan. The project began to explore automated collaborative filtering in 1992 but is most well known for its worldwide trial of an automated collaborative filtering system for Usenet news in 1996. Since then the project has expanded its scope to research overall information by filtering solutions, integrating into content-based methods, as well as, improving current collaborative filtering technology.

Problem Objective :

Here, we ask you to perform the analysis using the Exploratory Data Analysis technique. You need to find features affecting the ratings of any particular movie and build a model to predict the movie ratings.

Analysis Tasks to be performed:-

- Import the three datasets
- Create a new dataset [Master_Data] with the following columns MovieID Title UserID Age Gender Occupation Rating. (Hint: (i) Merge two tables at a time. (ii) Merge the tables using two primary keys MovieID & UserId)
- Explore the datasets using visual representations (graphs or tables), also include your comments on the following:

1. User Age Distribution
2. User rating of the movie “Toy Story”
3. Top 25 movies by viewership rating
4. Find the ratings for all the movies reviewed by for a particular user of user id = 2696

- Feature Engineering: Use column genres:

1. Find out all the unique genres (Hint: split the data in column genre making a list and then process the data to find out only the unique categories of genres)
2. 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.
3. Determine the features affecting the ratings of any particular movie.

4. Develop an appropriate model to predict the movie ratings

[101]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings("ignore")
```

[102]:
```
movies = pd.read_csv("movies.csv", names=['MovieID', 'Title', 'Genres'] ,␣
↪delimiter="::", error_bad_lines = False)
```

[103]:
```
movies
```

[103]:
```
      MovieID                               Title  \
0           1                    Toy Story (1995)
1           2                      Jumanji (1995)
2           3             Grumpier Old Men (1995)
3           4            Waiting to Exhale (1995)
4           5  Father of the Bride Part II (1995)
…         …                                   …
3878     3948             Meet the Parents (2000)
3879     3949          Requiem for a Dream (2000)
3880     3950                    Tigerland (2000)
3881     3951             Two Family House (2000)
3882     3952               Contender, The (2000)

                           Genres
0      Animation|Children's|Comedy
1     Adventure|Children's|Fantasy
2                  Comedy|Romance
3                    Comedy|Drama
4                          Comedy
…                             …
3878                       Comedy
3879                        Drama
3880                        Drama
3881                        Drama
3882               Drama|Thriller

[3883 rows x 3 columns]
```

[104]:
```
ratings = pd.read_csv("ratings.csv", names=['UserID', 'MovieID', 'Rating',␣
↪'Timestamp'] , delimiter="::", error_bad_lines = False)
```

[105]:
```
ratings
```

[105]:

	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
…	…	…	…	…
1000204	6040	1091	1	956716541
1000205	6040	1094	5	956704887
1000206	6040	562	5	956704746
1000207	6040	1096	4	956715648
1000208	6040	1097	4	956715569

[1000209 rows x 4 columns]

[106]:
```
users = pd.read_csv("users.csv", names=['UserID', 'Gender', 'Age',␣
↪'Occupation', 'Zip-code'] , delimiter="::", error_bad_lines = False)
```

[107]:
```
users
```

[107]:

	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
…	…	…	…	…	…
6035	6036	F	25	15	32603
6036	6037	F	45	1	76006
6037	6038	F	56	1	14706
6038	6039	F	45	0	01060
6039	6040	M	25	6	11106

[6040 rows x 5 columns]

[108]:
```
movies.shape
```

[108]: (3883, 3)

[109]:
```
ratings.shape
```

[109]: (1000209, 4)

[110]:
```
df1 = movies.merge(ratings,on='MovieID',how='inner')
df1.head()
```

[110]:

	MovieID	Title	Genres	UserID	Rating	Timestamp
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	5	978824268
1	1	Toy Story (1995)	Animation|Children's|Comedy	6	4	978237008
2	1	Toy Story (1995)	Animation|Children's|Comedy	8	4	978233496
3	1	Toy Story (1995)	Animation|Children's|Comedy	9	5	978225952
4	1	Toy Story (1995)	Animation|Children's|Comedy	10	5	978226474

[111]:
```
df1.shape
```

[111]:
```
(1000209, 6)
```

[112]:
```
users.shape
```

[112]:
```
(6040, 5)
```

[113]:
```
master = df1.merge(users,on='UserID',how='inner')
master.head()
```

[113]:

	MovieID	Title	Genres	UserID	Rating	Timestamp	Gender	Age	Occupation	Zip-code
0	1	Toy Story (1995)	Animation|Children's|Comedy	1	5	978824268	F	1	10	48067
1	48	Pocahontas (1995)	Animation|Children's|Musical|Romance	1	5	978824351	F	1	10	48067
2	150	Apollo 13 (1995)	Drama	1	5	978301777	F	1	10	48067
3	260	Star Wars: Episode IV - A New Hope (1977)	Action|Adventure|Fantasy|Sci-Fi	1	4	978300760	F	1	10	48067
4	527	Schindler's List (1993)	Drama|War	1	5	978824195	F	1	10	48067

[114]:
```
master.shape
```

[114]: (1000209, 10)

- Explore the datasets using visual representations (graphs or tables), also include your comments on the following:

1. User Age Distribution-

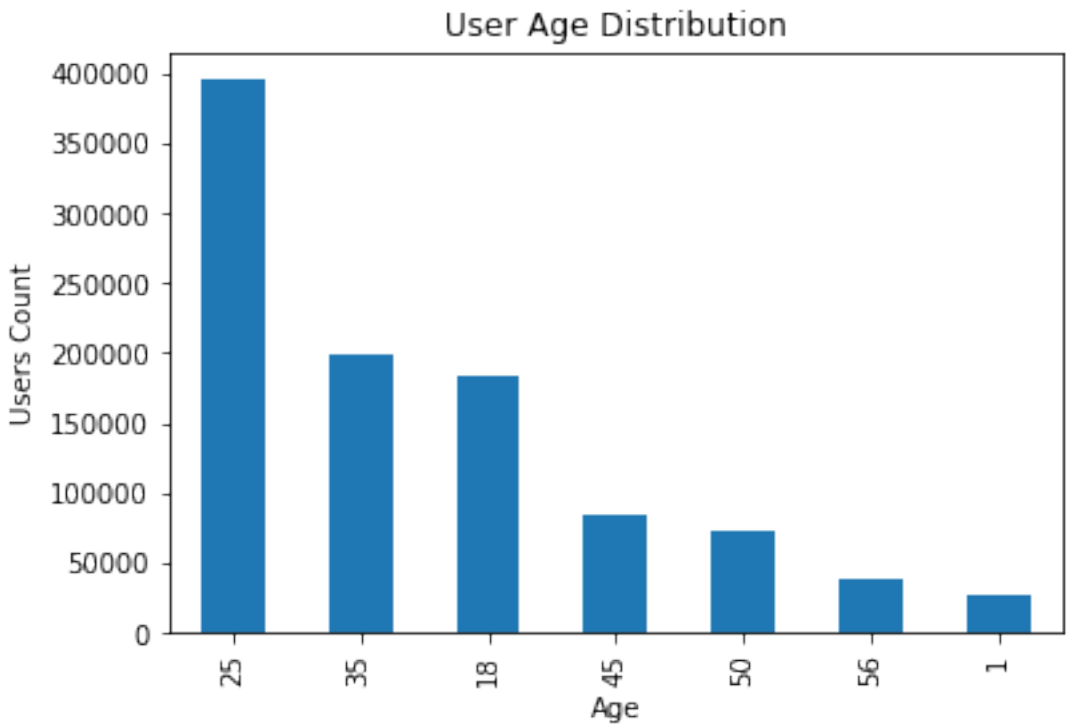
[115]:
```
master['Age'].value_counts()
```

[115]:
```
25    395556
35    199003
18    183536
45     83633
50     72490
56     38780
1      27211
Name: Age, dtype: int64
```

[116]:
```
# Percentage of age distribution.
master['Age'].value_counts()/ len(master) * 100
```

[116]:
```
25    39.547335
35    19.896142
18    18.349765
45     8.361552
50     7.247485
56     3.877190
1      2.720531
Name: Age, dtype: float64
```

[117]:
```
master['Age'].value_counts().plot(kind='bar')
plt.xlabel("Age")
plt.title("User Age Distribution")
plt.ylabel("Users Count")
plt.show()
```



- Age wise distribution- *00-18 = 02.720531%* 18-24 = 18.349765% *25-34 = 39.547335%* 35-44 = 19.896142% *45-49 = 08.361552%* 50-55 = 07.247485% *56+ = 03.877190%

1. Here we can see thet 20% users are below 25 yrs of age.
2. Age group 25-34 contains around 40% of users.
3. 90% users are below 50 yrs of age.

- Explore the datasets using visual representations (graphs or tables), also include your comments on the following:

2. User rating of the movie "Toy Story"

[118]:
```
toystory = master[master['Title'].str.contains('Toy Story') == True]
```

[119]:
```
toystory
```

[119]:

	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]
```

[120]:
```
toystory.shape
```

[120]:
```
(3662, 10)
```

[121]:
```
toystory.groupby(["Title","Rating"]).size()
```

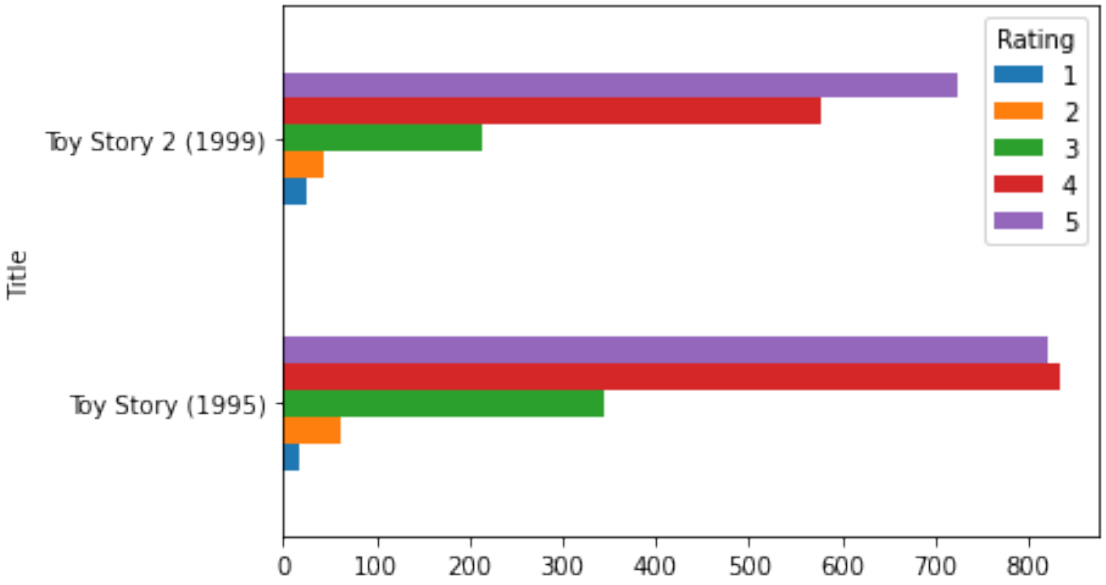
[121]:
```
Title               Rating
Toy Story (1995)    1          16
                    2          61
                    3         345
                    4         835
                    5         820
Toy Story 2 (1999)  1          25
                    2          44
                    3         214
                    4         578
                    5         724
dtype: int64
```

[122]:
```
toystory.groupby(["Title","Rating"]).size()/len(toystory)*100
```

[122]:
```
Title               Rating
Toy Story (1995)    1          0.436920
                    2          1.665756
                    3          9.421081
                    4         22.801748
                    5         22.392135
Toy Story 2 (1999)  1          0.682687
```

```
2          1.201529
3          5.843801
4         15.783725
5         19.770617
dtype: float64
```

[123]:
```
toystory.groupby(["Title","Rating"]).size().unstack().
 ↪plot(kind='barh',stacked=False,legend=True)
plt.show()
```



Conclusion- 80% of users gave 4 or 5 rating to both Toy Story movies.

- Explore the datasets using visual representations (graphs or tables), also include your comments on the following:

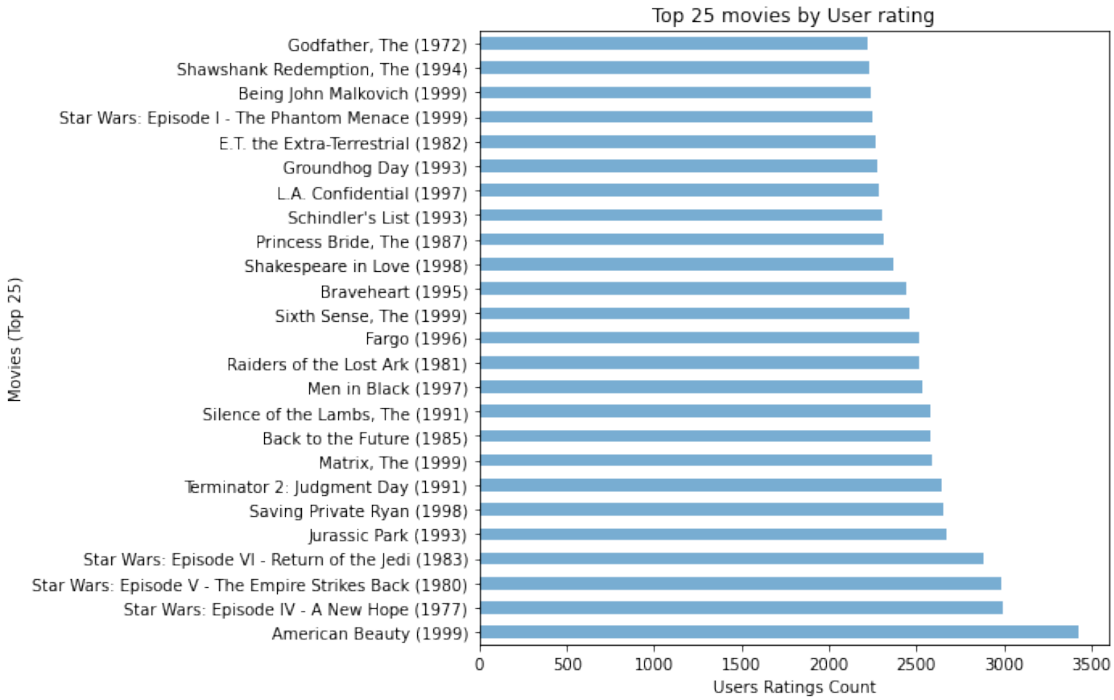
3. Top 25 movies by viewership rating

[124]:
```
top25 = master.groupby('Title').size().sort_values(ascending=False)[:25]
top25
```

[124]:
```
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
```

[125]:
```
top25.plot(kind='barh',alpha=0.6,figsize=(7,7))
plt.xlabel("Users Ratings Count")
plt.ylabel("Movies (Top 25)")
plt.title("Top 25 movies by User rating")
plt.show()
```



Conclusion- American Beauty (1999) recived most number of user rating. 3428 users watched American Beauty.

- Explore the datasets using visual representations (graphs or tables), also include your comments on the following:

4. Find the ratings for all the movies reviewed by for a particular user of user id = 2696

[126]:
```
user2696 = master[master["UserID"] == 2696]
user2696
```

[126]:

	MovieID	Title	Genres	UserID	Rating	Timestamp	Gender
991035	350	Client, The (1994)	Drama|Mystery|Thriller	2696	3	973308886	M
991036	800	Lone Star (1996)	Drama|Mystery	2696	5	973308842	M
991037	1092	Basic Instinct (1992)	Mystery|Thriller	2696	4	973308886	M
991038	1097	E.T. the Extra-Terrestrial (1982)	Children's|Drama|Fantasy|Sci-Fi	2696	3	973308690	M
991039	1258	Shining, The (1980)	Horror	2696	4	973308710	M
991040	1270	Back to the Future (1985)	Comedy|Sci-Fi	2696	2	973308676	M
991041	1589	Cop Land (1997)	Crime|Drama|Mystery	2696	3	973308865	M
991042	1617	L.A. Confidential (1997)	Crime|Film-Noir|Mystery|Thriller	2696	4	973308842	M
991043	1625	Game, The (1997)	Mystery|Thriller	2696	4	973308842	M
991044	1644	I Know What You Did Last Summer (1997)	Horror|Mystery|Thriller	2696	2	973308920	M
991045	1645	Devil's Advocate, The (1997)	Crime|Horror|Mystery|Thriller	2696	4	973308904	M
991046	1711	Midnight in the Garden of Good and Evil (1997)	Comedy|Crime|Drama|Mystery	2696	4	973308904	M
991047	1783	Palmetto (1998)	Film-Noir|Mystery|Thriller	2696	4	973308865	M
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)					

```
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
```

[127]:
```
user2696.value_counts().sum()
```

[127]:
```
20
```

Conclusion- User 2696 gave ratings to 20 Movies.

- Feature Engineering: Use column genres:

1. Find out all the unique genres (Hint: split the data in column genre making a list and then process the data to find out only the unique categories of genres)

[128]:
```
genres = master['Genres'].str.split("|")
```

[129]:
```
genres
```

[129]:
```
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
```

[130]:
```
listgenres = set()
for genre in genres:
    listgenres = listgenres.union(set(genre))
```

[131]:
```
listgenres
```

[131]:
```
{'Action',
 'Adventure',
 'Animation',
 "Children's",
 'Comedy',
 'Crime',
 'Documentary',
 'Drama',
 'Fantasy',
 'Film-Noir',
 'Horror',
 'Musical',
 'Mystery',
 'Romance',
 'Sci-Fi',
 'Thriller',
 'War',
 'Western'}
```

[132]:
```
len(listgenres)
```

[132]:
```
18
```

Conclusion- There are total 18 Genres.

- 2. 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.

[133]:
```
ratingsOneHot = master['Genres'].str.get_dummies("|")
```

[134]:
```
ratingsOneHot.head()
```

[134]:

	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

[135]:
```
master = pd.concat([master,ratingsOneHot],axis=1)
```

[136]:
```
master.head()
```

[136]:

	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]
```

[137]:
```
master.columns
```

[137]:
```
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')
```

[138]:
```
master.to_csv("Final_Master.csv")
```

- 3. Determine the features affecting the ratings of any particular movie.

[139]:
```
master[["title","Year"]] = master.Title.str.extract("(.)\s\((.\d+)",expand=True)
```

[140]:
```
master = master.drop(columns=["title"])
master.head()
```

[140]:
```
   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]
```

[141]:
```
master.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
```

[142]:
```
master['Year'] = master.Year.astype(int)
```

[143]:
```
master['Movie_Age'] = 2022 - master.Year
master.head()
```

[143]:
```
   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         27
1         0    0        0  1995         27
2         0    0        0  1995         27
3         0    0        0  1977         45
4         0    1        0  1993         29

[5 rows x 30 columns]
```

[144]:
```
master['Gender'] = master.Gender.str.replace('F','1')
```

[145]:
```
master['Gender'] = master.Gender.str.replace('M','0')
```

[146]:
```
master['Gender'] = master.Gender.astype(int)
```

[147]:
```
master.head()
```

[147]:
```
   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

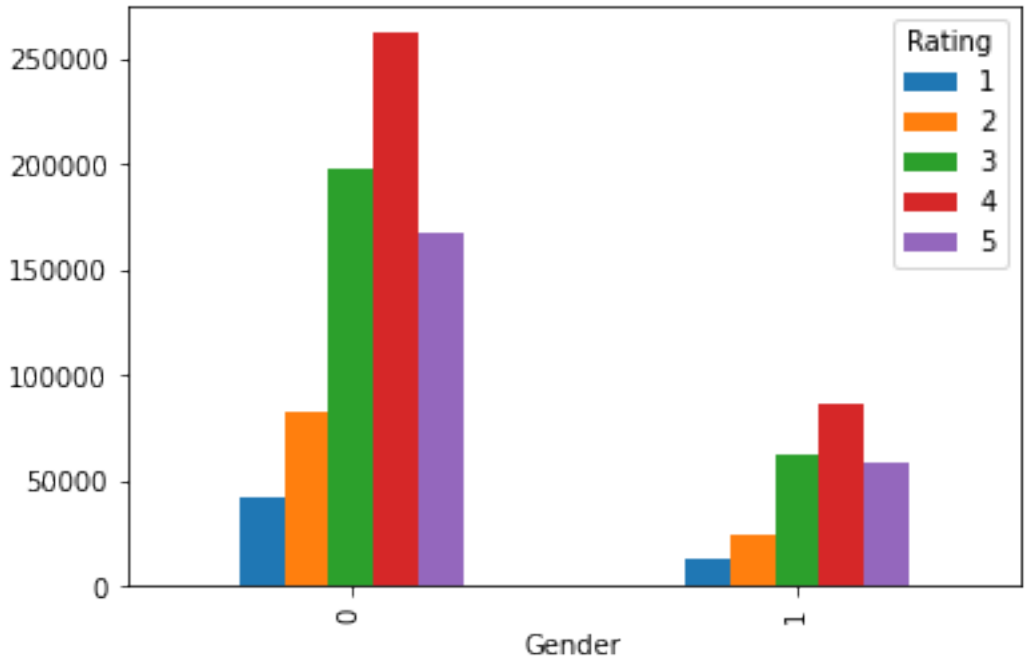
   Thriller  War  Western  Year  Movie_Age
0         0    0        0  1995         27
1         0    0        0  1995         27
2         0    0        0  1995         27
3         0    0        0  1977         45
4         0    1        0  1993         29

[5 rows x 30 columns]
```

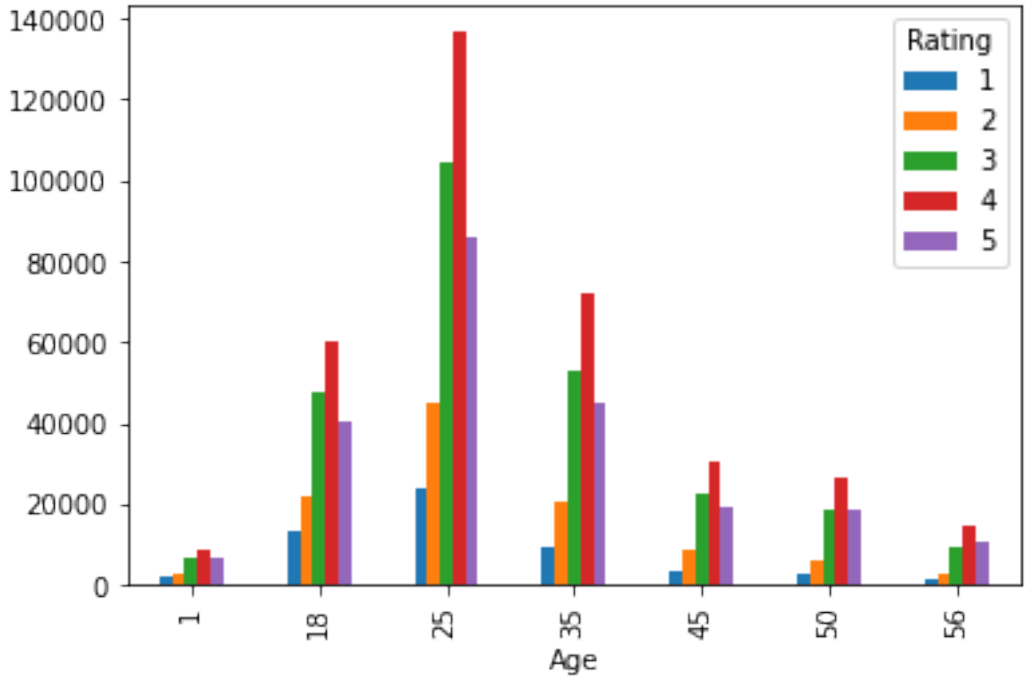
[148]:
```
genderaffect = master.groupby('Gender').size().sort_values(ascending=False)[:25]
genderaffect
```

[148]:
```
Gender
0    753769
1    246440
dtype: int64
```

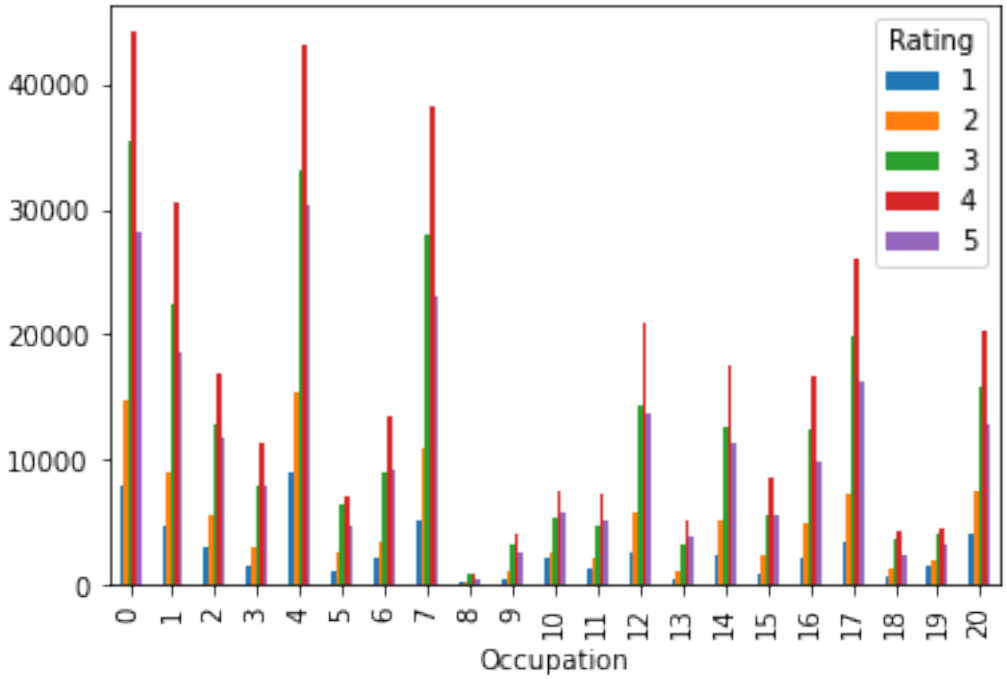
[149]:
```
master.groupby(["Gender","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



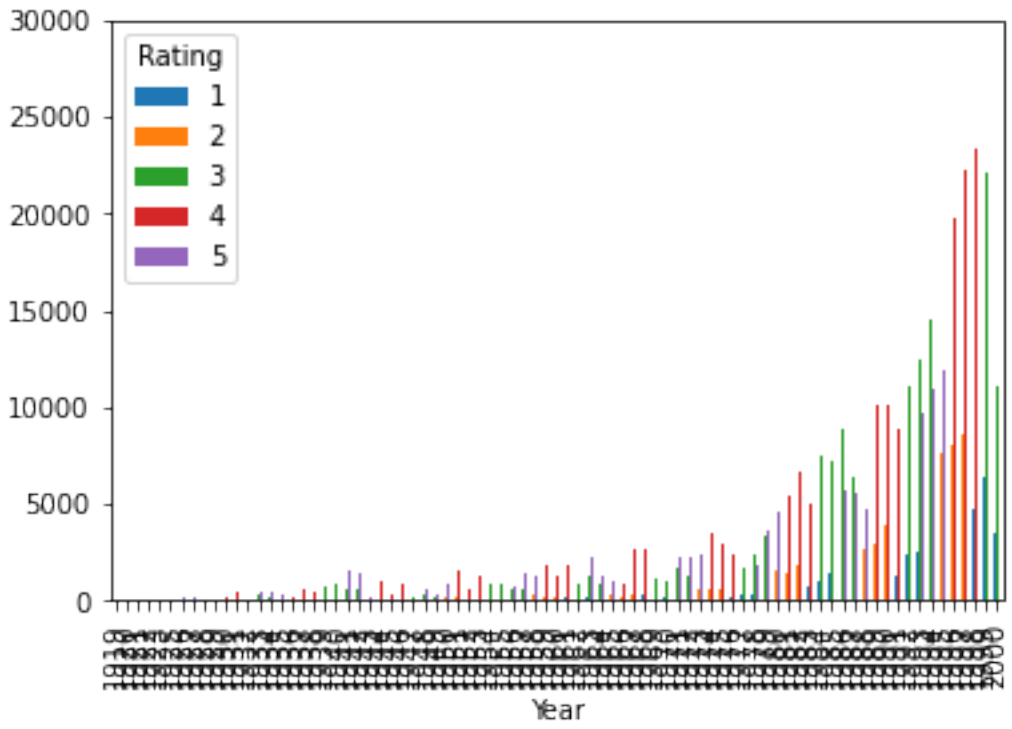
[150]:
```
master.groupby(["Age","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



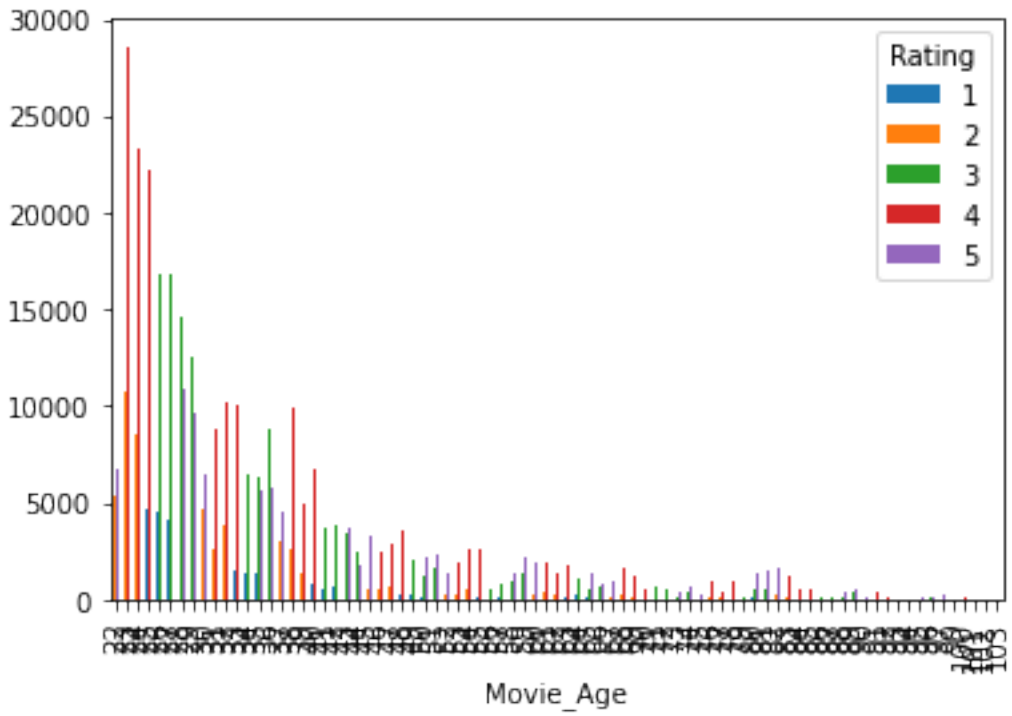
[151]:
```
master.groupby(["Occupation","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



[152]:
```
master.groupby(["Year","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



[153]:
```
master.groupby(["Movie_Age","Rating"]).size().unstack().
 ↪plot(kind='bar',stacked=False,legend=True)
plt.show()
```



- 4. Develop an appropriate model to predict the movie ratings.

[154]:
```
first_500 = master[:1000]
```

[155]:
```
first_500
```

[155]:

	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         27
1           0    0        0  1995         27
2           0    0        0  1995         27
3           0    0        0  1977         45
4           0    1        0  1993         29
..        …  …       …   …        …
995         0    0        0  1998         24
996         1    0        0  1998         24
997         0    0        0  1998         24
998         0    1        0  1985         37
999         0    1        0  1988         34

[1000 rows x 30 columns]
```

[156]:
```
features = first_500[['MovieID','Age','Occupation']].values
```

[157]:
```
labels = first_500[['Rating']].values
```

[158]:
```
features
```

[158]:
```
array([[   1,    1,   10],
       [  48,    1,   10],
       [ 150,    1,   10],
       …,
       [2394,   18,    3],
```

```
            [2402,   18,    3],
            [2404,   18,    3]], dtype=int64)
```

[159]:
```
labels
```

[159]:
```
array([[5],
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```

[160]:
```
# machine learning
from sklearn.model_selection import train_test_split
```

[161]:
```
x_train, x_test, y_train, y_test = train_test_split(features,labels,test_size=0.
↪33,random_state=42)
```

[162]:
```
x_train
```

[162]:
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[163]:
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x_test
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[163]:
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```

[166]:
```
# Logistic Regression
from sklearn.linear_model import LogisticRegression
```

[167]:
```
logreg = LogisticRegression()
logreg.fit(x_train, y_train)
Y_pred = logreg.predict(x_test)
acc_log = round(logreg.score(x_train, y_train) * 100, 2)
acc_log
```

[167]: 36.72

[168]:
```
# Decision Tree
from sklearn.tree import DecisionTreeClassifier
```

[169]:
```
decision_tree = DecisionTreeClassifier()
decision_tree.fit(x_train, y_train)
Y_pred = decision_tree.predict(x_test)
acc_decision_tree = round(decision_tree.score(x_train, y_train) * 100, 2)
acc_decision_tree
```

[169]: 100.0

[170]:
```
# Random Forest
from sklearn.ensemble import RandomForestClassifier
```

[171]:
```
random_forest = RandomForestClassifier(n_estimators=100)
random_forest.fit(x_train, y_train)
Y_pred = random_forest.predict(x_test)
random_forest.score(x_train, y_train)
acc_random_forest = round(random_forest.score(x_train, y_train) * 100, 2)
acc_random_forest
```

[171]: 100.0

[172]:
```
models = pd.DataFrame({
    'Model': ['Logistic Regression', 'Random Forest','Decision Tree'],
```

```
    'Score': [ acc_log, acc_random_forest, acc_decision_tree]})
models
```

[172]:
```
                  Model   Score
0  Logistic Regression   36.72
1        Random Forest  100.00
2        Decision Tree  100.00
```

[173]:
```
models.sort_values(by='Score', ascending=False)
```

[173]:
```
                  Model   Score
1        Random Forest  100.00
2        Decision Tree  100.00
0  Logistic Regression   36.72
```

[ ]:
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