Untitled

May 16, 2022

1 Analyzing Google Play Store Data

1.1 Installing Required Libraries

1] Numpy
2] Pandas
3] MatplotLib
4] Seaborn
5] Jovian

Install all the Libraries Before Starting Your Project

[95]:
```
!pip install jovian opendatasets --upgrade --quiet
```

[2]:
```
project_name = "Google-play-store-analysis"
```

[3]:
```
!pip install jovian --upgrade -q
```

[4]:
```
import jovian
```

[5]:
```
jovian.commit(project=project_name)
```

```
<IPython.core.display.Javascript object>
```

```
[jovian] Updating notebook "shrey2627/google-play-store-analysis" on
https://jovian.ai
[jovian] Committed successfully! https://jovian.ai/shrey2627/google-play-store-
analysis
```

[5]:
```
'https://jovian.ai/shrey2627/google-play-store-analysis'
```

[6]:
```
import numpy as np
import pandas as pd
import matplotlib
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

[7]:
```
import warnings
warnings.filterwarnings('ignore')
```

1.2 Getting Dataset

Here we I am taking dataset from Kaggle
https://www.kaggle.com/datasets/lava18/google-play-store-apps

[8]:
```
apps_df = pd.read_csv("googleplaystore2.csv")
```

1.3 Reading Dataset

Lets go through the entire dataset

[9]:
```
apps_df
```

[9]:

	App	Category	Rating	Reviews	Size	Installs	Type	Price	Content Rating	Genres	Android Ver
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	4.1	159	19M	10,000+	Free	0	Everyone	Art & Design	4.0.3 and up
1	Coloring book moana	ART_AND_DESIGN	3.9	967	14M	500,000+	Free	0	Everyone	Art & Design;Pretend Play	4.0.3 and up
2	U Launcher Lite - FREE Live Cool Themes, Hide …	ART_AND_DESIGN	4.7	87510	8.7M	5,000,000+	Free	0	Everyone	Art & Design	4.0.3 and up
3	Sketch - Draw & Paint	ART_AND_DESIGN	4.5	215644	25M	50,000,000+	Free	0	Teen	Art & Design	4.2 and up
4	Pixel Draw - Number Art Coloring Book	ART_AND_DESIGN	4.3	967	2.8M	100,000+	Free	0			
…	…	…	…	…	…	…	…	…			
10836	Sya9a Maroc - FR	FAMILY	4.5	38	53M	5,000+	Free	0			
10837	Fr. Mike Schmitz Audio Teachings	FAMILY	5.0	4	3.6M	100+	Free	0			
10838	Parkinson Exercices FR	MEDICAL	NaN	3	9.5M	1,000+	Free	0			
10839	The SCP Foundation DB fr nn5n	BOOKS_AND_REFERENCE	4.5	114	Varies with device	1,000+	Free	0			
10840	iHoroscope - 2018 Daily Horoscope & Astrology	LIFESTYLE	4.5	398307	19M	10,000,000+	Free	0			

```
4           Everyone    Art & Design;Creativity          4.4 and up
…              …                      …                    …
10836       Everyone                 Education          4.1 and up
10837       Everyone                 Education          4.1 and up
10838       Everyone                   Medical          2.2 and up
10839     Mature 17+          Books & Reference  Varies with device
10840       Everyone                 Lifestyle  Varies with device

[10841 rows x 11 columns]
```

[10]:
```
apps_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10841 entries, 0 to 10840
Data columns (total 11 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   App             10841 non-null  object
 1   Category        10841 non-null  object
 2   Rating          9367 non-null   float64
 3   Reviews         10841 non-null  object
 4   Size            10841 non-null  object
 5   Installs        10841 non-null  object
 6   Type            10840 non-null  object
 7   Price           10841 non-null  object
 8   Content Rating  10840 non-null  object
 9   Genres          10841 non-null  object
 10  Android Ver     10838 non-null  object
dtypes: float64(1), object(10)
memory usage: 931.8+ KB
```

[11]:
```
apps_df.columns
```

[11]:
```
Index(['App', 'Category', 'Rating', 'Reviews', 'Size', 'Installs', 'Type',
       'Price', 'Content Rating', 'Genres', 'Android Ver'],
      dtype='object')
```

[12]:
```
apps_df.shape
```

[12]:
```
(10841, 11)
```

2 Data Cleaning and Transforming

Here we will perform some cleaning methods to remove Null values and change data types of colu

[13]:
```
apps_df['Rating'].unique()
```

[13]:
```
array([ 4.1,  3.9,  4.7,  4.5,  4.3,  4.4,  3.8,  4.2,  4.6,  3.2,  4. ,
        nan,  4.8,  4.9,  3.6,  3.7,  3.3,  3.4,  3.5,  3.1,  5. ,  2.6,
        3. ,  1.9,  2.5,  2.8,  2.7,  1. ,  2.9,  2.3,  2.2,  1.7,  2. ,
        1.8,  2.4,  1.6,  2.1,  1.4,  1.5,  1.2, 19. ])
```

Here in the column Ratings we have one row with more than 5 value, Lets Drop the row.

[14]:
```
apps_df.drop(apps_df[apps_df.Rating > 5].index, inplace = True)
```

[15]:
```
apps_df['Rating'].unique()
```

[15]:
```
array([4.1, 3.9, 4.7, 4.5, 4.3, 4.4, 3.8, 4.2, 4.6, 3.2, 4. , nan, 4.8,
       4.9, 3.6, 3.7, 3.3, 3.4, 3.5, 3.1, 5. , 2.6, 3. , 1.9, 2.5, 2.8,
       2.7, 1. , 2.9, 2.3, 2.2, 1.7, 2. , 1.8, 2.4, 1.6, 2.1, 1.4, 1.5,
       1.2])
```

Rating Column have all the numeric value with object data type. So we need to change its data type to float from object.

[16]:
```
apps_df.Reviews = pd.to_numeric(apps_df.Reviews)
```

Lets Process the Size and Install column

[17]:
```
apps_df.Size = apps_df.Size.apply(lambda x:x.replace('M','e+6'))
apps_df.Size = apps_df.Size.apply(lambda X:X.replace('k','e+3'))
apps_df.Size = apps_df.Size.replace("Varies with device",np.nan)
```

[18]:
```
apps_df.Size = pd.to_numeric(apps_df.Size)
```

[19]:
```
apps_df.Installs = apps_df.Installs.apply(lambda x:x.replace('+',''))
apps_df.Installs = apps_df.Installs.apply(lambda x:x.replace(',',''))
```

[20]:
```
apps_df.Installs = pd.to_numeric(apps_df.Installs)
```

[21]:
```
apps_df
```

[21]:

	App	Category	\
0	Photo Editor & Candy Camera & Grid & ScrapBook	ART_AND_DESIGN	
1	Coloring book moana	ART_AND_DESIGN	
2	U Launcher Lite - FREE Live Cool Themes, Hide …	ART_AND_DESIGN	
3	Sketch - Draw & Paint	ART_AND_DESIGN	
4	Pixel Draw - Number Art Coloring Book	ART_AND_DESIGN	
…	…	…	
10836	Sya9a Maroc - FR	FAMILY	
10837	Fr. Mike Schmitz Audio Teachings	FAMILY	
10838	Parkinson Exercices FR	MEDICAL	
10839	The SCP Foundation DB fr nn5n	BOOKS_AND_REFERENCE	
10840	iHoroscope - 2018 Daily Horoscope & Astrology	LIFESTYLE	

```
       Rating  Reviews        Size  Installs  Type Price Content Rating  \
0         4.1      159  19000000.0     10000  Free     0       Everyone
1         3.9      967  14000000.0    500000  Free     0       Everyone
2         4.7    87510   8700000.0   5000000  Free     0       Everyone
3         4.5   215644  25000000.0  50000000  Free     0           Teen
4         4.3      967   2800000.0    100000  Free     0       Everyone
…         …        …          …         …   …   …              …
10836     4.5       38  53000000.0      5000  Free     0       Everyone
10837     5.0        4   3600000.0       100  Free     0       Everyone
10838     NaN        3   9500000.0      1000  Free     0       Everyone
10839     4.5      114         NaN      1000  Free     0     Mature 17+
10840     4.5   398307  19000000.0  10000000  Free     0       Everyone

                         Genres         Android Ver
0                  Art & Design        4.0.3 and up
1      Art & Design;Pretend Play        4.0.3 and up
2                  Art & Design        4.0.3 and up
3                  Art & Design          4.2 and up
4        Art & Design;Creativity          4.4 and up
…                          …                 …
10836                Education          4.1 and up
10837                Education          4.1 and up
10838                  Medical          2.2 and up
10839          Books & Reference  Varies with device
10840                Lifestyle  Varies with device

[10840 rows x 11 columns]
```

Now lets Clean Type and Price Column

[26]:
```
apps_df['Type'].unique()
```

[26]:
```
array(['Free', 'Paid'], dtype=object)
```

[25]:
```
apps_df["Type"].fillna("Free", inplace = True)
```

[28]:
```
apps_df
```

[28]:
```
                                                 App             Category  \
0         Photo Editor & Candy Camera & Grid & ScrapBook       ART_AND_DESIGN
1                                   Coloring book moana       ART_AND_DESIGN
2      U Launcher Lite - FREE Live Cool Themes, Hide …      ART_AND_DESIGN
3                                   Sketch - Draw & Paint       ART_AND_DESIGN
4                 Pixel Draw - Number Art Coloring Book       ART_AND_DESIGN
…                                                   …                  …
10836                                 Sya9a Maroc - FR               FAMILY
```

```
10837                    Fr. Mike Schmitz Audio Teachings               FAMILY
10838                              Parkinson Exercices FR               MEDICAL
10839                        The SCP Foundation DB fr nn5n  BOOKS_AND_REFERENCE
10840      iHoroscope - 2018 Daily Horoscope & Astrology             LIFESTYLE

       Rating  Reviews        Size  Installs  Type Price Content Rating  \
0         4.1      159  19000000.0     10000  Free     0       Everyone
1         3.9      967  14000000.0    500000  Free     0       Everyone
2         4.7    87510   8700000.0   5000000  Free     0       Everyone
3         4.5   215644  25000000.0  50000000  Free     0           Teen
4         4.3      967   2800000.0    100000  Free     0       Everyone
…       …      …          …       …   …   …            …
10836     4.5       38  53000000.0      5000  Free     0       Everyone
10837     5.0        4   3600000.0       100  Free     0       Everyone
10838     NaN        3   9500000.0      1000  Free     0       Everyone
10839     4.5      114         NaN      1000  Free     0     Mature 17+
10840     4.5   398307  19000000.0  10000000  Free     0       Everyone

                         Genres         Android Ver
0                  Art & Design        4.0.3 and up
1      Art & Design;Pretend Play        4.0.3 and up
2                  Art & Design        4.0.3 and up
3                  Art & Design          4.2 and up
4        Art & Design;Creativity          4.4 and up
…                          …                …
10836                Education          4.1 and up
10837                Education          4.1 and up
10838                  Medical          2.2 and up
10839          Books & Reference  Varies with device
10840                Lifestyle  Varies with device

[10840 rows x 11 columns]
```

[29]:
```
apps_df.Price = apps_df.Price.str.strip('$')
```

[30]:
```
apps_df.Price = pd.to_numeric(apps_df.Price)
```

[31]:
```
apps_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10840 entries, 0 to 10840
Data columns (total 11 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   App             10840 non-null  object
 1   Category        10840 non-null  object
 2   Rating          9366 non-null   float64
```

```
 3   Reviews          10840 non-null  int64
 4   Size             9145 non-null   float64
 5   Installs         10840 non-null  int64
 6   Type             10840 non-null  object
 7   Price            10840 non-null  float64
 8   Content Rating   10840 non-null  object
 9   Genres           10840 non-null  object
 10  Android Ver      10838 non-null  object
dtypes: float64(3), int64(2), object(6)
memory usage: 1016.2+ KB
```

[32]:
```
apps_df['Content Rating'].unique()
```

[32]:
```
array(['Everyone', 'Teen', 'Everyone 10+', 'Mature 17+',
       'Adults only 18+', 'Unrated'], dtype=object)
```

[33]:
```
apps_df['Genres'].unique()
```

[33]:
```
array(['Art & Design', 'Art & Design;Pretend Play',
       'Art & Design;Creativity', 'Art & Design;Action & Adventure',
       'Auto & Vehicles', 'Beauty', 'Books & Reference', 'Business',
       'Comics', 'Comics;Creativity', 'Communication', 'Dating',
       'Education;Education', 'Education', 'Education;Creativity',
       'Education;Music & Video', 'Education;Action & Adventure',
       'Education;Pretend Play', 'Education;Brain Games', 'Entertainment',
       'Entertainment;Music & Video', 'Entertainment;Brain Games',
       'Entertainment;Creativity', 'Events', 'Finance', 'Food & Drink',
       'Health & Fitness', 'House & Home', 'Libraries & Demo',
       'Lifestyle', 'Lifestyle;Pretend Play',
       'Adventure;Action & Adventure', 'Arcade', 'Casual', 'Card',
       'Casual;Pretend Play', 'Action', 'Strategy', 'Puzzle', 'Sports',
       'Music', 'Word', 'Racing', 'Casual;Creativity',
       'Casual;Action & Adventure', 'Simulation', 'Adventure', 'Board',
       'Trivia', 'Role Playing', 'Simulation;Education',
       'Action;Action & Adventure', 'Casual;Brain Games',
       'Simulation;Action & Adventure', 'Educational;Creativity',
       'Puzzle;Brain Games', 'Educational;Education', 'Card;Brain Games',
       'Educational;Brain Games', 'Educational;Pretend Play',
       'Entertainment;Education', 'Casual;Education',
       'Music;Music & Video', 'Racing;Action & Adventure',
       'Arcade;Pretend Play', 'Role Playing;Action & Adventure',
       'Simulation;Pretend Play', 'Puzzle;Creativity',
       'Sports;Action & Adventure', 'Educational;Action & Adventure',
       'Arcade;Action & Adventure', 'Entertainment;Action & Adventure',
       'Puzzle;Action & Adventure', 'Strategy;Action & Adventure',
       'Music & Audio;Music & Video', 'Health & Fitness;Education',
       'Adventure;Education', 'Board;Brain Games',
```

```
        'Board;Action & Adventure', 'Board;Pretend Play',
        'Casual;Music & Video', 'Role Playing;Pretend Play',
        'Entertainment;Pretend Play', 'Video Players & Editors;Creativity',
        'Card;Action & Adventure', 'Medical', 'Social', 'Shopping',
        'Photography', 'Travel & Local',
        'Travel & Local;Action & Adventure', 'Tools', 'Tools;Education',
        'Personalization', 'Productivity', 'Parenting',
        'Parenting;Music & Video', 'Parenting;Education',
        'Parenting;Brain Games', 'Weather', 'Video Players & Editors',
        'Video Players & Editors;Music & Video', 'News & Magazines',
        'Maps & Navigation', 'Health & Fitness;Action & Adventure',
        'Educational', 'Casino', 'Adventure;Brain Games',
        'Trivia;Education', 'Lifestyle;Education',
        'Books & Reference;Creativity', 'Books & Reference;Education',
        'Puzzle;Education', 'Role Playing;Education',
        'Role Playing;Brain Games', 'Strategy;Education',
        'Racing;Pretend Play', 'Communication;Creativity',
        'Strategy;Creativity'], dtype=object)
```

Lets Drop unnecessary columns

[34]:
```
apps_df.drop(['Android Ver'],axis=1,inplace=True)
```

[35]:
```
apps_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10840 entries, 0 to 10840
Data columns (total 10 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   App             10840 non-null  object
 1   Category        10840 non-null  object
 2   Rating          9366 non-null   float64
 3   Reviews         10840 non-null  int64
 4   Size            9145 non-null   float64
 5   Installs        10840 non-null  int64
 6   Type            10840 non-null  object
 7   Price           10840 non-null  float64
 8   Content Rating  10840 non-null  object
 9   Genres          10840 non-null  object
dtypes: float64(3), int64(2), object(5)
memory usage: 931.6+ KB
```

3 Data Visualization

Now Lets get some visuals from our Cleaned Dataset Using Python libraries like Seaborn and Mat

Now lets see the Top 10 categories which has the highest number of Installed Applications

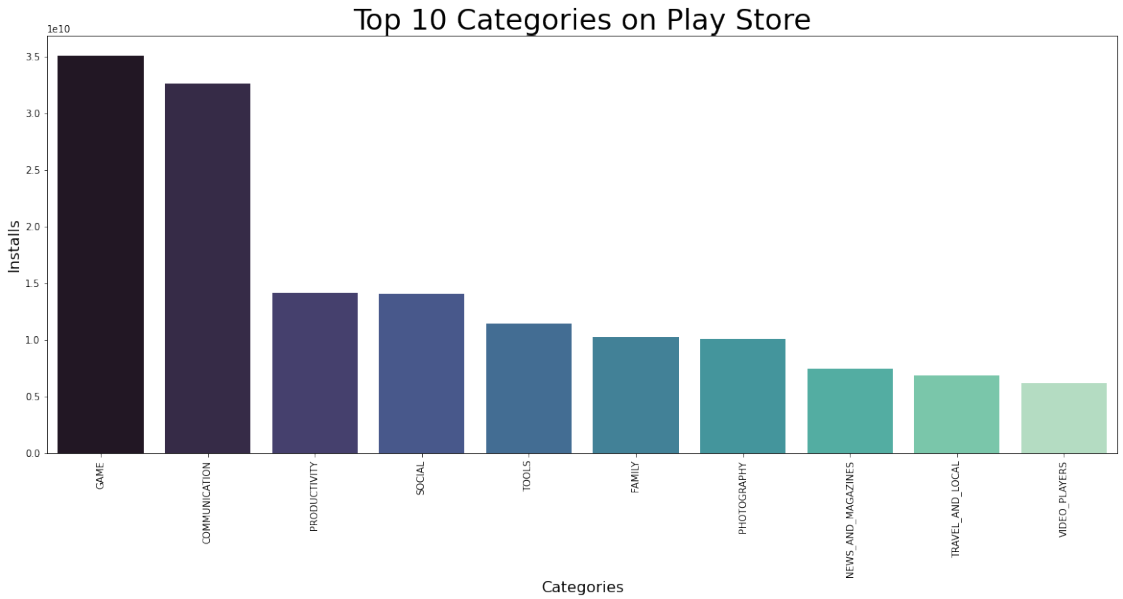
[36]:
```
most_instal = apps_df.groupby('Category').sum().sort_values(by =␣
↪'Installs',ascending = False).head(10)
```

[37]:
```
most_instal
```

[37]:

Category	Rating	Reviews	Size	Installs	Price
GAME	4702.1	1585422349	4.503565e+10	35086024415	287.30
COMMUNICATION	1364.0	815462260	3.118177e+09	32647276251	83.14
PRODUCTIVITY	1478.2	114116975	3.933369e+09	14176091369	250.93
SOCIAL	1102.2	621241422	3.713193e+09	14069867902	15.97
TOOLS	2970.8	273185044	6.481954e+09	11452771915	267.25
FAMILY	7323.9	410226330	5.188087e+10	10258263505	2434.78
PHOTOGRAPHY	1328.9	213516650	4.411387e+09	10088247655	134.21
NEWS_AND_MAGAZINES	962.8	54400863	2.813108e+09	7496317760	3.98
TRAVEL_AND_LOCAL	928.7	62617919	4.733663e+09	6868887146	49.95
VIDEO_PLAYERS	650.2	110380188	2.107080e+09	6222002720	10.46

[38]:
```
plt.figure(figsize=(20,8))
fig = sns.barplot(x = most_instal.index,y =most_instal.Installs,data =␣
↪most_instal, palette = 'mako')
fig.set_xlabel('Categories',fontsize = 16)
fig.set_ylabel('Installs', fontsize = 16)
fig.set_xticklabels(fig.get_xticklabels(),rotation = 90,fontsize = 10)
fig.set_title('Top 10 Categories on Play Store', fontsize = 30)
plt.show()
```



Now Lets look the Categories which have highest sold applications

[39]:
```
most_sold = apps_df.groupby('Category').sum().sort_values(by =␣
↪'Price',ascending = False)
```

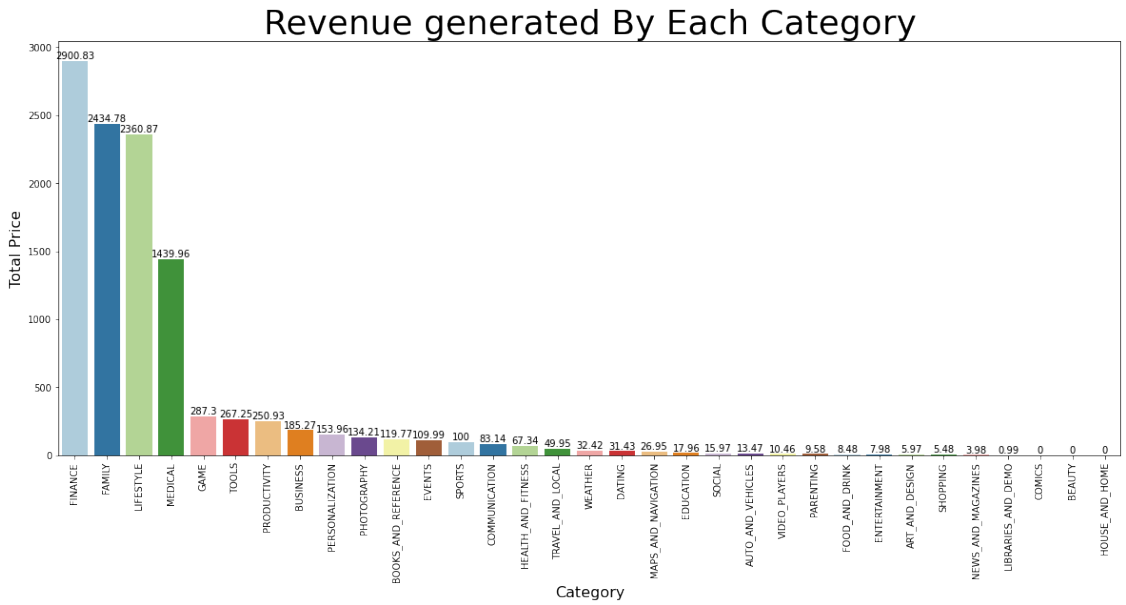
[40]:
```
most_sold
```

[40]:

Category	Rating	Reviews	Size	Installs	Price
FINANCE	1334.6	17550728	5.504070e+09	876648734	2900.83
FAMILY	7323.9	410226330	5.188087e+10	10258263505	2434.78
LIFESTYLE	1285.8	12882784	5.090302e+09	537643539	2360.87
MEDICAL	1466.2	1585975	8.519003e+09	53257437	1439.96
GAME	4702.1	1585422349	4.503565e+10	35086024415	287.30
TOOLS	2970.8	273185044	6.481954e+09	11452771915	267.25
PRODUCTIVITY	1478.2	114116975	3.933369e+09	14176091369	250.93
BUSINESS	1248.8	13954552	5.788865e+09	1001914865	185.27
PERSONALIZATION	1361.5	89346140	4.010843e+09	2325494782	153.96
PHOTOGRAPHY	1328.9	213516650	4.411387e+09	10088247655	134.21
BOOKS_AND_REFERENCE	773.6	21959069	2.622232e+09	1921469576	119.77
EVENTS	199.6	161018	7.959340e+08	15973161	109.99
SPORTS	1347.3	70830169	7.569433e+09	1751174498	100.00
COMMUNICATION	1364.0	815462260	3.118177e+09	32647276251	83.14
HEALTH_AND_FITNESS	1270.3	37893743	6.011072e+09	1583072512	67.34
TRAVEL_AND_LOCAL	928.7	62617919	4.733663e+09	6868887146	49.95
WEATHER	318.3	14604735	7.480820e+08	426100520	32.42
DATING	774.3	7291278	3.524618e+09	264310807	31.43
MAPS_AND_NAVIGATION	502.4	30659254	1.794389e+09	724281890	26.95
EDUCATION	680.3	39595786	2.307782e+09	871452000	17.96
SOCIAL	1102.2	621241422	3.713193e+09	14069867902	15.97
AUTO_AND_VEHICLES	305.9	1163666	1.502786e+09	53130211	13.47
VIDEO_PLAYERS	650.2	110380188	2.107080e+09	6222002720	10.46
PARENTING	215.0	958331	1.215700e+09	31521110	9.58
FOOD_AND_DRINK	454.2	8883330	2.218500e+09	273898751	8.48
ENTERTAINMENT	614.8	59178154	1.966800e+09	2869160000	7.98
ART_AND_DESIGN	270.2	1714440	7.670000e+08	124338100	5.97
SHOPPING	1013.8	115041222	3.251261e+09	3247848785	5.48
NEWS_AND_MAGAZINES	962.8	54400863	2.813108e+09	7496317760	3.98
LIBRARIES_AND_DEMO	271.6	1037118	9.088335e+08	62995910	0.99
COMICS	241.0	3383276	6.877530e+08	56086150	0.00
BEAUTY	179.7	396240	6.484000e+08	27197050	0.00
HOUSE_AND_HOME	319.0	3976385	1.086556e+09	168712461	0.00

[41]:
```
plt.figure(figsize=(20,8))
fig1 = sns.barplot(x = most_sold.index,y =most_sold.Price,data = most_sold,␣
↪palette = 'Paired')
```

```
fig1.set_xlabel('Category',fontsize = 16)
fig1.set_ylabel('Total Price', fontsize = 16)
fig1.set_xticklabels(fig1.get_xticklabels(),rotation = 90,fontsize = 10)
fig1.set_title('Revenue generated By Each Category', fontsize = 36)
fig1.bar_label(fig1.containers[0])
plt.show()
```



Lets go through the highest Rated Categories

[42]:
```
top_rated = apps_df.groupby('Category').sum().sort_values(by =␣
↪'Rating',ascending = False).head(5)
```

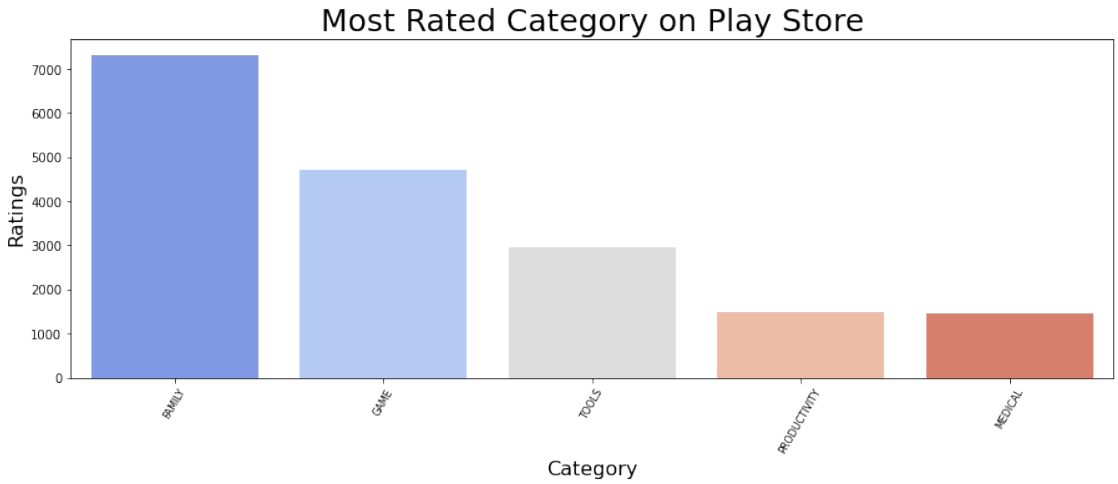
[43]:
```
top_rated
```

[43]:

Category	Rating	Reviews	Size	Installs	Price
FAMILY	7323.9	410226330	5.188087e+10	10258263505	2434.78
GAME	4702.1	1585422349	4.503565e+10	35086024415	287.30
TOOLS	2970.8	273185044	6.481954e+09	11452771915	267.25
PRODUCTIVITY	1478.2	114116975	3.933369e+09	14176091369	250.93
MEDICAL	1466.2	1585975	8.519003e+09	53257437	1439.96

[44]:
```
plt.figure(figsize=(15,5))
fig2 = sns.barplot(x = top_rated.index,y =top_rated.Rating,data = top_rated,␣
↪palette = 'coolwarm')
fig2.set_xlabel('Category',fontsize = 16)
fig2.set_ylabel('Ratings', fontsize = 16)
```

```
fig2.set_xticklabels(fig2.get_xticklabels(),rotation = 60,fontsize = 8)
fig2.set_title('Most Rated Category on Play Store', fontsize = 25)
plt.show()
```



Lets look total number of Application under all the ratings

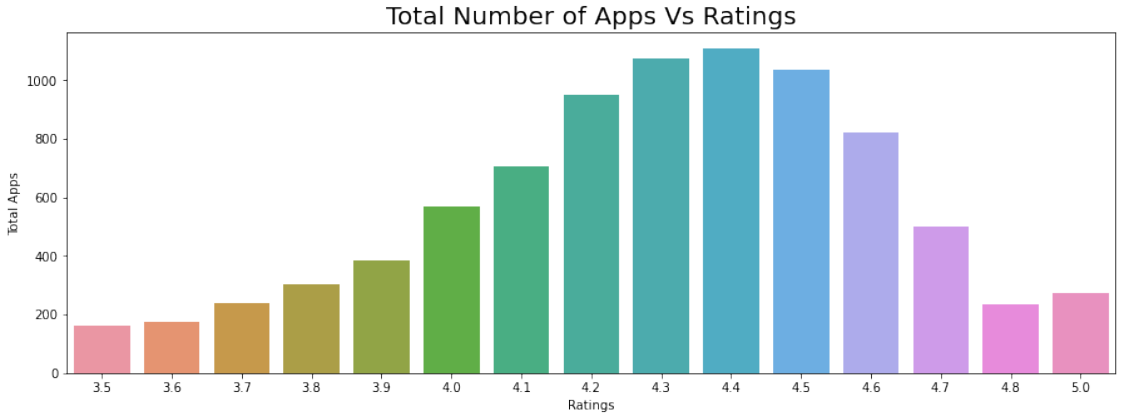
[45]:
```
total_rating = apps_df['Rating'].value_counts().head(15)
```

[46]:
```
total_rating
```

[46]:
```
4.4    1109
4.3    1076
4.5    1038
4.2     952
4.6     823
4.1     708
4.0     568
4.7     499
3.9     386
3.8     303
5.0     274
3.7     239
4.8     234
3.6     174
3.5     163
Name: Rating, dtype: int64
```

[47]:
```
plt.figure(figsize=(15,5))
fig3 = sns.barplot(total_rating.index,total_rating)
fig3.set_xlabel('Ratings',fontsize = 10)
fig3.set_ylabel('Total Apps', fontsize = 10)
```

```
fig3.set_title('Total Number of Apps Vs Ratings', fontsize = 20)
plt.show()
```



Letss look what percentage of application are free and paid.

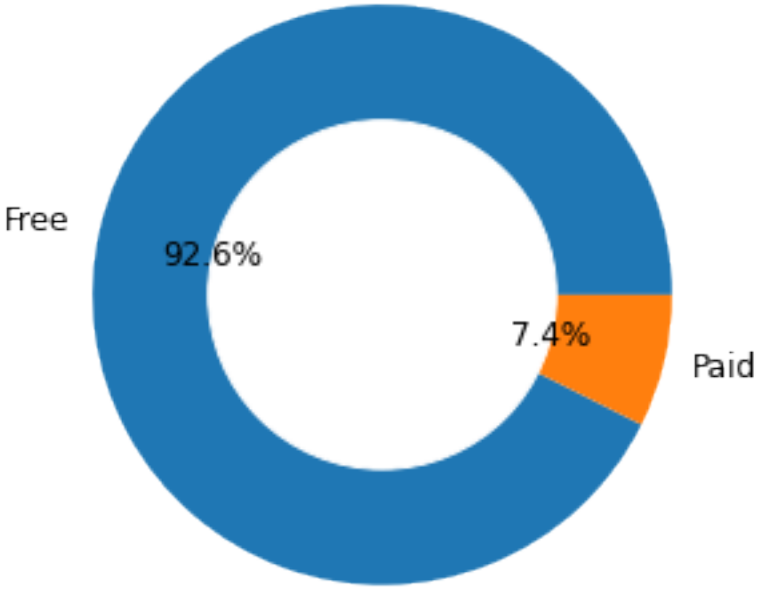
[49]:
```
typo = apps_df['Type'].value_counts()
```

[50]:
```
typo
```

[50]:
```
Free    10040
Paid      800
Name: Type, dtype: int64
```

[85]:
```
plt.figure(figsize=(15,5))
plt.pie(typo,labels=typo.index,autopct='%1.1f%%',textprops={'fontsize': 12})
fig4=plt.Circle( (0,0), 0.6, color='white')
p=plt.gcf()
p.gca().add_artist(fig4)

plt.show()
```



Lets look How many total application lies under each age restriction protocols on Play Store

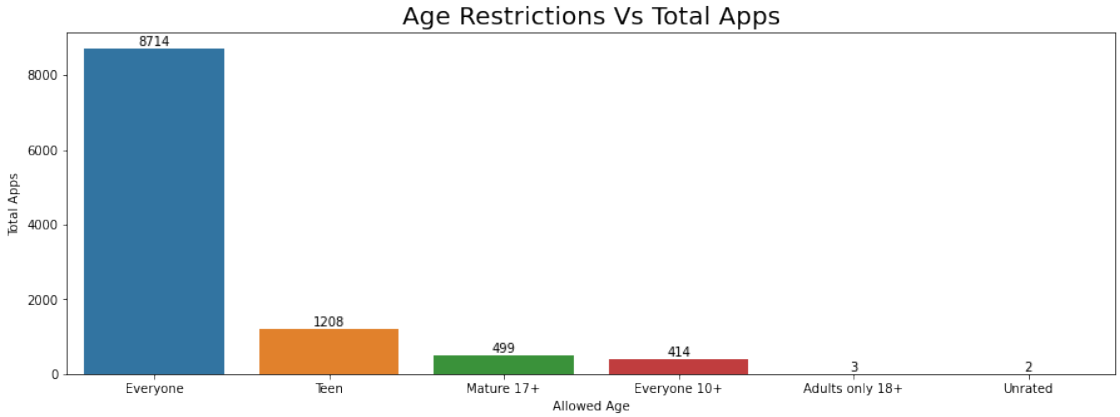
[81]:
```
age_grp = apps_df['Content Rating'].value_counts()
```

[82]:
```
age_grp
```

[82]:
```
Everyone           8714
Teen               1208
Mature 17+          499
Everyone 10+        414
Adults only 18+       3
Unrated               2
Name: Content Rating, dtype: int64
```

[93]:
```
plt.figure(figsize=(15,5))
fig5 = sns.barplot(age_grp.index,age_grp)
fig5.set_xlabel('Allowed Age',fontsize = 10)
fig5.set_ylabel('Total Apps', fontsize = 10)
fig5.set_title('Age Restrictions Vs Total Apps', fontsize = 20)
fig5.bar_label(fig5.containers[0])

plt.show()
```



4 Question and Answers

First Lets Create a Copy of our Dataset in order to perform operations to answer below mentioned questions. Doing this will not harm our actual dataset.

[120]:
```
apps_df_copy = apps_df.copy()
```

[122]:
```
apps_df_copy.set_index('App', inplace=True)
```

[123]:
```
apps_df_copy
```

[123]:
```
                                                    Category  \
App
Photo Editor & Candy Camera & Grid & ScrapBook       ART_AND_DESIGN
Coloring book moana                                  ART_AND_DESIGN
U Launcher Lite - FREE Live Cool Themes, Hide Apps    ART_AND_DESIGN
Sketch - Draw & Paint                                ART_AND_DESIGN
Pixel Draw - Number Art Coloring Book                ART_AND_DESIGN
…                                                           …
Sya9a Maroc - FR                                        FAMILY
Fr. Mike Schmitz Audio Teachings                        FAMILY
Parkinson Exercices FR                                 MEDICAL
The SCP Foundation DB fr nn5n                BOOKS_AND_REFERENCE
iHoroscope - 2018 Daily Horoscope & Astrology          LIFESTYLE

                                                    Rating  Reviews  \
App
Photo Editor & Candy Camera & Grid & ScrapBook         4.1      159
Coloring book moana                                    3.9      967
U Launcher Lite - FREE Live Cool Themes, Hide Apps      4.7    87510
Sketch - Draw & Paint                                  4.5   215644
Pixel Draw - Number Art Coloring Book                  4.3      967
```

```
…                                                    …      …
Sya9a Maroc - FR                                   4.5     38
Fr. Mike Schmitz Audio Teachings                   5.0      4
Parkinson Exercices FR                             NaN      3
The SCP Foundation DB fr nn5n                      4.5    114
iHoroscope - 2018 Daily Horoscope & Astrology      4.5 398307

                                                        Size  Installs  \
App
Photo Editor & Candy Camera & Grid & ScrapBook      19000000.0     10000
Coloring book moana                                 14000000.0    500000
U Launcher Lite - FREE Live Cool Themes, Hide Apps   8700000.0   5000000
Sketch - Draw & Paint                               25000000.0  50000000
Pixel Draw - Number Art Coloring Book                2800000.0    100000
…                                                          …       …
Sya9a Maroc - FR                                    53000000.0      5000
Fr. Mike Schmitz Audio Teachings                     3600000.0       100
Parkinson Exercices FR                               9500000.0      1000
The SCP Foundation DB fr nn5n                              NaN      1000
iHoroscope - 2018 Daily Horoscope & Astrology       19000000.0  10000000

                                                    Type  Price  \
App
Photo Editor & Candy Camera & Grid & ScrapBook      Free    0.0
Coloring book moana                                 Free    0.0
U Launcher Lite - FREE Live Cool Themes, Hide Apps  Free    0.0
Sketch - Draw & Paint                               Free    0.0
Pixel Draw - Number Art Coloring Book               Free    0.0
…                                                   …    …
Sya9a Maroc - FR                                    Free    0.0
Fr. Mike Schmitz Audio Teachings                    Free    0.0
Parkinson Exercices FR                              Free    0.0
The SCP Foundation DB fr nn5n                       Free    0.0
iHoroscope - 2018 Daily Horoscope & Astrology       Free    0.0

                                                   Content Rating  \
App
Photo Editor & Candy Camera & Grid & ScrapBook           Everyone
Coloring book moana                                      Everyone
U Launcher Lite - FREE Live Cool Themes, Hide Apps       Everyone
Sketch - Draw & Paint                                       Teen
Pixel Draw - Number Art Coloring Book                    Everyone
…                                                           …
Sya9a Maroc - FR                                         Everyone
Fr. Mike Schmitz Audio Teachings                         Everyone
Parkinson Exercices FR                                   Everyone
The SCP Foundation DB fr nn5n                          Mature 17+
```

```
iHoroscope - 2018 Daily Horoscope & Astrology            Everyone

                                                                 Genres
App
Photo Editor & Candy Camera & Grid & ScrapBook                   Art & Design
Coloring book moana                                 Art & Design;Pretend Play
U Launcher Lite - FREE Live Cool Themes, Hide Apps               Art & Design
Sketch - Draw & Paint                                            Art & Design
Pixel Draw - Number Art Coloring Book                 Art & Design;Creativity
…                                                                          …
Sya9a Maroc - FR                                                 Education
Fr. Mike Schmitz Audio Teachings                                 Education
Parkinson Exercices FR                                             Medical
The SCP Foundation DB fr nn5n                          Books & Reference
iHoroscope - 2018 Daily Horoscope & Astrology                    Lifestyle

[10840 rows x 9 columns]
```

4.0.1 Question 1] Which Application has the highest and the lowest Ratings?

Top 10 Highest Rated Apps

[130]:
```
most_rated_apps = apps_df_copy['Rating'] == 5.0
```

[131]:
```
apps_df_copy[most_rated_apps].head(10)
```

[131]:
```
                                        Category  Rating  Reviews  \
App
Hojiboy Tojiboyev Life Hacks              COMICS     5.0       15
American Girls Mobile Numbers             DATING     5.0        5
Awake Dating                              DATING     5.0        2
Spine- The dating app                     DATING     5.0        5
Girls Live Talk - Free Text and Video Chat DATING    5.0        6
Online Girls Chat Group                   DATING     5.0        5
Speeding Joyride & Car Meet App           DATING     5.0        3
SUMMER SONIC app                          EVENTS     5.0        4
Prosperity                                EVENTS     5.0       16
Mindvalley U Tallinn 2018                 EVENTS     5.0        1

                                             Size  Installs  Type  Price  \
App
Hojiboy Tojiboyev Life Hacks           37000000.0      1000  Free    0.0
American Girls Mobile Numbers           4400000.0      1000  Free    0.0
Awake Dating                           70000000.0       100  Free    0.0
Spine- The dating app                   9300000.0       500  Free    0.0
Girls Live Talk - Free Text and Video Chat 5000000.0    100  Free    0.0
Online Girls Chat Group                 5000000.0       100  Free    0.0
```

```
Speeding Joyride & Car Meet App             25000000.0       100  Free    0.0
SUMMER SONIC app                            61000000.0       500  Free    0.0
Prosperity                                   2300000.0       100  Free    0.0
Mindvalley U Tallinn 2018                   21000000.0       100  Free    0.0

                                                Content Rating  Genres
App
Hojiboy Tojiboyev Life Hacks                          Everyone  Comics
American Girls Mobile Numbers                     Mature 17+  Dating
Awake Dating                                      Mature 17+  Dating
Spine- The dating app                                   Teen  Dating
Girls Live Talk - Free Text and Video Chat        Mature 17+  Dating
Online Girls Chat Group                           Mature 17+  Dating
Speeding Joyride & Car Meet App                   Mature 17+  Dating
SUMMER SONIC app                                    Everyone  Events
Prosperity                                          Everyone  Events
Mindvalley U Tallinn 2018                           Everyone  Events
```

Top 10 Least Rated Apps

[132]:
```
least_rated_apps = apps_df_copy['Rating'] <=1.0
```

[133]:
```
apps_df_copy[least_rated_apps].head(10)
```

[133]:
```
                                    Category  Rating  Reviews        Size  \
App
House party - live chat                DATING     1.0        1   9200000.0
Speech Therapy: F                      FAMILY     1.0        1  16000000.0
Clarksburg AH                         MEDICAL     1.0        1  28000000.0
Truck Driving Test Class 3 BC          FAMILY     1.0        1   2000000.0
BJ Bridge Standard American 2018         GAME     1.0        1   4900000.0
MbH BM                                MEDICAL     1.0        1   2300000.0
CB Mobile Biz                         FINANCE     1.0        3   8400000.0
Thistletown CI                    PRODUCTIVITY     1.0        1   6600000.0
CJ DVD Rentals                   COMMUNICATION     1.0        5  13000000.0
CR Magazine                           BUSINESS     1.0        1   7800000.0

                                  Installs  Type  Price Content Rating  \
App
House party - live chat                 10  Free   0.00     Mature 17+
Speech Therapy: F                       10  Paid   2.99       Everyone
Clarksburg AH                           50  Free   0.00       Everyone
Truck Driving Test Class 3 BC           50  Paid   1.49       Everyone
BJ Bridge Standard American 2018      1000  Free   0.00       Everyone
MbH BM                                 100  Free   0.00       Everyone
CB Mobile Biz                          500  Free   0.00       Everyone
Thistletown CI                         100  Free   0.00       Everyone
```

```
CJ DVD Rentals                          100  Free   0.00       Everyone
CR Magazine                             100  Free   0.00       Everyone

                                          Genres
App
House party - live chat                   Dating
Speech Therapy: F                      Education
Clarksburg AH                            Medical
Truck Driving Test Class 3 BC          Education
BJ Bridge Standard American 2018            Card
MbH BM                                   Medical
CB Mobile Biz                            Finance
Thistletown CI                       Productivity
CJ DVD Rentals                      Communication
CR Magazine                              Business
```

4.0.2 Question 2] Which applications has the highest and lowest reviews?

Top 10 Applications with the highest Reviews

[128]:
```
highest_review = apps_df_copy['Reviews'].sort_values(ascending = False).head(10)
```

[129]:
```
highest_review
```

[129]:
```
App
Facebook                                    78158306
Facebook                                    78128208
WhatsApp Messenger                          69119316
WhatsApp Messenger                          69119316
WhatsApp Messenger                          69109672
Instagram                                   66577446
Instagram                                   66577313
Instagram                                   66577313
Instagram                                   66509917
Messenger - Text and Video Chat for Free    56646578
Name: Reviews, dtype: int64
```

Top 10 Applications with the lowest Reviews

[134]:
```
lowest_review = apps_df_copy['Reviews'].sort_values(ascending = True).head(10)
```

[136]:
```
lowest_review
```

[136]:
```
App
BAR-B-Q Recipes                             0
SHUTTLLS CQ - Connect Ride Go               0
CQ Ukraine                                  0
EG | Explore Folegandros                    0
```

```
CQ Electrical Group                                    0
25WPM Amateur ham radio Koch CW Morse code trainer     0
Cypress College Library                                0
qEG APP / Química EG SRL                               0
Create My App                                          0
Global Shop                                            0
Name: Reviews, dtype: int64
```

4.0.3 Question 3] Which Application is the biggest in Size?

[137]:
```
big_app = apps_df_copy['Size'].sort_values(ascending = False).head(5)
```

[138]:
```
big_app
```

[138]:
```
App
Mini Golf King - Multiplayer Game    100000000.0
Ultimate Tennis                      100000000.0
Hungry Shark Evolution               100000000.0
SimCity BuildIt                      100000000.0
Talking Babsy Baby: Baby Games       100000000.0
Name: Size, dtype: float64
```

4.0.4 Question 4] How many Application have more the one million Downloads?

[139]:
```
one_mil = apps_df_copy['Installs']>10e+6
```

[141]:
```
apps_df_copy[one_mil]
```

[141]:
```
                                          Category  Rating  Reviews  \
App
Sketch - Draw & Paint                    ART_AND_DESIGN     4.5   215644
Wattpad  Free Books               BOOKS_AND_REFERENCE     4.6  2914724
Amazon Kindle                     BOOKS_AND_REFERENCE     4.2   814080
Google Play Books                 BOOKS_AND_REFERENCE     3.9  1433233
Indeed Job Search                            BUSINESS     4.3   674730
…                                                 …     …       …
Talking Tom Bubble Shooter                     FAMILY     4.4   687136
Flight Simulator: Fly Plane 3D                 FAMILY     4.0   660613
Toy Truck Rally 3D                               GAME     4.0   301895
Motorola FM Radio                       VIDEO_PLAYERS     3.9    54815
Photo Editor Collage Maker Pro            PHOTOGRAPHY     4.5  1519671

                                        Size    Installs  Type  Price  \
App
Sketch - Draw & Paint           25000000.0    50000000  Free    0.0
Wattpad  Free Books                    NaN   100000000  Free    0.0
```

```
Amazon Kindle                          NaN   100000000  Free    0.0
Google Play Books                      NaN  1000000000  Free    0.0
Indeed Job Search                      NaN    50000000  Free    0.0
…                                      …          …    …    …
Talking Tom Bubble Shooter      54000000.0    50000000  Free    0.0
Flight Simulator: Fly Plane 3D  21000000.0    50000000  Free    0.0
Toy Truck Rally 3D              25000000.0    50000000  Free    0.0
Motorola FM Radio                      NaN   100000000  Free    0.0
Photo Editor Collage Maker Pro         NaN   100000000  Free    0.0

                                Content Rating                     Genres
App
Sketch - Draw & Paint                     Teen              Art & Design
Wattpad  Free Books                       Teen         Books & Reference
Amazon Kindle                             Teen         Books & Reference
Google Play Books                         Teen         Books & Reference
Indeed Job Search                      Everyone                  Business
…                                         …                         …
Talking Tom Bubble Shooter             Everyone                    Casual
Flight Simulator: Fly Plane 3D         Everyone                Simulation
Toy Truck Rally 3D                     Everyone                    Racing
Motorola FM Radio                      Everyone  Video Players & Editors
Photo Editor Collage Maker Pro         Everyone               Photography

[828 rows x 9 columns]
```

[142]:
```
len_app = len(apps_df_copy[one_mil])
```

[143]:
```
print("There are {} apps with more than one millions downloads".format(len_app))
```

```
There are 828 apps with more than one millions downloads
```

4.0.5 Question 5] Which is the Costliest and Cheapest Paid Application on Google Play Store?

Costliest Application on Google Play Store

[146]:
```
cost_app = apps_df_copy['Price'].sort_values(ascending = False).head(1)
```

[147]:
```
cost_app
```

[147]:
```
App
I'm Rich - Trump Edition    400.0
Name: Price, dtype: float64
```

Cheapest Paid Application on Google Play Store

[148]:
```
cheap_apps = apps_df_copy['Price']!=0
```

[156]:
```
apps_df_copy[cheap_apps].sort_values(by = 'Price',ascending = True).head(1)
```

[156]:

App	Category	Rating	Reviews	Size	Installs	Type	Price	Content Rating	Genres
Little Magnet BT Pro	TOOLS	4.6	251	3800000.0	1000	Paid	0.99	Everyone	Tools

[161]:
```
!pip install jovian --upgrade --quiet
```

[162]:
```
import jovian
```

[ ]:
```
jovian.commit(outputs=['googleplaystore2.csv'])
```

```
<IPython.core.display.Javascript object>
```

[160]:
```
jovian.commit(project=project_name)
```

```
<IPython.core.display.Javascript object>
```

```
[jovian] Updating notebook "shrey2627/google-play-store-analysis" on
https://jovian.ai
[jovian] Committed successfully! https://jovian.ai/shrey2627/google-play-store-
analysis
```

[160]:
```
'https://jovian.ai/shrey2627/google-play-store-analysis'
```

[ ]:
```

```