EDA And Feature Engineering Of Google Play Store Dataset

1) Problem statement. Today, 1.85 million different apps are available for users to download. Android users have even more from which to choose, with 2.56 million available through the Google Play Store. These apps have come to play a huge role in the way we live our lives today. Our Objective is to find the Most Popular Category, find the App with largest number of installs , the App with largest size etc. 2) Data Collection.

The data consists of 20 column and 10841 rows.

Steps We Are Going to Follow

1. Data Clearning
2. Exploratory Data Analysis

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

warnings.filterwarnings("ignore")

%matplotlib inline

df=pd.read_csv('https://raw.githubusercontent.com/krishnaik06/
playstore-Dataset/main/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.shape
```

```
(10841, 13)
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10841 entries, 0 to 10840
Data columns (total 13 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  Last Updated    10841 non-null  object 
 11  Current Ver     10833 non-null  object 
 12  Android Ver     10838 non-null  object 
dtypes: float64(1), object(12)
memory usage: 1.1+ MB
```

```
df.describe()
```

```
            Rating
count  9367.000000
mean      4.193338
std       0.537431
min       1.000000
25%       4.000000
50%       4.300000
```

```
75%         4.500000
max        19.000000
```

Missing Value

```
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
```

Observations

The dataset has missing values

```
df.head(2)

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

  Reviews Size  Installs  Type Price Content Rating  \
0     159  19M   10,000+  Free     0       Everyone   
1     967  14M  500,000+  Free     0       Everyone   

                      Genres      Last Updated Current Ver   Android 
Ver  
0               Art & Design   January 7, 2018       1.0.0  4.0.3 and 
up  
1  Art & Design;Pretend Play  January 15, 2018       2.0.0  4.0.3 and 
up  

df['Reviews'].unique()
```

```
array(['159', '967', '87510', ..., '603', '1195', '398307'],
dtype=object)
```

```
df.shape
```

```
(10841, 13)
```

```
df['Reviews'].str.isnumeric().sum()
```

```
10840
```

```
df[~df['Reviews'].str.isnumeric()]
```

```
                                           App Category  Rating
Reviews  \
10472  Life Made WI-Fi Touchscreen Photo Frame      1.9    19.0
3.0M

         Size Installs Type     Price Content Rating
Genres  \
10472  1,000+     Free    0  Everyone            NaN  February 11,
2018

      Last Updated Current Ver Android Ver
10472       1.0.19  4.0 and up         NaN
```

```
df_copy=df.copy()
```

```
df_copy=df_copy.drop(df_copy.index[10472])
```

```
df_copy[~df_copy['Reviews'].str.isnumeric()]
```

```
Empty DataFrame
Columns: [App, Category, Rating, Reviews, Size, Installs, Type, Price,
Content Rating, Genres, Last Updated, Current Ver, Android Ver]
Index: []
```

```
df_copy['Reviews']=df_copy['Reviews'].astype(int)
```

```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10840 entries, 0 to 10840
Data columns (total 13 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            10840 non-null  object
 5   Installs        10840 non-null  object
 6   Type            10839 non-null  object
 7   Price           10840 non-null  object
 8   Content Rating  10840 non-null  object
 9   Genres          10840 non-null  object
 10  Last Updated    10840 non-null  object
 11  Current Ver     10832 non-null  object
 12  Android Ver     10838 non-null  object
dtypes: float64(1), int64(1), object(11)
memory usage: 1.2+ MB
```

```
df_copy['Size'].unique()
```

```
array(['19M', '14M', '8.7M', '25M', '2.8M', '5.6M', '29M', '33M',
'3.1M',
       '28M', '12M', '20M', '21M', '37M', '2.7M', '5.5M', '17M',
'39M',
       '31M', '4.2M', '7.0M', '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', '2.5M', '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', '3.7M', '22M', '7.4M', '6.4M', '3.2M', '8.2M', '9.9M',
       '4.9M', '9.5M', '5.0M', '5.9M', '13M', '73M', '6.8M', '3.5M',
       '4.0M', '2.3M', '7.2M', '2.1M', '42M', '7.3M', '9.1M', '55M',
       '23k', '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', '118k', '44M', '695k',
'1.6M',
       '6.2M', '18k', '53M', '1.4M', '3.0M', '5.8M', '3.8M', '9.6M',
       '45M', '63M', '49M', '77M', '4.4M', '4.8M', '70M', '6.9M',
'9.3M',
       '10.0M', '8.1M', '36M', '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', '34M', '93M', '65M',
'79M',
       '100M', '58M', '50M', '68M', '64M', '67M', '60M', '94M',
'232k',
       '99M', '624k', '95M', '8.5k', '41k', '292k', '11k', '80M',
'1.7M',
       '74M', '62M', '69M', '75M', '98M', '85M', '82M', '96M', '87M',
       '71M', '86M', '91M', '81M', '92M', '83M', '88M', '704k',
'862k',
       '899k', '378k', '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', '902k',
'818k',
       '81k', '939k', '169k', '45k', '475k', '965k', '90M', '545k',
'61k',
       '283k', '655k', '714k', '93k', '872k', '121k', '322k', '1.0M',
       '976k', '172k', '238k', '549k', '206k', '954k', '444k', '717k',
       '210k', '609k', '308k', '705k', '306k', '904k', '473k', '175k',
       '350k', '383k', '454k', '421k', '70k', '812k', '442k', '842k',
       '417k', '412k', '459k', '478k', '335k', '782k', '721k', '430k',
       '429k', '192k', '200k', '460k', '728k', '496k', '816k', '414k',
       '506k', '887k', '613k', '243k', '569k', '778k', '683k', '592k',
       '319k', '186k', '840k', '647k', '191k', '373k', '437k', '598k',
       '716k', '585k', '982k', '222k', '219k', '55k', '948k', '323k',
       '691k', '511k', '951k', '963k', '25k', '554k', '351k', '27k',
       '82k', '208k', '913k', '514k', '551k', '29k', '103k', '898k',
       '743k', '116k', '153k', '209k', '353k', '499k', '173k', '597k',
       '809k', '122k', '411k', '400k', '801k', '787k', '237k', '50k',
       '643k', '986k', '97k', '516k', '837k', '780k', '961k', '269k',
       '20k', '498k', '600k', '749k', '642k', '881k', '72k', '656k',
       '601k', '221k', '228k', '108k', '940k', '176k', '33k', '663k',
       '34k', '942k', '259k', '164k', '458k', '245k', '629k', '28k',
       '288k', '775k', '785k', '636k', '916k', '994k', '309k', '485k',
       '914k', '903k', '608k', '500k', '54k', '562k', '847k', '957k',
       '688k', '811k', '270k', '48k', '329k', '523k', '921k', '874k',
       '981k', '784k', '280k', '24k', '518k', '754k', '892k', '154k',
       '860k', '364k', '387k', '626k', '161k', '879k', '39k', '970k',
       '170k', '141k', '160k', '144k', '143k', '190k', '376k', '193k',
       '246k', '73k', '658k', '992k', '253k', '420k', '404k', '470k',
       '226k', '240k', '89k', '234k', '257k', '861k', '467k', '157k',
       '44k', '676k', '67k', '552k', '885k', '1020k', '582k', '619k'],
      dtype=object)
```

19M (MB) converted to 19000

```
df_copy['Size']=df_copy['Size'].str.replace('M','000')
df_copy['Size']=df_copy['Size'].str.replace('k','')
df_copy['Size']=df_copy['Size'].replace('Varies with device',np.nan)
df_copy['Size']=df_copy['Size'].astype(float)

df_copy['Size'].unique()
```

```
array([1.90e+04, 1.40e+04, 8.70e+00, 2.50e+04, 2.80e+00, 5.60e+00,
       2.90e+04, 3.30e+04, 3.10e+00, 2.80e+04, 1.20e+04, 2.00e+04,
       2.10e+04, 3.70e+04, 2.70e+00, 5.50e+00, 1.70e+04, 3.90e+04,
       3.10e+04, 4.20e+00, 7.00e+00, 2.30e+04, 6.00e+00, 6.10e+00,
       4.60e+00, 9.20e+00, 5.20e+00, 1.10e+04, 2.40e+04,      nan,
       9.40e+00, 1.50e+04, 1.00e+04, 1.20e+00, 2.60e+04, 8.00e+00,
       7.90e+00, 5.60e+04, 5.70e+04, 3.50e+04, 5.40e+04, 2.01e+02,
       3.60e+00, 5.70e+00, 8.60e+00, 2.40e+00, 2.70e+04, 2.50e+00,
       1.60e+04, 3.40e+00, 8.90e+00, 3.90e+00, 2.90e+00, 3.80e+04,
       3.20e+04, 5.40e+00, 1.80e+04, 1.10e+00, 2.20e+00, 4.50e+00,
       9.80e+00, 5.20e+04, 9.00e+00, 6.70e+00, 3.00e+04, 2.60e+00,
       7.10e+00, 3.70e+00, 2.20e+04, 7.40e+00, 6.40e+00, 3.20e+00,
       8.20e+00, 9.90e+00, 4.90e+00, 9.50e+00, 5.00e+00, 5.90e+00,
       1.30e+04, 7.30e+04, 6.80e+00, 3.50e+00, 4.00e+00, 2.30e+00,
       7.20e+00, 2.10e+00, 4.20e+04, 7.30e+00, 9.10e+00, 5.50e+04,
       2.30e+01, 6.50e+00, 1.50e+00, 7.50e+00, 5.10e+04, 4.10e+04,
       4.80e+04, 8.50e+00, 4.60e+04, 8.30e+00, 4.30e+00, 4.70e+00,
       3.30e+00, 4.00e+04, 7.80e+00, 8.80e+00, 6.60e+00, 5.10e+00,
       6.10e+04, 6.60e+04, 7.90e+01, 8.40e+00, 1.18e+02, 4.40e+04,
       6.95e+02, 1.60e+00, 6.20e+00, 1.80e+01, 5.30e+04, 1.40e+00,
       3.00e+00, 5.80e+00, 3.80e+00, 9.60e+00, 4.50e+04, 6.30e+04,
       4.90e+04, 7.70e+04, 4.40e+00, 4.80e+00, 7.00e+04, 6.90e+00,
       9.30e+00, 1.00e+01, 8.10e+00, 3.60e+04, 8.40e+04, 9.70e+04,
       2.00e+00, 1.90e+00, 1.80e+00, 5.30e+00, 4.70e+04, 5.56e+02,
       5.26e+02, 7.60e+04, 7.60e+00, 5.90e+04, 9.70e+00, 7.80e+04,
       7.20e+04, 4.30e+04, 7.70e+00, 6.30e+00, 3.34e+02, 3.40e+04,
       9.30e+04, 6.50e+04, 7.90e+04, 1.00e+05, 5.80e+04, 5.00e+04,
       6.80e+04, 6.40e+04, 6.70e+04, 6.00e+04, 9.40e+04, 2.32e+02,
       9.90e+04, 6.24e+02, 9.50e+04, 4.10e+01, 2.92e+02, 1.10e+01,
       8.00e+04, 1.70e+00, 7.40e+04, 6.20e+04, 6.90e+04, 7.50e+04,
       9.80e+04, 8.50e+04, 8.20e+04, 9.60e+04, 8.70e+04, 7.10e+04,
       8.60e+04, 9.10e+04, 8.10e+04, 9.20e+04, 8.30e+04, 8.80e+04,
       7.04e+02, 8.62e+02, 8.99e+02, 3.78e+02, 2.66e+02, 3.75e+02,
       1.30e+00, 9.75e+02, 9.80e+02, 4.10e+00, 8.90e+04, 6.96e+02,
       5.44e+02, 5.25e+02, 9.20e+02, 7.79e+02, 8.53e+02, 7.20e+02,
       7.13e+02, 7.72e+02, 3.18e+02, 5.80e+01, 2.41e+02, 1.96e+02,
       8.57e+02, 5.10e+01, 9.53e+02, 8.65e+02, 2.51e+02, 9.30e+02,
       5.40e+02, 3.13e+02, 7.46e+02, 2.03e+02, 2.60e+01, 3.14e+02,
       2.39e+02, 3.71e+02, 2.20e+02, 7.30e+02, 7.56e+02, 9.10e+01,
       2.93e+02, 1.70e+01, 7.40e+01, 1.40e+01, 3.17e+02, 7.80e+01,
       9.24e+02, 9.02e+02, 8.18e+02, 8.10e+01, 9.39e+02, 1.69e+02,
       4.50e+01, 4.75e+02, 9.65e+02, 9.00e+04, 5.45e+02, 6.10e+01,
       2.83e+02, 6.55e+02, 7.14e+02, 9.30e+01, 8.72e+02, 1.21e+02,
       3.22e+02, 1.00e+00, 9.76e+02, 1.72e+02, 2.38e+02, 5.49e+02,
       2.06e+02, 9.54e+02, 4.44e+02, 7.17e+02, 2.10e+02, 6.09e+02,
       3.08e+02, 7.05e+02, 3.06e+02, 9.04e+02, 4.73e+02, 1.75e+02,
       3.50e+02, 3.83e+02, 4.54e+02, 4.21e+02, 7.00e+01, 8.12e+02,
       4.42e+02, 8.42e+02, 4.17e+02, 4.12e+02, 4.59e+02, 4.78e+02,
       3.35e+02, 7.82e+02, 7.21e+02, 4.30e+02, 4.29e+02, 1.92e+02,
       2.00e+02, 4.60e+02, 7.28e+02, 4.96e+02, 8.16e+02, 4.14e+02,
       5.06e+02, 8.87e+02, 6.13e+02, 2.43e+02, 5.69e+02, 7.78e+02,
       6.83e+02, 5.92e+02, 3.19e+02, 1.86e+02, 8.40e+02, 6.47e+02,
       1.91e+02, 3.73e+02, 4.37e+02, 5.98e+02, 7.16e+02, 5.85e+02,
       9.82e+02, 2.22e+02, 2.19e+02, 5.50e+01, 9.48e+02, 3.23e+02,
       6.91e+02, 5.11e+02, 9.51e+02, 9.63e+02, 2.50e+01, 5.54e+02,
       3.51e+02, 2.70e+01, 8.20e+01, 2.08e+02, 9.13e+02, 5.14e+02,
       5.51e+02, 2.90e+01, 1.03e+02, 8.98e+02, 7.43e+02, 1.16e+02,
       1.53e+02, 2.09e+02, 3.53e+02, 4.99e+02, 1.73e+02, 5.97e+02,
       8.09e+02, 1.22e+02, 4.11e+02, 4.00e+02, 8.01e+02, 7.87e+02,
       2.37e+02, 5.00e+01, 6.43e+02, 9.86e+02, 9.70e+01, 5.16e+02,
       8.37e+02, 7.80e+02, 9.61e+02, 2.69e+02, 2.00e+01, 4.98e+02,
       6.00e+02, 7.49e+02, 6.42e+02, 8.81e+02, 7.20e+01, 6.56e+02,
       6.01e+02, 2.21e+02, 2.28e+02, 1.08e+02, 9.40e+02, 1.76e+02,
       3.30e+01, 6.63e+02, 3.40e+01, 9.42e+02, 2.59e+02, 1.64e+02,
       4.58e+02, 2.45e+02, 6.29e+02, 2.80e+01, 2.88e+02, 7.75e+02,
       7.85e+02, 6.36e+02, 9.16e+02, 9.94e+02, 3.09e+02, 4.85e+02,
       9.14e+02, 9.03e+02, 6.08e+02, 5.00e+02, 5.40e+01, 5.62e+02,
       8.47e+02, 9.57e+02, 6.88e+02, 8.11e+02, 2.70e+02, 4.80e+01,
       3.29e+02, 5.23e+02, 9.21e+02, 8.74e+02, 9.81e+02, 7.84e+02,
       2.80e+02, 2.40e+01, 5.18e+02, 7.54e+02, 8.92e+02, 1.54e+02,
       8.60e+02, 3.64e+02, 3.87e+02, 6.26e+02, 1.61e+02, 8.79e+02,
       3.90e+01, 9.70e+02, 1.70e+02, 1.41e+02, 1.60e+02, 1.44e+02,
       1.43e+02, 1.90e+02, 3.76e+02, 1.93e+02, 2.46e+02, 7.30e+01,
       6.58e+02, 9.92e+02, 2.53e+02, 4.20e+02, 4.04e+02, 4.70e+02,
       2.26e+02, 2.40e+02, 8.90e+01, 2.34e+02, 2.57e+02, 8.61e+02,
       4.67e+02, 1.57e+02, 4.40e+01, 6.76e+02, 6.70e+01, 5.52e+02,
       8.85e+02, 1.02e+03, 5.82e+02, 6.19e+02])
```

```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10840 entries, 0 to 10840
Data columns (total 13 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  object 
 6   Type            10839 non-null  object 
 7   Price           10840 non-null  object 
 8   Content Rating  10840 non-null  object 
 9   Genres          10840 non-null  object 
 10  Last Updated    10840 non-null  object 
 11  Current Ver     10832 non-null  object 
 12  Android Ver     10838 non-null  object 
dtypes: float64(2), int64(1), object(10)
memory usage: 1.2+ MB
```

```
df_copy['Installs'].unique()
```

```
array(['10,000+', '500,000+', '5,000,000+', '50,000,000+', '100,000+',
       '50,000+', '1,000,000+', '10,000,000+', '5,000+',
'100,000,000+',
       '1,000,000,000+', '1,000+', '500,000,000+', '50+', '100+',
'500+',
       '10+', '1+', '5+', '0+', '0'], dtype=object)
```

```
df_copy['Price'].unique()
```

```
array(['0', '$4.99', '$3.99', '$6.99', '$1.49', '$2.99', '$7.99',
'$5.99',
       '$3.49', '$1.99', '$9.99', '$7.49', '$0.99', '$9.00', '$5.49',
       '$10.00', '$24.99', '$11.99', '$79.99', '$16.99', '$14.99',
       '$1.00', '$29.99', '$12.99', '$2.49', '$10.99', '$1.50',
'$19.99',
       '$15.99', '$33.99', '$74.99', '$39.99', '$3.95', '$4.49',
'$1.70',
       '$8.99', '$2.00', '$3.88', '$25.99', '$399.99', '$17.99',
       '$400.00', '$3.02', '$1.76', '$4.84', '$4.77', '$1.61',
'$2.50',
       '$1.59', '$6.49', '$1.29', '$5.00', '$13.99', '$299.99',
'$379.99',
       '$37.99', '$18.99', '$389.99', '$19.90', '$8.49', '$1.75',
       '$14.00', '$4.85', '$46.99', '$109.99', '$154.99', '$3.08',
       '$2.59', '$4.80', '$1.96', '$19.40', '$3.90', '$4.59',
'$15.46',
       '$3.04', '$4.29', '$2.60', '$3.28', '$4.60', '$28.99', '$2.95',
       '$2.90', '$1.97', '$200.00', '$89.99', '$2.56', '$30.99',
'$3.61',
       '$394.99', '$1.26', '$1.20', '$1.04'], dtype=object)
```

```
chars_to_remove=['+',',','$']
cols_to_clean=['Installs','Price']
for item in chars_to_remove:
    for cols in cols_to_clean:
        df_copy[cols]=df_copy[cols].str.replace(item,'')
```

```
df_copy['Price'].unique()
```

```
array(['0', '4.99', '3.99', '6.99', '1.49', '2.99', '7.99', '5.99',
       '3.49', '1.99', '9.99', '7.49', '0.99', '9.00', '5.49',
'10.00',
       '24.99', '11.99', '79.99', '16.99', '14.99', '1.00', '29.99',
       '12.99', '2.49', '10.99', '1.50', '19.99', '15.99', '33.99',
       '74.99', '39.99', '3.95', '4.49', '1.70', '8.99', '2.00',
'3.88',
       '25.99', '399.99', '17.99', '400.00', '3.02', '1.76', '4.84',
       '4.77', '1.61', '2.50', '1.59', '6.49', '1.29', '5.00',
'13.99',
       '299.99', '379.99', '37.99', '18.99', '389.99', '19.90',
'8.49',
       '1.75', '14.00', '4.85', '46.99', '109.99', '154.99', '3.08',
       '2.59', '4.80', '1.96', '19.40', '3.90', '4.59', '15.46',
'3.04',
       '4.29', '2.60', '3.28', '4.60', '28.99', '2.95', '2.90',
'1.97',
       '200.00', '89.99', '2.56', '30.99', '3.61', '394.99', '1.26',
       '1.20', '1.04'], dtype=object)
```

```
df_copy['Installs'].unique()
```

```
array(['10000', '500000', '5000000', '50000000', '100000', '50000',
       '1000000', '10000000', '5000', '100000000', '1000000000',
'1000',
       '500000000', '50', '100', '500', '10', '1', '5', '0'],
dtype=object)
```

```
df_copy['Installs']=df_copy['Installs'].astype('int')
df_copy['Price']=df_copy['Price'].astype('float')
```

```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10840 entries, 0 to 10840
Data columns (total 13 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            10839 non-null  object 
 7   Price           10840 non-null  float64
 8   Content Rating  10840 non-null  object 
 9   Genres          10840 non-null  object 
 10  Last Updated    10840 non-null  object 
 11  Current Ver     10832 non-null  object 
 12  Android Ver     10838 non-null  object 
dtypes: float64(3), int64(2), object(8)
memory usage: 1.2+ MB
```

```
df_copy['Last Updated']=pd.to_datetime(df_copy['Last Updated'])
df_copy['Day']=df_copy['Last Updated'].dt.day
df_copy['Month']=df_copy['Last Updated'].dt.month
df_copy['Year']=df_copy['Last Updated'].dt.year
```

```
df_copy.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 10840 entries, 0 to 10840
Data columns (total 16 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            10839 non-null  object        
 7   Price           10840 non-null  float64       
 8   Content Rating  10840 non-null  object        
 9   Genres          10840 non-null  object        
 10  Last Updated    10840 non-null  datetime64[ns]
 11  Current Ver     10832 non-null  object        
 12  Android Ver     10838 non-null  object        
 13  Day             10840 non-null  int64         
 14  Month           10840 non-null  int64         
 15  Year            10840 non-null  int64         
dtypes: datetime64[ns](1), float64(3), int64(5), object(7)
memory usage: 1.4+ MB
```

```
df_copy['Content Rating'].value_counts()
```

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

EDA

```
df_copy.head(2)
```

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

   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   

                      Genres Last Updated Current Ver   Android Ver  
```

```
Day  \
0                Art & Design   2018-01-07       1.0.0  4.0.3 and up
7
1  Art & Design;Pretend Play   2018-01-15       2.0.0  4.0.3 and up
15

   Month  Year
0      1  2018
1      1  2018
```

```
df_copy[df_copy.duplicated('App')].shape
```

```
(1181, 16)
```

Observations

the dataset has duplicate records

```
df_copy=df_copy.drop_duplicates(subset=['App'],keep='first')
```

```
df_copy[df_copy.duplicated('App')].shape
```

```
(0, 16)
```

```
## Lets go ahead and explore more data
numeric_features = [feature for feature in df_copy.columns if 
df_copy[feature].dtype != 'O']
categorical_features = [feature for feature in df_copy.columns if 
df_copy[feature].dtype == 'O']

# print columns
print('We have {} numerical features : 
{}'.format(len(numeric_features), numeric_features))
print('\nWe have {} categorical features : 
{}'.format(len(categorical_features), categorical_features))
```

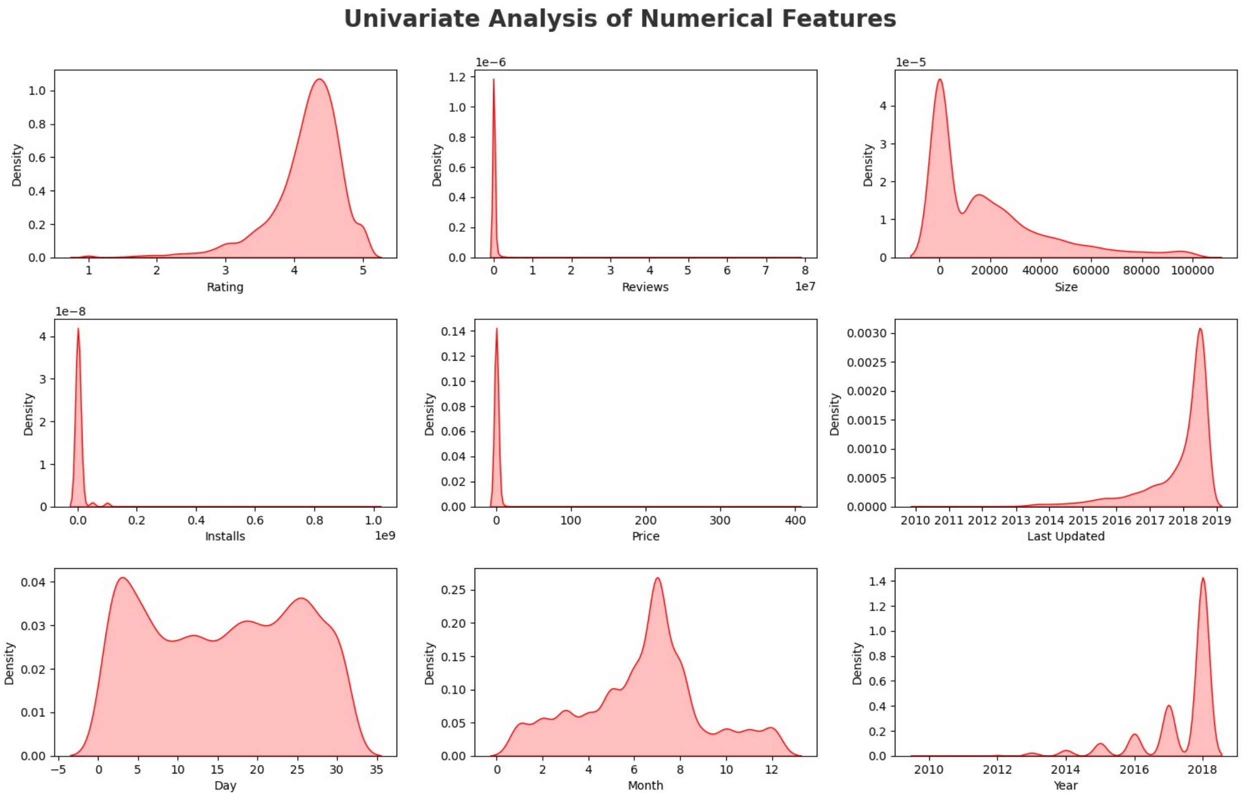
```
We have 9 numerical features : ['Rating', 'Reviews', 'Size', 
'Installs', 'Price', 'Last Updated', 'Day', 'Month', 'Year']

We have 7 categorical features : ['App', 'Category', 'Type', 'Content 
Rating', 'Genres', 'Current Ver', 'Android Ver']
```

```
## Visualization Diagrams

plt.figure(figsize=(15, 15))
plt.suptitle('Univariate Analysis of Numerical Features', fontsize=20, 
fontweight='bold', alpha=0.8, y=1.)

for i in range(0, len(numeric_features)):
    plt.subplot(5, 3, i+1)
    sns.kdeplot(x=df_copy[numeric_features[i]],shade=True, color='r')
    plt.xlabel(numeric_features[i])
    plt.tight_layout()
```



Observations

- Rating and Year is left skewed while Reviews,Size,Installs and Price are right skewed

```
# categorical columns
plt.figure(figsize=(20, 15))
plt.suptitle('Univariate Analysis of Categorical Features',
fontsize=20, fontweight='bold', alpha=0.8, y=1.)
category = [ 'Type', 'Content Rating']
for i in range(0, len(category)):
    plt.subplot(2, 2, i+1)
    sns.countplot(x=df[category[i]],palette="Set2")
    plt.xlabel(category[i])
    plt.xticks(rotation=45)
    plt.tight_layout()
```

which is the most popular app category?

```
df_copy.head()

df_copy['Category'].value_counts().plot.pie(y=df_copy['Category'],figs
ize=(15,16),autopct='%1.1f')
```

Observations

1. There are more kinds of apps in playstore which are under category of family, games & tools
2. Beatuty,comics,arts and weather kinds of apps are very less in playstore

```
## Top 10 App Categories
category = pd.DataFrame(df_copy['Category'].value_counts())
#Dataframe of apps on the basis of category
category.rename(columns = {'Category':'Count'},inplace=True)

category

## top 10 app
plt.figure(figsize=(15,6))
sns.barplot(x=category.index[:10], y ='Count',data =
category[:10],palette='hls')
plt.title('Top 10 App categories')
plt.xticks(rotation=90)
plt.show()
```

Insights

1. Family category has the most number of apps with 18% of apps belonging to it, followed by Games category which has 11% of the apps.
2. Least number of apps belong to the Beauty category with less than 1% of the total apps belonging to it.

Which Category has largest number of installations??

```
df_cat_installs = df_copy.groupby(['Category'])
['Installs'].sum().sort_values(ascending = False).reset_index()
df_cat_installs.Installs = df_cat_installs.Installs/1000000000#
converting into billions
df2 = df_cat_installs.head(10)
plt.figure(figsize = (14,10))
sns.set_context("talk")
sns.set_style("darkgrid")

ax = sns.barplot(x = 'Installs' , y = 'Category' , data = df2 )
ax.set_xlabel('No. of Installations in Billions')
ax.set_ylabel('')
ax.set_title("Most Popular Categories in Play Store", size = 20)
```

Thank You !!!□