Google Playstore App Rating Prediction

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

df=pd.read_csv("googleplaystore.csv")

df.head()
```

```
                                                 App        Category
Rating  \
0     Photo Editor & Candy Camera & Grid & ScrapBook  ART_AND_DESIGN
4.1
1                                 Coloring book moana  ART_AND_DESIGN
3.9
2  U Launcher Lite – FREE Live Cool Themes, Hide ...  ART_AND_DESIGN
4.7
3                               Sketch - Draw & Paint  ART_AND_DESIGN
4.5
4              Pixel Draw - Number Art Coloring Book  ART_AND_DESIGN
4.3

  Reviews  Size     Installs  Type Price Content Rating  \
0     159   19M      10,000+  Free     0       Everyone
1     967   14M     500,000+  Free     0       Everyone
2   87510  8.7M   5,000,000+  Free     0       Everyone
3  215644   25M  50,000,000+  Free     0           Teen
4     967  2.8M     100,000+  Free     0       Everyone

                      Genres      Last Updated         Current Ver  \
0               Art & Design   January 7, 2018               1.0.0
1  Art & Design;Pretend Play  January 15, 2018               2.0.0
2               Art & Design    August 1, 2018               1.2.4
3               Art & Design      June 8, 2018  Varies with device
4    Art & Design;Creativity     June 20, 2018                 1.1

    Android Ver
0  4.0.3 and up
1  4.0.3 and up
2  4.0.3 and up
3    4.2 and up
4    4.4 and up
```

```
df.isnull().sum()
```

```
App                 0
Category            0
```

```
Rating              1474
Reviews                0
Size                   0
Installs               0
Type                   1
Price                  0
Content Rating         1
Genres                 0
Last Updated           0
Current Ver            8
Android Ver            3
dtype: int64
```

```
#Dropping the rows which have any null records
df=df.dropna()
df=df.reset_index(drop=True)
```

```
df.isnull().sum()
```

```
App               0
Category          0
Rating            0
Reviews           0
Size              0
Installs          0
Type              0
Price             0
Content Rating    0
Genres            0
Last Updated      0
Current Ver       0
Android Ver       0
dtype: int64
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9360 entries, 0 to 9359
Data columns (total 13 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   App             9360 non-null   object 
 1   Category        9360 non-null   object 
 2   Rating          9360 non-null   float64
 3   Reviews         9360 non-null   object 
 4   Size            9360 non-null   object 
 5   Installs        9360 non-null   object 
 6   Type            9360 non-null   object 
 7   Price           9360 non-null   object 
 8   Content Rating  9360 non-null   object 
```

```
 9   Genres          9360 non-null   object
 10  Last Updated    9360 non-null   object
 11  Current Ver     9360 non-null   object
 12  Android Ver     9360 non-null   object
dtypes: float64(1), object(12)
memory usage: 950.8+ KB
```

```
#Converting the Reviews column into integers
df['Reviews']=df["Reviews"].astype(int)

df["Size"].unique()
```

```
array(['19M', '14M', '8.7M', '25M', '2.8M', '5.6M', '29M', '33M',
'3.1M',
       '28M', '12M', '20M', '21M', '37M', '5.5M', '17M', '39M', '31M',
       '4.2M', '23M', '6.0M', '6.1M', '4.6M', '9.2M', '5.2M', '11M',
       '24M', 'Varies with device', '9.4M', '15M', '10M', '1.2M',
'26M',
       '8.0M', '7.9M', '56M', '57M', '35M', '54M', '201k', '3.6M',
'5.7M',
       '8.6M', '2.4M', '27M', '2.7M', '2.5M', '7.0M', '16M', '3.4M',
       '8.9M', '3.9M', '2.9M', '38M', '32M', '5.4M', '18M', '1.1M',
       '2.2M', '4.5M', '9.8M', '52M', '9.0M', '6.7M', '30M', '2.6M',
       '7.1M', '22M', '6.4M', '3.2M', '8.2M', '4.9M', '9.5M', '5.0M',
       '5.9M', '13M', '73M', '6.8M', '3.5M', '4.0M', '2.3M', '2.1M',
       '42M', '9.1M', '55M', '23k', '7.3M', '6.5M', '1.5M', '7.5M',
'51M',
       '41M', '48M', '8.5M', '46M', '8.3M', '4.3M', '4.7M', '3.3M',
'40M',
       '7.8M', '8.8M', '6.6M', '5.1M', '61M', '66M', '79k', '8.4M',
       '3.7M', '118k', '44M', '695k', '1.6M', '6.2M', '53M', '1.4M',
       '3.0M', '7.2M', '5.8M', '3.8M', '9.6M', '45M', '63M', '49M',
'77M',
       '4.4M', '70M', '9.3M', '8.1M', '36M', '6.9M', '7.4M', '84M',
'97M',
       '2.0M', '1.9M', '1.8M', '5.3M', '47M', '556k', '526k', '76M',
       '7.6M', '59M', '9.7M', '78M', '72M', '43M', '7.7M', '6.3M',
'334k',
       '93M', '65M', '79M', '100M', '58M', '50M', '68M', '64M', '34M',
       '67M', '60M', '94M', '9.9M', '232k', '99M', '624k', '95M',
'8.5k',
       '41k', '292k', '80M', '1.7M', '10.0M', '74M', '62M', '69M',
'75M',
       '98M', '85M', '82M', '96M', '87M', '71M', '86M', '91M', '81M',
       '92M', '83M', '88M', '704k', '862k', '899k', '378k', '4.8M',
       '266k', '375k', '1.3M', '975k', '980k', '4.1M', '89M', '696k',
       '544k', '525k', '920k', '779k', '853k', '720k', '713k', '772k',
       '318k', '58k', '241k', '196k', '857k', '51k', '953k', '865k',
       '251k', '930k', '540k', '313k', '746k', '203k', '26k', '314k',
       '239k', '371k', '220k', '730k', '756k', '91k', '293k', '17k',
```

```
       '74k', '14k', '317k', '78k', '924k', '818k', '81k', '939k',
'169k',
       '45k', '965k', '90M', '545k', '61k', '283k', '655k', '714k',
'93k',
       '872k', '121k', '322k', '976k', '206k', '954k', '444k', '717k',
       '210k', '609k', '308k', '306k', '175k', '350k', '383k', '454k',
       '1.0M', '70k', '812k', '442k', '842k', '417k', '412k', '459k',
       '478k', '335k', '782k', '721k', '430k', '429k', '192k', '460k',
       '728k', '496k', '816k', '414k', '506k', '887k', '613k', '778k',
       '683k', '592k', '186k', '840k', '647k', '373k', '437k', '598k',
       '716k', '585k', '982k', '219k', '55k', '323k', '691k', '511k',
       '951k', '963k', '25k', '554k', '351k', '27k', '82k', '208k',
       '551k', '29k', '103k', '116k', '153k', '209k', '499k', '173k',
       '597k', '809k', '122k', '411k', '400k', '801k', '787k', '50k',
       '643k', '986k', '516k', '837k', '780k', '20k', '498k', '600k',
       '656k', '221k', '228k', '176k', '34k', '259k', '164k', '458k',
       '629k', '28k', '288k', '775k', '785k', '636k', '916k', '994k',
       '309k', '485k', '914k', '903k', '608k', '500k', '54k', '562k',
       '847k', '948k', '811k', '270k', '48k', '523k', '784k', '280k',
       '24k', '892k', '154k', '18k', '33k', '860k', '364k', '387k',
       '626k', '161k', '879k', '39k', '170k', '141k', '160k', '144k',
       '143k', '190k', '376k', '193k', '473k', '246k', '73k', '253k',
       '957k', '420k', '72k', '404k', '470k', '226k', '240k', '89k',
       '234k', '257k', '861k', '467k', '676k', '552k', '582k',
'619k'],
      dtype=object)
```

```
def mb_to_kb(a):
  if a.endswith("M"):
    return float(a[:-1])*1000
  elif a.endswith("k"):
    return float(a[:-1])
  else:
    return a

df["Size"]=df["Size"].apply(lambda x:mb_to_kb(x))

df[df["Size"]=="Varies with device"]
```

```
                                                  App
Category  \
35                                  Floor Plan Creator
ART_AND_DESIGN
40                           Textgram - write on photos
ART_AND_DESIGN
50                         Used Cars and Trucks for Sale
AUTO_AND_VEHICLES
65                                  Ulysse Speedometer
AUTO_AND_VEHICLES
66                                              REPUVE
```

```
AUTO_AND_VEHICLES
...                                                   ...
...
9267  My Earthquake Alerts - US & Worldwide Earthquakes
WEATHER
9279                                            Posta App
MAPS_AND_NAVIGATION
9307                     Chat For Strangers - Video Chat
SOCIAL
9348          Frim: get new friends on local chat rooms
SOCIAL
9358                       The SCP Foundation DB fr nn5n
BOOKS_AND_REFERENCE

      Rating  Reviews                Size     Installs  Type Price  \
35       4.1    36639  Varies with device   5,000,000+  Free     0
40       4.4   295221  Varies with device  10,000,000+  Free     0
50       4.6    17057  Varies with device   1,000,000+  Free     0
65       4.3    40211  Varies with device   5,000,000+  Free     0
66       3.9      356  Varies with device     100,000+  Free     0
...      ...      ...                ...          ...   ...    ...
9267     4.4     3471  Varies with device     100,000+  Free     0
9279     3.6        8  Varies with device       1,000+  Free     0
9307     3.4      622  Varies with device     100,000+  Free     0
9348     4.0    88486  Varies with device   5,000,000+  Free     0
9358     4.5      114  Varies with device       1,000+  Free     0

     Content Rating             Genres        Last Updated  \
35         Everyone       Art & Design       July 14, 2018
40         Everyone       Art & Design       July 30, 2018
50         Everyone    Auto & Vehicles       July 30, 2018
65         Everyone    Auto & Vehicles       July 30, 2018
66         Everyone    Auto & Vehicles        May 25, 2018
...             ...                ...                 ...
9267       Everyone            Weather       July 24, 2018
9279       Everyone  Maps & Navigation  September 27, 2017
9307     Mature 17+             Social        May 23, 2018
9348     Mature 17+             Social      March 23, 2018
9358     Mature 17+  Books & Reference    January 19, 2015

             Current Ver         Android Ver
35    Varies with device        2.3.3 and up
40    Varies with device  Varies with device
50    Varies with device  Varies with device
65    Varies with device  Varies with device
66    Varies with device  Varies with device
...                  ...                 ...
9267  Varies with device  Varies with device
9279  Varies with device          4.4 and up
9307  Varies with device  Varies with device
```

```
9348  Varies with device  Varies with device
9358  Varies with device  Varies with device

[1637 rows x 13 columns]
```

```
rows=df[df["Size"]=="Varies with device"].index
df.drop(rows,inplace=True)
```

```
#Removing the '+' symbol from each value in Installs column
df["Installs"].value_counts()
```

```
1,000,000+        1301
100,000+          1037
10,000+            968
10,000,000+        825
1,000+             689
5,000,000+         535
500,000+           490
50,000+            436
5,000+             419
100+               303
100,000,000+       201
500+               197
50,000,000+        147
10+                 67
50+                 56
500,000,000+        30
1,000,000,000+      10
5+                   9
1+                   3
Name: Installs, dtype: int64
```

```
df["Installs"]=df["Installs"].str[:-1]
df["Installs"]=df["Installs"].apply(lambda x:x.replace(",",""))

df["Installs"]=df["Installs"].astype(int)
```

```
#Removing the '$' sign from the Price Column
df["Price"].unique()
```

```
array(['0', '$4.99', '$6.99', '$7.99', '$3.99', '$5.99', '$2.99',
'$1.99',
       '$9.99', '$0.99', '$9.00', '$5.49', '$10.00', '$24.99',
'$11.99',
       '$79.99', '$16.99', '$14.99', '$29.99', '$12.99', '$3.49',
       '$10.99', '$7.49', '$1.50', '$19.99', '$15.99', '$33.99',
'$39.99',
       '$2.49', '$4.49', '$1.70', '$1.49', '$3.88', '$399.99',
'$17.99',
       '$400.00', '$3.02', '$1.76', '$4.84', '$4.77', '$1.61',
'$1.59',
```

```
       '$6.49', '$1.29', '$299.99', '$379.99', '$37.99', '$18.99',
       '$389.99', '$8.49', '$1.75', '$14.00', '$2.00', '$3.08',
'$2.59',
       '$19.40', '$15.46', '$8.99', '$3.04', '$13.99', '$4.29',
'$3.28',
       '$4.60', '$1.00', '$2.90', '$1.97', '$2.56', '$1.20'],
dtype=object)
```

```
df["Price"]=df["Price"].apply(lambda x:x.replace("$",""))
df["Price"]=df["Price"].astype(float)
```

```
#Removing the rows with more nummber of rating than installs
df["Rating"].between(0,5).sum()
```

```
7723
```

```
rows=df[df["Installs"]<df["Reviews"]].index
df.drop(rows,inplace=True)
```

```
df.head()
```

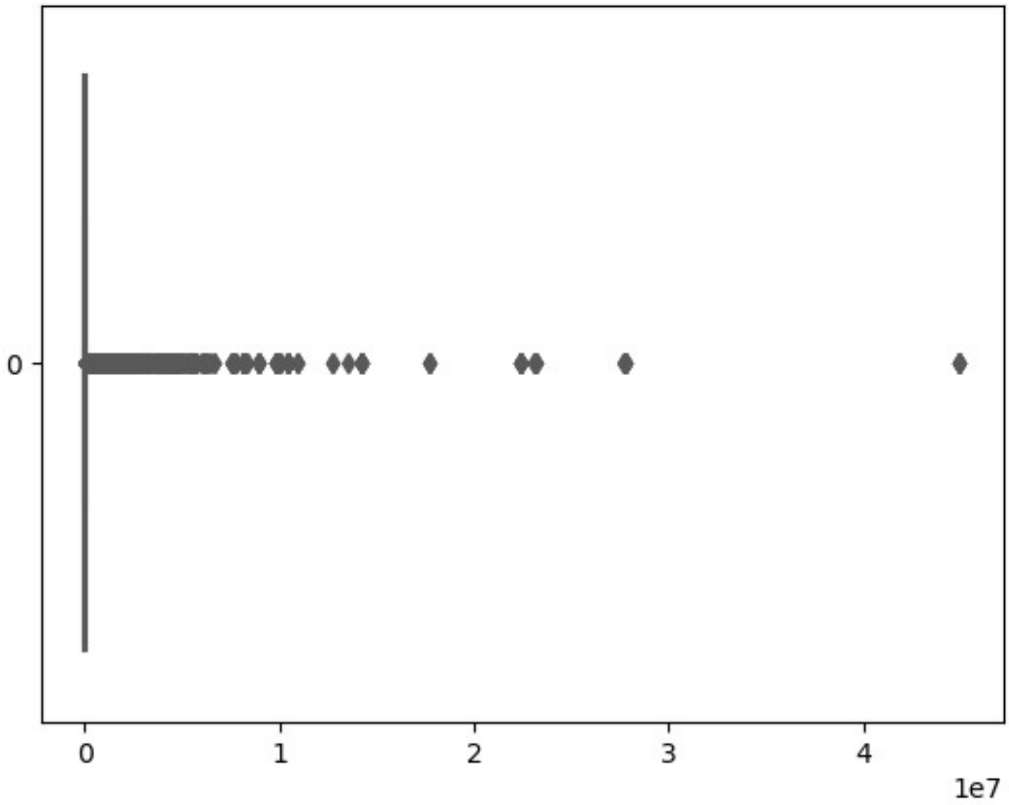
```
                                                 App        Category
Rating  \
0     Photo Editor & Candy Camera & Grid & ScrapBook  ART_AND_DESIGN
4.1
1                                Coloring book moana  ART_AND_DESIGN
3.9
2  U Launcher Lite – FREE Live Cool Themes, Hide ...  ART_AND_DESIGN
4.7
3                             Sketch - Draw & Paint  ART_AND_DESIGN
4.5
4              Pixel Draw - Number Art Coloring Book  ART_AND_DESIGN
4.3

   Reviews     Size  Installs  Type  Price Content Rating  \
0      159  19000.0     10000  Free    0.0       Everyone
1      967  14000.0    500000  Free    0.0       Everyone
2    87510   8700.0   5000000  Free    0.0       Everyone
3   215644  25000.0  50000000  Free    0.0           Teen
4      967   2800.0    100000  Free    0.0       Everyone

                      Genres      Last Updated         Current Ver  \
0               Art & Design   January 7, 2018               1.0.0
1  Art & Design;Pretend Play  January 15, 2018               2.0.0
2               Art & Design    August 1, 2018               1.2.4
3               Art & Design      June 8, 2018  Varies with device
4    Art & Design;Creativity     June 20, 2018                 1.1

    Android Ver
0  4.0.3 and up
1  4.0.3 and up
```

```
2  4.0.3 and up
3    4.2 and up
4    4.4 and up
```

Univariate Analysis

```
#Outlier Correction
sns.boxplot(data=df['Reviews'],orient="h",palette="Set2")
```

```
<Axes: >
```




```
df["Reviews"].value_counts()
```

```
2          80
3          77
5          74
4          71
1          66
          ..
192661      1
54207       1
1335799     1
```

```
148506      1
398307      1
Name: Reviews, Length: 4669, dtype: int64
```

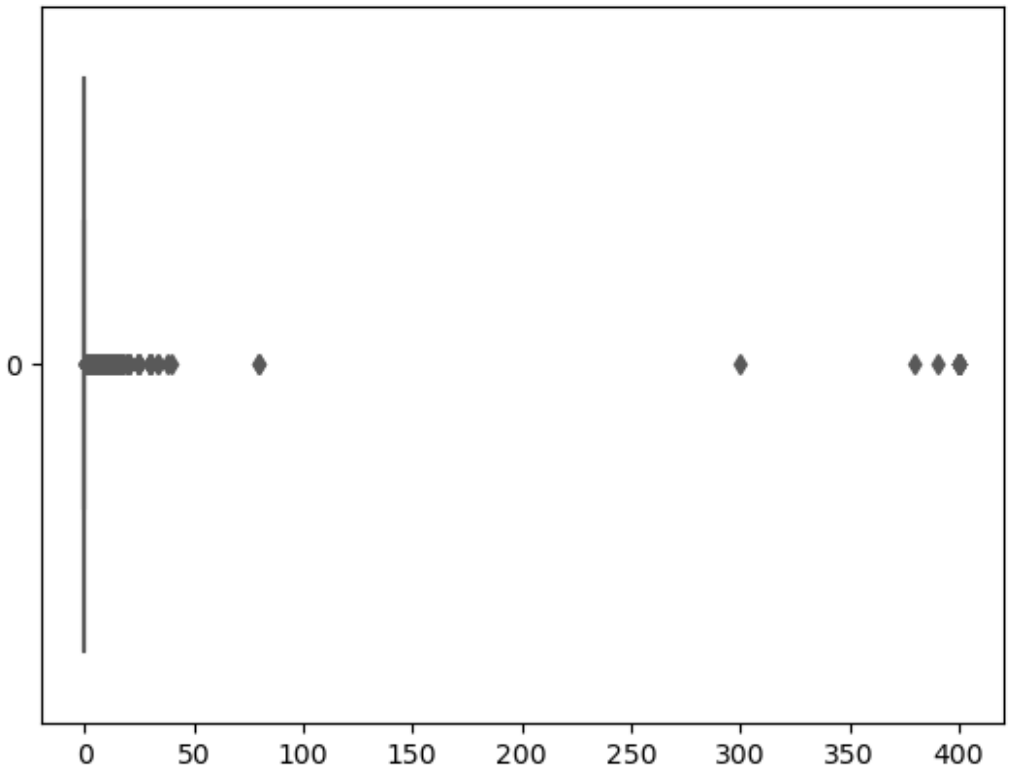
```
rows=df[df["Reviews"]>2000000].index
```

```
df.drop(rows,inplace=True)
```

```
#Drop these as most seem to be junk apps
```

```
sns.boxplot(data=df['Price'],orient="h",palette="Set2")
```

```
<Axes: >
```




```
rows=df[df["Price"]>200].index
```

```
df.drop(rows,inplace=True)
```

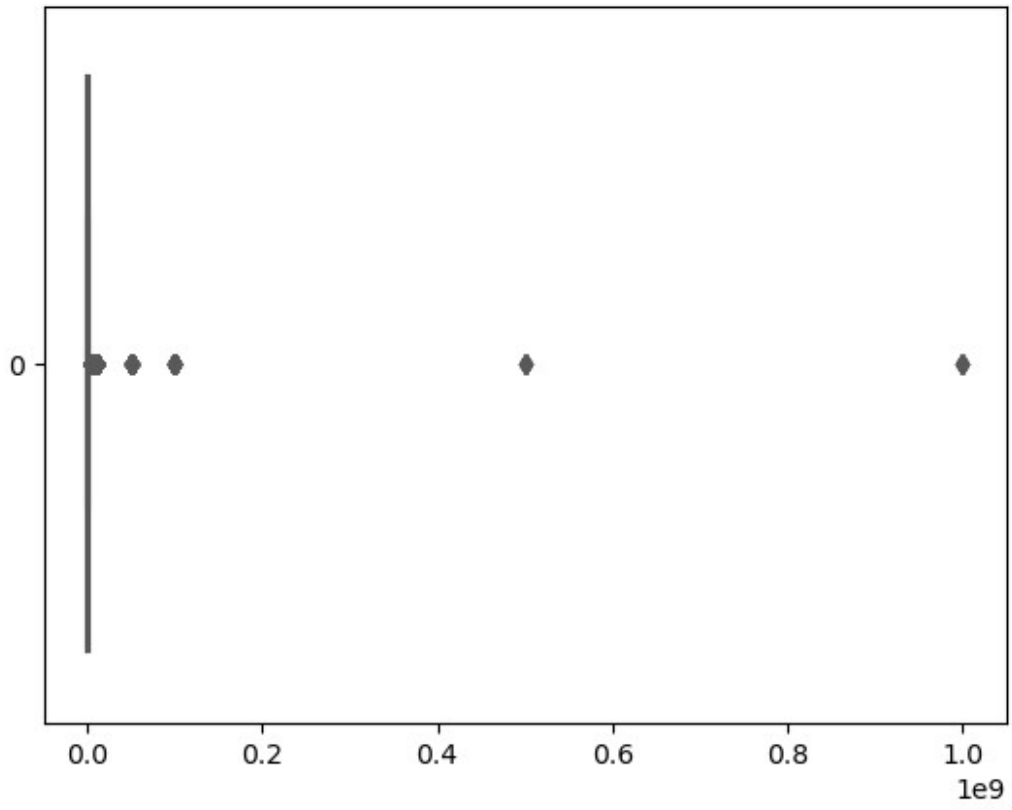
```
df.head()
```

```
                                                 App        Category
Rating  \
0     Photo Editor & Candy Camera & Grid & ScrapBook  ART_AND_DESIGN
4.1
1                                Coloring book moana  ART_AND_DESIGN
3.9
```

```
2  U Launcher Lite – FREE Live Cool Themes, Hide ...  ART_AND_DESIGN
4.7
3                              Sketch - Draw & Paint  ART_AND_DESIGN
4.5
4               Pixel Draw - Number Art Coloring Book  ART_AND_DESIGN
4.3

   Reviews     Size  Installs  Type  Price Content Rating  \
0      159  19000.0     10000  Free    0.0       Everyone
1      967  14000.0    500000  Free    0.0       Everyone
2    87510   8700.0   5000000  Free    0.0       Everyone
3   215644  25000.0  50000000  Free    0.0           Teen
4      967   2800.0    100000  Free    0.0       Everyone

                      Genres      Last Updated         Current Ver  \
0               Art & Design   January 7, 2018               1.0.0
1  Art & Design;Pretend Play  January 15, 2018               2.0.0
2               Art & Design    August 1, 2018               1.2.4
3               Art & Design      June 8, 2018  Varies with device
4    Art & Design;Creativity     June 20, 2018                 1.1

    Android Ver
0  4.0.3 and up
1  4.0.3 and up
2  4.0.3 and up
3    4.2 and up
4    4.4 and up
```

```
#Outlier Correction
sns.boxplot(data=df['Installs'],orient="h",palette="Set2")
```

```
<Axes: >
```

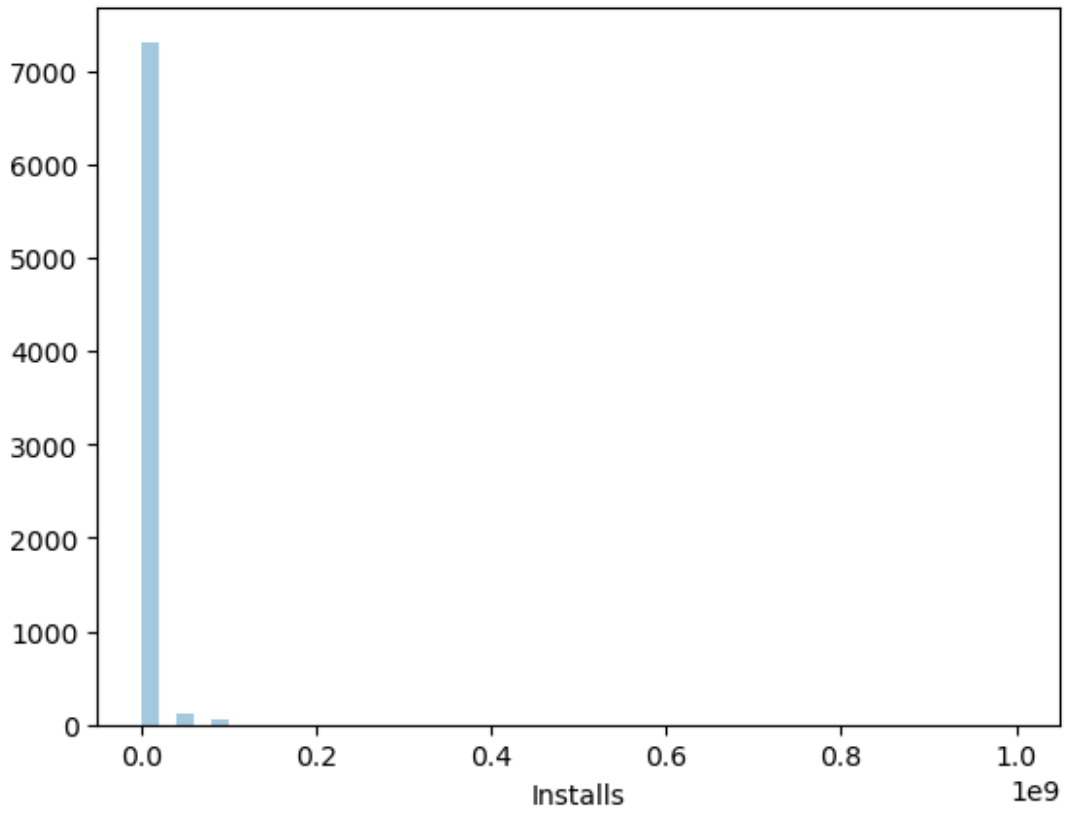



```
# -Find out the different percentiles – 10, 25, 50, 70, 90, 95, 99

#-Decide a threshold as cutoff for outlier and drop records having
values more than that
#-There seems to be some outliers in installs field too. Hence setting
the threshold at 500000

perc=[.10, .25, .50, .70, .90, .95, .99]
df["Installs"].describe(percentiles=perc)
```

```
count    7.483000e+03
mean     3.947465e+06
std      2.781831e+07
min      5.000000e+00
10%      1.000000e+03
25%      1.000000e+04
50%      1.000000e+05
70%      1.000000e+06
90%      1.000000e+07
95%      1.000000e+07
99%      5.000000e+07
max      1.000000e+09
Name: Installs, dtype: float64
```

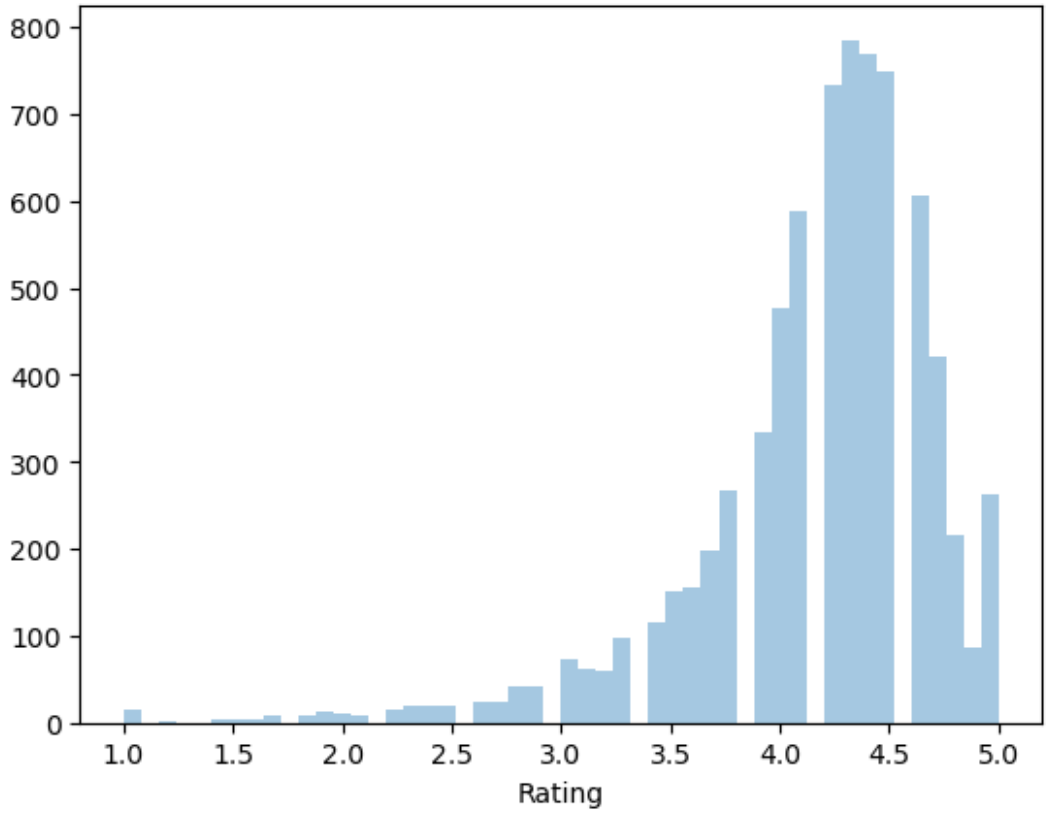
```
sns.distplot(df["Installs"],kde=False)
```

```
C:\Users\varun\AppData\Local\Temp\ipykernel_6352\2628286323.py:1:
UserWarning:

`distplot` is a deprecated function and will be removed in seaborn
v0.14.0.

Please adapt your code to use either `displot` (a figure-level
function with
similar flexibility) or `histplot` (an axes-level function for
histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(df["Installs"],kde=False)

<Axes: xlabel='Installs'>
```



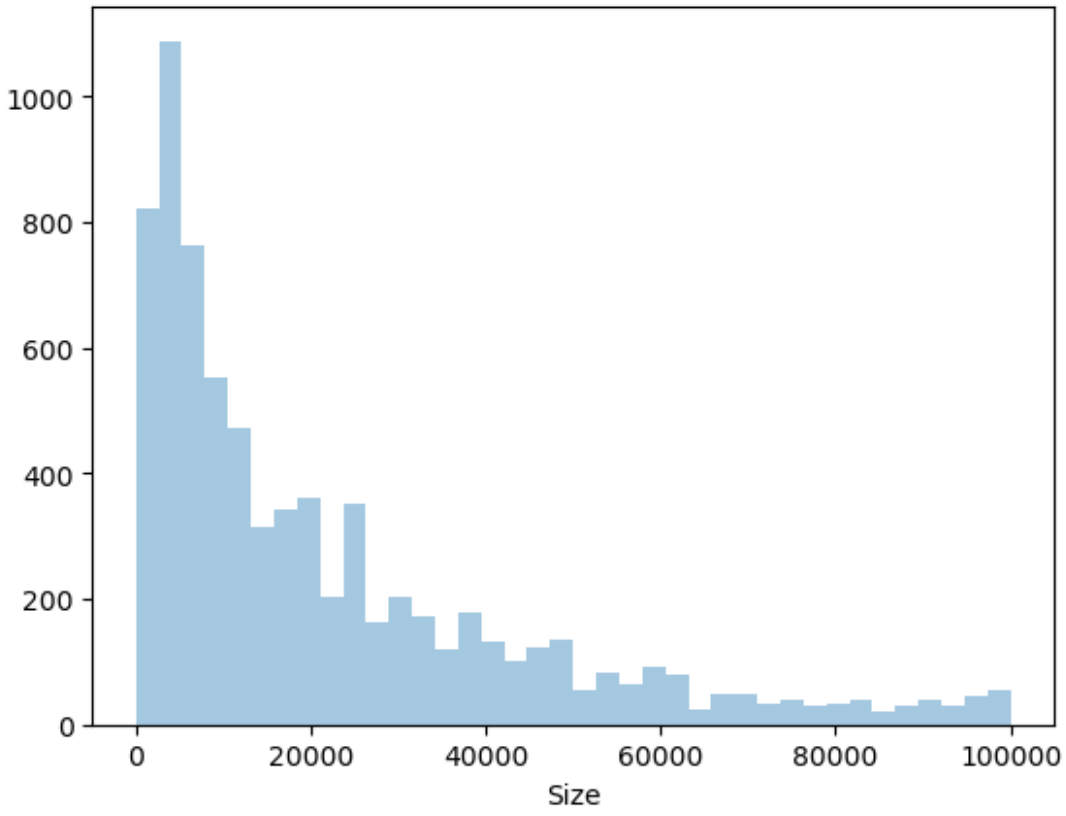

```
rows=df[df["Price"]>500000].index

df.drop(rows,inplace=True)

sns.distplot(df["Rating"],kde=False)
```

```
C:\Users\varun\AppData\Local\Temp\ipykernel_6352\729776272.py:1:
UserWarning:

`distplot` is a deprecated function and will be removed in seaborn
v0.14.0.

Please adapt your code to use either `displot` (a figure-level
function with
similar flexibility) or `histplot` (an axes-level function for
histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(df["Rating"],kde=False)

<Axes: xlabel='Rating'>
```



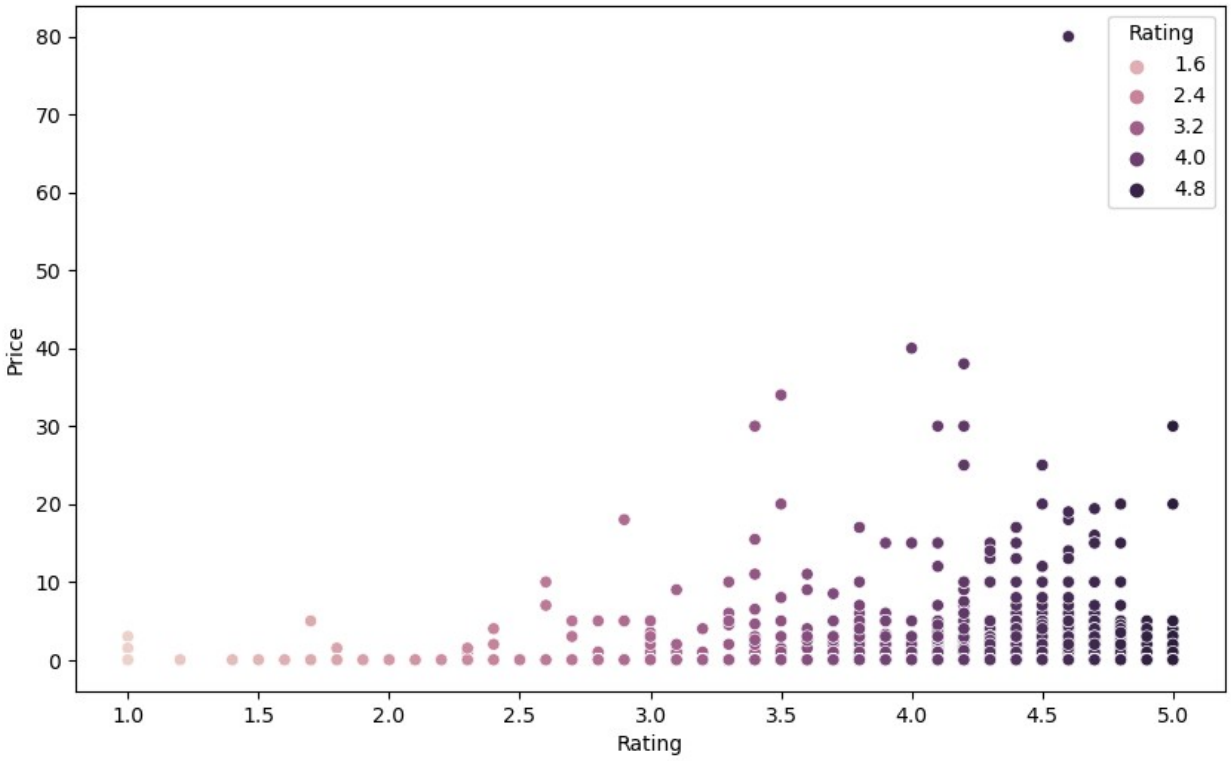

```
sns.distplot(df["Size"],kde=False)

C:\Users\varun\AppData\Local\Temp\ipykernel_6352\1818158713.py:1:
UserWarning:

`distplot` is a deprecated function and will be removed in seaborn
```

```
v0.14.0.

Please adapt your code to use either `displot` (a figure-level
function with
similar flexibility) or `histplot` (an axes-level function for
histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(df["Size"],kde=False)

<Axes: xlabel='Size'>
```



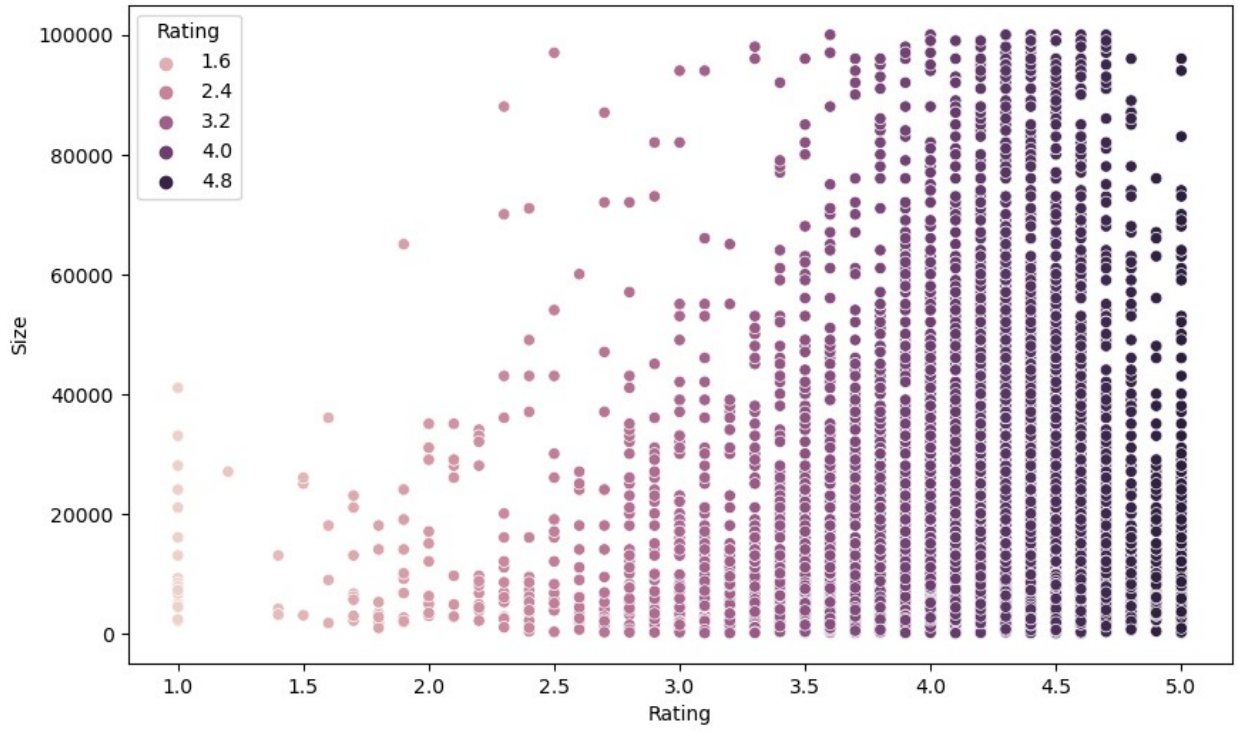
Bivariate analysis:

```
plt.figure(figsize=(10,6))
sns.scatterplot(x=df["Rating"],y=df["Price"],hue=df["Rating"])

<Axes: xlabel='Rating', ylabel='Price'>
```



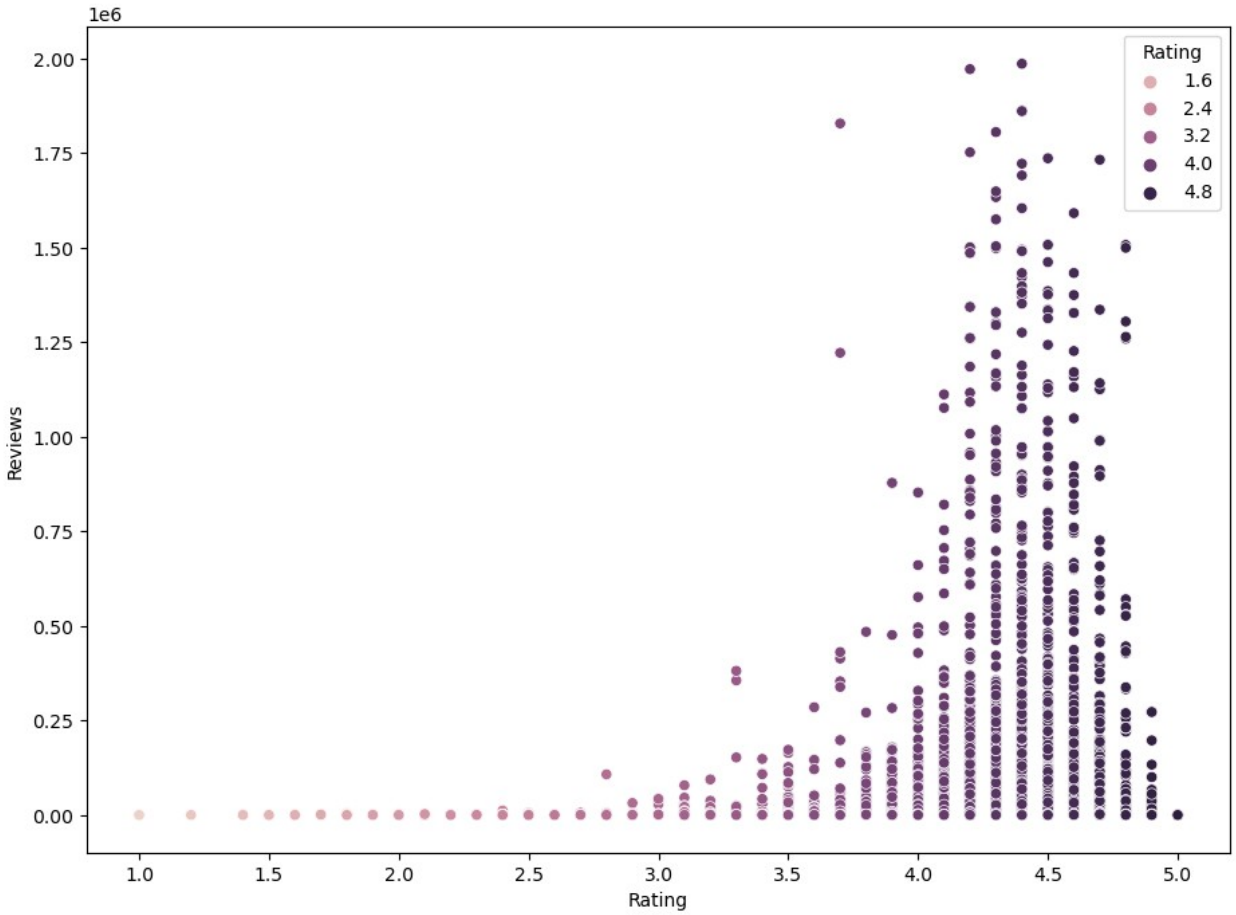

```
plt.figure(figsize=(10,6))
sns.scatterplot(x=df["Rating"],y=df["Size"],hue=df["Rating"])
```

```
<Axes: xlabel='Rating', ylabel='Size'>
```



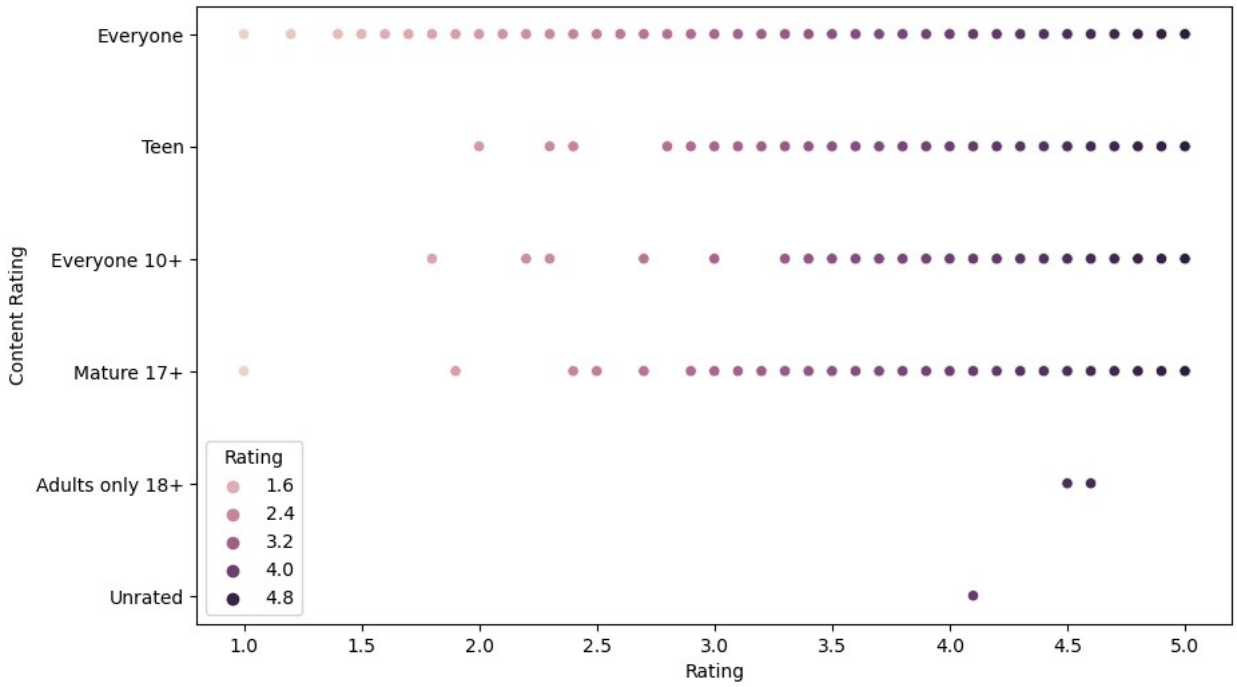

```
plt.figure(figsize=(11,8))
sns.scatterplot(x=df["Rating"],y=df["Reviews"],hue=df["Rating"])
```

```
<Axes: xlabel='Rating', ylabel='Reviews'>
```



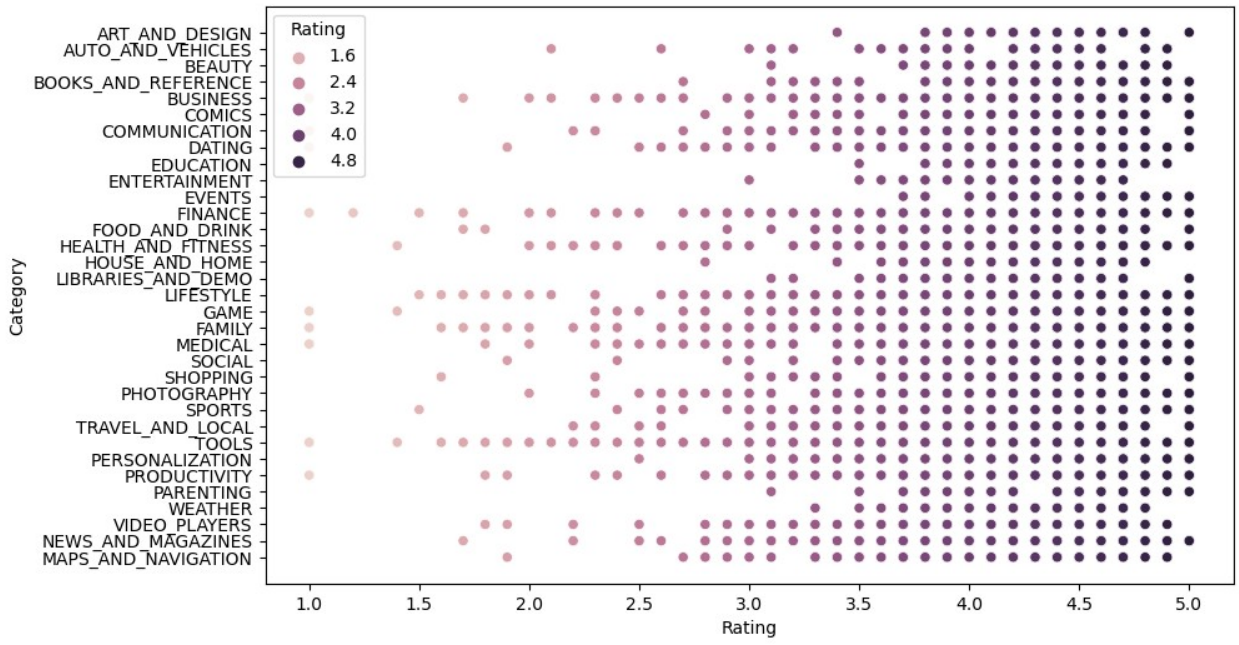

```
plt.figure(figsize=(10,6))
sns.scatterplot(x=df["Rating"],y=df["Content
Rating"],hue=df["Rating"])
```

```
<Axes: xlabel='Rating', ylabel='Content Rating'>
```




```
plt.figure(figsize=(10,6))
sns.scatterplot(x=df["Rating"],y=df["Category"],hue=df["Rating"])
```

```
<Axes: xlabel='Rating', ylabel='Category'>
```



Data Preprocessing

```
inp1 = df.copy()
inp1.columns
```

```
Index(['App', 'Category', 'Rating', 'Reviews', 'Size', 'Installs',
'Type',
       'Price', 'Content Rating', 'Genres', 'Last Updated', 'Current
Ver',
       'Android Ver'],
      dtype='object')
```

```
#Reseting the rows' index
inp1=inp1.reset_index(drop=True)
```

```
#Droping all teh unnecessary columns from the dataset
col_useful=['Category', 'Rating', 'Reviews', 'Size', 'Installs',
       'Price','Content Rating', 'Genres']
df_useful =inp1[col_useful]
```

```
df_useful.head()
```

```
          Category  Rating  Reviews     Size  Installs  Price Content
Rating  \
0  ART_AND_DESIGN     4.1      159  19000.0     10000    0.0
Everyone
1  ART_AND_DESIGN     3.9      967  14000.0    500000    0.0
Everyone
2  ART_AND_DESIGN     4.7    87510   8700.0   5000000    0.0
Everyone
3  ART_AND_DESIGN     4.5   215644  25000.0  50000000    0.0
Teen
4  ART_AND_DESIGN     4.3      967   2800.0    100000    0.0
Everyone

                      Genres
0               Art & Design
1  Art & Design;Pretend Play
2               Art & Design
3               Art & Design
4    Art & Design;Creativity
```

```
df_useful['log_Installs'] = df_useful['Installs'].apply(np.log1p)
```

```
C:\Users\varun\AppData\Local\Temp\ipykernel_6352\302540963.py:1:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

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

```
returning-a-view-versus-a-copy
  df_useful['log_Installs'] = df_useful['Installs'].apply(np.log1p)
```

```
df_useful['log_Installs']
```

```
0        9.210440
1       13.122365
2       15.424949
3       17.727534
4       11.512935
          ...
7478     6.908755
7479     6.216606
7480     8.517393
7481     4.615121
7482    16.118096
Name: log_Installs, Length: 7483, dtype: float64
```

```
df_useful['log_Reviews'] = np.log1p(df_useful['Reviews'])
```

```
C:\Users\varun\AppData\Local\Temp\ipykernel_6352\414248437.py:1:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  df_useful['log_Reviews'] = np.log1p(df_useful['Reviews'])
```

```
df_useful['log_Reviews']
```

```
0        5.075174
1        6.875232
2       11.379520
3       12.281389
4        6.875232
          ...
7478     3.806662
7479     2.079442
7480     3.663562
7481     1.609438
7482    12.894981
Name: log_Reviews, Length: 7483, dtype: float64
```

```
#Converting categorical columns to numeric columns
dummy = ['Category', 'Genres','Content Rating']
inp2 = pd.get_dummies(df_useful,columns=dummy,drop_first=True)
inp2.head()
```

```
   Rating  Reviews     Size  Installs  Price  log_Installs
log_Reviews  \
0     4.1      159  19000.0     10000    0.0      9.210440
5.075174
1     3.9      967  14000.0    500000    0.0     13.122365
6.875232
2     4.7    87510   8700.0   5000000    0.0     15.424949
11.379520
3     4.5   215644  25000.0  50000000    0.0     17.727534
12.281389
4     4.3      967   2800.0    100000    0.0     11.512935
6.875232

   Category_AUTO_AND_VEHICLES  Category_BEAUTY
Category_BOOKS_AND_REFERENCE  \
0                           0                0
0
1                           0                0
0
2                           0                0
0
3                           0                0
0
4                           0                0
0

   ...  Genres_Video Players & Editors  \
0  ...                               0
1  ...                               0
2  ...                               0
3  ...                               0
4  ...                               0

   Genres_Video Players & Editors;Creativity  \
0                                          0
1                                          0
2                                          0
3                                          0
4                                          0

   Genres_Video Players & Editors;Music & Video  Genres_Weather
Genres_Word  \
0                                             0               0
0
1                                             0               0
0
2                                             0               0
0
3                                             0               0
0
```

```
4                                                 0                0
0

   Content Rating_Everyone  Content Rating_Everyone 10+  \
0                        1                            0
1                        1                            0
2                        1                            0
3                        0                            0
4                        1                            0

   Content Rating_Mature 17+  Content Rating_Teen  Content
Rating_Unrated
0                          0                    0
0
1                          0                    0
0
2                          0                    0
0
3                          0                    1
0
4                          0                    0
0

[5 rows x 155 columns]
```

```
df_train=inp2.iloc[:,1:]
df_test=inp2.iloc[:,0]
df_train.shape
```

```
(7483, 154)
```

```
#Spliting the dataset into training and testing dataset

from sklearn.model_selection import train_test_split
X_train,X_test,y_train,y_test=train_test_split(df_train,df_test,test_s
ize=0.3)
```

machine learning (model building)

```
from sklearn.linear_model import LinearRegression
regressor=LinearRegression()
model=regressor.fit(X_train, y_train)

#Predicting the Test result

y_pred=model.predict(X_test)

#Finding various metrics for evaluating the regression model from
sklearn library

from sklearn.metrics import r2_score,mean_squared_error
```

```
print('R2_Score=',r2_score(y_test,y_pred))
print('Root_Mean_Squared_Error(RMSE)=',np.sqrt(mean_squared_error(y_te
st,y_pred)))
```

```
R2_Score= 0.1228978530511744
Root_Mean_Squared_Error(RMSE)= 0.5427793437397055
```

```
a=pd.DataFrame({'Actual':y_test,'Predicted':y_pred});a.head(10)
```

	Actual	Predicted
5098	4.5	4.457942
5501	3.3	3.849888
496	4.2	4.185315
910	4.6	4.474242
3149	4.8	4.259059
2098	4.1	3.605412
6627	4.1	4.176261
1442	4.8	4.639270
4352	4.8	4.315058
4310	4.4	4.517972

Conclusion : - With the help of linear regression , the predicted ratings are very cose the the actual ratings

```
```