Google PlayStore Data Analysis

December 21, 2019

1 Google PlayStore Analysis -- By Mrinal Gosain

IMPORTING LIBRARIES

[1]:
```
#CORE LIBRARIES!
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import plotly
import seaborn as sns
import cufflinks as cf
%matplotlib inline
```

[34]:
```
#SOME ADDITIONAL LIBRARIES !
import missingno as msno    # USED FOR CHECKING MISSING VALUES VISUALLY!
import plotly.graph_objects as go
import plotly.express as px
plotly.offline.init_notebook_mode(connected=True)
from matplotlib import rcParams
rcParams['figure.figsize']=(20,10)
sns.set()
```

LOADING DATA

[3]:
```
#READING DATA FROM APPS.CSV!
df= pd.read_csv('apps.csv')
```

[4]:
```
#QUICK GLANCE AT THE DATA!
df.head(5)
```

[4]:
```
                                                 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        Genres  \
```

```
0      159   19M      10,000+  Free     0       Everyone  Art & Design
1      967   14M     500,000+  Free     0       Everyone  Art & Design
2    87510  8.7M   5,000,000+  Free     0       Everyone  Art & Design
3   215644   25M  50,000,000+  Free     0           Teen  Art & Design
4      967  2.8M     100,000+  Free     0       Everyone  Art & Design

      Last Updated         Current Ver   Android Ver
0  January 7, 2018               1.0.0  4.0.3 and up
1     Pretend Play    January 15, 2018        2.0.0
2   August 1, 2018               1.2.4  4.0.3 and up
3     June 8, 2018  Varies with device    4.2 and up
4       Creativity       June 20, 2018           1.1
```

[5]:
```
#SHAPE OF THE DATA!
df.shape
```

[5]:
```
(9659, 13)
```

[6]:
```
#CHECKING COLUMN NAMES IN THE DATASET!
df.columns
```

[6]:
```
Index(['App', 'Category', 'Rating', 'Reviews', 'Size', 'Installs', 'Type',
       'Price', 'Content Rating', 'Genres', 'Last Updated', 'Current Ver',
       'Android Ver'],
      dtype='object')
```

[7]:
```
#CHECKING UNIQUE CATEGORIES IN THE DATA!
df['Category'].unique()
```

[7]:
```
array(['ART_AND_DESIGN', 'AUTO_AND_VEHICLES', 'BEAUTY',
       'BOOKS_AND_REFERENCE', 'BUSINESS', 'COMICS', 'COMMUNICATION',
       'DATING', 'EDUCATION', 'ENTERTAINMENT', 'EVENTS', 'FINANCE',
       'FOOD_AND_DRINK', 'HEALTH_AND_FITNESS', 'HOUSE_AND_HOME',
       'LIBRARIES_AND_DEMO', 'LIFESTYLE', 'GAME', 'FAMILY', 'MEDICAL',
       'SOCIAL', 'SHOPPING', 'PHOTOGRAPHY', 'SPORTS', 'TRAVEL_AND_LOCAL',
       'TOOLS', 'PERSONALIZATION', 'PRODUCTIVITY', 'PARENTING', 'WEATHER',
       'VIDEO_PLAYERS', 'NEWS_AND_MAGAZINES', 'MAPS_AND_NAVIGATION'],
      dtype=object)
```

[8]:
```
#TOTAL UNIQUE CATEGORIES!
df['Category'].nunique()
```

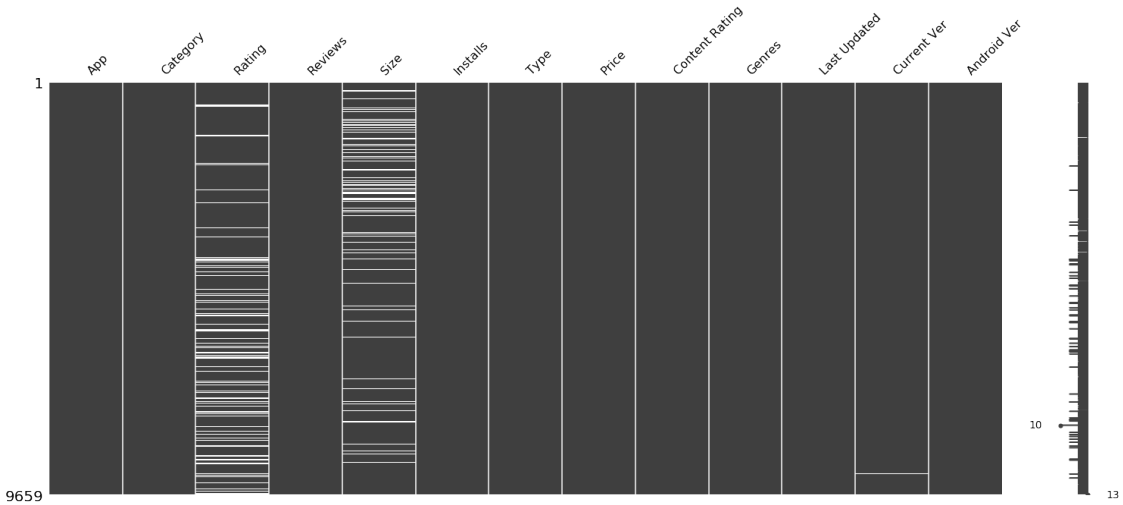
[8]:
```
33
```

[9]:
```
#QUCIK INFORMATION ABOUT THE DATA!   --> DATA HAS MISSING VALUES!
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 9659 entries, 0 to 9658
Data columns (total 13 columns):
App                9659 non-null object
Category           9659 non-null object
Rating             8196 non-null float64
Reviews            9659 non-null int64
Size               8432 non-null object
Installs           9659 non-null object
Type               9658 non-null object
Price              9659 non-null object
Content Rating     9659 non-null object
Genres             9659 non-null object
Last Updated       9659 non-null object
Current Ver        9651 non-null object
Android Ver        9657 non-null object
dtypes: float64(1), int64(1), object(11)
memory usage: 981.1+ KB
```

[10]:
```
#USING MISSING NO LIBRARY!  --> WHITE LINES SHOWS MISSING ROWS IN THE DATA!
msno.matrix(df)
```

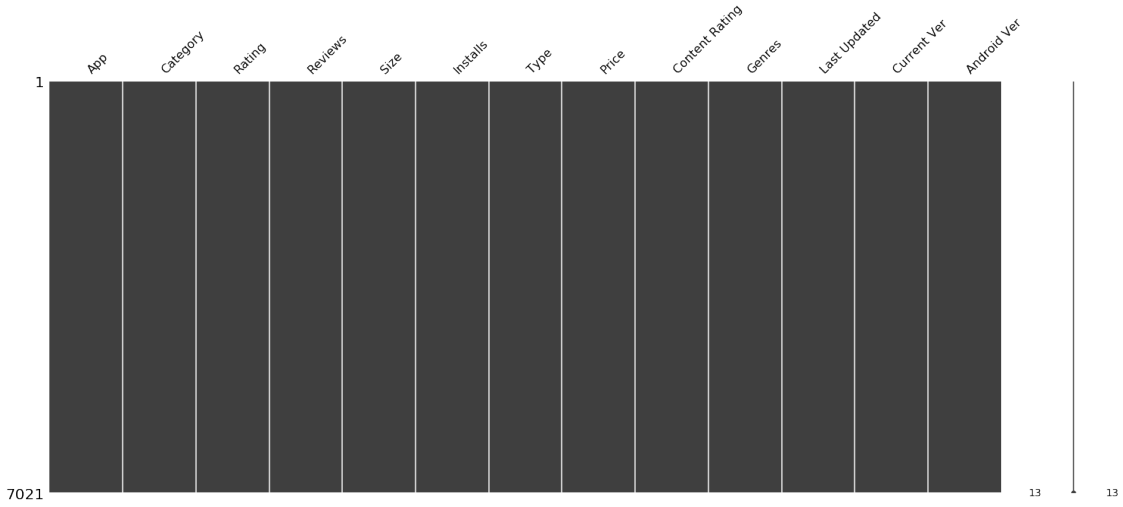
[10]: <matplotlib.axes._subplots.AxesSubplot at 0x7faac41fb7f0>



[11]:
```
#DROPPING NANS, NULL ENTRIES IN THE DATA!
df= df.dropna()
```

[12]:
```
#NO WHITE LINES --> DATA HAS NO MISSING DATA!
msno.matrix(df)
```

[12]: <matplotlib.axes._subplots.AxesSubplot at 0x7faac41630f0>



2 Cleaning Columns : Size , Installs , Price!

[13]:
```
#  --> Cleaning Size column!
#  --> REMOVING 'M' FROM THE END ('M' REPRESENTS MEGABYTES!)
df.Size= df.Size.apply(lambda x: float(x[:-1]))
```

[14]:
```
#CUSTOMIZED FUNCTION MADE TO CLEAN INSTALLS AND PRICE
# PRICE CONTAINS '$' IN THE STARTING
# INSTALLS HAS ',' AND '+' IN THE VALUES!
def Cleaner(x):
    num=''
    for i in x:
        if i in '1234567890.':
            num=num+i
        else:
            pass
    return(float(num))
```

[15]:
```
# INSTALLS AND PRICE CLEANED!
df['Installs']= df['Installs'].apply(Cleaner)
df['Price']= df['Price'].apply(Cleaner)
```

[16]:
```
# NOTE GENRE COLUMN IS SAME AS CATEGORY!
df= df.drop('Genres',axis=1)
```

[17]:
```
#USELESS FEATURES DROPPED!
df=df.drop(['Last Updated','Current Ver'],axis=1)
```

[20]:
```
# CHECK ANDROID VERSION IT HAS LONG STRING WHEREAS I AM INTERESTED IN KNOWING␣
 ↪THE ANDROID VERSION
# FEATURE EXTRACTION!
def AndroidVersionCleaner(x):
    try:
        return(int(x[0]))              #TAKING FIRST VALUE FROM THE VERSION!
    except:
        return(-1) # REPLACING UNEXPECTED ERRORS BY -1
```

[19]:
```
#APPLYING OUR CUSTOMIZED FUNCTION!
df['Android Ver']= df['Android Ver'].apply(AndroidVersionCleaner)
```

[21]:
```
#UNIQUE ENTRIES!
df['Android Ver'].nunique()
```

[21]:
```
11
```

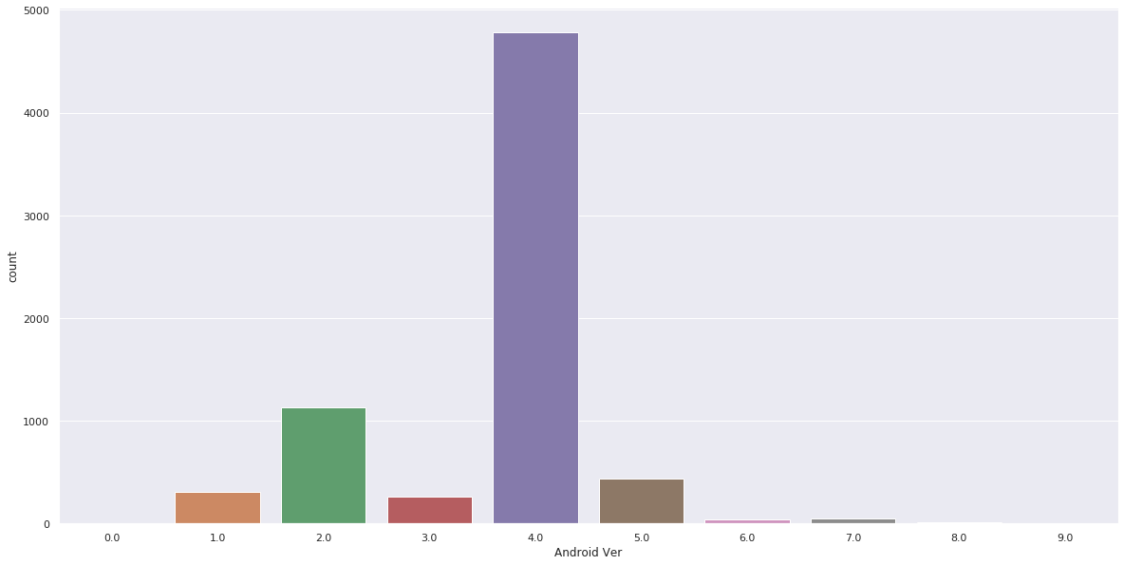
[22]:
```
#CHECKING THE VALUES IN THE ANDROID VERSION COLUMN!
df['Android Ver'].unique()
```

[22]:
```
array([ 4,  2,  1,  3,  5,  6,  7, -1,  9,  8,  0])
```

[30]:
```
df.loc[df['Android Ver']==-1,'Android Ver']=df['Android Ver'].median()␣
 ↪#Replacing -1 with median values!
```

[35]:
```
# CHECKING DISTRIBUTION USING COUNTPLOT!
# --> Most of the apps supports 4+ android version!
sns.countplot(df['Android Ver'])
```

[35]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac3e35a90>
```

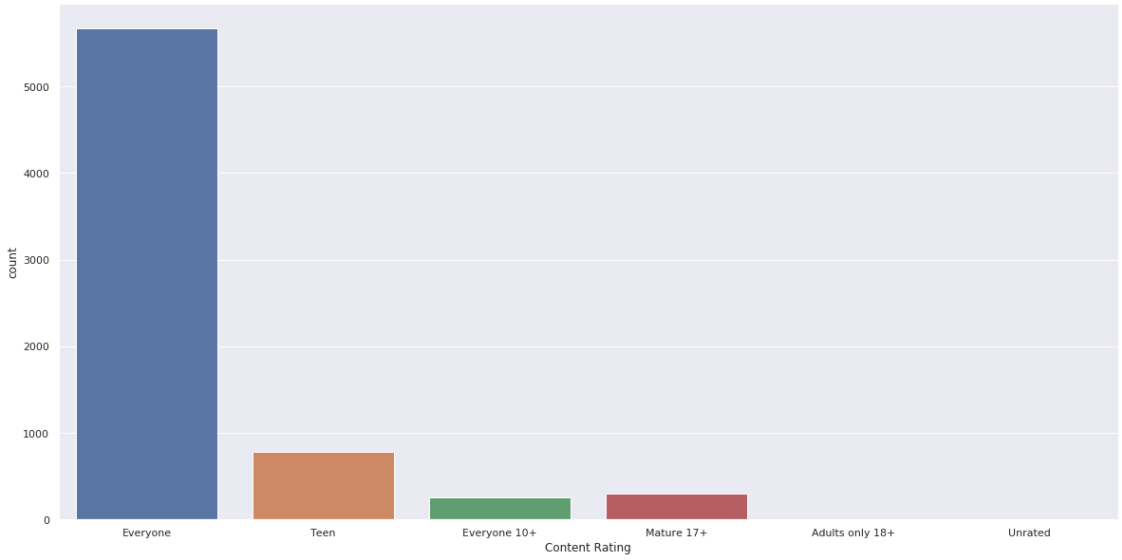


[37]:
```
#CHECKING CONTENT RATING UNIQUE VALUES!
df['Content Rating'].unique()
```

[37]:
```
array(['Everyone', 'Teen', 'Everyone 10+', 'Mature 17+',
       'Adults only 18+', 'Unrated'], dtype=object)
```

[38]:
```
sns.countplot(df['Content Rating'])
```

[38]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac3d81c50>
```



[39]:
```
df['Content Rating'].value_counts()
```

[39]:
```
Everyone           5676
Teen                779
Mature 17+          304
Everyone 10+        259
Adults only 18+       2
Unrated               1
Name: Content Rating, dtype: int64
```

[40]:
```
#CHECKING APPS WITH "ADULT ONLY 18+" RATINGS!
df[df['Content Rating']=='Adults only 18+']
```

[40]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Content Rating	Android Ver
262	Manga Master - Best manga & comic reader	COMICS	4.6	24005	4.9	500000.0	Free	0.0	Adults only 18+	4.0
2378	DraftKings - Daily Fantasy Sports	SPORTS	4.5	50017	41.0	1000000.0	Free	0.0	Adults only 18+	4.0

[41]:
```
#CHECKING APPS WITH "UNRATED" RATINGS!
df[df['Content Rating']=='Unrated']
```

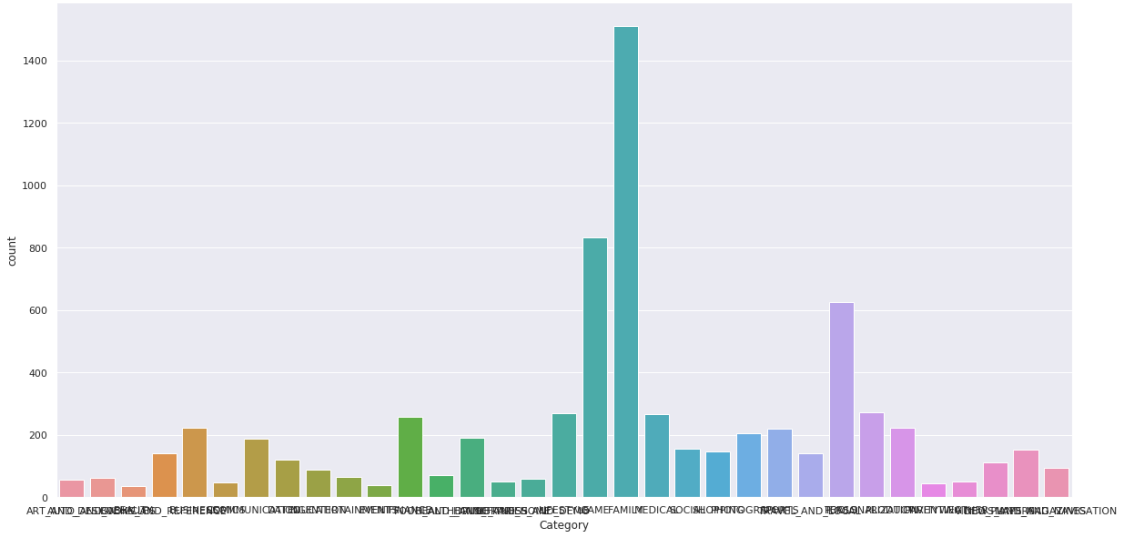
[41]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Content Rating	Android Ver
7189	DC Universe Online Map	TOOLS	4.1	1186	6.4	50000.0	Free	0.0	Unrated	2.0

3 DIVING DEEPER INTO APP CATEGORIES IN THE GOOGLE PLAY STORE!

[43]:
```
#COUNT PLOT FOR QUICK GLANCE AT THIS CATEGORY! --> MOST OF THE CATEGORY HAS␣
↪LESS APPS IN THIS DATA!
sns.countplot(df['Category'])
```

[43]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac3d266a0>
```



[44]:
```
df['Category'].value_counts()
```

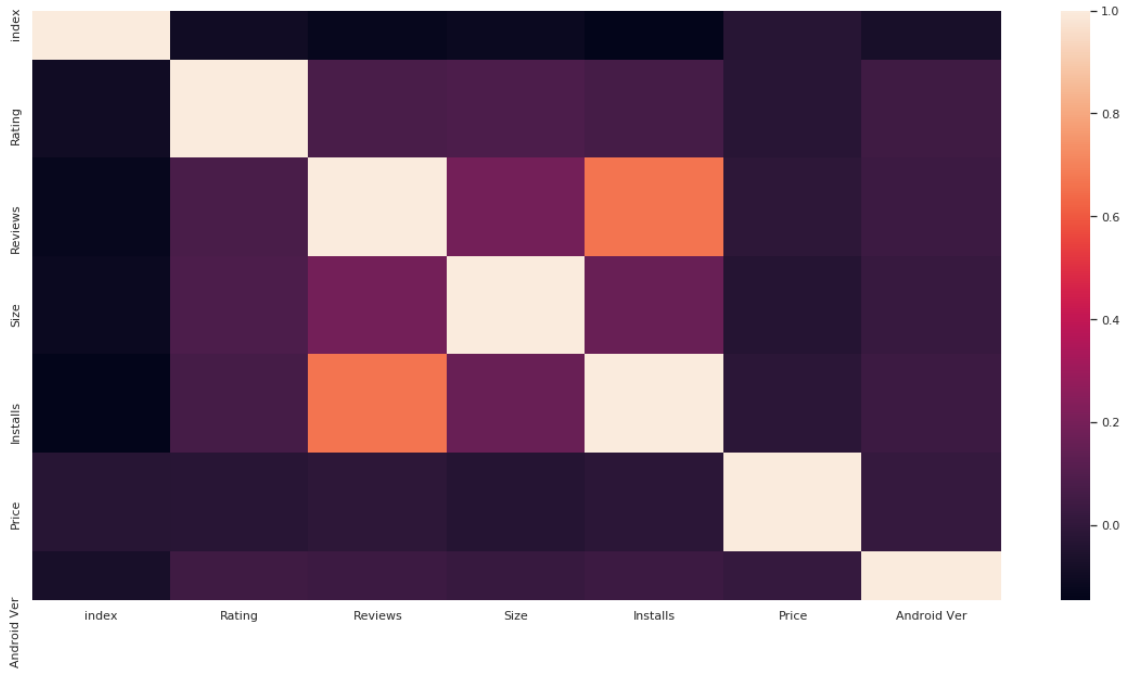
[44]:
```
FAMILY                 1511
GAME                    832
TOOLS                   625
PERSONALIZATION         274
LIFESTYLE               269
MEDICAL                 266
FINANCE                 258
PRODUCTIVITY            223
BUSINESS                222
SPORTS                  221
PHOTOGRAPHY             204
HEALTH_AND_FITNESS      191
COMMUNICATION           188
SOCIAL                  156
NEWS_AND_MAGAZINES      154
SHOPPING                146
TRAVEL_AND_LOCAL        141
BOOKS_AND_REFERENCE     141
DATING                  122
VIDEO_PLAYERS           112
MAPS_AND_NAVIGATION      94
EDUCATION                88
FOOD_AND_DRINK           72
ENTERTAINMENT            64
AUTO_AND_VEHICLES        63
LIBRARIES_AND_DEMO       60
ART_AND_DESIGN           58
```

```
HOUSE_AND_HOME          50
WEATHER                 50
COMICS                  47
PARENTING               44
EVENTS                  38
BEAUTY                  37
Name: Category, dtype: int64
```

[46]:
```
# Grouping apps if apps are more than 200 in the data!
df1= df.groupby('Category').filter(lambda x: len(x) >= 200).reset_index()
```

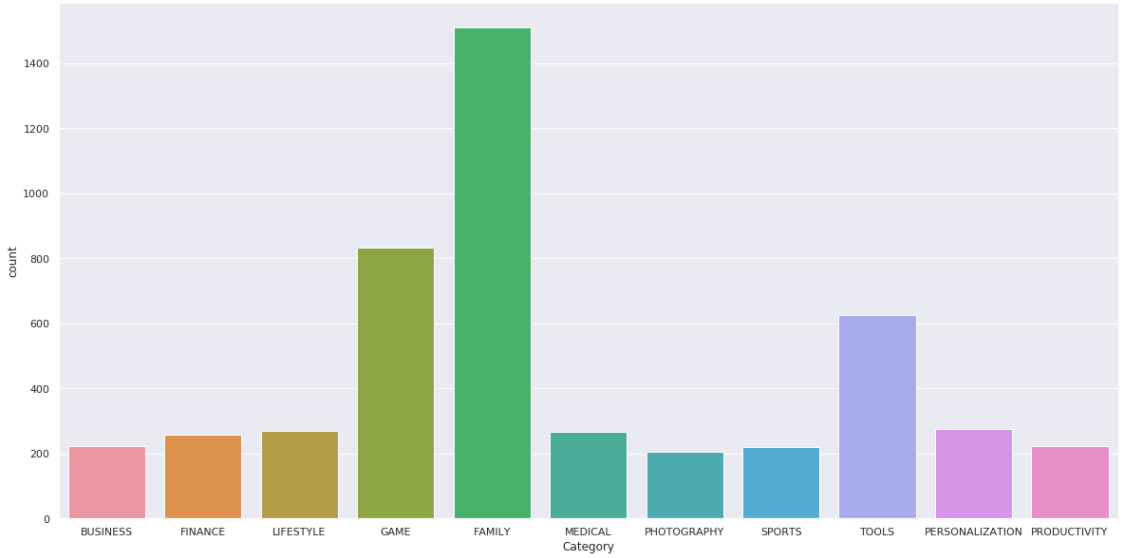
[95]:
```
# Installs and Reviews are highly correlated!
sns.heatmap(df1.corr())
```

[95]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac05f6860>
```



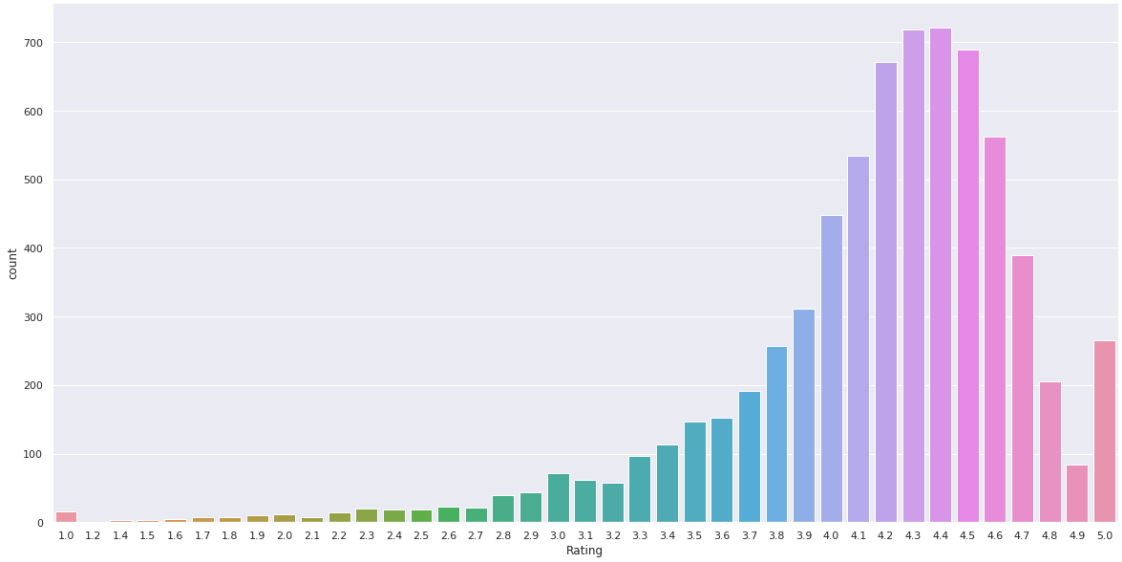
[48]:
```
sns.countplot(df1.Category)
# --> There are more family related and game related apps !
```

[48]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac3481e10>
```



[50]:
```
#DISTRIBUTION OF RATING
# --> AVERAGE RATING IS AROUND 4.1 AND THE DISTRIBUTION IS SKEWED WHICH IMPLIES␣
 ↪MOST OF THE PEOPLE HAVE TENDENCY
# TO GIVE 5 STARS IF THEY LIKE THE APP OR '1' STAR IF THEY DON'T LIKE THE APP.

sns.countplot(df.Rating)
```

[50]: <matplotlib.axes._subplots.AxesSubplot at 0x7faac33a54e0>



SOME SUMMARY DESCRIPTIVE STATISTICS OF THE RATING DISTRIBUTION

[54]:
```
df.Rating.mean()
```

[54]: 4.160703603475289

[55]:
```
df.Rating.std()
```

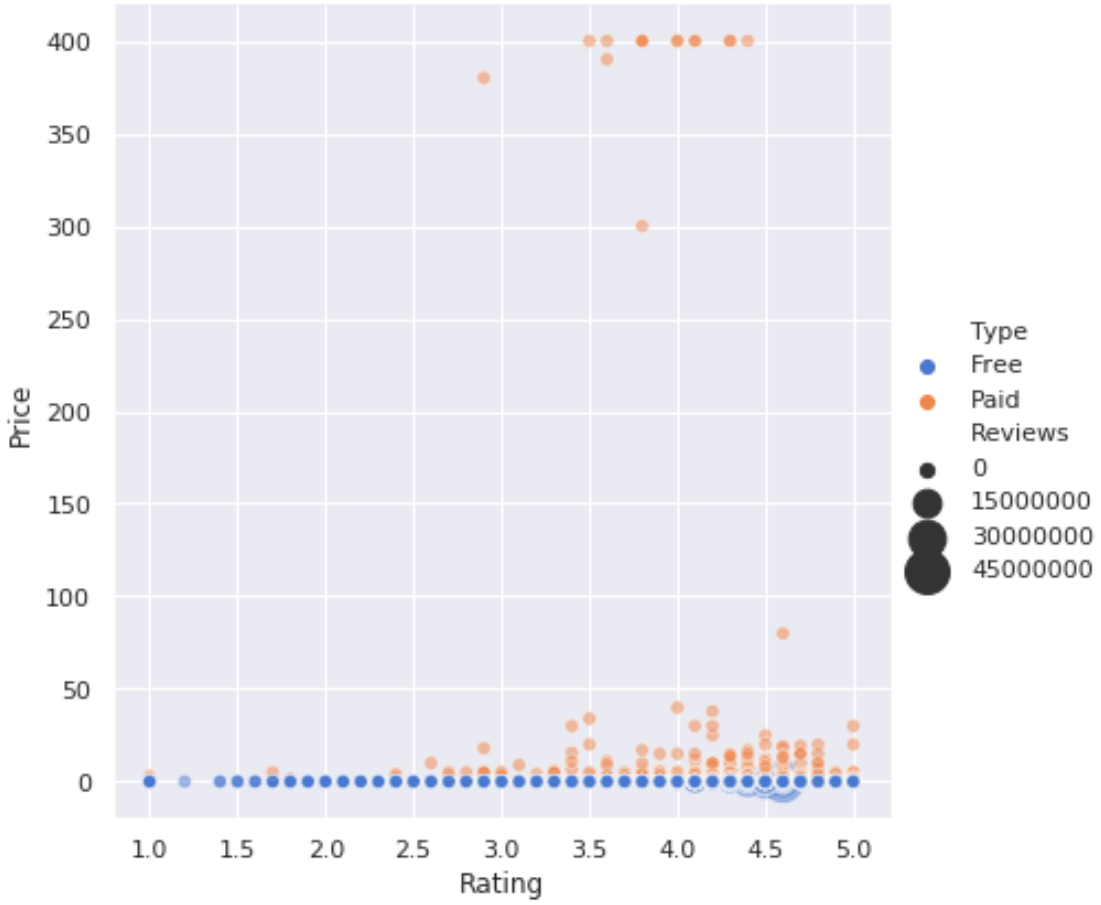
[55]: 0.5592409543681227

[56]:
```
df.Rating.median()
```

[56]: 4.3

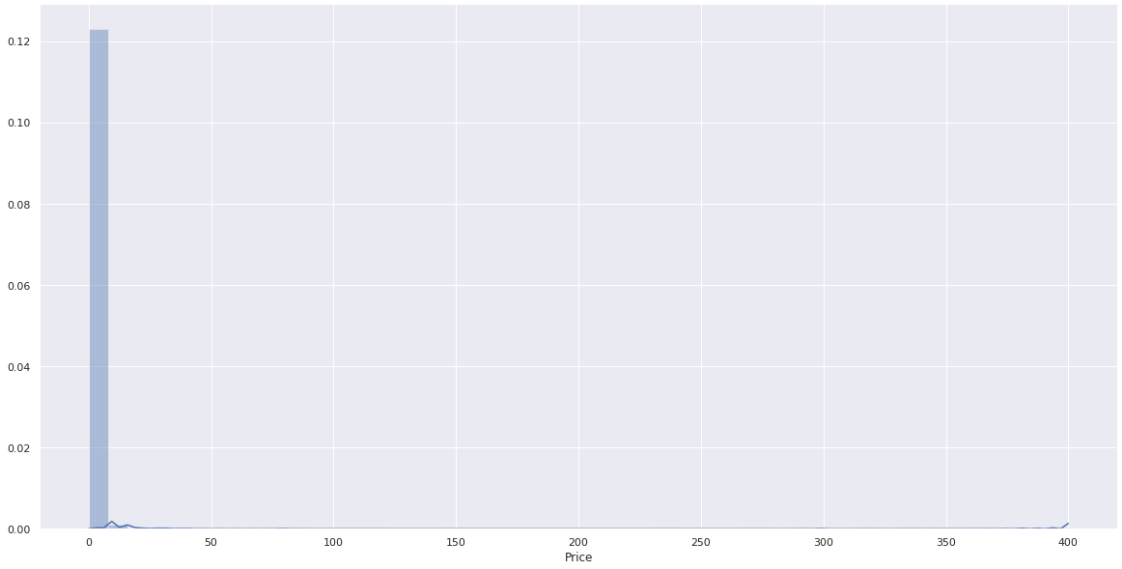
[59]:
```
# PRICE VS RATINGS WHERE TYPE OF APPS IS EITHER PAID OR FREE
# CIRCLE IS LARGER IF REVIEWS ARE MORE
sns.relplot(y="Price", x="Rating", hue="Type", size="Reviews", sizes=(40, 400),␣
↪alpha=.5, palette="muted", height=6, data=df1)
```

[59]: <seaborn.axisgrid.FacetGrid at 0x7faac31e9d30>



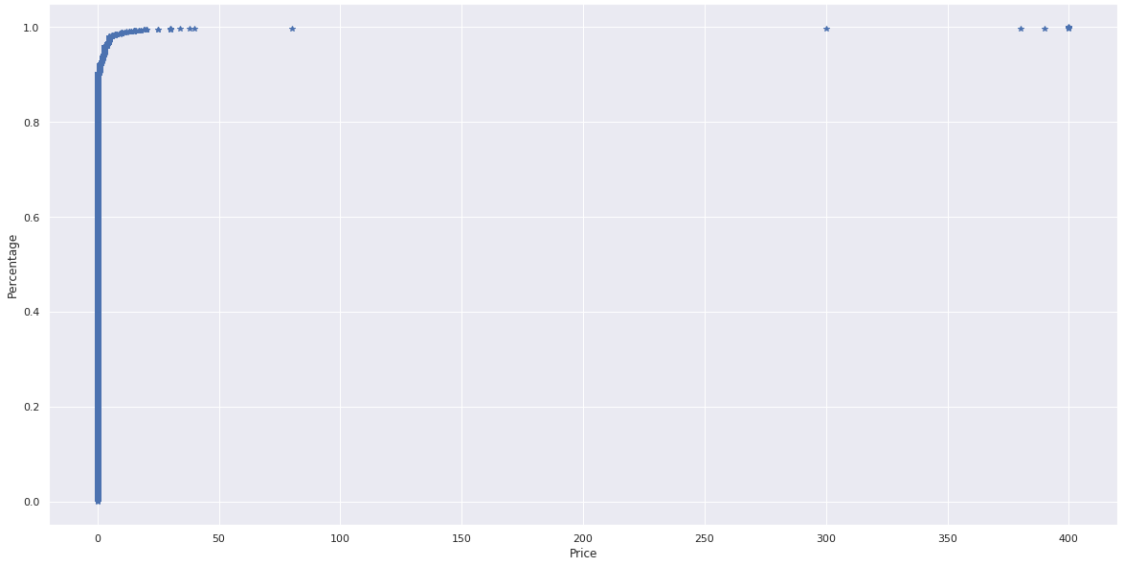
[62]:
```
#This is the distribution of price but it doesn't tell anything if someone␣
↪looks at it!
sns.distplot(df1.Price)
```

[62]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac2fee2b0>
```



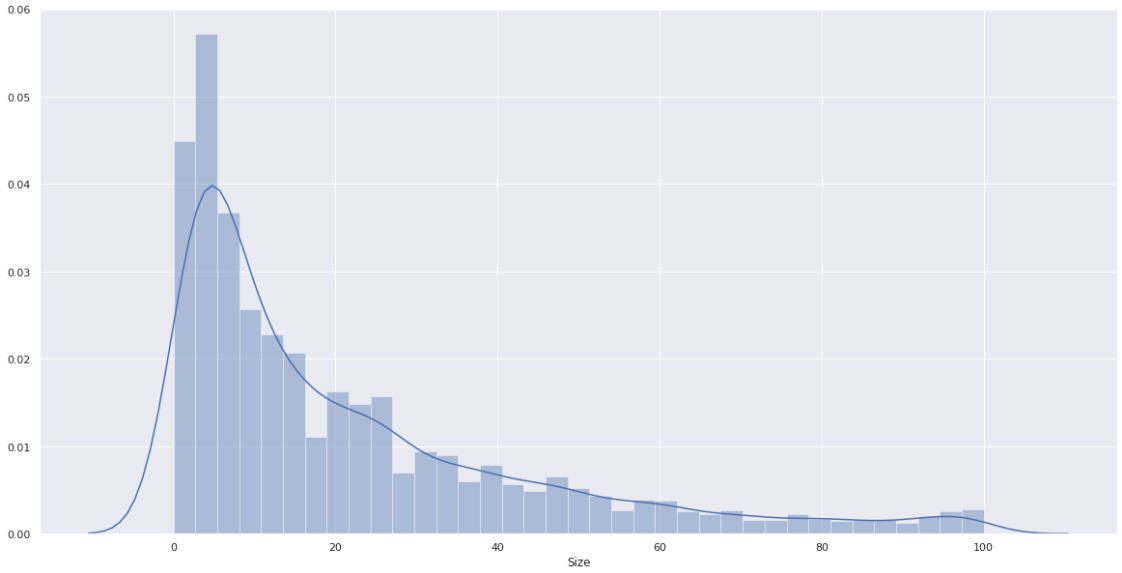
[65]:
```
#ECDF Function! (empirical cumulative distribution function)

def ecdf(series,name):

    x=np.sort(series)
    y=np.arange(1,len(x)+1)/len(x)
    plt.figure(figsize=(20,10))

    ax=plt.plot(x,y,marker='*',linestyle='none')
    ax=plt.xlabel(name)
    ax=plt.ylabel('Percentage')
```

[70]:
```
# Inference: Almost 99% of the data is below $50
ecdf(df1.Price,"Price")
```

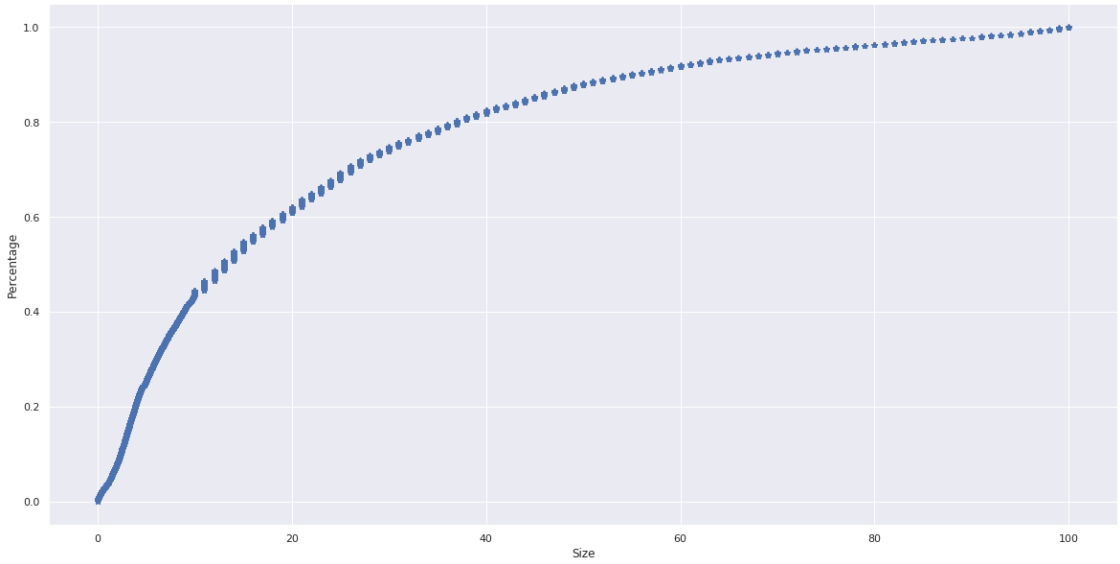


[75]:
```
#Distribution of Size!
sns.distplot(df['Size'])
```

[75]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac2b33eb8>
```



[71]:
```
#Inference: Around 90% of the apps are below 60MB
ecdf(df.Size,'Size')
```



4 Segragating Junk Apps!

[77]:
```
#Apps whose price is more than $50. 1% of the apps have price more than $50
JunkApps = df1[df1.Price>50]
```

[79]:
```
#LOOK AT JUNK APPS!
JunkApps
```

[79]:

	index	App	Category	Rating	Reviews	\
543	1755	Vargo Anesthesia Mega App	MEDICAL	4.6	92	
1246	3327	most expensive app (H)	FAMILY	4.3	6	
1342	3465	I'm rich	LIFESTYLE	3.8	718	
1345	3469	I'm Rich - Trump Edition	LIFESTYLE	3.6	275	
1914	4396	I am rich	LIFESTYLE	3.8	3547	
1916	4398	I am Rich Plus	FAMILY	4.0	856	
1917	4399	I am rich VIP	LIFESTYLE	3.8	411	
1918	4400	I Am Rich Premium	FINANCE	4.1	1867	
1919	4401	I am extremely Rich	LIFESTYLE	2.9	41	
1920	4402	I am Rich!	FINANCE	3.8	93	
1921	4403	I am rich(premium)	FINANCE	3.5	472	
1924	4406	I Am Rich Pro	FAMILY	4.4	201	
1926	4408	I am rich (Most expensive app)	FINANCE	4.1	129	
1928	4410	I Am Rich	FAMILY	3.6	217	
1930	4413	I am Rich	FINANCE	4.3	180	
1932	4417	I AM RICH PRO PLUS	FINANCE	4.0	36	

```
       Size  Installs  Type   Price Content Rating  Android Ver
543   32.00    1000.0  Paid   79.99       Everyone          4.0
1246   1.50     100.0  Paid  399.99       Everyone          7.0
1342  26.00   10000.0  Paid  399.99       Everyone          4.0
1345   7.30   10000.0  Paid  400.00       Everyone          4.0
1914   1.80  100000.0  Paid  399.99       Everyone          4.0
1916   8.70   10000.0  Paid  399.99       Everyone          4.0
1917   2.60   10000.0  Paid  299.99       Everyone          4.0
1918   4.70   50000.0  Paid  399.99       Everyone          4.0
1919   2.90    1000.0  Paid  379.99       Everyone          4.0
1920  22.00    1000.0  Paid  399.99       Everyone          4.0
1921   0.96    5000.0  Paid  399.99       Everyone          4.0
1924   2.70    5000.0  Paid  399.99       Everyone          1.0
1926   2.70    1000.0  Paid  399.99           Teen          4.0
1928   4.90   10000.0  Paid  389.99       Everyone          4.0
1930   3.80    5000.0  Paid  399.99       Everyone          4.0
1932  41.00    1000.0  Paid  399.99       Everyone          4.0
```

[80]:
```
len(JunkApps)
```

[80]:
```
16
```

5 AppsRel : Relevant Apps!

[81]:
```
AppsRel = df1[df1.Price<50]
```

[83]:
```
AppsRel.count()
```

[83]:
```
index             4889
App               4889
Category          4889
Rating            4889
Reviews           4889
Size              4889
Installs          4889
Type              4889
Price             4889
Content Rating    4889
Android Ver       4889
dtype: int64
```

[84]:
```
# Grouping by Category!
apps_by_categ = AppsRel.groupby('Category').mean().reset_index()
```

[85]:
```
apps_by_categ= apps_by_categ.drop(['index','Android Ver'],axis=1)
```

[86]:
```
apps_by_categ
```

[86]:

	Category	Rating	Reviews	Size	Installs	Price
0	BUSINESS	4.096396	19777.873874	13.934414	1.740013e+06	0.231622
1	FAMILY	4.179894	75173.839416	29.049542	2.357423e+06	0.417034
2	FINANCE	4.107937	35184.686508	18.091746	9.703345e+05	0.158452
3	GAME	4.235697	629111.813702	42.879375	1.386100e+07	0.326190
4	LIFESTYLE	4.099621	29029.125000	15.648409	1.531773e+06	0.278182
5	MEDICAL	4.160755	3908.849057	18.859472	1.190535e+05	1.905547
6	PERSONALIZATION	4.324453	102438.248175	11.577482	3.266905e+06	0.420876
7	PHOTOGRAPHY	4.114216	188368.549020	15.783873	7.323006e+06	0.325343
8	PRODUCTIVITY	4.132735	104201.569507	12.060673	5.813014e+06	0.237489
9	SPORTS	4.200905	113725.389140	26.400000	3.648468e+06	0.363032
10	TOOLS	4.005600	133461.089600	8.297264	4.607286e+06	0.293760

[87]:
```
#Plotting Ratings and Size of the Relevant Apps!
fig = go.Figure()
fig.add_trace(go.Bar(

    x=apps_by_categ.Category,
    y=apps_by_categ.Rating,
    name='Ratings',
    marker_color='indianred'

))
fig.add_trace(go.Bar(

    x=apps_by_categ.Category,
    y=apps_by_categ.Size,
    name='Size',
    marker_color='lightsalmon'
))

# Here we modify the tickangle of the xaxis, resulting in rotated labels.
```

```
fig.update_layout(barmode='group', xaxis_tickangle=-45)
fig.show()
```

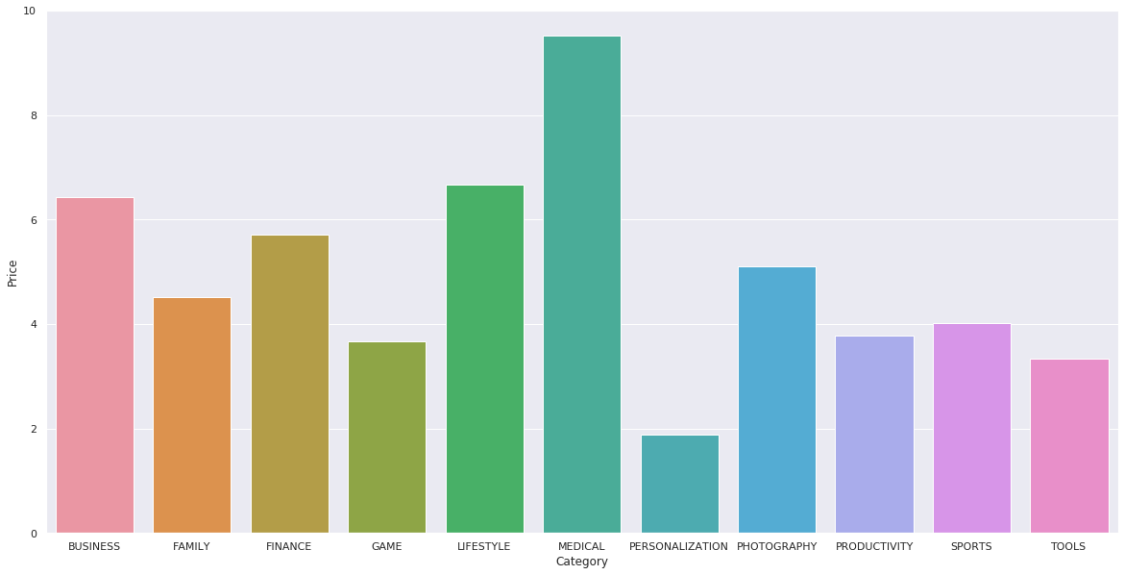
6 Paid Apps EDA (Exploratory Data Analysis!)

[89]:
```
PaidApps= AppsRel[AppsRel.Type=='Paid']    #appsRel --> Apps Relvant!
```

[90]:
```
PaidApps= PaidApps.groupby('Category').mean().reset_index()
```

[91]:
```
sns.barplot(data=PaidApps,x='Category',y='Price')
```

[91]: <matplotlib.axes._subplots.AxesSubplot at 0x7faac19ca358>



Number of Installation vs Type of Apps!

[92]:
```
fig = go.Figure()
trace0 = go.Box(
    # Data for paid apps
    y=AppsRel['Installs'][AppsRel['Type'] == 'Paid'],
    name = 'Paid'
)

trace1 = go.Box(
    # Data for free apps
    y=AppsRel['Installs'][AppsRel['Type'] == 'Free'],
    name = 'Free'
```

```
)

layout = go.Layout(
    title = "Number of downloads of paid apps vs. free apps",
    yaxis = dict(
        type = 'log',
        autorange = True
    )
)

# Add trace0 and trace1 to a list for plotting
data = [trace0,trace1]
plotly.offline.iplot({'data': data, 'layout': layout})
```

[108]:
```
#Paid apps have on an average a better ratings. This could potentially be␣
 ↪because of the fact that the developers
# extend extra support and features. Also, there is no 'Ads' running!
fig = px.box(df1, x="Type", y="Rating")
fig.show()
```

7 Loading Reviews.csv

[96]:
```
rev= pd.read_csv('user_reviews.csv')
```

[97]:
```
rev.shape
```

[97]:
```
(64295, 5)
```

[98]:
```
rev= rev.dropna()
```

[99]:
```
rev.shape
```

[99]:
```
(37427, 5)
```

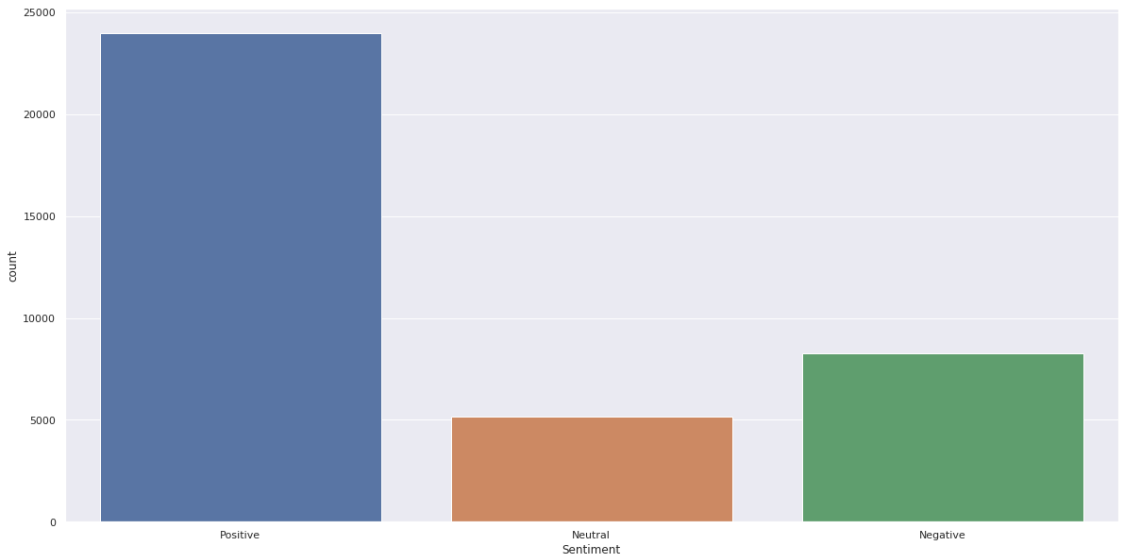
[100]:
```
rev.head()
```

[100]:
```
                     App                                Translated_Review  \
0  10 Best Foods for You  I like eat delicious food. That's I'm cooking …
1  10 Best Foods for You    This help eating healthy exercise regular basis
3  10 Best Foods for You         Works great especially going grocery store
4  10 Best Foods for You                                    Best idea us
5  10 Best Foods for You                                        Best way

  Sentiment  Sentiment_Polarity  Sentiment_Subjectivity
0  Positive                1.00                0.533333
```

```
1   Positive                0.25                0.288462
3   Positive                0.40                0.875000
4   Positive                1.00                0.300000
5   Positive                1.00                0.300000
```

[101]:
```
sns.countplot(rev.Sentiment)
```

[101]:
```
<matplotlib.axes._subplots.AxesSubplot at 0x7faac00a4400>
```



[102]:
```
rev[rev['Sentiment']=='Neutral']
```

[102]:
```
                                App  \
8              10 Best Foods for You
9              10 Best Foods for You
22             10 Best Foods for You
25             10 Best Foods for You
29             10 Best Foods for You
…                                …
64189  Hotwire Hotel & Car Rental App
64194  Hotwire Hotel & Car Rental App
64200  Housing-Real Estate & Property
64205  Housing-Real Estate & Property
64218  Housing-Real Estate & Property

                                    Translated_Review Sentiment  \
8                                   Looking forward app,   Neutral
9                  It helpful site ! It help foods get !   Neutral
22                                          God health   Neutral
```

```
25                    I found lot wealth form health…   Neutral
29                                         On test…   Neutral
…                                                …       …
64189         Solid app. No issues yet. Been using year.   Neutral
64194  Keeps telling there's problem date time, can't…   Neutral
64200  Why business? Your filters don't work.. redire…   Neutral
64205   I want list property sale option. Please connect   Neutral
64218  What nonsensical app.. doesn't owner postings …   Neutral

       Sentiment_Polarity  Sentiment_Subjectivity
8                     0.0                     0.0
9                     0.0                     0.0
22                    0.0                     0.0
25                    0.0                     0.0
29                    0.0                     0.0
…                     …                       …
64189                 0.0                     0.1
64194                 0.0                     0.0
64200                 0.0                     0.0
64205                 0.0                     0.0
64218                 0.0                     0.0

[5158 rows x 5 columns]
```

[103]:
```
rev= rev.groupby('App').mean()
```

[104]:
```
rev
```

[104]:
```
                                                    Sentiment_Polarity  \
App
10 Best Foods for You                                         0.470733
104    -                                                   0.392405
11st                                                          0.185943
1800 Contacts - Lens Store                                    0.318145
1LINE - One Line with One Touch                               0.196290
…                                                                …
Hotels.com: Book Hotel Rooms & Find Vacation Deals            0.101622
Hotspot Shield Free VPN Proxy & Wi-Fi Security                0.251765
Hotstar                                                       0.038178
Hotwire Hotel & Car Rental App                                0.187029
Housing-Real Estate & Property                               -0.021427

                                                    Sentiment_Subjectivity
App
10 Best Foods for You                                             0.495455
104    -                                                       0.545516
11st                                                              0.455340
```

```
1800 Contacts - Lens Store                                    0.591098
1LINE - One Line with One Touch                               0.557315
…                                                                …
Hotels.com: Book Hotel Rooms & Find Vacation Deals             0.545444
Hotspot Shield Free VPN Proxy & Wi-Fi Security                0.393284
Hotstar                                                       0.493964
Hotwire Hotel & Car Rental App                                0.459717
Housing-Real Estate & Property                                0.378532

[865 rows x 2 columns]
```

[105]:
```
#Merging two Dataframes on 'App'
merged_df=pd.merge(df1,rev, on = 'App', how = "inner")
```

[106]:
```
merged_df
```

[106]:
```
     index                                                App   Category  \
0      197  Curriculum vitae App CV Builder Free Resume Maker   BUSINESS
1      198                                    Google Primer   BUSINESS
2      206                                     Call Blocker   BUSINESS
3      231                 Fast Scanner : Free PDF Scan   BUSINESS
4      236                                       Google Ads   BUSINESS
..     …                                                …        …
316   3159                                          Hay Day     FAMILY
317   3210                                       Fruit Ninja®       GAME
318   3226                                       Bad Piggies     FAMILY
319   4434                          Diary with lock password  LIFESTYLE
320   4720                 Avakin Life - 3D virtual world     FAMILY

     Rating   Reviews  Size     Installs  Type  Price Content Rating  \
0       4.5      4458   3.9     500000.0  Free    0.0       Everyone
1       4.4     62272  18.0   10000000.0  Free    0.0       Everyone
2       4.6    188841   3.2    5000000.0  Free    0.0       Everyone
3       4.5    103755  14.0   10000000.0  Free    0.0       Everyone
4       4.3     29313  20.0    5000000.0  Free    0.0       Everyone
..      …       …   …          …   …    …            …
316     4.5  10053186  94.0  100000000.0  Free    0.0       Everyone
317     4.3   5091448  41.0  100000000.0  Free    0.0       Everyone
318     4.3   1168959  66.0   50000000.0  Free    0.0       Everyone
319     4.3    179139   9.7    5000000.0  Free    0.0       Everyone
320     4.4   1275373  91.0   10000000.0  Free    0.0           Teen

     Android Ver  Sentiment_Polarity  Sentiment_Subjectivity
0            4.0            0.393703                0.498036
1            4.0            0.750000                0.675000
2            4.0            0.027973                0.655431
3            4.0            0.313063                0.427900
```

```
4            4.0            0.139965                0.432399
..           …                 …                     …
316          4.0            0.019572                0.503682
317          4.0            0.154795                0.493289
318          4.0            0.007941                0.538949
319          4.0            0.292267                0.509656
320          4.0            0.080859                0.505326

[321 rows x 13 columns]
```

[112]:
```
# People feel more positive about paid apps on average!. Reason: it might have␣
↪received more positive reviews!
fig = px.box(merged_df, x="Type", y="Sentiment_Polarity")
fig.show()
```

8 Thank You!