```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
plt.rcParams.update({'figure.figsize':(10,8), 'figure.dpi':100})
```

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount
```

```
link= ("/content/drive/MyDrive/Product/Battery Drainage Investigation /Battresponses.csv")
```

```
df = pd.read_csv(link, index_col='Timestamp',
                 parse_dates=True, dayfirst=True)
```

```
df.head(25)
```

Timestamp	Name	mob	drvr	cop	g_maps	life	b_health
2023-01-13 16:47:01	Michelle Eyas	Redmi Note 11 Pro 5G	19.09	19.09	19.09	NaN	NaN
2023-01-14 16:20:37	Myat Thu Kha	Tecno Spark4	0.00	0.00	0.00	NaN	NaN
2023-01-16 09:54:07	Michelle Eyas	Redmi Note 11 Pro 5G	19.15	19.15	19.15	NaN	NaN
2023-01-16 10:00:37	Seph	Iphone 12	24.00	19.00	2.00	NaN	NaN
2023-01-16 10:00:37	David Henderson	Samsung Galaxy Ultra S21	0.00	0.00	0.00	NaN	NaN
2023-01-16 10:09:25	Sora	Realme C25s	0.21	0.34	0.00	NaN	NaN
2023-01-16 10:16:28	Peach	Iphone 11	25.00	0.00	0.00	NaN	NaN
2023-01-16 10:35:29	Kyaw Sandi	IOS 7	21.00	13.00	0.00	3	NaN
2023-01-16 13:34:53	Mya Min Aye	Redmi K40S	0.50	1.00	1.20	3 months	NaN
2023-01-16 13:44:59	Si Thu Pyae Sone	iPhone Xs Max	5.00	1.00	0.00	1 year	83.0
2023-01-16 13:48:16	Marshall	Samsung Galaxy Note 9	2.90	5.20	12.50	2 years	NaN
2023-01-16 16:11:17	Myat Thu Kha	Tecno Spark 4	0.00	2.00	1.00	4 years	NaN
2023-01-16 16:30:57	Nigel Leong	Iphone XS Max	21.00	0.00	1.00	3 years ++	NaN
2023-01-16 16:38:46	Eaint	iphone X	20.00	1.00	3.00	4yr	75.0
2023-01-16 16:56:57	Thet Wint Naing	CPH2363	0.00	0.00	0.00	> 6 months	NaN
2023-01-16 16:57:06	Ye Lin Aung	OnePlus Nord 2T	0.83	0.59	0.44	3 Months	NaN
2023-01-16 17:32:59	Keito	Samsung Galaxy S22 Ultra (SM-S908E/DS)	0.10	0.20	0.20	6 months	97.0
2023-01-16 17:48:48	Ryan Lewis	iPhone 13 Pro	32.00	1.00	1.00	Over 1 year	93.0
2023-01-16 20:43:46	June Arjunka	iPhone XR	16.00	0.00	0.00	2 years	87.0
2023-01-16 22:27:20	Sittikorn - QA	iphone13	0.00	3.00	0.00	6 month	98.0
2023-01-17 14:41:11	Nigel Leong	Iphone XS Max	28.00	1.00	1.00	3 years ++	81.0
2023-01-17 14:43:10	Ryan Lewis	iPhone 13pro	2.00	0.00	0.00	Over 1 year	93.0
2023-01-17 14:43:40	Peach	Iphone 11	30.00	0.00	0.00	around 4 years	75.0
2023-01-17 14:44:05	David Henderson	Samsung S21 Ultra	0.00	0.00	0.00	18 months	NaN
2023-01-17 14:44:12	Sora	realme C25s	0.38	2.09	0.13	15 months	NaN

```
df.describe()
```

	drvr	cop	g_maps	b_health
count	69.000000	69.000000	69.000000	36.000000
mean	11.032319	2.480580	2.926957	80.638889
std	11.910742	4.250535	5.584463	16.078651

Double-click (or enter) to edit

25%	0.380000	0.200000	0.000000	75.000000
max	51.000000	19.150000	23.000000	98.000000

identify Iphone User

Steps in data cleaning:

1. Identifed ios user by str contains pattern method
2. populate null data slot with values

Data Visualisation: Scatterplot by individual devices and App Usage.

```
ip = df.mob.str.contains(pat = 'ip|Ip|iP|IO|IP')
iphone = df.loc[ip]
iphone.head(5)
iphone.g_maps.describe()
```

```
count    37.000000
mean      2.459459
std       4.711656
min       0.000000
25%       0.000000
50%       1.000000
75%       2.000000
max      23.000000
Name: g_maps, dtype: float64
```

identify Android user

Steps in data cleaning:

1. Identifed ios user by str contains pattern method
2. populate null data slot with values

Data Visualisation: Scatterplot by individual devices and App Usage.

```
not_iphone = df.mob.str.contains(pat = 'ip|Ip|iP|IO|IP|test') == False
android = df.loc[not_iphone]
android.head(5)
```

Timestamp	Name	mob	drvr	cop	g_maps	life	b_health
2023-01-13 16:47:01	Michelle Eyas	Redmi Note 11 Pro 5G	19.09	19.09	19.09	NaN	NaN
2023-01-14 16:20:37	Myat Thu Kha	Tecno Spark4	0.00	0.00	0.00	NaN	NaN
2023-01-16 09:54:07	Michelle Eyas	Redmi Note 11 Pro 5G	19.15	19.15	19.15	NaN	NaN
2023-01-16 10:00:37	David Henderson	Samsung Galaxy Ultra S21	0.00	0.00	0.00	NaN	NaN
2023-01-16 10:09:25	Sora	Realme C25s	0.21	0.34	0.00	NaN	NaN

Scatter Plot of Battery Usage by App

Trace 1 🅳 : Drive Safe by DRVR
Trace 2 🅲 : Co-Pilot by ZenDrive
Trace 3 🅶 : Google Maps by Googe

```
from plotly.subplots import make_subplots
import plotly.graph_objects as go

fig = make_subplots(rows=3, cols=1)

fig.add_trace(
```

```
        go.Scatter(
            name ="drvr",
            x=iphone.mob,
            y=iphone.drvr,
            mode="markers"),
        row=1, col=1
    )

    fig.add_trace(
        go.Scatter(
            name ="copilot",
            x=iphone.mob,
            y=iphone.cop,
            mode="markers"),
        row=2, col=1
    )

    fig.add_trace(
        go.Scatter(
            name ="google maps",
            x=iphone.mob,
            y=iphone.g_maps,
            mode="markers"),
        row=3, col=1
    )

    fig.update_layout(height=1000, width=1000, title_text="Battery Usage - IOS")

    fig.show()
```

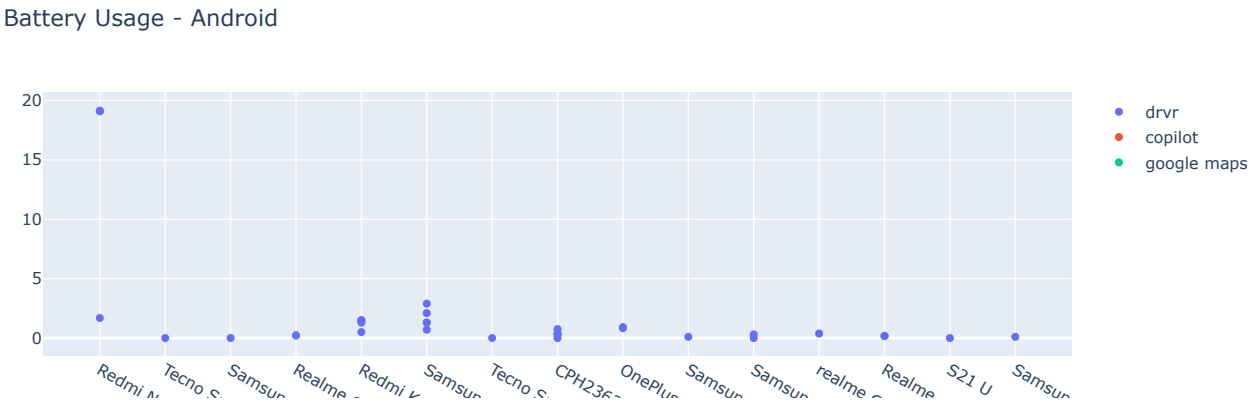
Analysis(IOS Devices)

DriveSafe consumed the highest amount of battery usage with mean ranging from 20% to 30%.

Meanwhile, Copilot and Google Maps have the mean consumption range from 0% to 5% respectively.

In the IOS area, we can conclude on case **BT5 and BT6** from documentation, where DriveSafe drains more battery than the other application with similar functions.

```
from plotly.subplots import make_subplots
import plotly.graph_objects as go

fig = make_subplots(rows=3, cols=1)

fig.add_trace(
    go.Scatter(
        name ="drvr",
        x=android.mob,
        y=android.drvr,
        mode="markers"),
    row=1, col=1
)

fig.add_trace(
    go.Scatter(
        name ="copilot",
        x=android.mob,
        y=android.cop,
        mode="markers"),
    row=2, col=1
)

fig.add_trace(
    go.Scatter(
        name ="google maps",
        x=android.mob,
        y=android.g_maps,
        mode="markers"),
    row=3, col=1
)

fig.update_layout(height=1000, width=1000, title_text="Battery Usage - Android")

fig.show()
```



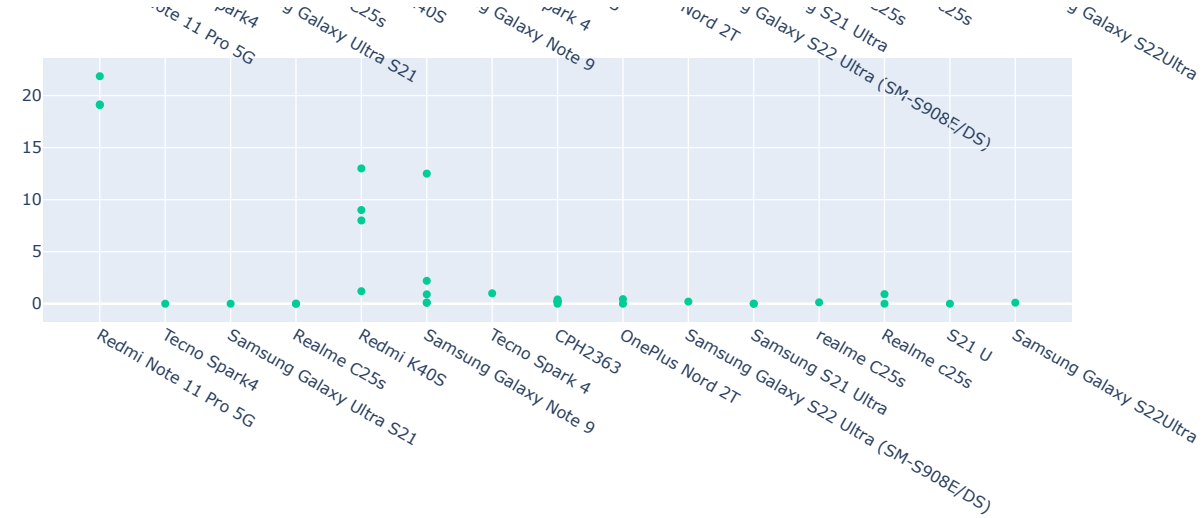
Analysis(Android Devices)

Meanwhile,DriveSafe, Copilot and Google Maps have the mean consumption range from 0% to 5% respectively.

In the Android area, we can conclude on case **BT3 and BT4** from documentation, where DriveSafe drains more battery than the other application with similar functions.

Conclusion

This is an interesting observation we gathered from this experiment, between the difference in the result between two operating systems. At such, our further actions would be to consult with the team developers to highlight this issue, do further testing on certain key features to identify the problem area.



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