

EDA_Smartphone

August 7, 2023

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

This dataset consists of smartphones and it's features such as pricing, battery capacity, ratings, os, etc. There are certain range of smartphone brands which are handcrafted or limited edition signed mobile piece or two brand coming together to collaborate converting normal phone into premium edition.

```
[2]: df=pd.read_csv("smartphones.csv")
df.head().T
```

```
[2]:
```

	0	1 \
brand_name	Apple	Apple
model	Apple iPhone 11	Apple iPhone 11 (128GB)
price	38999	46999
avg_rating	7.3	7.5
5G_or_not	0	0
processor_brand	bionic	bionic
num_cores	6	6
processor_speed	2.65	2.65
battery_capacity	3110	3110
fast_charging_available	0	0
ram_capacity	4	4
internal_memory	64	128
screen_size	6.1	6.1
refresh_rate	60	60
num_rear_cameras	2	2
os	ios	ios
primary_camera_rear	12.0	12.0
primary_camera_front	12	12
extended_memory_available	0	0
resolution_height	1792	1792
resolution_width	828	828

	2	3 \
brand_name	Apple	Apple

model	Apple iPhone 11 Pro Max	Apple iPhone 12
price	109900	51999
avg_rating	7.7	7.4
5G_or_not	0	1
processor_brand	bionic	bionic
num_cores	6	6
processor_speed	2.65	3.1
battery_capacity	3500	2815
fast_charging_available	1	0
ram_capacity	4	4
internal_memory	64	64
screen_size	6.5	6.1
refresh_rate	60	60
num_rear_cameras	3	2
os	ios	ios
primary_camera_rear	12.0	12.0
primary_camera_front	12	12
extended_memory_available	0	0
resolution_height	2688	2532
resolution_width	1242	1170

	4
brand_name	Apple
model	Apple iPhone 12 (128GB)
price	55999
avg_rating	7.5
5G_or_not	1
processor_brand	bionic
num_cores	6
processor_speed	3.1
battery_capacity	2815
fast_charging_available	0
ram_capacity	4
internal_memory	128
screen_size	6.1
refresh_rate	60
num_rear_cameras	2
os	ios
primary_camera_rear	12.0
primary_camera_front	12
extended_memory_available	0
resolution_height	2532
resolution_width	1170

```
[13]: df.shape
```

```
[13]: (980, 21)
```

```
[14]: df.size
```

```
[14]: 20580
```

```
[3]: df.columns
```

```
[3]: Index(['brand_name', 'model', 'price', 'avg_rating', '5G_or_not',  
        'processor_brand', 'num_cores', 'processor_speed', 'battery_capacity',  
        'fast_charging_available', 'ram_capacity', 'internal_memory',  
        'screen_size', 'refresh_rate', 'num_rear_cameras', 'os',  
        'primary_camera_rear', 'primary_camera_front',  
        'extended_memory_available', 'resolution_height', 'resolution_width'],  
        dtype='object')
```

```
[15]: df.info()
```

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 980 entries, 0 to 979  
Data columns (total 21 columns):  
#   Column                                Non-Null Count  Dtype  
---  -  
0   brand_name                            980 non-null    object  
1   model                                980 non-null    object  
2   price                                980 non-null    int64  
3   avg_rating                            980 non-null    float64  
4   5G_or_not                             980 non-null    int64  
5   processor_brand                       980 non-null    object  
6   num_cores                             980 non-null    int64  
7   processor_speed                       980 non-null    float64  
8   battery_capacity                      980 non-null    int64  
9   fast_charging_available               980 non-null    int64  
10  ram_capacity                          980 non-null    int64  
11  internal_memory                      980 non-null    int64  
12  screen_size                          980 non-null    float64  
13  refresh_rate                         980 non-null    int64  
14  num_rear_cameras                     980 non-null    int64  
15  os                                    980 non-null    object  
16  primary_camera_rear                  980 non-null    float64  
17  primary_camera_front                 980 non-null    int64  
18  extended_memory_available            980 non-null    int64  
19  resolution_height                    980 non-null    int64  
20  resolution_width                     980 non-null    int64  
dtypes: float64(4), int64(13), object(4)  
memory usage: 160.9+ KB
```

```
[4]: df.describe(include="all").T
```

```
[4]:
```

	count	unique		top	freq	mean	\
brand_name	980	46		Xiaomi	134	NaN	
model	980	980	Apple	iPhone 11	1	NaN	
price	980.0	NaN		NaN	NaN	32520.504082	
avg_rating	980.0	NaN		NaN	NaN	7.436633	
5G_or_not	980.0	NaN		NaN	NaN	0.560204	
processor_brand	980	14		snapdragon	422	NaN	
num_cores	980.0	NaN		NaN	NaN	7.765306	
processor_speed	980.0	NaN		NaN	NaN	2.456051	
battery_capacity	980.0	NaN		NaN	NaN	4793.410204	
fast_charging_available	980.0	NaN		NaN	NaN	0.854082	
ram_capacity	980.0	NaN		NaN	NaN	6.560204	
internal_memory	980.0	NaN		NaN	NaN	141.036735	
screen_size	980.0	NaN		NaN	NaN	6.536765	
refresh_rate	980.0	NaN		NaN	NaN	92.256122	
num_rear_cameras	980.0	NaN		NaN	NaN	2.814286	
os	980	3		android	917	NaN	
primary_camera_rear	980.0	NaN		NaN	NaN	50.319286	
primary_camera_front	980.0	NaN		NaN	NaN	16.6	
extended_memory_available	980.0	NaN		NaN	NaN	0.630612	
resolution_height	980.0	NaN		NaN	NaN	2214.663265	
resolution_width	980.0	NaN		NaN	NaN	1075.852041	

	std	min	25%	50%	75%	\
brand_name	NaN	NaN	NaN	NaN	NaN	
model	NaN	NaN	NaN	NaN	NaN	
price	39531.812669	3499.0	12999.0	19994.5	35491.5	
avg_rating	1.353992	3.0	7.0	7.9	8.4	
5G_or_not	0.496616	0.0	0.0	1.0	1.0	
processor_brand	NaN	NaN	NaN	NaN	NaN	
num_cores	0.841966	4.0	8.0	8.0	8.0	
processor_speed	0.474052	1.2	2.05	2.4	2.9	
battery_capacity	1031.70485	1821.0	4500.0	5000.0	5000.0	
fast_charging_available	0.353205	0.0	1.0	1.0	1.0	
ram_capacity	2.744378	1.0	4.0	6.0	8.0	
internal_memory	107.134516	8.0	64.0	128.0	128.0	
screen_size	0.349162	3.54	6.5	6.58	6.67	
refresh_rate	28.988052	60.0	60.0	90.0	120.0	
num_rear_cameras	0.776441	1.0	2.0	3.0	3.0	
os	NaN	NaN	NaN	NaN	NaN	
primary_camera_rear	33.000968	2.0	24.0	50.0	64.0	
primary_camera_front	10.87712	0.0	8.0	16.0	16.0	
extended_memory_available	0.482885	0.0	0.0	1.0	1.0	
resolution_height	516.484254	480.0	1612.0	2400.0	2408.0	
resolution_width	290.164931	480.0	1080.0	1080.0	1080.0	

max

brand_name	NaN
model	NaN
price	650000.0
avg_rating	8.9
5G_or_not	1.0
processor_brand	NaN
num_cores	8.0
processor_speed	3.22
battery_capacity	22000.0
fast_charging_available	1.0
ram_capacity	18.0
internal_memory	1024.0
screen_size	8.03
refresh_rate	240.0
num_rear_cameras	4.0
os	NaN
primary_camera_rear	200.0
primary_camera_front	60.0
extended_memory_available	1.0
resolution_height	3840.0
resolution_width	2460.0

1 Exploratory Data Analysis

```
[135]: df.nunique()
```

```
[135]: brand_name      46
      model          980
      price          379
      avg_rating      34
      5G_or_not        2
      processor_brand  14
      num_cores         3
      processor_speed  35
      battery_capacity  92
      fast_charging_available  2
      ram_capacity      9
      internal_memory   8
      screen_size      79
      refresh_rate       6
      num_rear_cameras   4
      os                3
      primary_camera_rear  18
      primary_camera_front  19
      extended_memory_available  2
      resolution_height  65
```

```
resolution_width          40
dtype: int64
```

```
[27]: df["brand_name"].value_counts()
```

```
[27]: Xiaomi      134
Samsung      132
Vivo         111
Realme       97
Oppo         88
Motorola     52
Apple        46
Oneplus      42
Poco         41
Tecno        33
Iqoo         32
Infinix      29
Huawei        16
Google       14
Honor        13
Nokia        13
Itel         10
Sony         9
Asus         7
Nubia        6
Nothing      5
Lava         4
Jio          4
Redmi        3
Gionee       3
Letv         3
LG           3
Micromax     3
Oukitel      3
Ikall        3
Royole       2
Lyf          2
Lenovo       2
Doogee       2
Zte          2
Leitz        1
Leeco        1
Duoqin       1
Sharp        1
Cola         1
Tcl          1
Cat          1
```

```
Tesla          1
Vertu          1
Blu            1
Blackview      1
Name: brand_name, dtype: int64
```

```
[27]: df["processor_brand"].value_counts()
```

```
[27]: snapdragon    422
      helio         201
      dimensity    177
      exynos        60
      bionic        45
      unisoc        26
      tiger         24
      google         9
      kirin          7
      spreadtrum     4
      sc9863a        2
      fusion         1
      qualcomm       1
      mediatek       1
      Name: processor_brand, dtype: int64
```

```
[29]: df["os"].value_counts()
```

```
[29]: android     917
      ios         46
      other       17
      Name: os, dtype: int64
```

```
[30]: df.corr()
```

```
[30]:
```

	price	avg_rating	5G_or_not	num_cores	\
price	1.000000	-0.040959	0.305066	-0.063534	
avg_rating	-0.040959	1.000000	0.287089	0.353046	
5G_or_not	0.305066	0.287089	1.000000	0.138870	
num_cores	-0.063534	0.353046	0.138870	1.000000	
processor_speed	0.479759	0.218419	0.590981	0.155064	
battery_capacity	-0.173102	0.117933	-0.033734	0.282485	
fast_charging_available	0.116739	0.414655	0.355858	0.358722	
ram_capacity	0.386002	0.276783	0.533957	0.299205	
internal_memory	0.557168	0.111269	0.403837	0.041564	
screen_size	0.113253	0.139914	0.230598	0.390662	
refresh_rate	0.244115	0.299560	0.611794	0.230134	
num_rear_cameras	0.125330	0.317394	0.206512	0.342629	
primary_camera_rear	0.092095	0.231300	0.347918	0.311351	

primary_camera_front	0.163107	0.226876	0.358073	0.227530
extended_memory_available	-0.448628	-0.108795	-0.507752	0.083010
resolution_height	0.353578	0.337678	0.504365	0.258043
resolution_width	0.340592	0.066261	0.301828	0.133390

	processor_speed	battery_capacity	\
price	0.479759	-0.173102	
avg_rating	0.218419	0.117933	
5G_or_not	0.590981	-0.033734	
num_cores	0.155064	0.282485	
processor_speed	1.000000	-0.081909	
battery_capacity	-0.081909	1.000000	
fast_charging_available	0.339952	0.178370	
ram_capacity	0.595150	0.101529	
internal_memory	0.484009	-0.007400	
screen_size	0.264262	0.382927	
refresh_rate	0.524328	0.110972	
num_rear_cameras	0.243604	0.176037	
primary_camera_rear	0.262717	0.192560	
primary_camera_front	0.379883	0.016309	
extended_memory_available	-0.646121	0.199151	
resolution_height	0.534882	0.035284	
resolution_width	0.349078	-0.021155	

	fast_charging_available	ram_capacity	\
price	0.116739	0.386002	
avg_rating	0.414655	0.276783	
5G_or_not	0.355858	0.533957	
num_cores	0.358722	0.299205	
processor_speed	0.339952	0.595150	
battery_capacity	0.178370	0.101529	
fast_charging_available	1.000000	0.439538	
ram_capacity	0.439538	1.000000	
internal_memory	0.279877	0.592332	
screen_size	0.346687	0.396613	
refresh_rate	0.415278	0.573977	
num_rear_cameras	0.470952	0.384908	
primary_camera_rear	0.427440	0.431377	
primary_camera_front	0.334683	0.522193	
extended_memory_available	-0.166626	-0.482666	
resolution_height	0.510112	0.578105	
resolution_width	0.318720	0.380274	

	internal_memory	screen_size	refresh_rate	\
price	0.557168	0.113253	0.244115	
avg_rating	0.111269	0.139914	0.299560	
5G_or_not	0.403837	0.230598	0.611794	

num_cores	0.041564	0.390662	0.230134
processor_speed	0.484009	0.264262	0.524328
battery_capacity	-0.007400	0.382927	0.110972
fast_charging_available	0.279877	0.346687	0.415278
ram_capacity	0.592332	0.396613	0.573977
internal_memory	1.000000	0.276401	0.380263
screen_size	0.276401	1.000000	0.333411
refresh_rate	0.380263	0.333411	1.000000
num_rear_cameras	0.236609	0.371769	0.293381
primary_camera_rear	0.200656	0.329288	0.468284
primary_camera_front	0.257647	0.218401	0.403030
extended_memory_available	-0.397903	-0.094878	-0.445877
resolution_height	0.427218	0.295926	0.481937
resolution_width	0.341709	0.334099	0.294688

	num_rear_cameras	primary_camera_rear \
price	0.125330	0.092095
avg_rating	0.317394	0.231300
5G_or_not	0.206512	0.347918
num_cores	0.342629	0.311351
processor_speed	0.243604	0.262717
battery_capacity	0.176037	0.192560
fast_charging_available	0.470952	0.427440
ram_capacity	0.384908	0.431377
internal_memory	0.236609	0.200656
screen_size	0.371769	0.329288
refresh_rate	0.293381	0.468284
num_rear_cameras	1.000000	0.455010
primary_camera_rear	0.455010	1.000000
primary_camera_front	0.406890	0.479275
extended_memory_available	-0.055110	-0.136152
resolution_height	0.465547	0.394871
resolution_width	0.342834	0.257728

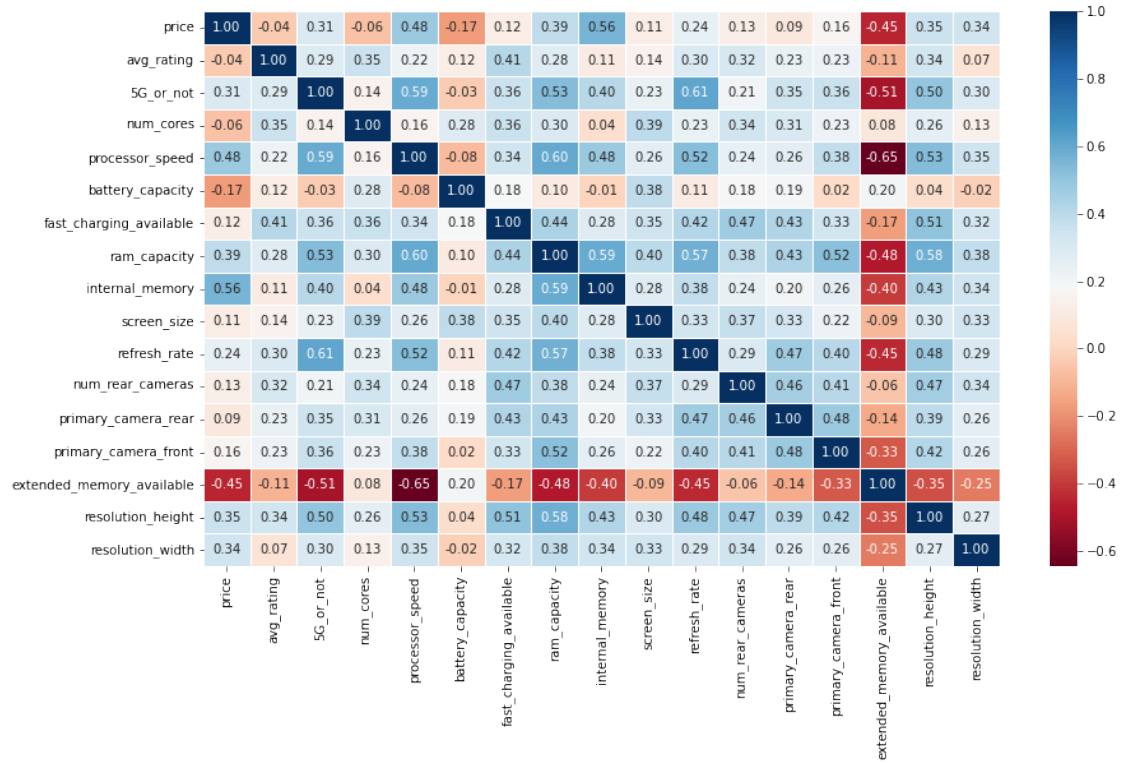
	primary_camera_front	extended_memory_available \
price	0.163107	-0.448628
avg_rating	0.226876	-0.108795
5G_or_not	0.358073	-0.507752
num_cores	0.227530	0.083010
processor_speed	0.379883	-0.646121
battery_capacity	0.016309	0.199151
fast_charging_available	0.334683	-0.166626
ram_capacity	0.522193	-0.482666
internal_memory	0.257647	-0.397903
screen_size	0.218401	-0.094878
refresh_rate	0.403030	-0.445877
num_rear_cameras	0.406890	-0.055110

primary_camera_rear	0.479275	-0.136152
primary_camera_front	1.000000	-0.327648
extended_memory_available	-0.327648	1.000000
resolution_height	0.417795	-0.353785
resolution_width	0.261157	-0.249250

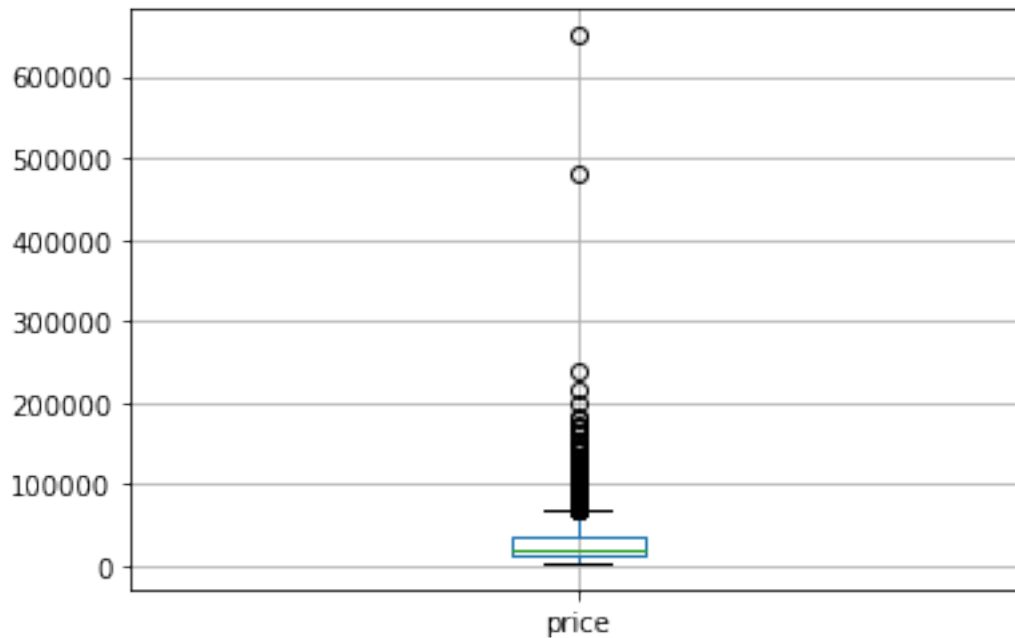
	resolution_height	resolution_width
price	0.353578	0.340592
avg_rating	0.337678	0.066261
5G_or_not	0.504365	0.301828
num_cores	0.258043	0.133390
processor_speed	0.534882	0.349078
battery_capacity	0.035284	-0.021155
fast_charging_available	0.510112	0.318720
ram_capacity	0.578105	0.380274
internal_memory	0.427218	0.341709
screen_size	0.295926	0.334099
refresh_rate	0.481937	0.294688
num_rear_cameras	0.465547	0.342834
primary_camera_rear	0.394871	0.257728
primary_camera_front	0.417795	0.261157
extended_memory_available	-0.353785	-0.249250
resolution_height	1.000000	0.265519
resolution_width	0.265519	1.000000

```
[23]: fig, ax = plt.subplots(figsize=(14, 8))
      sns.heatmap(df.corr(),annot=True,linewidth=0.5,fmt="0.2f",cmap="RdBu")
```

```
[23]: <AxesSubplot:>
```



```
[7]: # Outliers in Price
df.boxplot(column=['price'])
plt.show()
```



```
[14]: df.sort_values(by=['price'],ascending=False).head()
```

```
[14]:      brand_name      model  price  avg_rating \
732      Vertu      Vertu Signature Touch  650000      6.2
909      Xiaomi  Xiaomi Redmi K20 Pro Signature Edition  480000      8.8
94      Huawei      Huawei Mate 50 RS Porsche Design  239999      8.1
91      Huawei      Huawei Mate 30 RS Porsche Design  214990      3.0
873      Xiaomi      Xiaomi Mi Mix Alpha  199990      3.5

      5G_or_not  processor_brand  num_cores  processor_speed  battery_capacity \
732          0      snapdragon          8          1.50      2275
909          0      snapdragon          8          2.80      4000
94          0      snapdragon          8          3.20      4700
91          1          kirin          8          2.86      4500
873          1      snapdragon          8          2.96      4050

      fast_charging_available  ...  internal_memory  screen_size  refresh_rate \
732                        0  ...           64          4.70          60
909                        1  ...          256          6.39          60
94                         1  ...          512          6.74         120
91                         1  ...          512          6.53          60
873                        1  ...          512          7.92          60

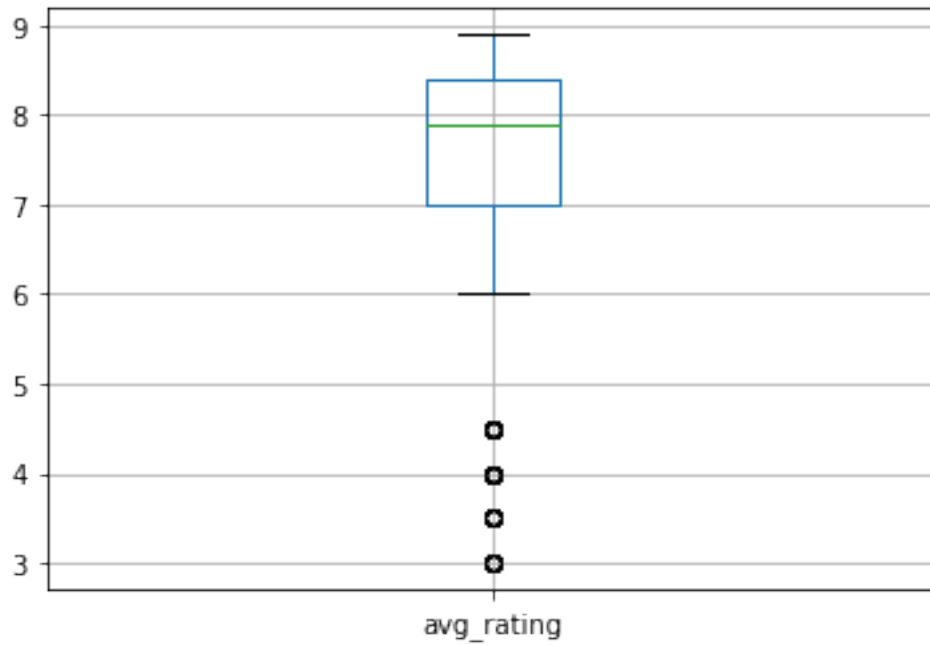
      num_rear_cameras      os  primary_camera_rear  primary_camera_front \
732                  1  android          13.0              2
909                  3  android          48.0             20
94                   3   other          50.0             13
91                   4  android          40.0             32
873                  3  android         108.0             20

      extended_memory_available  resolution_height  resolution_width
732                          0          1920          1080
909                          0          2340          1080
94                           1          2616          1212
91                           1          2400          1176
873                          0          2250          2088
```

```
[5 rows x 21 columns]
```

The average smartphone price lies between 0 to 1 lakh, while the above dataframe shows insights of the smartphone prices which are either premium or limited edition or collaboration between 2 brands such as Huawei X Porsche

```
[11]: df.boxplot(column=['avg_rating'])
plt.show()
```



```
[19]: df.sort_values(by=['avg_rating'],ascending=False).head().T
```

```
[19]:
```

	979	213 \
brand_name	Zte	Motorola
model	ZTE Axon 40 Ultra 5G	Motorola Edge Plus
price	61990	57999
avg_rating	8.9	8.9
5G_or_not	1	1
processor_brand	snapdragon	snapdragon
num_cores	8	8
processor_speed	3.0	2.84
battery_capacity	5000	5000
fast_charging_available	1	1
ram_capacity	8	12
internal_memory	128	256
screen_size	6.8	6.7
refresh_rate	120	90
num_rear_cameras	3	3
os	android	android
primary_camera_rear	64.0	108.0
primary_camera_front	16	25
extended_memory_available	0	0
resolution_height	2480	2340
resolution_width	1116	1080

	849	854	855
brand_name	Xiaomi	Xiaomi	Xiaomi
model	Xiaomi 12 Pro 5G	Xiaomi 12T Pro 5G	Xiaomi 13 5G
price	50990	59990	46990
avg_rating	8.9	8.9	8.9
5G_or_not	1	1	1
processor_brand	snapdragon	snapdragon	snapdragon
num_cores	8	8	8
processor_speed	3.0	3.2	3.2
battery_capacity	4600	5000	4500
fast_charging_available	1	1	1
ram_capacity	8	8	8
internal_memory	256	128	128
screen_size	6.73	6.67	6.36
refresh_rate	120	120	120
num_rear_cameras	3	3	3
os	android	android	android
primary_camera_rear	50.0	200.0	50.0
primary_camera_front	32	20	32
extended_memory_available	0	0	0
resolution_height	3200	2712	2400
resolution_width	1440	1220	1080

Certain premium brands such as Vertu (which is handcrafted mobile brand) or collaboration of brands with other luxury brandssuch as xiaomi signature edition or Huawei Porsche design limited edition leads to higher prices than normal pricing mechanism. The average prices ranges from 4000 to 1 lakh

```
[18]: df.sort_values(by=['ram_capacity'],ascending=False).head().T
```

	49	51 \
brand_name	Asus	Asus
model	Asus ROG Phone 6 Pro 5G	Asus ROG Phone 7
price	89999	75990
avg_rating	8.8	8.7
5G_or_not	1	1
processor_brand	snapdragon	snapdragon
num_cores	8	8
processor_speed	3.2	3.2
battery_capacity	6000	6000
fast_charging_available	1	1
ram_capacity	18	18
internal_memory	512	256
screen_size	6.78	6.8
refresh_rate	165	165
num_rear_cameras	3	3
os	android	android
primary_camera_rear	50.0	64.0

primary_camera_front	12	32
extended_memory_available	0	0
resolution_height	2448	2448
resolution_width	1080	1080

	401	385 \
brand_name	Oppo	Oppo
model	OPPO Reno 9 Pro 5G	OPPO Reno 10 Pro
price	39999	42990
avg_rating	8.6	8.6
5G_or_not	1	1
processor_brand	dimensity	dimensity
num_cores	8	8
processor_speed	2.85	3.05
battery_capacity	4500	5000
fast_charging_available	1	1
ram_capacity	16	16
internal_memory	256	256
screen_size	6.7	6.73
refresh_rate	120	120
num_rear_cameras	2	2
os	android	android
primary_camera_rear	50.0	50.0
primary_camera_front	32	32
extended_memory_available	0	0
resolution_height	2412	2412
resolution_width	1080	1080

	190
brand_name	Lenovo
model	Lenovo Legion Pro 2
price	59999
avg_rating	8.9
5G_or_not	1
processor_brand	snapdragon
num_cores	8
processor_speed	2.84
battery_capacity	5000
fast_charging_available	1
ram_capacity	16
internal_memory	512
screen_size	6.5
refresh_rate	144
num_rear_cameras	2
os	android
primary_camera_rear	64.0
primary_camera_front	20

```

extended_memory_available      0
resolution_height              2400
resolution_width               1080

```

```
[17]: df.sort_values(by=['battery_capacity'],ascending=False).head().T
```

```
[17]:
```

	58	409	410 \
brand_name	Doogee	Oukitel	Oukitel
model	Doogee V Max	Oukitel WP19	Oukitel WP21
price	45999	29990	22990
avg_rating	8.8	8.4	8.2
5G_or_not	1	0	0
processor_brand	dimensity	helio	helio
num_cores	8	8	8
processor_speed	2.6	2.0	2.2
battery_capacity	22000	21000	9800
fast_charging_available	1	1	1
ram_capacity	12	8	12
internal_memory	256	256	256
screen_size	6.58	6.78	6.78
refresh_rate	120	60	120
num_rear_cameras	3	3	3
os	android	android	other
primary_camera_rear	108.0	64.0	64.0
primary_camera_front	32	16	32
extended_memory_available	1	1	0
resolution_height	2408	2400	2400
resolution_width	1080	1080	1080

	411	624
brand_name	Oukitel	Samsung
model	Oukitel WP9	Samsung Galaxy F63
price	25899	21999
avg_rating	7.2	8.4
5G_or_not	0	1
processor_brand	helio	dimensity
num_cores	8	8
processor_speed	2.0	2.0
battery_capacity	8000	7000
fast_charging_available	0	1
ram_capacity	6	6
internal_memory	128	128
screen_size	5.86	6.7
refresh_rate	60	60
num_rear_cameras	3	4
os	android	android
primary_camera_rear	16.0	64.0

primary_camera_front	8	32
extended_memory_available	1	1
resolution_height	1520	2400
resolution_width	720	1080

```
[4]: df.sort_values(by=['processor_speed'],ascending=False).head()
```

```
[4]:
```

	brand_name	model	price	avg_rating	5G_or_not	\
25	Apple	Apple iPhone 14 Plus	74999	8.2	1	
13	Apple	Apple iPhone 13 (512GB)	91999	8.0	1	
27	Apple	Apple iPhone 14 Plus (512GB)	104999	8.3	1	
26	Apple	Apple iPhone 14 Plus (256GB)	84999	8.3	1	
23	Apple	Apple iPhone 14 (512GB)	95999	8.2	1	

	processor_brand	num_cores	processor_speed	battery_capacity	\
25	bionic	6	3.22	4325	
13	bionic	6	3.22	3240	
27	bionic	6	3.22	4325	
26	bionic	6	3.22	4325	
23	bionic	6	3.22	3279	

	fast_charging_available	...	internal_memory	screen_size	refresh_rate	\
25	1	...	128	6.7	60	
13	1	...	512	6.1	60	
27	1	...	512	6.7	60	
26	1	...	256	6.7	60	
23	1	...	512	6.1	60	

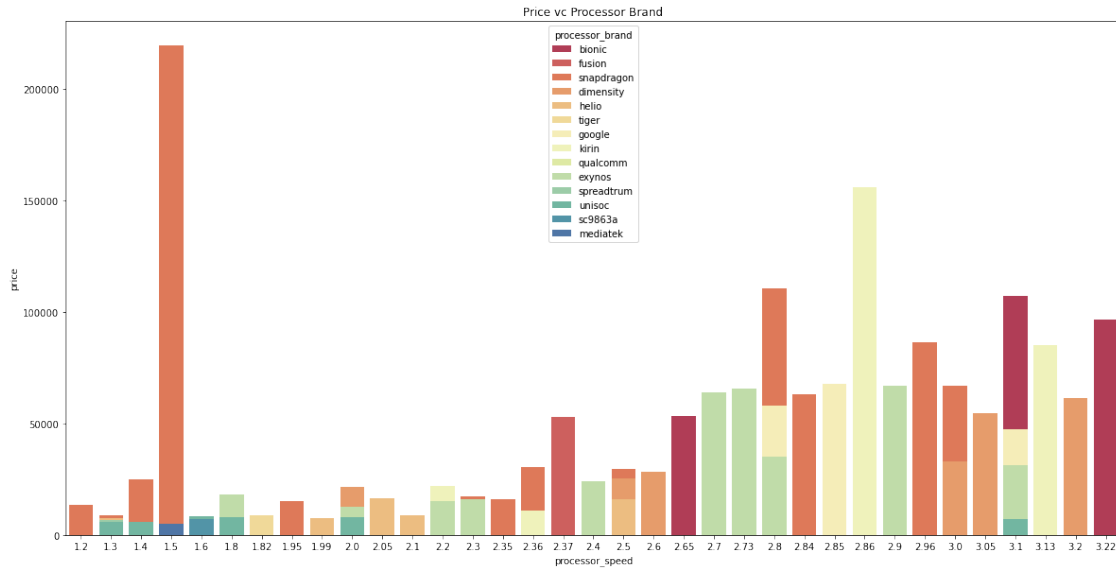
	num_rear_cameras	os	primary_camera_rear	primary_camera_front	\
25	2	ios	12.0	12	
13	2	ios	12.0	12	
27	2	ios	12.0	12	
26	2	ios	12.0	12	
23	2	ios	12.0	12	

	extended_memory_available	resolution_height	resolution_width
25	0	2778	1284
13	0	2532	1170
27	0	2778	1284
26	0	2778	1284
23	0	2532	1170

[5 rows x 21 columns]

```
[3]: plt.figure(figsize=(20,10))
sns.
↳ barplot(data=df,y="price",x="processor_speed",hue="processor_brand",palette="Spectral",ci=F
```

```
plt.title("Price vc Processor Brand")
plt.show()
```



Snapdragon with a processor speed of 1.5 is the most widely used processor brand irrespective of smartphone price