# Smartphones Sales 📱

Product Analysis project

Agenda:

- Dataset
- Data Cleaning and Transformation
- Data Exploration
- Dashboard
- ML model 🔥 In the second part ISA

## Dataset

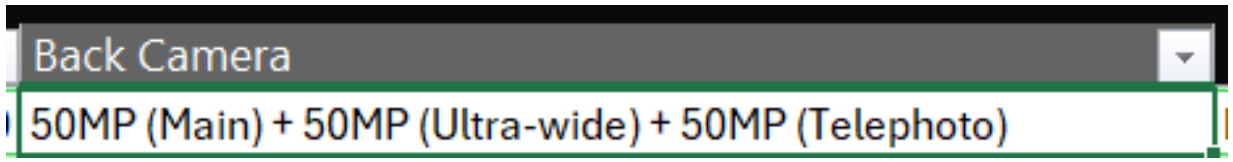
This dataset contains more than 900 types of smartphones with these **features:**

- Company Name
- Model Name
- Front Camera
- Back Camera
- Processor
- Battery Capacity
- Screen Size
- Launched Price
- Launched Year
- Mobile Weight in grams
- RAM

# Data Cleaning and Transformation 🧹

## Feature engineering:

Let's take an example of Back Camera column:




I noticed that the Back Camera column contains multiple attributes within the same cell. While this isn't necessarily wrong, it can lead to the loss of important information during analysis.

To address this, I applied **one-hot encoding**, which helps improve our analysis by breaking down the data into separate features. Additionally, if we plan to build a machine learning model, one-hot encoding will significantly enhance its performance by providing structured, numerical data.

| Total MB's of Back Camera | is back camera contains wide angle | is back camera contains ultra-wide angle | is backcamera contains Telephoto | is backcamera contains macro |
|---|---|---|---|---|
| 48 | 0 | 0 | 0 | 0 |
| 48 | 0 | 0 | 0 | 0 |
| 48 | 0 | 0 | 0 | 0 |
| 48 | 0 | 0 | 0 | 0 |
| 48 | 0 | 0 | 0 | 0 |
| 48 | 0 | 0 | 0 | 0 |
| 62 | 0 | 0 | 0 | 0 |
| 62 | 0 | 0 | 0 | 0 |

To make this in Power Query, I used split columns by delimiter, then replaced values: if ‘yes,’ replace 1; if ‘no,’ replace 0.

## I did the same in front camera:

| Total MB's of front camera | is Front Camera contains ultrawide | is Front Camera supports 4K | is front camera contains UDC | is front camera contains Telephoto |
|---|---|---|---|---|
| 12 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 |
| 12 | 0 | 0 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 |
| 12 | 0 | 1 | 0 | 0 |

And to enhance the analysis, I converted this feature:

Before cleaning

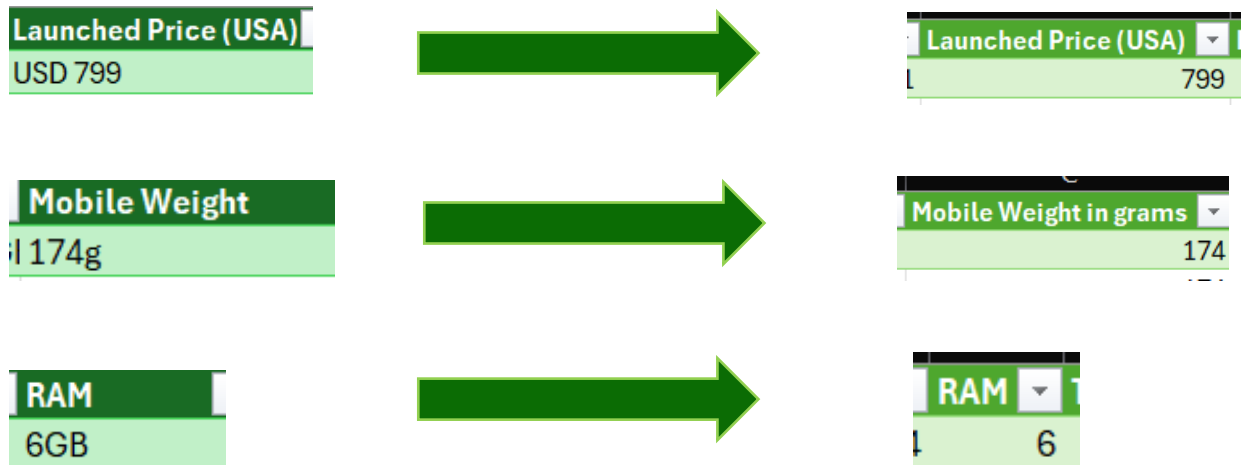
| Battery Capacity |
|---|
| 3,600mAh |

| Screen Size |
|---|
| 6.1 inches |

after cleaning

| Battery Capacity in mAh |
|---|
| 3600 |

| Screen Size in inches |
|---|
| 6.1 |




Finally, if you are interested, feel free to see the data.

Data before cleaning  Data after cleaning

Ok, after cleaning and transformation, we want to explore our data and understand it more, so we will use Python to make data exploration.

# Data Exploration 🔍

Sample of our data exploration:

```
In [9]: #number of rows and columns
        df.shape
Out[9]: (930, 19)
```

```
In [5]: #mean, min, max and more for numerical features
        df.describe()
```

Out[5]:

| | Mobile Weight in grams | RAM | Total MB's of front camera | is Front Camera contains ultrawide | is Front Camera supports 4K | is front camera contains UDC | is front camera contains Telephoto | Total MB's of Back Camera | is back camera contains wide angle | is back camera contains ultra-wide angle | is backcamera contains Telephoto | is backcamera contains macro | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **count** | 930.000000 | 930.000000 | 928.000000 | 930.000000 | 930.000000 | 930.000000 | 930.000000 | 930.000000 | 930.000000 | 930.000000 | 930.000000 | 930.000000 | 9 |
| **mean** | 228.267097 | 7.810753 | 18.202586 | 0.002151 | 0.038710 | 0.003226 | 0.002151 | 55.487097 | 0.010753 | 0.037634 | 0.016129 | 0.011828 | 50 |
| **std** | 105.432503 | 3.229671 | 12.077595 | 0.046349 | 0.193006 | 0.056735 | 0.046349 | 36.819262 | 0.103192 | 0.190413 | 0.126040 | 0.108169 | 13 |
| **min** | 135.000000 | 1.000000 | 2.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 5.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 20 |
| **25%** | 185.000000 | 6.000000 | 8.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 25.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 44 |
| **50%** | 194.000000 | 8.000000 | 16.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 50.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 50 |
| **75%** | 208.000000 | 8.000000 | 32.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 64.000000 | 0.000000 | 0.000000 | 0.000000 | 0.000000 | 50 |
| **max** | 732.000000 | 20.000000 | 68.000000 | 1.000000 | 1.000000 | 1.000000 | 1.000000 | 212.000000 | 1.000000 | 1.000000 | 1.000000 | 1.000000 | 112 |

```
In [12]: df.isnull().sum()

Out[12]: Company Name                                0
         Model Name                                  0
         Mobile Weight in grams                      0
         RAM                                         0
         Total MB's of front camera                  2
         is Front Camera contains ultrawide          0
         is Front Camera supports 4K                 0
         is front camera contains UDC                0
         is front camera contains Telephoto          0
         Total MB's of Back Camera                   0
         is back camera contains wide angle          0
         is back camera contains ultra-wide angle    0
         is backcamera contains Telephoto            0
         is backcamera contains macro                0
         Processor                                   0
         Battery Capacity in mAh                     0
         Screen Size in inches                       0
         Launched Price (USA)                        0
         Launched Year                               0
         dtype: int64
```

There is a null in (Total MBs of front camera).

Ok, let's go to the data and see the problem.

| | A | B | C | D | E |
|---|---|---|---|---|---|
| | Company Name | Model Name | Mobile Weight in grams | RAM | Total MB's of front camera |
| 34 | Huawei | Nova 9 Pro | 186 | 8 | |
| 40 | Huawei | Nova 10 Pro | 191 | 8 | |

These two phones have blank in MBs of front camera

So Let’s see the raw data.

| Company Name | Model Name | Mobile Weight | RAM | Front Camera |
|---|---|---|---|---|
| Huawei | Nova 9 Pro | 186g | 8GB | Dual 32MP |

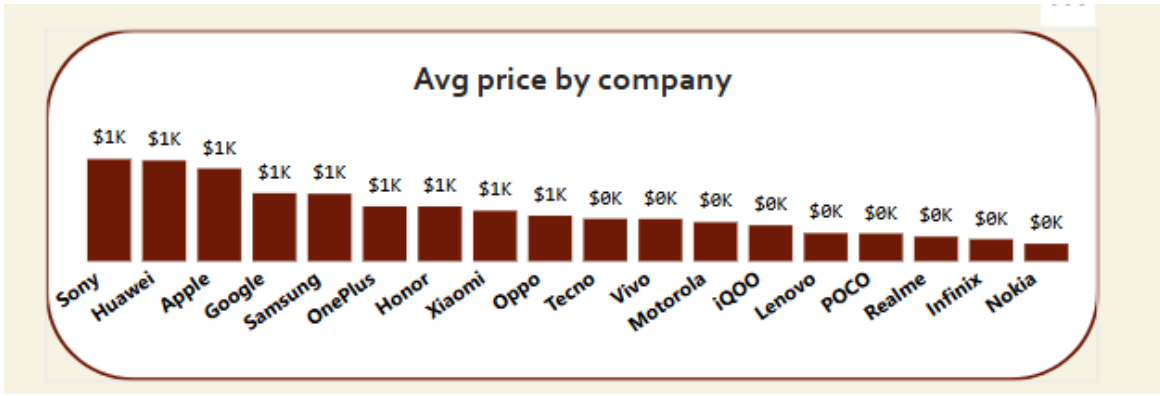
| Company Name | Model Name | Mobile Weight | RAM | Front Camera |
|---|---|---|---|---|
| Huawei | Nova 10 Pro | 191g | 8GB | Dual 60MP |

So I entered these two values manually.

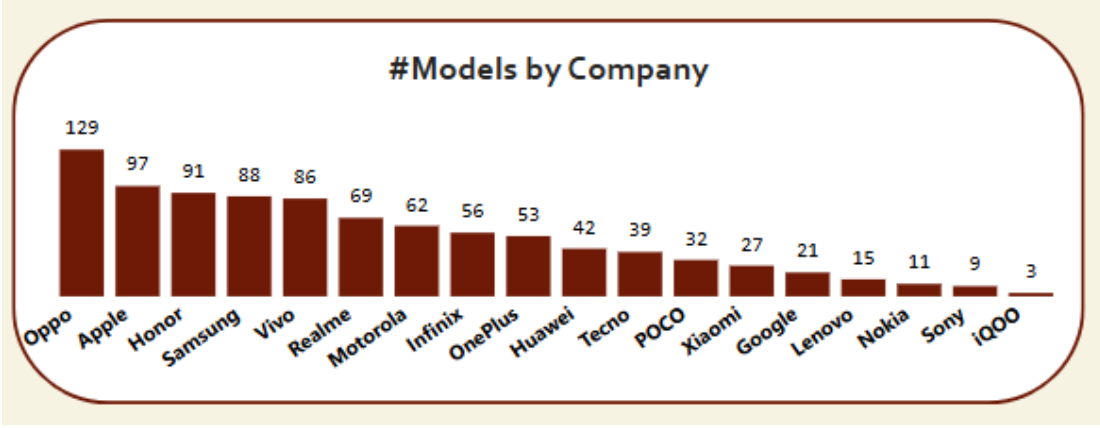
Again, if you are interested, feel free to see the full data exploration here .

# Dashboard

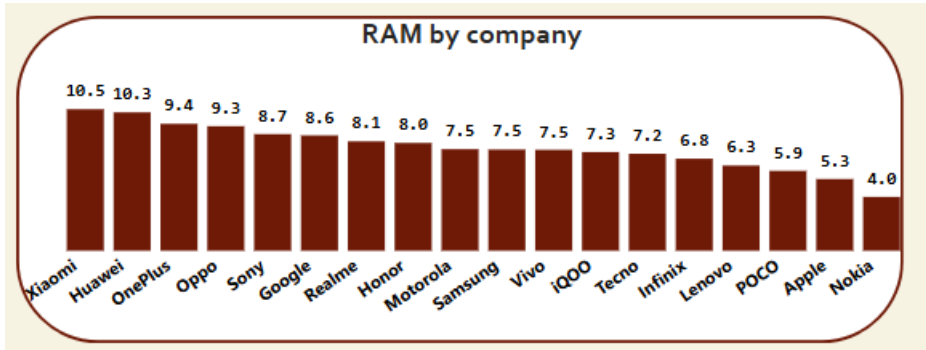
What is the average price of smartphones for each company in this dataset?



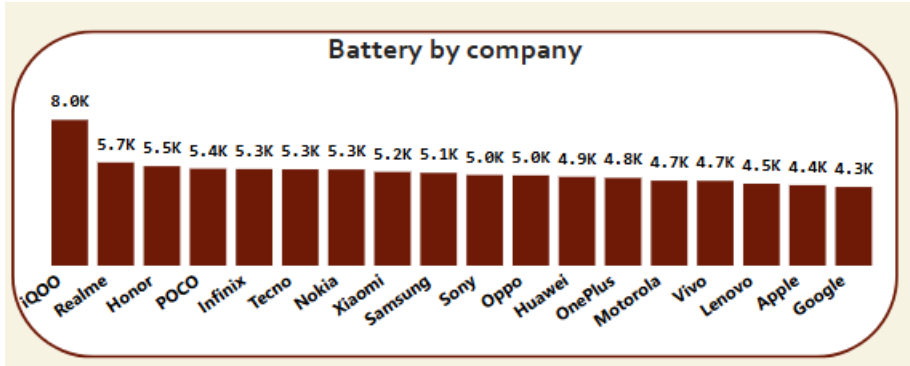

What is number of smartphones models for each company in this dataset?



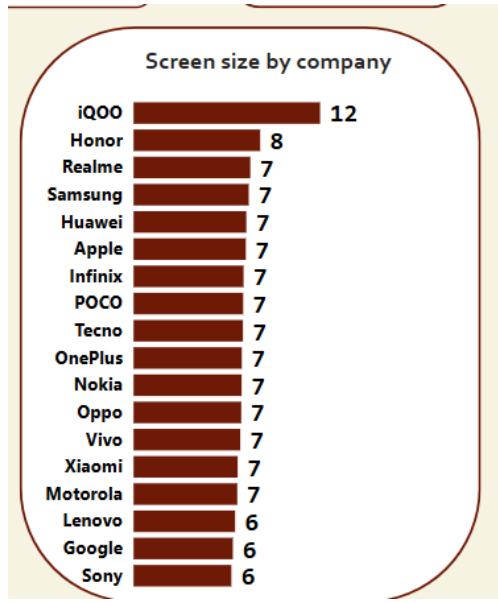
What is the average RAM per company?



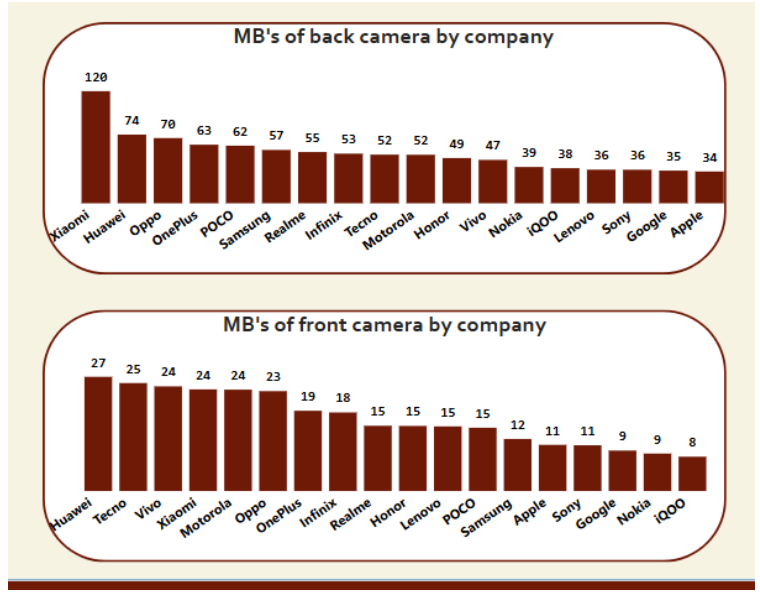

What is the average battery per company?



What is the average Screen size per company?

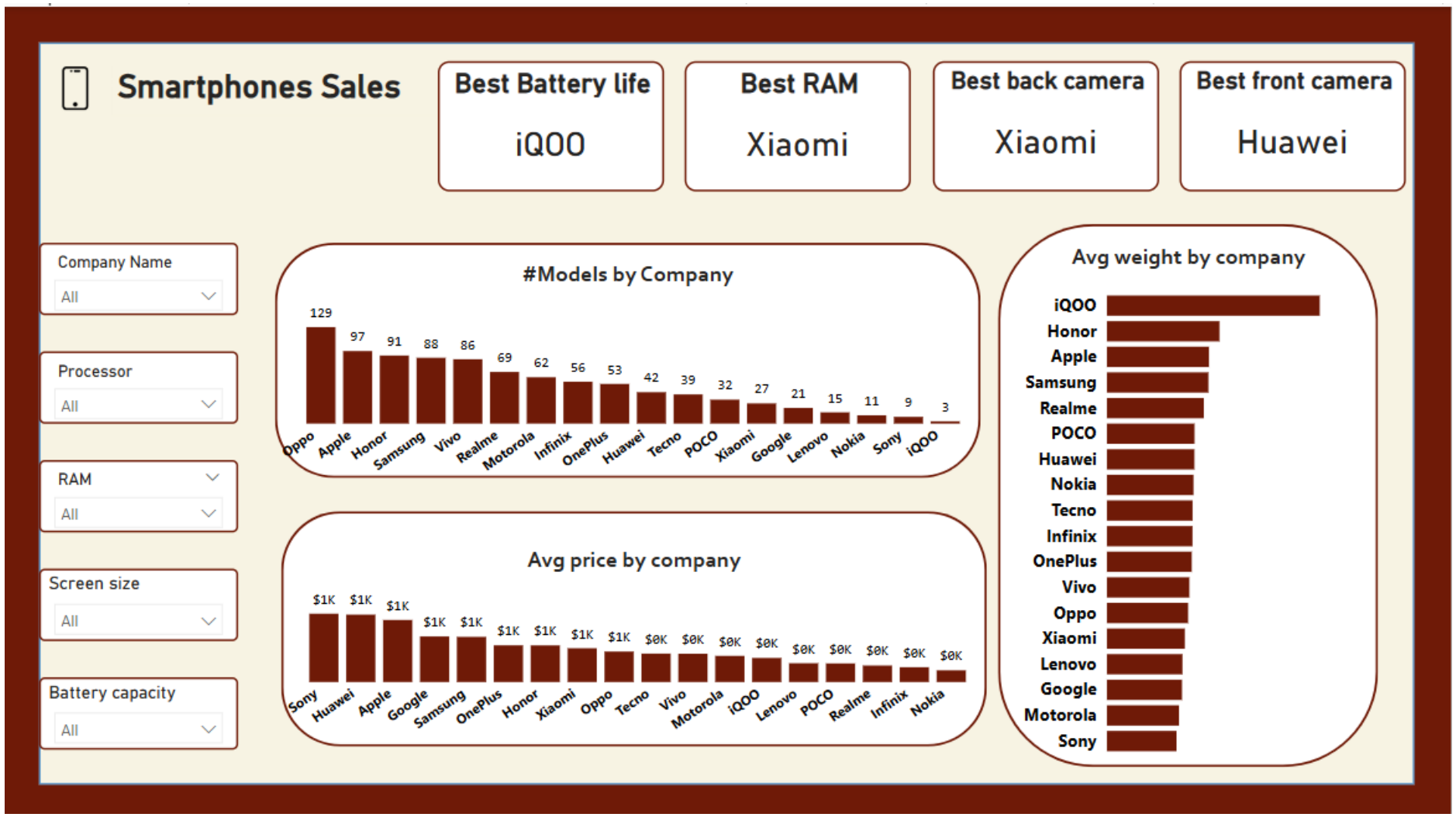



What is the average MB’s of camera by company?

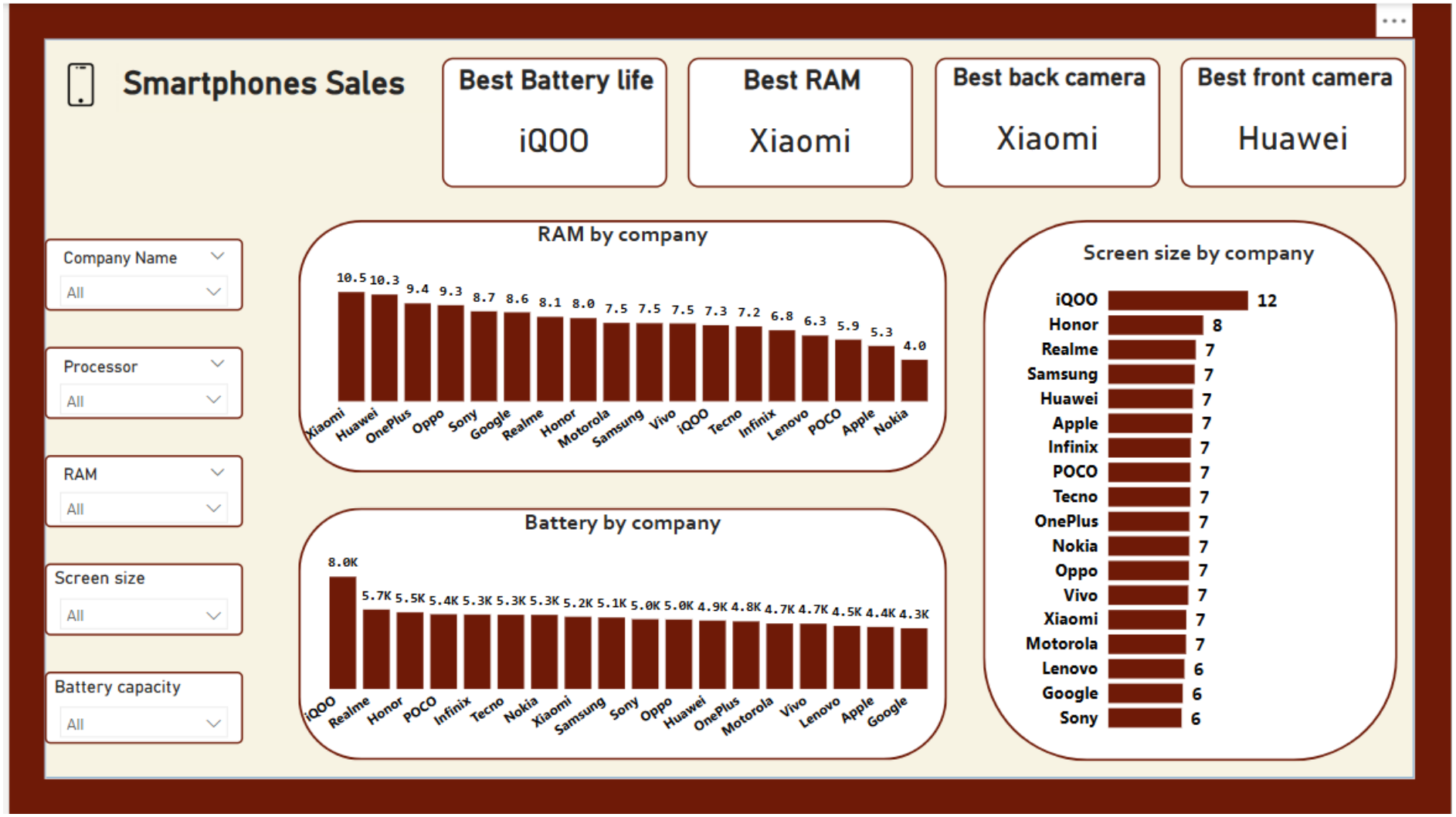


# Full dashboard

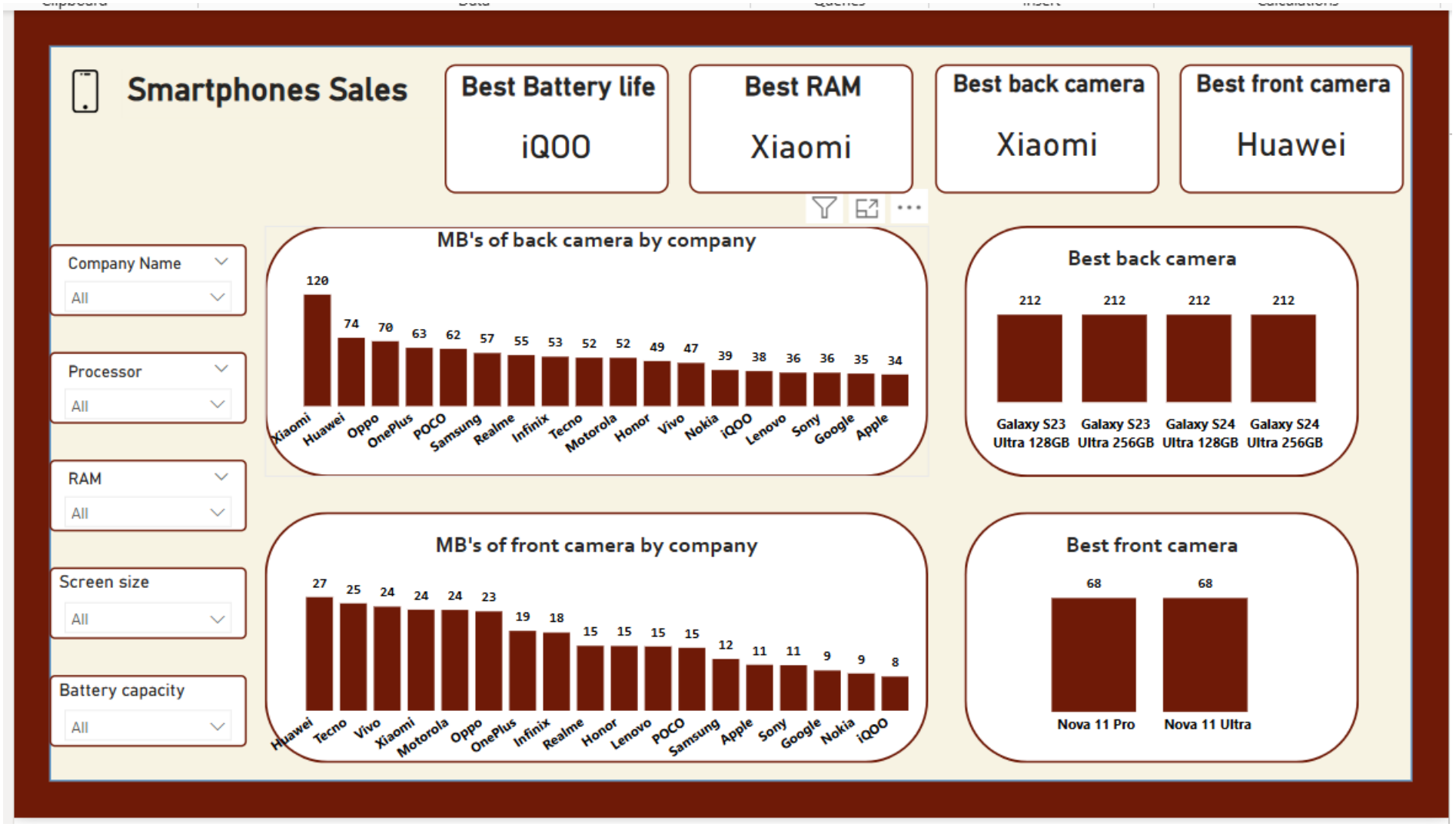
## Page 1:



Page 2:


Smartphones Sales
Best Battery life
iQOO
Best RAM
Xiaomi
Best back camera
Xiaomi
Best front camera
Huawei
Company Name
All
Processor
All
RAM
All
Screen size
All
Battery capacity
All
RAM by company
10.5 10.3 9.4 9.3 8.7 8.6 8.1 8.0 7.5 7.5 7.5 7.3 7.2 6.8 6.3 5.9 5.3 4.0
Xiaomi Huawei OnePlus Oppo Sony Google Realme Honor Motorola Samsung Vivo iQOO Tecno Infinix Lenovo POCO Apple Nokia
Battery by company
8.0K 5.7K 5.5K 5.4K 5.3K 5.3K 5.3K 5.2K 5.1K 5.0K 5.0K 4.9K 4.8K 4.7K 4.7K 4.5K 4.4K 4.3K
iQOO Realme Honor POCO Infinix Tecno Nokia Xiaomi Samsung Sony Oppo Huawei OnePlus Motorola Vivo Lenovo Apple Google
Screen size by company
iQOO 12
Honor 8
Realme 7
Samsung 7
Huawei 7
Apple 7
Infinix 7
POCO 7
Tecno 7
OnePlus 7
Nokia 7
Oppo 7
Vivo 7
Xiaomi 7
Motorola 7
Lenovo 6
Google 6
Sony 6

Page 3:


Smartphones Sales
Best Battery life
iQOO
Best RAM
Xiaomi
Best back camera
Xiaomi
Best front camera
Huawei
Company Name
All
Processor
All
RAM
All
Screen size
All
Battery capacity
All
MB's of back camera by company
120
74
70
63
62
57
55
53
52
52
49
47
39
38
36
36
35
34
Xiaomi
Huawei
Oppo
OnePlus
POCO
Samsung
Realme
Infinix
Tecno
Motorola
Honor
Vivo
Nokia
iQOO
Lenovo
Sony
Google
Apple
Best back camera
212
212
212
212
Galaxy S23 Ultra 128GB
Galaxy S23 Ultra 256GB
Galaxy S24 Ultra 128GB
Galaxy S24 Ultra 256GB
MB's of front camera by company
27
25
24
24
24
23
19
18
15
15
15
15
12
11
11
9
9
8
Huawei
Tecno
Vivo
Xiaomi
Motorola
Oppo
OnePlus
Infinix
Realme
Honor
Lenovo
POCO
Samsung
Apple
Sony
Google
Nokia
iQOO
Best front camera
68
68
Nova 11 Pro
Nova 11 Ultra