

CASE STUDY on Smartphone_Specs

February 5, 2025

1 Case study on Smartphone_Specs_Dataset by Abhishek Shri-mali

DATA CLEANING/HANDLING PART:

```
[4]: !pip install pandas
import pandas as pd
df = pd.read_csv("mobile.csv") # reading the csv file
df.head(5) # validation
```

```
Defaulting to user installation because normal site-packages is not writeable
Requirement already satisfied: pandas in
c:\users\abhis\appdata\roaming\python\python312\site-packages (2.2.3)
Requirement already satisfied: numpy>=1.26.0 in
c:\users\abhis\appdata\roaming\python\python312\site-packages (from pandas)
(2.1.2)
Requirement already satisfied: python-dateutil>=2.8.2 in
c:\users\abhis\appdata\roaming\python\python312\site-packages (from pandas)
(2.9.0.post0)
Requirement already satisfied: pytz>=2020.1 in
c:\users\abhis\appdata\roaming\python\python312\site-packages (from pandas)
(2024.2)
Requirement already satisfied: tzdata>=2022.7 in
c:\users\abhis\appdata\roaming\python\python312\site-packages (from pandas)
(2024.2)
Requirement already satisfied: six>=1.5 in
c:\users\abhis\appdata\roaming\python\python312\site-packages (from python-
dateutil>=2.8.2->pandas) (1.17.0)
```

```
[4]: Unnamed: 0 Brand Model \
0 0.0 Sony Xperia L2 LTE-A AM H3321
1 1.0 Sony Xperia L2 Dual SIM TD-LTE EMEA H4311
2 2.0 LG LMX210NMW K Series K9 2018 Dual SIM LTE EMEA
3 3.0 LG LMX410EOW K Series K11 2018 Dual SIM LTE-A / K...
4 4.0 Sony Xperia L2 Dual SIM TD-LTE APAC H4331

Released Announced Hardware Designer Manufacturer \
0 26-01-2018 08-01-2018 Sony Sony
1 26-01-2018 08-01-2018 Sony Sony
```

2	24-03-2018	22-02-2018	LG Electronics	LG Electronics
3	01-05-2018	22-02-2018	LG Electronics	LG Electronics
4	01-02-2018	08-01-2018	Sony	Sony

	General Extras	Width	Height	...	\
0	Haptic touch feedback	78.0	150.0	...	
1	Haptic touch feedback	78.0	150.0	...	
2	Haptic touch feedback	73.2	146.3	...	
3	Haptic touch feedback	75.3	148.7	...	
4	Haptic touch feedback	78.0	150.0	...	

	Camera Extra Functions	\
0	HDR photo , Macro mode , Panorama Photo , Fac...	
1	HDR photo , Macro mode , Panorama Photo , Fac...	
2	HDR photo , Red-eye reduction , Burst mode , ...	
3	HDR photo , Red-eye reduction , Burst mode , ...	
4	HDR photo , Macro mode , Panorama Photo , Fac...	

	Secondary Video Recording	Nominal Battery Capacity	Estimated Battery Life	\
0	1920x1080 pixel	3300.0	NaN	
1	1920x1080 pixel	3300.0	NaN	
2	1280x720 pixel	2500.0	NaN	
3	1920x1080 pixel	3000.0	NaN	
4	1920x1080 pixel	3300.0	NaN	

	Market Countries	\
0	Brazil , USA	
1	Czech , Germany , Hungary , Poland , Russia ,...	
2	Russia , Ukraine	
3	Armenia , Czech , Germany , Italy , Kazakhsta...	
4	Australia , Singapore , Taiwan , Vietnam	

	Market Regions	Price Memory Capacity	\
0	North America , South America	NaN	32.0
1	Eastern Europe , Europe , Middle East , West...	NaN	32.0
2	Eastern Europe , Europe	NaN	16.0
3	Asia , Eastern Europe , Europe , Western Europe	NaN	16.0
4	Asia , Australia , Southeast Asia	NaN	32.0

	Cam1_mp	Cam2_mp
0	12.8	7.7
1	12.8	7.7
2	8.0	4.9
3	13.0	8.0
4	12.8	7.7

[5 rows x 50 columns]

```
[3]: df.columns = df.columns.str.strip() # trim
      ↪ whitespaces from column names
df = df.apply(lambda x:x.str.strip() if x.dtype == "object" else x) # trimming
      ↪ the whitespaces from rows as well as columns.
df.to_csv("Cleaned_Mobile.csv",index = False) # to save
      ↪ the file
print("File Saved Successfully")
```

File Saved Successfully

```
[ ]: # Generating a csv file for units sold (it does not contains real data,i made
      ↪ it just for practice purpose)
import pandas as pd
import random
input_file = "mobile.csv"
df = pd.read_csv(input_file)

model_names= df["Model"]
output_df = pd.DataFrame({
    'Model':model_names,
    'Units_Sold': [random.randint(100,100000)for _ in range(len(model_names))]
})

output_file = "units_sold"
output_df.to_csv(output_file,index = False)
print(f"New csv file saved!")
```

Connecting SQL Workbench to Jupyter Notebook:

```
[1]: ! pip install sqlalchemy pymysql
      ! pip install cryptography
```

Defaulting to user installation because normal site-packages is not writeable

Collecting sqlalchemy

Downloading SQLAlchemy-2.0.37-cp312-cp312-win_amd64.whl.metadata (9.9 kB)

Collecting pymysql

Downloading PyMySQL-1.1.1-py3-none-any.whl.metadata (4.4 kB)

Collecting greenlet!=0.4.17 (from sqlalchemy)

Downloading greenlet-3.1.1-cp312-cp312-win_amd64.whl.metadata (3.9 kB)

Requirement already satisfied: typing-extensions>=4.6.0 in

c:\users\abhis\appdata\roaming\python\python312\site-packages (from sqlalchemy) (4.12.2)

Downloading SQLAlchemy-2.0.37-cp312-cp312-win_amd64.whl (2.1 MB)

----- 0.0/2.1 MB ? eta -:-:-

----- 0.5/2.1 MB 4.2 MB/s eta 0:00:01

----- 1.8/2.1 MB 5.3 MB/s eta 0:00:01

----- 2.1/2.1 MB 5.4 MB/s eta 0:00:00

Downloading PyMySQL-1.1.1-py3-none-any.whl (44 kB)

Downloading greenlet-3.1.1-cp312-cp312-win_amd64.whl (299 kB)
 Installing collected packages: pymysql, greenlet, sqlalchemy
 Successfully installed greenlet-3.1.1 pymysql-1.1.1 sqlalchemy-2.0.37
 Defaulting to user installation because normal site-packages is not writeable
 Requirement already satisfied: cryptography in
 c:\programdata\miniconda3\lib\site-packages (42.0.5)
 Requirement already satisfied: cffi>=1.12 in c:\programdata\miniconda3\lib\site-packages (from cryptography) (1.16.0)
 Requirement already satisfied: pycparser in c:\programdata\miniconda3\lib\site-packages (from cffi>=1.12->cryptography) (2.21)

```
[2]: from sqlalchemy import create_engine
import pandas as pd
```

```
[3]: # Create database connection using SQLAlchemy
# engine = create_engine('mysql+pymysql://your_username:your_password@localhost/
# your_database')

engine = create_engine('mysql+pymysql://root:#####/Smartphones')
```

Questions (Case Study):

```
[8]: # # 1. Retrieve all columns for the first 10 records in the dataset.
query = """
select * from cleaned_mobile
limit 10;
"""

df = pd.read_sql(query, engine)
df.head(5)
```

```
[8]: Unnamed: 0 Brand Model \
0      0.0 Sony      Xperia L2 LTE-A AM H3321
1      1.0 Sony      Xperia L2 Dual SIM TD-LTE EMEA H4311
2      2.0 LG      LMX210NMW K Series K9 2018 Dual SIM LTE EMEA
3      3.0 LG      LMX410EOW K Series K11 2018 Dual SIM LTE-A / K...
4      4.0 Sony      Xperia L2 Dual SIM TD-LTE APAC H4331
```

	Released	Announced	Hardware Designer	Manufacturer	\
0	26-01-2018	08-01-2018	Sony	Sony	
1	26-01-2018	08-01-2018	Sony	Sony	
2	24-03-2018	22-02-2018	LG Electronics	LG Electronics	
3	01-05-2018	22-02-2018	LG Electronics	LG Electronics	
4	01-02-2018	08-01-2018	Sony	Sony	

	General Extras	Width	Height	...	\
0	Haptic touch feedback	78.0	150.0	...	
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Camera Extra Functions \				
0	HDR photo , Macro mode , Panorama Photo , Face...			
1	HDR photo , Macro mode , Panorama Photo , Face...			
2	HDR photo , Red-eye reduction , Burst mode , M...			
3	HDR photo , Red-eye reduction , Burst mode , T...			
4	HDR photo , Macro mode , Panorama Photo , Face...			

Secondary Video Recording	Nominal Battery Capacity	Estimated Battery Life \
0 1920x1080 pixel		3300
1 1920x1080 pixel		3300
2 1280x720 pixel		2500
3 1920x1080 pixel		3000
4 1920x1080 pixel		3300

Market Countries \	
0	Brazil , USA
1	Czech , Germany , Hungary , Poland , Russia , ...
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Market Regions	Price	Memory Capacity \
0 North America , South America		32.0
1 Eastern Europe , Europe , Middle East , Weste...		32.0
2 Eastern Europe , Europe		16.0
3 Asia , Eastern Europe , Europe , Western Europe		16.0
4 Asia , Australia , Southeast Asia		32.0

Cam1_mp	Cam2_mp
0 12.8	7.7
1 12.8	7.7
2 8.0	4.9
3 13.0	8.0
4 12.8	7.7

[5 rows x 50 columns]

```
[9]: # 2. List all unique brands in the dataset.
query = """select distinct Brand from cleaned_mobile;"""
df = pd.read_sql(query,engine)
df
```

```
[9]:      Brand
0      Sony
1       LG
2      Oppo
3    Alcatel
4    Samsung
..      ...
103  VinSmart
104  Microsoft
105    Vertu
106    Nothing
107     Acer

[108 rows x 1 columns]
```

```
[10]: # 3. Find all models released in the year 2020.
query = """ select model from cleaned_mobile
where Released like '%%2020%%'; """ # doubled the percentage to
    ↪ avoid injection errors
df = pd.read_sql_query(query, engine)
df
```

```
[10]:      model
0  Honor 9X Standard Edition Dual SIM TD-LTE APAC...
1  Y6s 2019 Dual SIM TD-LTE LATAM 64GB JAT-LX3 / ...
2      Moto E6 Plus TD-LTE EU 32GB XT2025-2
3      AQUOS zero2 TD-LTE JP SH-01M
4  Z6 Pro 5G Premium Edition Dual SIM TD-LTE CN 2...
...      ...
1447      2.4 LTE LATAM 64GB
1448      2.4 Dual SIM LTE LATAM 32GB
1449      2.4 Dual SIM Global TD-LTE 64GB
1450      2.4 Dual SIM LTE LATAM 64GB
1451  View 2 2020 TD-LTE US 32GB B131DL

[1452 rows x 1 columns]
```

```
[15]: # 4. Count the total number of devices in the dataset.
query = """select count("MyUnknownColumn") from cleaned_mobile;"""
df = pd.read_sql_query(query, engine)
df
```

```
[15]:      count("MyUnknownColumn")
0      8049
```

```
[23]: # 5. Get the average screen resolution of all devices.
query = """ select
```

```

avg(cast(substring_index(Resolution,'x',1)as unsigned))as avg_width,
avg(cast(substring_index(Resolution,'x',-1)as unsigned))as avg_height
from cleaned_mobile;
"""
df = pd.read_sql_query(query,engine)
df

```

```

[23]:      avg_width  avg_height
0    1002.3751    2148.556

```

```

[13]: # 6 Find devices with a battery capacity greater than 4000 mAh.
query = """select model,`Nominal Battery Capacity` from cleaned_mobile
where `Nominal Battery Capacity` > 4000;"""
df = pd.read_sql_query(query,engine)
df

```

```

[13]:                                     model \
0                                CAT S61 Global Dual SIM TD-LTE
1                                CAT S61 Dual SIM LTE US
2                                Vivo X Dual SIM LTE-A V0230WW
3                                PhonePad 3 Dual SIM LTE
4                                Hammer Axe Pro Dual SIM LTE
...
4505  Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...
4506    Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3
4507    Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3
4508    Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4
4509    Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...

      Nominal Battery Capacity
0                                4500
1                                4500
2                                4010
3                                4100
4                                5000
...
4505                                5000
4506                                5000
4507                                5000
4508                                5000
4509                                5000

[4510 rows x 2 columns]

```

```

[16]: # 7. List all devices that support Bluetooth 5.0.
query = """select model,Bluetooth from cleaned_mobile where Bluetooth =_
↳"Bluetooth 5.0";

```

```

"""
df= pd.read_sql_query(query,engine)
df

```

```

[16]:

```

	model	Bluetooth
0	Xperia XA2 Ultra TD-LTE EMEA H3213 / SM22	Bluetooth 5.0
1	Xperia XA2 Ultra LTE-A AM H3223	Bluetooth 5.0
2	V300S V30S ThinQ TD-LTE	Bluetooth 5.0
3	V300SW V30S+ ThinQ TD-LTE	Bluetooth 5.0
4	Xperia XA2 Dual SIM TD-LTE EMEA H4113	Bluetooth 5.0
...
3354	A3 TD-LTE US A509DL	Bluetooth 5.0
3355	Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3	Bluetooth 5.0
3356	Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3	Bluetooth 5.0
3357	Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4	Bluetooth 5.0
3358	Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...	Bluetooth 5.0

[3359 rows x 2 columns]

```

[18]: # 8. Retrieve all devices manufactured by Samsung.
query = """select model,brand from cleaned_mobile where brand = "Samsung";
"""
df = pd.read_sql_query(query,engine)
df

```

```

[18]:

```

	model	brand
0	SM-J701M Galaxy J7 Neo 2017 LTE-A LATAM	Samsung
1	SM-J701MT Galaxy J7 Neo 2017 HD TV Duos LTE-A ...	Samsung
2	SM-G960F Galaxy S9 TD-LTE	Samsung
3	SM-G965F Galaxy S9+ TD-LTE / Galaxy S9 Plus	Samsung
4	SM-G960U Galaxy S9 TD-LTE US	Samsung
...
1394	SM-M146B/DSN Galaxy M14 5G 2023 Standard Editi...	Samsung
1395	SM-M146B/N Galaxy M14 5G 2023 Standard Edition...	Samsung
1396	SM-M146B/N Galaxy M14 5G 2023 Standard Edition...	Samsung
1397	SM-E146B/DS Galaxy F14 5G 2023 Premium Edition...	Samsung
1398	SM-E146B/DS Galaxy F14 5G 2023 Standard Editio...	Samsung

[1399 rows x 2 columns]

```

[20]: # 9. Get devices that have a scratch-resistant screen.
query = """select model, `Scratch Resistant Screen`from cleaned_mobile where_
↳ `Scratch Resistant Screen` = "Yes";"""
df = pd.read_sql_query(query,engine)
df

```



```
[20]:                                     model \
0                                Xperia L2 LTE-A AM H3321
1                                Xperia L2 Dual SIM TD-LTE EMEA H4311
2                                Xperia L2 Dual SIM TD-LTE APAC H4331
3                                A83 Dual SIM TD-LTE MY VN EG PK
4                                A83 Dual SIM TD-LTE RU KZ PH KE
...
3863  Moto G23 2023 Standard Edition Dual SIM TD-LTE...
3864  Moto G23 2023 Premium Edition Global Dual SIM ...
3865  Moto G23 2023 Premium Edition Dual SIM TD-LTE ...
3866  Honor X5 4G Global Dual SIM TD-LTE LATAM 32GB ...
3867  Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...

Scratch Resistant Screen
0                                Yes
1                                Yes
2                                Yes
3                                Yes
4                                Yes
...
3863                                Yes
3864                                Yes
3865                                Yes
3866                                Yes
3867                                Yes

[3868 rows x 2 columns]
```

```
[28]: # 10. Display the model and price of devices with a camera resolution higher
      ↪ than 12 MP.
query = """select Model, Price from cleaned_mobile
where Cam1_mp >12 and Cam2_mp > 12;"""
df = pd.read_sql_query(query,engine)
df
```

```
[28]:                                     Model    Price
0                                Xperia XA2 Ultra TD-LTE EMEA H3213 / SM22
1                                Xperia XA2 Ultra LTE-A AM H3223
2                                5 Dual SIM LTE EMEA 5086D
3                                Blade V9 Dual SIM LTE-A AM Version 2 32GB
4                                ZenFone 5 Lite 2018 Global Dual SIM TD-LTE Ver...
...
4137  Moto G23 2023 Standard Edition TD-LTE LATAM 12...
4138  Moto G23 2023 Standard Edition Dual SIM TD-LTE...
4139  Moto G23 2023 Standard Edition Dual SIM TD-LTE...    1599.0
4140  Moto G23 2023 Premium Edition Global Dual SIM ...     229.0
4141  Moto G23 2023 Premium Edition Dual SIM TD-LTE ...     699.0
```

[4142 rows x 2 columns]

```
[21]: # 11. Find the top 5 heaviest devices.
query = """select model,Mass from cleaned_mobile
order by Mass DESC
limit 5;
"""
df = pd.read_sql_query(query,engine)
df
```

```
[21]:
```

	model	Mass
0	Elegance E9 Dual SIM LTE	460.0
1	Elegance E11 Dual SIM LTE	420.0
2	BV9100 Global Dual SIM TD-LTE	408.0
3	S80 Lite Global Dual SIM TD-LTE	398.0
4	S80 Global Dual SIM TD-LTE	398.0

```
[32]: # 12. Count the number of devices per manufacturer.
query = """select brand,count(distinct Model) as brand_count from_
↪cleaned_mobile group by brand;

"""
df = pd.read_sql_query(query,engine)
df
```

```
[32]:
```

	brand	brand_count
0	Acer	1
1	Acorn	1
2	AdvanceTC	1
3	Alcatel	100
4	Allview	21
..
103	VKWorld	7
104	Vodafone	5
105	Wiko	43
106	Xiaomi	885
107	ZTE	299

[108 rows x 2 columns]

```
[33]: # 13. Retrieve the average battery capacity grouped by brand.
query = """select brand,avg(`Nominal Battery Capacity`) from cleaned_mobile_
↪group by brand;
"""
df = pd.read_sql_query(query,engine)
df
```

```
[33]:      brand  avg(`Nominal Battery Capacity`)
0      Sony      3940.2143
1       LG      3403.0291
2      Oppo      4493.1897
3  Alcatel      2826.3000
4   Samsung      4358.0365
..      ...
103  VinSmart      3300.0000
104  Microsoft      4450.0000
105   Vertu      4600.0000
106   Nothing      4500.0000
107    Acer      3000.0000
```

[108 rows x 2 columns]

```
[34]: # 14. Find the total number of devices with dual cameras.
query = """select count(Cam2_mp) from cleaned_mobile where Cam2_mp is not NULL;
"""
df = pd.read_sql_query(query,engine)
df
```

```
[34]:      count(Cam2_mp)
0           8049
```

```
[37]: # 15. Identify brands that have released devices in multiple regions.
query = """select distinct brand
from cleaned_mobile
where `Market Regions` like "%%,%";"""
df = pd.read_sql_query(query,engine)
df
```

```
[37]:      brand
0      Sony
1       LG
2      Oppo
3   Samsung
4    Nokia
..      ...
81    Sugar
82  Microsoft
83    Vertu
84   Nothing
85  T-Mobile
```

[86 rows x 1 columns]

```
[38]: # 16. List devices with a refresh rate above 90 Hz.
query = """select distinct Model from cleaned_mobile
where `Display Refresh Rate` > 90;"""
df = pd.read_sql_query(query,engine)
df
```

```
[38]:
```

	Model
0	Phone 2 Global TD-LTE RZ35-0259
1	AQUOS R2 Compact TD-LTE JP 803SH
2	AQUOS R2 Compact TD-LTE JP SH-M09
3	Z6 Standard Edition Dual SIM TD-LTE CN 64GB L7...
4	Z6 Standard Edition Dual SIM TD-LTE CN 128GB L...
...	...
2077	Realme 10 Pro+ 5G 2022 Premium Edition Dual SI...
2078	Realme 10 Pro+ 5G 2022 Premium Edition Dual SI...
2079	Realme 10 Pro+ 5G NFC 2022 Top Edition Dual SI...
2080	Realme 10 Pro+ 5G NFC 2022 Premium Edition Glo...
2081	Realme 10 Pro+ 5G NFC 2022 Standard Edition Gl...

[2082 rows x 1 columns]

```
[40]: # 17. Retrieve all devices with a resolution of 1080x1920 pixels.
query = """select distinct model from cleaned_mobile
where Resolution = "1080x1920";"""
df = pd.read_sql_query(query,engine)
df
```

```
[40]:
```

	model
0	Xperia XA2 Ultra TD-LTE EMEA H3213 / SM22
1	Xperia XA2 Ultra LTE-A AM H3223
2	Xperia XA2 Dual SIM TD-LTE EMEA H4113
3	SM-J701M Galaxy J7 Neo 2017 LTE-A LATAM
4	SM-J701MT Galaxy J7 Neo 2017 HD TV Duos LTE-A ...
...	...
79	U20 Global Dual SIM TD-LTE 16GB U685H
80	SM-G611MT/DS Galaxy J7 Prime 2 TV 2018 Duos LT...
81	SM-G611M/DS Galaxy J7 Prime 2 2018 Duos LTE LATAM
82	Balmuda Phone 5G TD-LTE JP
83	Balmuda Phone 5G TD-LTE JP A101BM

[84 rows x 1 columns]

```
[42]: #18. Find the top 3 brands with the most models in the dataset.
query = """select brand,count(*) as count from cleaned_mobile group by brand
order by count desc
limit 3;"""
df = pd.read_sql_query(query,engine)
```

```
df
```

```
[42]:      brand  count
0  Samsung   1399
1    Oppo    917
2  Xiaomi    886
```

```
[44]: #19. Retrieve devices with an "Octa-core" CPU.
query = """select model from cleaned_mobile where CPU like "%octa-core%";"""
df = pd.read_sql_query(query,engine)
df
```

```
[44]:                                     model
0    LMX410EOW K Series K11 2018 Dual SIM LTE-A / K...
1                A83 Dual SIM TD-LTE MY VN EG PK
2                A83 Dual SIM TD-LTE RU KZ PH KE
3                A39 Dual SIM TD-LTE ID VN CPH1605
4    Xperia XA2 Ultra TD-LTE EMEA H3213 / SM22
...
7011  Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...
7012  Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3
7013  Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3
7014  Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4
7015  Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...

[7016 rows x 1 columns]
```

```
[45]: # 20. Find models with RAM greater than 8 GB.
query = """select model from cleaned_mobile where
cast(substring_index(`RAM Capacity (converted)`, " ",1) as unsigned)>8;"""
df = pd.read_sql_query(query,engine)
df
```

```
[45]:                                     model
0                One Touch Pixi 3 3.5 LATAM OT-4009F
1                One Touch Pixi 3 3.5 LATAM OT-4023A
2                One Touch Pixi 3 3.5 EMEA OT-4023X
3                One Touch Pixi 3 3.5 EMEA OT-4022X
4    One Touch Pixi 3 3.5 Dual SIM EMEA OT-4022D
..
965  Realme 10 Pro 5G 2022 Top Edition Dual SIM TD-...
966  Realme 10 Pro+ 5G NFC 2022 Top Edition Dual SI...
967  Realme 10 Pro+ 5G NFC 2022 Top Edition Dual SI...
968  Realme 10 Pro+ 5G NFC 2022 Top Edition Global ...
969  Realme 10 Pro+ 5G NFC 2022 Top Edition Dual SI...

[970 rows x 1 columns]
```

```
[4]: # 21. Retrieve devices with the highest resolution for each brand.
query = """SELECT a.model, a.brand,
              (CAST(SUBSTRING_INDEX(a.Resolution, 'x', 1) AS UNSIGNED) *
               CAST(SUBSTRING_INDEX(a.Resolution, 'x', -1) AS UNSIGNED)) AS total_pixel
FROM cleaned_mobile a
JOIN (
      SELECT b.brand, MAX(CAST(SUBSTRING_INDEX(b.Resolution, 'x', 1) AS UNSIGNED)) AS
      ↪*
              CAST(SUBSTRING_INDEX(b.Resolution, 'x', -1) AS
      ↪UNSIGNED)) AS max_pixel
      FROM cleaned_mobile b
      GROUP BY b.brand
) max_res ON a.brand = max_res.brand
WHERE (CAST(SUBSTRING_INDEX(a.Resolution, 'x', 1) AS UNSIGNED) *
       CAST(SUBSTRING_INDEX(a.Resolution, 'x', -1) AS UNSIGNED)) = max_res.
      ↪max_pixel;"""
df = pd.read_sql_query(query, engine)
df
```

```
[4]:
```

	model	brand \
0	U12+ Dual SIM TD-LTE 128GB	HTC
1	8035 LTE	Doro
2	S1 TD-LTE Dual SIM	Pixelphone
3	Smart 508 LTE	FarEasTone
4	Smart 509 LTE	FarEasTone
..
528	Nubia Z50 Ultra 5G Top Edition Dual SIM TD-LTE...	ZTE
529	Nubia Z50 Ultra 5G Premium Edition Dual SIM TD...	ZTE
530	Nubia Z50 Ultra 5G Premium Edition Dual SIM TD...	ZTE
531	Nubia Z50 Ultra 5G Standard Edition Dual SIM T...	ZTE
532	Nubia Z50 Ultra 5G Photographer Edition Dual S...	ZTE

	total_pixel
0	4147200
1	921600
2	921600
3	921600
4	921600
..	...
528	2767680
529	2767680
530	2767680
531	2767680
532	2767680

[533 rows x 3 columns]

```
[5]: # 22. Find the average price of devices per manufacturer where price data is
      ↪available.
```

```
query = """select avg(Price) ,Manufacturer from cleaned_mobile
group by Manufacturer;"""
df = pd.read_sql_query(query,engine)
df
```

```
[5]:
```

	avg(Price)	Manufacturer
0	34848.514143	Sony
1	6216.710979	LG Electronics
2	133651.214555	BBK Electronics
3	18353.607990	TCL
4	104786.608331	Samsung Electronics
..
66	15517.400000	Hon Hai Precision
67	2849.000000	Huizhou HEG Technology
68	0.000000	Motorola Mobile Devices
69	35609.000000	OPPO India
70	0.000000	Global Components

[71 rows x 2 columns]

```
[6]: # 23. List devices that were released but not announced.
query = """select Model as `Models which are not announced`,Released
FROM cleaned_mobile
where Released is not null and Announced IS NULL or Announced = '';"""
df = pd.read_sql_query(query,engine)
df
```

```
[6]:
```

	Models which are not announced	Released
0	A37 Dual SIM TD-LTE IN KZ	01-06-2016
1	A37 Dual SIM TD-LTE EMEA	01-06-2016
2	A37 Dual SIM TD-LTE SG	01-06-2016
3	One Touch Pixi 4 4.0 Dual SIM LATAM 4034E	01-06-2016
4	H320AR Leon 3G	01-06-2015
..
317	SM-G316ML/DS Galaxy Ace 4 Neo Duos	01-07-2015
318	SM-G530MU Galaxy Grand Prime Duos	01-01-2015
319	Poco C40 Premium Edition Dual SIM TD-LTE IN 64...	01-03-2023
320	Redmi 12C Standard Edition Dual SIM TD-LTE IN ...	01-04-2023
321	Sospiro A60 LATAM	01-09-2022

[322 rows x 2 columns]

```
[9]: # 24. . Find devices with cameras supporting HDR and Panorama modes.
query = """select Model as `Models which supports HDR and Panorama modes in`
      ↪cameras`,`Camera Extra Functions`
```

```
FROM cleaned_mobile
where `Camera Extra Functions` like '%%HDR%%' and `Camera Extra Functions` like_
↳ '%%Panorama%%';"""
df = pd.read_sql_query(query,engine)
df
```

[9]: Models which supports HDR and Panorama modes in cameras \

```
0          Xperia L2 LTE-A AM H3321
1          Xperia L2 Dual SIM TD-LTE EMEA H4311
2          LMX210NMW K Series K9 2018 Dual SIM LTE EMEA
3          LMX410EOW K Series K11 2018 Dual SIM LTE-A / K...
4          Xperia L2 Dual SIM TD-LTE APAC H4331
...
7851 Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...
7852 Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3
7853 Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3
7854 Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4
7855 Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...
```

```
Camera Extra Functions
0  HDR photo , Macro mode , Panorama Photo , Face...
1  HDR photo , Macro mode , Panorama Photo , Face...
2  HDR photo , Red-eye reduction , Burst mode , M...
3  HDR photo , Red-eye reduction , Burst mode , T...
4  HDR photo , Macro mode , Panorama Photo , Face...
...
7851 HDR photo , Burst mode , Macro mode , Panorama...
7852 Pixel unification , HDR photo , Red-eye reduct...
7853 Pixel unification , HDR photo , Red-eye reduct...
7854 Pixel unification , HDR photo , Red-eye reduct...
7855 Pixel unification , HDR photo , Red-eye reduct...
```

[7856 rows x 2 columns]

[11]: #25. Retrieve the total number of devices released per year.

```
query = """Select count(Model) as `Model Count`,_
↳YEAR(str_to_date(Released,'%Y-%m-%d')) as
release_year from cleaned_mobile
GROUP BY release_year
order by release_year;"""
df = pd.read_sql_query(query,engine)
df
```

[11]:

	Model Count	release_year
0	5	NaN
1	3971	2001.0
2	247	2002.0

3	73	2003.0
4	144	2004.0
5	196	2006.0
6	149	2007.0
7	144	2008.0
8	135	2009.0
9	158	2011.0
10	180	2012.0
11	112	2013.0
12	156	2014.0
13	281	2016.0
14	143	2017.0
15	159	2018.0
16	125	2019.0
17	231	2021.0
18	130	2022.0
19	124	2023.0
20	274	2024.0
21	255	2026.0
22	170	2027.0
23	190	2028.0
24	213	2029.0
25	84	2031.0

```
[21]: # 26. List brands with devices supporting fast charging .
query = """
select Brand, GROUP_CONCAT(DISTINCT Model) AS Models, GROUP_CONCAT(DISTINCT_
↵ `USB Services`) AS `USB Services`
from cleaned_mobile
WHERE `USB Services` LIKE '%%fast charging%%'
group by Brand
order by Brand;"""
df = pd.read_sql_query(query,engine)
df
```

```
[21]:
```

	Brand	Models \
0	AdvanceTC	MAGIIC Xplore X7 Dual SIM LTE
1	Alcatel	1C 3G EU,1C Dual SIM 3G EU,5 Dual SIM LTE AM 5...
2	Allview	P8 Pro Dual SIM TD-LTE,X5 Soul Global Dual SIM...
3	Apple	iPhone 11 A2111 Dual SIM TD-LTE NA 128GB,iPhon...
4	Archos	Diamond 2019 Dual SIM LTE,X67 5G Global Dual S...
..
77	Vertu	Metavertu 5G Basic Edition Dual SIM TD-LTE 512GB
78	VKWorld	K1 Dual SIM TD-LTE,S8 Dual SIM LTE,VK7000 Dual...
79	Wiko	View 3 Pro Dual SIM TD-LTE 128GB M2766,View 3 ...
80	Xiaomi	Black Shark 2 Dual SIM TD-LTE CN 128GB SKW-A0,...
81	ZTE	a1 5G TD-LTE JP ZTG01,Axon 10 Pro 5G TD-LTE J...

```

                                USB Services
0  USB charging , USB fast charging , USB Host , ...
1  USB charging , USB fast charging,USB charging ...
2  USB charging , USB fast charging,USB charging ...
3  USB charging , USB fast charging,USB charging ...
4  USB charging , USB fast charging , USB Host , ...
..
77 USB charging , USB fast charging , USB Host , ...
78 USB charging , USB fast charging , USB Host , ...
79 USB charging , USB fast charging , USB Host , ...
80 USB charging , USB fast charging , USB Host , ...
81 USB charging , USB fast charging,USB charging ...

```

[82 rows x 3 columns]

```

[23]: # 27. Identify the lightest device for each brand.
query = """select Model,Min(Mass),Brand from cleaned_mobile
group by brand,Model;"""
df = pd.read_sql_query(query,engine)
df

```

```

[23]:
                                Model  Min(Mass)  Brand
0                      Xperia L2 LTE-A AM H3321    178.0   Sony
1              Xperia L2 Dual SIM TD-LTE EMEA H4311    178.0   Sony
2          LMX210NMW K Series K9 2018 Dual SIM LTE EMEA    152.0    LG
3      LMX410EOW K Series K11 2018 Dual SIM LTE-A / K...    162.0    LG
4              Xperia L2 Dual SIM TD-LTE APAC H4331    178.0   Sony
...
8038  Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...    193.0  Huawei
8039    Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3    177.2  Motorola
8040    Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3    177.2  Motorola
8041    Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4    177.2  Motorola
8042    Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...    177.2  Motorola

```

[8043 rows x 3 columns]

```

[25]: # 28. List all devices with a 4K video recording capability.
query = """select Model,`Video Recording` from cleaned_mobile where
`Video Recording` like '%%4096x2160%%';"""
df = pd.read_sql_query(query,engine)
df

```

```

[25]:
                                Model  Video Recording
0              SM-G960F Galaxy S9 TD-LTE  4096x2160 pixel
1      SM-G965F Galaxy S9+ TD-LTE / Galaxy S9 Plus  4096x2160 pixel
2              SM-G960U Galaxy S9 TD-LTE US  4096x2160 pixel

```

```

3          SM-G965F/DS Galaxy S9+ Duos TD-LTE 64GB 4096x2160 pixel
4          SM-G960W Galaxy S9 TD-LTE 4096x2160 pixel
..
207 Vivo X70t 5G Standard Edition Dual SIM TD-LTE ... 4096x2160 pixel
208 Vivo S12 Pro 5G 2022 Premium Edition Dual SIM ... 4096x2160 pixel
209 Vivo S12 Pro 5G 2022 Standard Edition Dual SIM... 4096x2160 pixel
210 Vivo S12 Pro 5G 2022 Standard Edition Dual SIM... 4096x2160 pixel
211 SM-N976Q Galaxy Note 10+ 5G Global TD-LTE 256GB 4096x2160 pixel

```

[212 rows x 2 columns]

```

[28]: #29. Retrieve models with an "f/1.8" or wider aperture.
query = """select Model,`Aperture (W)` from cleaned_mobile
where `Aperture (W)` like 'f/1.8%' OR `Aperture (W)` LIKE 'f/1.%%'
group by `Aperture (W)`,Model;"""
df = pd.read_sql_query(query,engine)
df

```

```

[28]:
Model Aperture (W)
0          V300S V30S ThinQ TD-LTE      f/1.60
1          V300SW V30S+ ThinQ TD-LTE     f/1.60
2          SM-J701M Galaxy J7 Neo 2017 LTE-A LATAM      f/1.90
3  SM-J701MT Galaxy J7 Neo 2017 HD TV Duos LTE-A ...    f/1.90
4          SM-G960F Galaxy S9 TD-LTE     f/1.50
...
5700 Moto G23 2023 Premium Edition Dual SIM TD-LTE ...    f/1.80
5701   Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3    f/1.80
5702   Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3    f/1.80
5703   Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4    f/1.80
5704   Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...    f/1.80

```

[5705 rows x 2 columns]

```

[30]: # 30. Generate a report showing the number of devices released per brand each
      ↪year, sorted by year and brand.
query = """select Brand, YEAR(str_to_date(Released,'%Y-%m-%d')) as
      ↪release_year, count(Model) as device_count
from cleaned_mobile
group by release_year,Brand
order by release_year, Brand;"""
df = pd.read_sql_query(query,engine)
df

```

```

[30]:
Brand release_year device_count
0    Doogee         NaN           1
1  Motorola         NaN           2
2     Noa          NaN           1

```

3	Pixelphone	NaN	1
4	Acer	2001.0	1
..
639	Sony	2031.0	2
640	Telstra	2031.0	1
641	Wiko	2031.0	1
642	Xiaomi	2031.0	8
643	ZTE	2031.0	3

[644 rows x 3 columns]

```
[31]: # 31. Calculate the correlation between battery capacity and device weight for
      ↪all devices. # we are using manual method by using correlation formula
query = """SELECT (sum(`Nominal Battery Capacity` * Mass) - (sum(`Nominal
      ↪Battery Capacity`) * sum(Mass) / count(*))) /
      (sqrt(sum(`Nominal Battery Capacity` * `Nominal Battery Capacity`) -
      ↪(sum(`Nominal Battery Capacity`) * sum(`Nominal Battery Capacity`) /
      count(*))) * sqrt(sum(Mass * Mass) - (sum(Mass) * sum(Mass) / count(*)))) AS
      ↪correlation
FROM cleaned_mobile;"""
df = pd.read_sql_query(query, engine)
df
```

```
[31]: correlation
0      0.6379
```

```
[32]: # 32.. Find the top 5 best-selling devices by combining the mobile data with
      ↪the sales table.
query = """select C.Model, U.Units_Sold from cleaned_mobile C
right join units_sold U on
C.Model = U.Model
order by U.Units_Sold desc
limit 5;"""
df = pd.read_sql_query(query, engine)
df
```

```
[32]:
```

	Model	Units_Sold
0	Redmi K50 Extreme Mercedes-AMG F1 Team Edition...	99998
1	SM-G973J Galaxy S10 WiMAX 2+ JP SCV41	99994
2	SM-F721W Galaxy Z Flip 4 5G TD-LTE CA 128GB	99993
3	Q815L Q Series Q8 2018 TD-LTE KR	99955
4	Moto E22i 2022 Dual SIM TD-LTE AU 32GB XT2239-20	99933

```
[ ]: # 33. Create a view that shows the average battery capacity and screen
      ↪resolution for each brand.

query = """ CREATE VIEW mobile as
```

```

select avg(`Nominal Battery Capacity`), avg(Resolution),Brand
from cleaned_mobile
group by Brand;
Select * from mobile;"""
df = pd.read_sql_query(query,engine)
df

```

```

[35]: query = """ Select * from mobile;"""
df = pd.read_sql_query(query,engine)
df

```

```

[35]:      avg(`Nominal Battery Capacity`)  avg(Resolution)      Brand
0                3940.2143        1266.428571        Sony
1                3403.0291         955.079365         LG
2                4493.1897         983.685932        Oppo
3                2826.3000         635.200000    Alcatel
4                4358.0365        1058.353109    Samsung
..                ...                ...        ...
103              3300.0000         720.000000    VinSmart
104              4450.0000        1344.000000  Microsoft
105              4600.0000        1080.000000     Vertu
106              4500.0000        1080.000000    Nothing
107              3000.0000         720.000000     Acer

```

[108 rows x 3 columns]

```

[36]: # 34. List all devices that have better battery capacity than the
# average of their brand (use a Common Table Expression).
query = """with CTE as (
select Brand,avg(`Nominal Battery Capacity`) as avg_battery
from cleaned_mobile
group by Brand
)
select Model,`Nominal Battery Capacity` , avg_battery
from cleaned_mobile  C
join      CTE on C.Brand = CTE.Brand
where C.`Nominal Battery Capacity` > CTE.avg_battery;"""
df = pd.read_sql_query(query,engine)
df

```

```

[36]:      Model \
0      3 Dual SIM LTE EMEA 5052D
1      3 LTE EMEA 5052Y
2      3x Dual SIM TD-LTE EMEA 5058Y / 5058I
3      3V Dual SIM TD-LTE EMEA 5099D / 5099U
4      5 Dual SIM LTE EMEA 5086D
...      ...

```

```

4243 Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...
4244 Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3
4245 Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3
4246 Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4
4247 Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...

```

	Nominal Battery Capacity	avg_battery
0	3000	2826.3000
1	3000	2826.3000
2	3000	2826.3000
3	3000	2826.3000
4	3000	2826.3000
...
4243	5000	4065.6088
4244	5000	4327.4518
4245	5000	4327.4518
4246	5000	4327.4518
4247	5000	4327.4518

[4248 rows x 3 columns]

[37]: *# 35. Identify the devices that rank in the top 10 for screen-to-body ratio*
↪(use a window function).

```

query = """select Model, `Display Area Utilization` from (
select Model,`Display Area Utilization`,
RANK() OVER ( ORDER BY `Display Area Utilization` DESC) as screen
from cleaned_mobile) as ranked
where screen<=10;"""
df = pd.read_sql_query(query,engine)
df

```

[37]:	Model	Display Area Utilization
0	Redmi 10 Prime 2022 Standard Edition Dual SIM ...	99.90%
1	Redmi 10 Prime 2022 Standard Edition Dual SIM ...	99.90%
2	Redmi 10 Prime 2022 Premium Edition Dual SIM T...	99.90%
3	Redmi 10 2021 Standard Edition Global Dual SIM...	99.90%
4	Redmi 10 2021 Standard Edition Dual SIM TD-LTE...	99.90%
5	Redmi 10 2021 Premium Edition Global Dual SIM ...	99.90%
6	Redmi 10 Prime 2021 Standard Edition Dual SIM ...	99.90%
7	Redmi 10 2021 Standard Edition Dual SIM TD-LTE...	99.90%
8	Redmi 10 2021 Standard Edition Global Dual SIM...	99.90%
9	Redmi 10 2021 Standard Edition Global Dual SIM...	99.90%
10	Redmi 10 2021 Standard Edition Global Dual SIM...	99.90%
11	Redmi 10 Prime 2021 Premium Edition Dual SIM T...	99.90%
12	Redmi 10 2021 Premium Edition Dual SIM TD-LTE ...	99.90%
13	Redmi 10 2021 Premium Edition Global Dual SIM ...	99.90%

[39]: # 36. Retrieve the details of devices along with their corresponding average price per brand (use a JOIN with a subquery).

```
query = """select C.*
from cleaned_mobile C
Join ( select
Brand, avg(Price) as Avg_PRICE
from cleaned_mobile
group by Brand) as brand_avg_price
ON C.Brand = brand_avg_price.Brand;
"""
df = pd.read_sql_query(query,engine)
df
```

[39]:

	Unnamed: 0	Brand	Model \
0	0.0	Sony	Xperia L2 LTE-A AM H3321
1	1.0	Sony	Xperia L2 Dual SIM TD-LTE EMEA H4311
2	2.0	LG	LMX210NMW K Series K9 2018 Dual SIM LTE EMEA
3	3.0	LG	LMX410EOW K Series K11 2018 Dual SIM LTE-A / K...
4	4.0	Sony	Xperia L2 Dual SIM TD-LTE APAC H4331
...
8044	8272.0	Huawei	Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...
8045	8273.0	Motorola	Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3
8046	8274.0	Motorola	Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3
8047	8275.0	Motorola	Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4
8048	8276.0	Motorola	Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...

	Released	Announced	Hardware Designer	Manufacturer \
0	26-01-2018	08-01-2018	Sony	Sony
1	26-01-2018	08-01-2018	Sony	Sony
2	24-03-2018	22-02-2018	LG Electronics	LG Electronics
3	01-05-2018	22-02-2018	LG Electronics	LG Electronics
4	01-02-2018	08-01-2018	Sony	Sony
...
8044	01-02-2023	25-01-2023	Huawei	Huawei
8045	08-08-2023	02-08-2023	Motorola Mobile Devices	Lenovo
8046	08-08-2023	02-08-2023	Motorola Mobile Devices	Lenovo
8047	01-08-2023	02-08-2023	Motorola Mobile Devices	Lenovo
8048	08-08-2023	02-08-2023	Motorola Mobile Devices	Lenovo

	General Extras	Width	Height	...	\
0	Haptic touch feedback	78.00	150.00	...	
1	Haptic touch feedback	78.00	150.00	...	
2	Haptic touch feedback	73.20	146.30	...	
3	Haptic touch feedback	75.30	148.70	...	
4	Haptic touch feedback	78.00	150.00	...	
...	
8044	Haptic touch feedback	75.57	164.04	...	

8045	Haptic touch feedback	73.82	161.46	...
8046	Haptic touch feedback	73.82	161.46	...
8047	Haptic touch feedback	73.82	161.46	...
8048	Haptic touch feedback	73.82	161.46	...

Camera Extra Functions \

0	HDR photo , Macro mode , Panorama Photo , Face...
1	HDR photo , Macro mode , Panorama Photo , Face...
2	HDR photo , Red-eye reduction , Burst mode , M...
3	HDR photo , Red-eye reduction , Burst mode , T...
4	HDR photo , Macro mode , Panorama Photo , Face...
...	...
8044	HDR photo , Burst mode , Macro mode , Panorama...
8045	Pixel unification , HDR photo , Red-eye reduct...
8046	Pixel unification , HDR photo , Red-eye reduct...
8047	Pixel unification , HDR photo , Red-eye reduct...
8048	Pixel unification , HDR photo , Red-eye reduct...

Secondary Video Recording Nominal Battery Capacity \

0	1920x1080 pixel	3300
1	1920x1080 pixel	3300
2	1280x720 pixel	2500
3	1920x1080 pixel	3000
4	1920x1080 pixel	3300
...
8044	1920x1080 pixel	5000
8045	1920x1080 pixel	5000
8046	1920x1080 pixel	5000
8047	1920x1080 pixel	5000
8048	1920x1080 pixel	5000

Estimated Battery Life \

0
1
2
3
4
...
8044
8045
8046
8047
8048

Market Countries \

0	Brazil , USA
1	Czech , Germany , Hungary , Poland , Russia , ...


```

2                                Russia , Ukraine
3    Armenia , Czech , Germany , Italy , Kazakhstan...
4                                Australia , Singapore , Taiwan , Vietnam
...
8044  Argentina , Chile , Ecuador , Guatemala , Mexi...
8045  Austria , Belgium , Bulgaria , Cyprus , Croati...
8046                                India
8047                                Egypt , Lebanon , Saudi Arabia , UAE
8048                                Costa Rica , Mexico , Paraguay , Peru

```

```

                                Market Regions    Price \
0                                North America , South America
1    Eastern Europe , Europe , Middle East , Weste...
2                                Eastern Europe , Europe
3    Asia , Eastern Europe , Europe , Western Europe
4                                Asia , Australia , Southeast Asia
...
8044  Central America , North America , South America 2499.0
8045  Asia , Eastern Europe , Europe , Western Europe 149.99
8046                                Asia 9999.0
8047                                Africa , Asia , Middle East
8048  Central America , North America , South America 3699.0

```

```

Memory Capacity Cam1_mp Cam2_mp
0                32.0    12.8    7.7
1                32.0    12.8    7.7
2                16.0     8.0    4.9
3                16.0    13.0    8.0
4                32.0    12.8    7.7
...
8044             32.0     8.0    5.0
8045            128.0    50.3    8.0
8046            128.0    50.3    8.0
8047            128.0    50.3    8.0
8048            128.0    50.3    8.0

```

[8049 rows x 50 columns]

```

[ ]: # 37. Create an indexed view for the most queried data: Brand, Model, and
      Released.
query = """CREATE table IndView AS
SELECT Brand, Model, Released
FROM cleaned_mobile;
CREATE INDEX IndViewIndex on IndView (Brand (255) ,Model (255) ,Released(255));
"""
df = pd.read_sql_query(query,engine)
df

```

```
[ ]: # to refresh the view
query = """TRUNCATE TABLE IndView;
INSERT INTO IndView
SELECT Brand, Model, Released
FROM cleaned_mobile;"""
df = pd.read_sql_query(query,engine)
df
```

```
[40]: query = """select * from IndView;"""
df = pd.read_sql_query(query,engine)
df
```

```
[40]:
```

	Brand	Model	Released
0	Sony	Xperia L2 LTE-A AM H3321	26-01-2018
1	Sony	Xperia L2 Dual SIM TD-LTE EMEA H4311	26-01-2018
2	LG	LMX210NMW K Series K9 2018 Dual SIM LTE EMEA	24-03-2018
3	LG	LMX410EOW K Series K11 2018 Dual SIM LTE-A / K...	01-05-2018
4	Sony	Xperia L2 Dual SIM TD-LTE APAC H4331	01-02-2018
...
8044	Huawei	Honor X5 4G Global TD-LTE LATAM 32GB VNA-LX3 /...	01-02-2023
8045	Motorola	Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3	08-08-2023
8046	Motorola	Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3	08-08-2023
8047	Motorola	Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4	01-08-2023
8048	Motorola	Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...	08-08-2023

[8049 rows x 3 columns]

```
[42]: # 38. List all brands that have released at least one device in every year
↳since 2015.

query = """select Brand
from cleaned_mobile
where YEAR(str_to_date(Released, '%d-%m-%Y')) >=2015
group by Brand
HAVING COUNT(DISTINCT YEAR(STR_TO_DATE(Released, '%d-%m-%Y'))))
= (SELECT COUNT(DISTINCT YEAR(STR_TO_DATE(Released, '%d-%m-%Y'))))
FROM cleaned_mobile WHERE YEAR(STR_TO_DATE(Released, '%d-%m-%Y')) >= 2015);
↳"""
df = pd.read_sql_query(query,engine)
df
```

```
[42]:
```

	Brand
0	BBK
1	Samsung
2	ZTE

```
[43]: # 39. Retrieve the heaviest device and its manufacturer for every year.
query = """Select cm.Model, cm.Brand, max_mass_table.Release_year, cm.Mass
from (SELECT
      Model,
      Mass,
      Brand,
      YEAR(STR_TO_DATE(Released, '%%d-%%m-%%Y')) AS Release_year
      FROM cleaned_mobile
    ) AS cm
INNER JOIN (
select Brand, YEAR(STR_TO_dATE(Released, '%%d-%%m-%%Y')) as Release_year,
Max(Mass) as MaxMass
from cleaned_mobile
group by Brand, Release_year)
as max_mass_table on cm.Brand = max_mass_table.Brand and cm.Release_year
= max_mass_table.Release_year and cm.Mass = max_mass_table.MaxMass
order by cm.Release_year asc;"""
df = pd.read_sql_query(query,engine)
df
```

```
[43]:
```

	Model	Brand	Release_year \
0	Vivo Y20 Dual SIM TD	BBK	2013
1	G6 Plus Dual SIM	GFive	2014
2	4G LTE 3 Dual SIM	GFive	2015
3	D6000 Dual SIM LTE EMEA 32GB	Innos	2015
4	One Touch Pixi 3 3.5 LATAM OT-4009F	Alcatel	2015
..
783	Pixel Fold 5G UW Global TD-LTE 512GB G9FPL	Google	2023
784	ROG Phone 7 Ultimate 5G Global Dual SIM TD-LTE...	Asus	2023
785	ROG Phone 7 Pro 5G Dual SIM TD-LTE CN Version ...	Asus	2023
786	ROG Phone 7 Ultimate 5G Dual SIM TD-LTE US Ver...	Asus	2023
787	Xperia 1 V 5G Dual SIM TD-LTE EMEA 256GB XQ-DQ54	Sony	2023

	Mass
0	143.0
1	135.0
2	151.0
3	198.0
4	104.0
..	...
783	283.0
784	246.0
785	246.0
786	246.0
787	187.0

[788 rows x 4 columns]

```
[44]: # 40. Using a CTE, calculate the yearly increase in average screen size for all
      ↪ devices.
query = """With avgscreen as (
SELECT Year(str_to_Date(Released,'%d-%m-%Y')) as ReleaseYear,
avg(Resolution) as avgRES
FROM cleaned_mobile
group by
ReleaseYear
),
YearlyIncrease as (
select
ReleaseYear,
avgRES,
LAG(avgRES,1,0) over (ORDER by ReleaseYear) as PrevYEARAVG,
(avgRES - LAG(avgRES,1,0) OVER (ORDER BY ReleaseYear)) as YearlyIncrease
from avgscreen)
Select
ReleaseYear,avgRES,YearlyIncrease
from YearlyIncrease
order by
ReleaseYear;"""
df = pd.read_sql_query(query,engine)
df
```

```
[44]:
```

	ReleaseYear	avgRES	YearlyIncrease
0	NaN	848.000000	848.000000
1	2013.0	720.000000	-128.000000
2	2014.0	480.000000	-240.000000
3	2015.0	573.684211	93.684211
4	2016.0	811.764706	238.080495
5	2017.0	741.293478	-70.471228
6	2018.0	951.493416	210.199938
7	2019.0	986.720105	35.226689
8	2020.0	1004.195592	17.475487
9	2021.0	1042.010072	37.814480
10	2022.0	1042.177750	0.167678
11	2023.0	1118.911051	76.733301

```
[ ]: # 41. Create a temporary table that contains only the models with USB C
      ↪ reversible.
query = """ CREATE TEMPORARY TABLE tempt as
select Model, `USB Connector` from cleaned_mobile
where `USB Connector` LIKE '%%USB C reversible%%`;

"""
df = pd.read_sql_query(query,engine)
df
```

```
[82]: query = """SELECT * FROM tempt;"""
df = pd.read_sql_query(query,engine)
df
```

```
[82]: Empty DataFrame
Columns: [Model, USB Connector]
Index: []
```

```
[83]: # 42. Find devices that are lighter than all other devices with similar
↳ battery capacity
query = """SELECT Model, Mass, `Nominal Battery Capacity`
FROM (
SELECT Model, Mass, `Nominal Battery Capacity`,
RANK() OVER (PARTITION BY `Nominal Battery Capacity`
ORDER BY Mass) AS MassRank
FROM cleaned_mobile
) ranked_devices
WHERE MassRank = 1;"""
df = pd.read_sql_query(query,engine)
df
```

```
[83]:
```

	Model	Mass \
0	S562Z Dual SIM TD-LTE CN	185.0
1	Palm Phone 2018 LTE US PVG100	62.5
2	Palm Phone 2018 Global LTE PVG100E / PVG100EU	62.5
3	Jelly Global Dual SIM TD-LTE	60.4
4	One Touch Pixi 3 3.5 LATAM OT-4023A	98.0
..
885	Armor 3W Global Dual SIM TD-LTE	364.9
886	K10 Global Dual SIM LTE	283.5
887	BL12000 Dual SIM LTE EMEA	300.0
888	Power 5 Dual SIM LTE	330.0
889	Power 5S Dual SIM LTE	330.0

	Nominal Battery Capacity
0	300
1	800
2	800
3	950
4	1150
..	...
885	10300
886	11000
887	12000
888	13000
889	13000

[890 rows x 3 columns]

```
[84]: # 43. Compare the sales of two specific brands (e.g., Samsung and Apple)↵
↵across
# regions (assume a sales table with brand, region, and units_sold).
query = """SELECT
C.`Market Regions`,
sum(CASE WHEN C.Brand = 'Samsung' Then S.units_sold else 0 end) as samsungsales,
sum(CASE WHEN C.Brand = 'Apple' then S.units_sold else 0 end ) as AppleSales
FROM cleaned_mobile C
INNER JOIN
units_sold S on C.Model = S.Model
group by
C.`Market Regions`;"""
df = pd.read_sql_query(query,engine)
df
```

```
[84]:
```

	Market Regions	samsungsales \
0	North America , South America	1358290.0
1	Eastern Europe , Europe , Middle East , Weste...	357516.0
2	Eastern Europe , Europe	70439.0
3	Asia , Eastern Europe , Europe , Western Europe	658460.0
4	Asia , Australia , Southeast Asia	132244.0
..
343	Australia , Central America , South America	42599.0
344	Central America , Southeast Asia	45358.0
345	Africa , Asia , Australia , Eastern Europe , E...	0.0
346	Australia , Eastern Europe , Europe , Middle E...	47356.0
347	Asia , Eastern Europe , Europe , Middle East ...	59952.0

	AppleSales
0	0.0
1	0.0
2	0.0
3	0.0
4	0.0
..	...
343	0.0
344	0.0
345	0.0
346	0.0
347	0.0

[348 rows x 3 columns]

```
[86]: # 44. Find the devices that support fast charging and are in the top 20% of↵
↵battery
```

```

# capacities (use PERCENT_RANK).
query = """ select Model, `USB Services`, `Nominal Battery Capacity`
from (
select Model, `USB Services`, `Nominal Battery Capacity`,
PERCENT_RANK() OVER (ORDER BY `Nominal Battery Capacity` DESC)
as BatteryCapacityRank
from cleaned_mobile
WHERE `USB Services` LIKE '%%USB fast charging%%') as
ranked_devices
where BatteryCapacityRank <= 0.20;"""
df = pd.read_sql_query(query,engine)
df

```

```

[86]:
                                Model \
0          BV9100 Global Dual SIM TD-LTE
1              Power 5 Dual SIM LTE
2              Power 5S Dual SIM LTE
3          BL12000 Dual SIM LTE EMEA
4              K10 Global Dual SIM LTE
...
1987  Moto G23 2023 Premium Edition Dual SIM TD-LTE ...
1988    Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3
1989    Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3
1990    Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4
1991    Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...

                                USB Services \
0  USB charging , USB fast charging , USB Host , ...
1  USB charging , USB fast charging , USB Host , ...
2  USB charging , USB fast charging , USB Host , ...
3  USB charging , USB fast charging , USB Host , ...
4  USB charging , USB fast charging , USB Host , ...
...
1987  USB charging , USB fast charging , USB Host , ...
1988  USB charging , USB fast charging , USB Host , ...
1989  USB charging , USB fast charging , USB Host , ...
1990  USB charging , USB fast charging , USB Host , ...
1991  USB charging , USB fast charging , USB Host , ...

Nominal Battery Capacity
0          13000
1          13000
2          13000
3          12000
4          11000
...
1987          5000

```

1988	5000
1989	5000
1990	5000
1991	5000

[1992 rows x 3 columns]

```
[87]: # 45. Identify the most common screen resolution and list all devices with that
      ↪ resolution
```

```
query = """select
Model,      `Resolution`
from cleaned_mobile
where `Resolution` = (
select `Resolution`
from cleaned_mobile
group by `Resolution`
order by count(*) desc
limit 1);"""
df = pd.read_sql_query(query,engine)
df
```

```
[87]:
```

	Model	Resolution
0	SM-A705FN/DS Galaxy A70 2019 Premium Edition D...	1080x2400
1	SM-A705FN/DS Galaxy A70 2019 Standard Edition ...	1080x2400
2	SM-A705F/DS Galaxy A70 2019 Standard Edition G...	1080x2400
3	SM-A707F/DSM Galaxy A70s 2019 Standard Edition...	1080x2400
4	SM-A707F/DSM Galaxy A70s 2019 Premium Edition ...	1080x2400
...
1561	Moto G73 5G 2023 Global Dual SIM TD-LTE 128GB ...	1080x2400
1562	Moto G14 2023 Dual SIM TD-LTE EU 128GB XT2341-3	1080x2400
1563	Moto G14 2023 Dual SIM TD-LTE IN 128GB XT2341-3	1080x2400
1564	Moto G14 2023 Dual SIM TD-LTE MEA 128GB XT2341-4	1080x2400
1565	Moto G14 2023 Dual SIM TD-LTE LATAM 128GB XT23...	1080x2400

[1566 rows x 2 columns]