BMS COLLEGE FOR WOMEN

(Autonomous)

Department Of Computer Science

Subject : Data Analytics

Topic : Electric Car Data(EV's)

Submitted To,

Sudheendra Sir

Overview of Electric Vehicle Sector

The supply of fossil fuels is constantly decreasing. The situation is very alarming.

It is time for the world to slowly adapt to electric vehicles. A lot of change needs to happen.

Major carmakers like Tesla and Porsche manufacture many electric vehicles.

The improvement of battery technology in recent years has led to the higher popularity of electric vehicles.

Buying an electric vehicle can be a great choice for consumers.

The drive quality, low noise levels, and convenience are really great.

In the United States, one year of driving a petrol car can cost from 1500 USD to 2500 USD.

On the other hand, the driving cost of Electric Vehicles is 500 USD. Electric cars are more preferable.

The maintenance cost of electric vehicles is also very low. They are economical to maintain. The energy conversion efficiency of electric vehicles is also high.

Electric vehicles use 60-70% of electrical energy.

On the other hand, vehicles based on internal combustion engines have an efficiency of 18-22% only.

Columns in our Dataset :

1.Brand

2.Model

3.Acceleration in sec

4.Top speed

5.Range of vehicle in km

6.Efficiency in kwh

7.Fast charge speed

8.Rapid charge

9.Power train

10.Plug type

11.Body style segment seats

12.Price in Euro

Analysis of data using Excel

Q1: Find the maximum, minimum and average of price.

Soln: Maximum: =max(n2:n207)

Minimum: =min(n2:n207)

Average: =average(n2:n207)

MIN PRICE
20129

MAX PRICE
215000

AVERAGE
55811.56

Q2: Using conditional formatting format the cells using different colours.

Soln: 1. Go to home

2. Select conditional formatting then, select highlight cell rules, select the appropriate one:

<=50000 – Yellow

>=50000 – Red

>=100000 – Green

F	G	H	I	J	K	L	M	N	O
Efficiency_WhKm	FastCharge_KmH	RapidCharge	PowerTrain	PlugType	BodyStyle	Segment	Seats	PriceEuro	
161	940	Yes	AWD	Type 2 CCS	Sedan	D	5	55480	
167	250	Yes	RWD	Type 2 CCS	Hatchback	C	5	30000	
181	620	Yes	AWD	Type 2 CCS	Liftback	D	5	56440	
206	560	Yes	RWD	Type 2 CCS	SUV	D	5	68040	
168	190	Yes	RWD	Type 2 CCS	Hatchback	B	4	32997	
180	620	Yes	AWD	Type 2 CCS	Sedan	F	5	105000	
168	220	Yes	FWD	Type 2 CCS	Hatchback	C	5	31900	
164	420	Yes	FWD	Type 2 CCS	Hatchback	B	5	29682	
153	650	Yes	RWD	Type 2 CCS	Sedan	D	5	46380	
193	540	Yes	AWD	Type 2 CCS	SUV	D	5	55000	

Q3: List the number of body styles.

Soln: =COUNTIF(K9:K214,R10)

BodyStyle	COUNTIF
SEDAN	10
HATCHBAC	32
LIFTBACK	5
SUV	45
PICKUP	3
MPV	1
CABRIO	3
SPV	3
STATION	1

Q4: List the number of cars that have (Yes) and don't have (No) rapid charge.

Soln: Yes: =COUNTIF(H2:H207,U3)

No: =COUNTIF(H2:H207,U4)

RapidCharge	COUNTIF
YES	98
NO	5

Q5: Count the total number of 5,4,7,6 seats in in each brand.

Soln: Using Formula:

=COUNTIFS($A$1:$A$104,P3,$M$1:$M$104,$Q$3)

Brand	Seats	5 seats	4 seats	7 seats	6 seats	2 seats
Tesla	5	5	1	4	3	0
Volkswagen	4	6	2	0	0	0
Polestar	7	1	0	0	0	0
BMW	6	2	2	0	0	0
Honda	2	0	2	0	0	0
Lucid		1	0	0	0	0
Peugeot		2	0	0	0	0
Audi		8	1	0	0	0
Mercedes		2	0	1	0	0
Nissan		7	0	1	0	0
Hyundai		3	0	0	0	0
Porsche		0	5	0	0	0
MG		1	0	0	0	0

Mini	0	1	0	0	0
Opel	3	0	0	0	0
Skoda	5	1	0	0	0
Volvo	1	0	0	0	0
Kia	5	0	0	0	0
Renault	4	1	0	0	0
Mazda	1	0	0	0	0
Lexus	1	0	0	0	0
CUPRA	0	1	0	0	0
SEAT	0	1	0	0	0
Lightyear	1	0	0	0	0
Aiways	1	0	0	0	0
DS	1	0	0	0	0
Citroen	1	0	0	0	0
Jaguar	1	0	0	0	0
Ford	4	0	0	0	0
Byton	3	0	0	0	0
Sono	1	0	0	0	0
Smart	0	1	0	0	2
Fiat	0	2	0	0	0

Using pivot table:

1: Select the full table and copy it

2: Go to insert tab and select pivot table, click ok then add brand to row and seats to column and values.

Sum of Seats	**Column Labels**

Row Labels	2	4	5	6	7	Grand Total
Aiways			5			5
Audi		4	40			44
BMW		8	10			18
Byton			15			15
Citroen			5			5
CUPRA		4				4
DS			5			5
Fiat		8				8
Ford			20			20
Honda		8				8
Hyundai			15			15
Jaguar			5			5
Kia			25			25
Lexus			5			5
Lightyear			5			5
Lucid			5			5
Mazda			5			5
Mercedes			10		7	17
MG			5			5
Mini		4				4
Nissan			35		7	42
Opel			15			15
Peugeot			10			10
Polestar			5			5
Porsche		20				20
Renault		4	20			24

SEAT		4				4
Skoda		4	25			29
Smart	4	4				8
Sono			5			5
Tesla		4	25	18	28	75
Volkswagen		8	30			38
Volvo			5			5
Grand Total	**4**	**84**	**355**	**18**	**42**	**503**

Q6: Total price of models in each brand with total price for each brand (pivot table).

Soln:

Row Labels	Sum of PriceEuro
Aiways	**36057**
U5	36057
Audi	**725343**
e-tron 50 quattro	67358
e-tron 55 quattro	79445
e-tron GT	125000
e-tron S 55 quattro	93800
e-tron S Sportback 55 quattro	96050

e-tron Sportback 50 quattro	69551
e-tron Sportback 55 quattro	81639
Q4 e-tron	55000
Q4 Sportback e-tron	57500
BMW	**212583**
i3 120 Ah	38017
i3s 120 Ah	41526
i4	65000
iX3	68040
Byton	**179500**
M-Byte 72 kWh 2WD	53500
M-Byte 95 kWh 2WD	62000
M-Byte 95 kWh 4WD	64000
Citroen	**40000**
e-C4	40000
CUPRA	**45000**
el-Born	45000
DS	**37422**
3 Crossback E-Tense	37422
Fiat	**72800**
500e Convertible	37900

500e Hatchback	34900
Ford	**218275**
Mustang Mach-E ER AWD	62900
Mustang Mach-E ER RWD	54475
Mustang Mach-E SR AWD	54000
Mustang Mach-E SR RWD	46900
Honda	**68918**
e	32997
e Advance	35921
Hyundai	**109225**
IONIQ Electric	34459
Kona Electric 39 kWh	33971
Kona Electric 64 kWh	40795
Jaguar	**75351**
I-Pace	75351
Kia	**179312**
e-Niro 39 kWh	34400
e-Niro 64 kWh	38105
e-Soul 39 kWh	33133
e-Soul 64 kWh	73674
Lexus	**50000**
UX 300e	50000

Lightyear	**149000**
One	149000
Lucid	**105000**
Air	105000
Mazda	**32646**
MX-30	32646
Mercedes	**185115**
EQA	45000
EQC 400 4MATIC	69484
EQV 300 Long	70631
MG	**30000**
ZS EV	30000
Mini	**31681**
Cooper SE	31681
Nissan	**367217**
Ariya 63kWh	45000
Ariya 87kWh	50000
Ariya e-4ORCE 63kWh	50000
Ariya e-4ORCE 87kWh	57500
Ariya e-4ORCE 87kWh Performance	65000
e-NV200 Evalia	33246
Leaf	29234
Leaf e+	37237
Opel	**106052**
Ampera-e	41906

Corsa-e	29146
Mokka-e	35000
Peugeot	**64043**
e-2008 SUV	34361
e-208	29682
Polestar	**56440**
2	56440
Porsche	**691329**
Taycan 4S	102945
Taycan 4S Plus	109302
Taycan Cross Turismo	150000
Taycan Turbo	148301
Taycan Turbo S	180781
Renault	**156341**
Kangoo Maxi ZE 33	38000
Twingo ZE	24790
Zoe ZE40 R110	29234
Zoe ZE50 R110	31184
Zoe ZE50 R135	33133
SEAT	**20129**
Mii Electric	20129
Skoda	**229534**
CITIGOe iV	24534
Enyaq iV 50	35000
Enyaq iV 60	37500
Enyaq iV 80	40000
Enyaq iV 80X	45000

Enyaq iV vRS	47500
Smart	**67982**
EQ forfour	22030
EQ fortwo cabrio	24565
EQ fortwo coupe	21387
Sono	**25500**
Sion	25500
Tesla	**1043540**
Cybertruck Dual Motor	55000
Cybertruck Single Motor	45000
Cybertruck Tri Motor	75000
Model 3 Long Range Dual Motor	55480
Model 3 Long Range Performance	61480
Model 3 Standard Range Plus	46380
Model S Long Range	79990
Model S Performance	96990
Model X Long Range	85990
Model X Performance	102990

Model Y Long Range Dual Motor	58620
Model Y Long Range Performance	65620
Roadster	215000
Volkswagen	**276819**
e-Golf	31900
e-Up!	21421
ID.3 1st	38987
ID.3 Pro	33000
ID.3 Pro Performance	35575
ID.3 Pro S	40936
ID.3 Pure	30000
ID.4	45000
Volvo	**60437**
XC40 P8 AWD Recharge	60437
Grand Total	**5748591**

=SUMIF($A$1:$A$104,R18,$N$1:$N$104)

Brand	Total Price
Tesla	1043540
Volkswagen	276819
Polestar	56440
BMW	212583

Honda	68918
Lucid	105000
Peugeot	64043
Audi	725343
Mercedes	185115
Nissan	367217
Hyundai	109225
Porsche	691329
MG	30000
Mini	31681
Opel	106052
Skoda	229534
Volvo	60437
Kia	179312
Renault	156341
Mazda	32646
Lexus	50000
CUPRA	45000
SEAT	20129
Lightyear	149000
Aiways	36057
DS	37422
Citroen	40000
Jaguar	75351
Ford	218275
Byton	179500
Sono	25500
Smart	67982

Fiat	72800

Q7: Total price of each body styles(pivot table).

Soln:

Row Labels	Sum of PriceEuro
Cabrio	277465
Hatchback	1116581
Liftback	416879
MPV	41906
Pickup	175000
Sedan	999669
SPV	141877
Station	150000
SUV	2429214
Grand Total	**5748591**

Q8: Counting the total number of power trains in each body style.

Soln:

=COUNTIFS($K$1:$K$104,P7,$I$1:$I$104,$Q$7)

BodyStyle	PowerTrain	AWD	RWD	FWD
Sedan	AWD	8	2	0
Hatchback	RWD	3	13	16
Liftback	FWD	4	0	1
SUV		22	8	15
Pickup		2	1	0
MPV		0	0	1
Cabrio		1	1	1
SPV		0	0	3
Station		1	0	0

Count of PowerTrain	**Column Labels**			
Row Labels	**AWD**	**FWD**	**RWD**	**Grand Total**
Cabrio	1	1	1	3
Hatchback	3	16	13	32
Liftback	4	1		5
MPV		1		1
Pickup	2		1	3
Sedan	8		2	10

SPV		3		3
Station	1			1
SUV	22	15	8	45
Grand Total	**41**	**37**	**25**	**103**

POWER BI

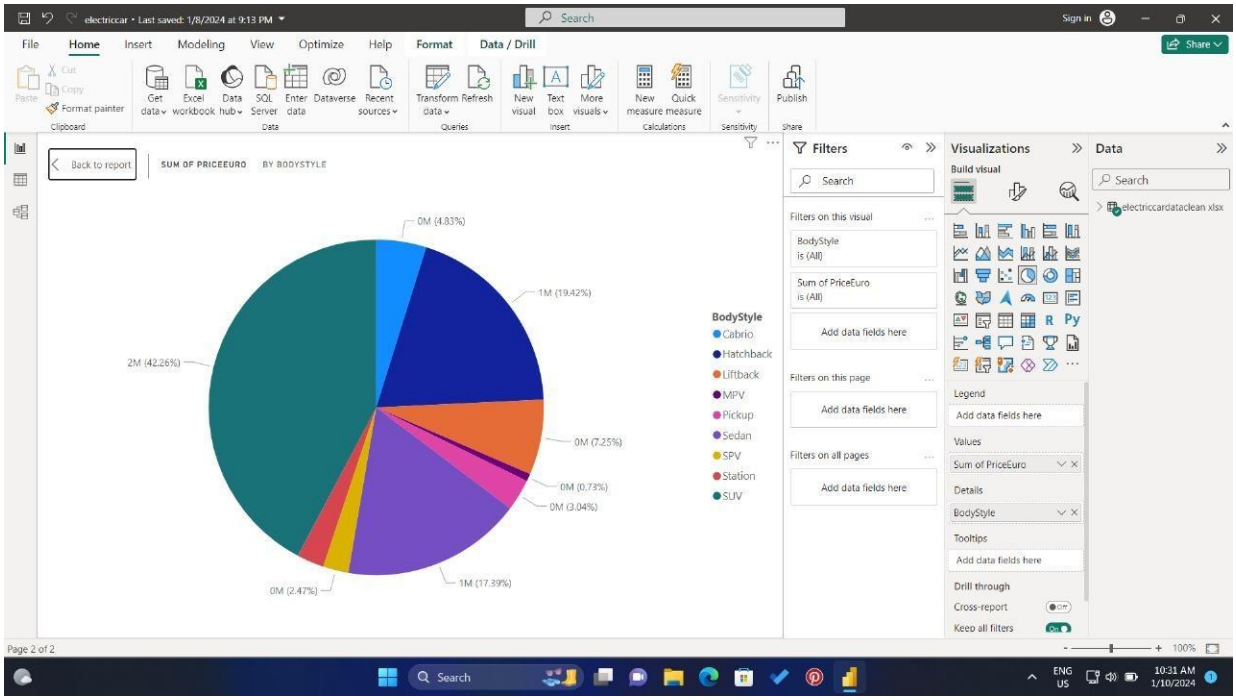
Power BI is a business intelligence platform that provides non-technical business users with tools for aggregating, analysing, visualizing and sharing data.

Types of Power BI :

- Power BI Desktop
- Power BI Report Server
- Power BI Report Builder
- Power BI Data gateway

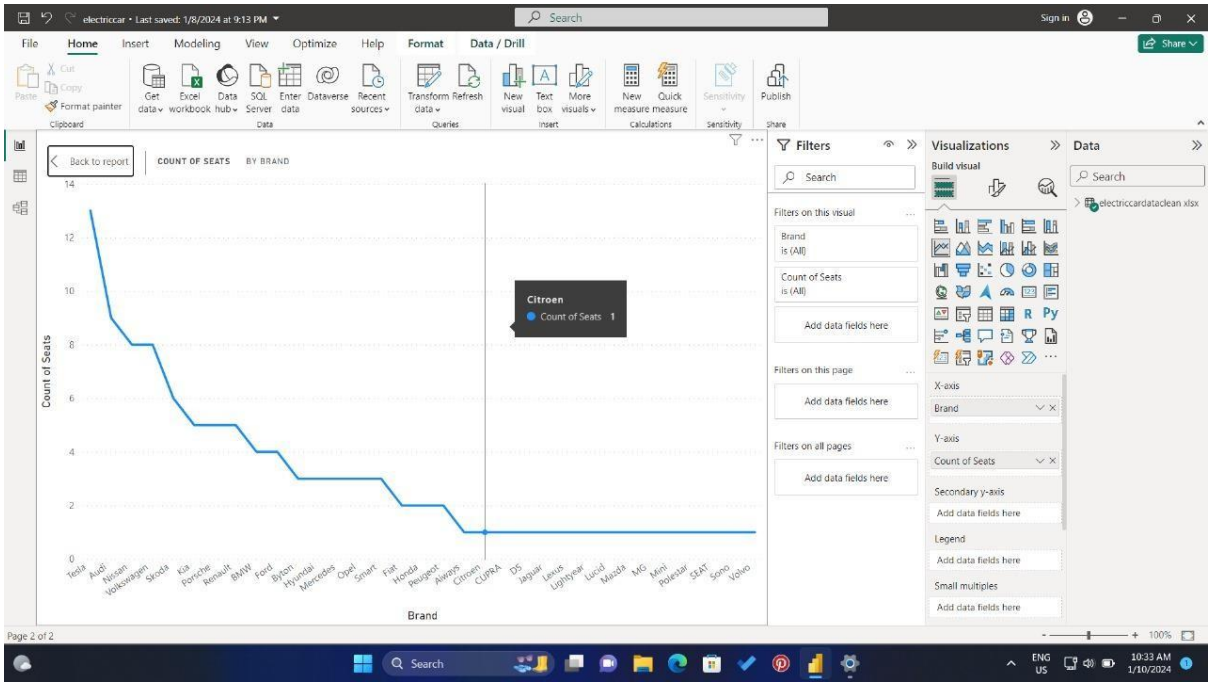
PIE CHART

A pie chart is a built-in visualization chart that displays data in a circular chart or pie. Each slice of the pie represents an element of the dataset, shown as a percentage of the whole.



Inference : Looking at the pie chart, we can see the pricing strategies based on body styles. This shows that SUVs have the highest total prices, representing the largest share at around 42% . MPV has the lowest share at around 0.73% .

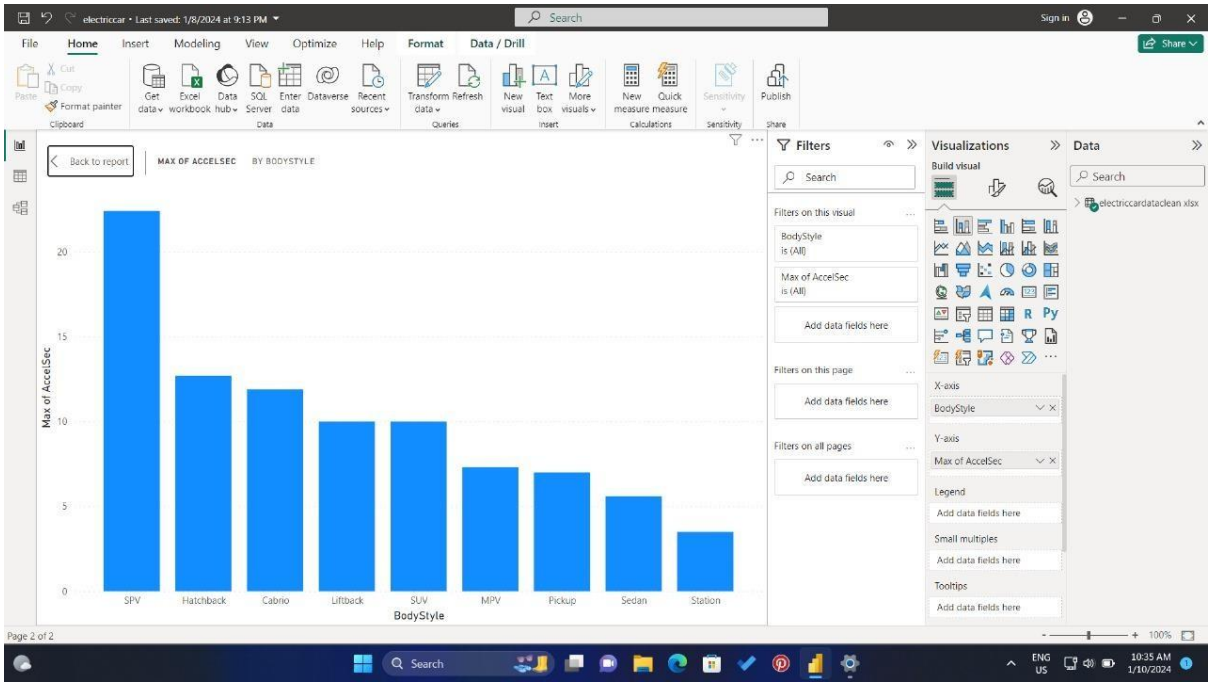
LINE CHART



Inference : Based on the line chart, we can see that car brand(A) Tesla, Audi, Nissan, Volkswagen, Skoda, Kia, Porsche consistently has the highest number of car seats over the years, followed by car brand(B) Renult, BMW, Ford, Byton, Hyundai, Smart, Opel, Fiat. Car brand(C) Mazda, Volva, Mini, Polestar, Mg, Lucid, Lexus, Jaguar shows a slight decrease in the number of car seat of 1. This suggests that car brands(A)and(B) prioritize offering more spacious vehicles with a higher seating capacity compared to car brand(C).

COLUMN CHART

A column chart is a type of bar chart that portrays the compositions and comparisons of several variables through time.

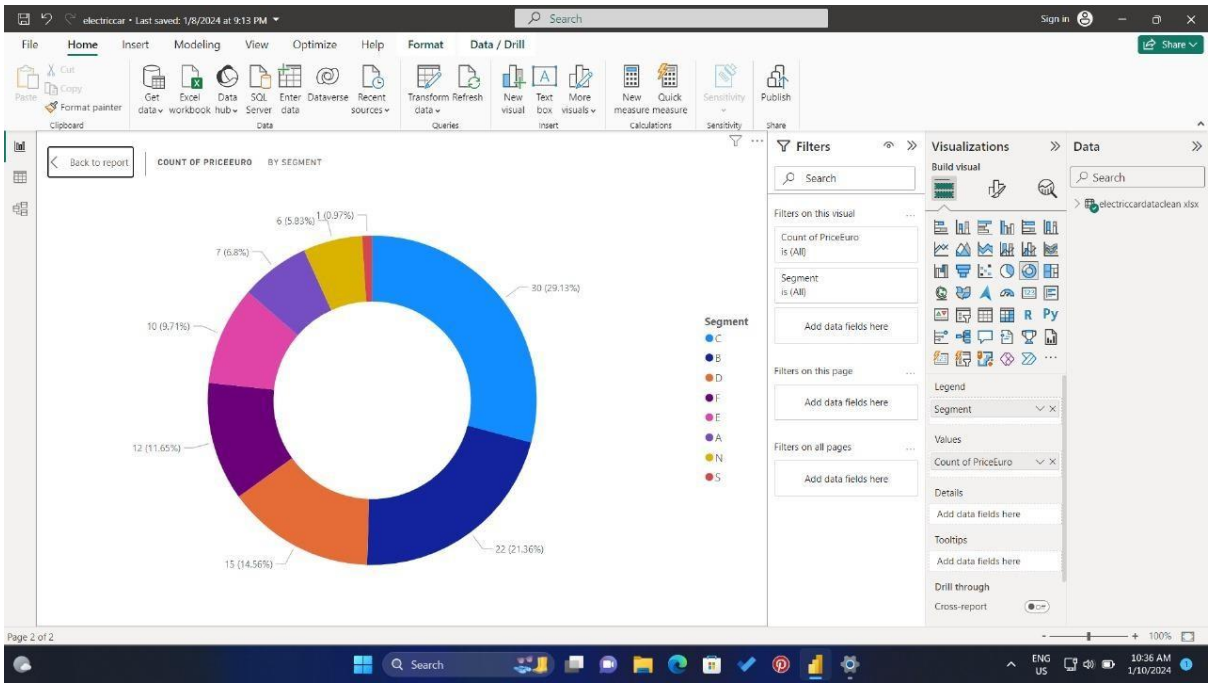


Inference : Based on the bar chart of the maximum acceleration seconds based on car body style, SPV have the highest maximum acceleration seconds among all car body styles, indicating that they may have a slower acceleration compared to other body styles. Hatchback, Cabrio, Liftback, SUV show a moderate range of maximum acceleration seconds, suggesting that they have a decent balance between power and acceleration. Station, Sedan exhibit the lowest maximum acceleration seconds, indicating that they have a faster acceleration capability compared to other body styles.

DONUT CHART

(count of price Euro by segment)

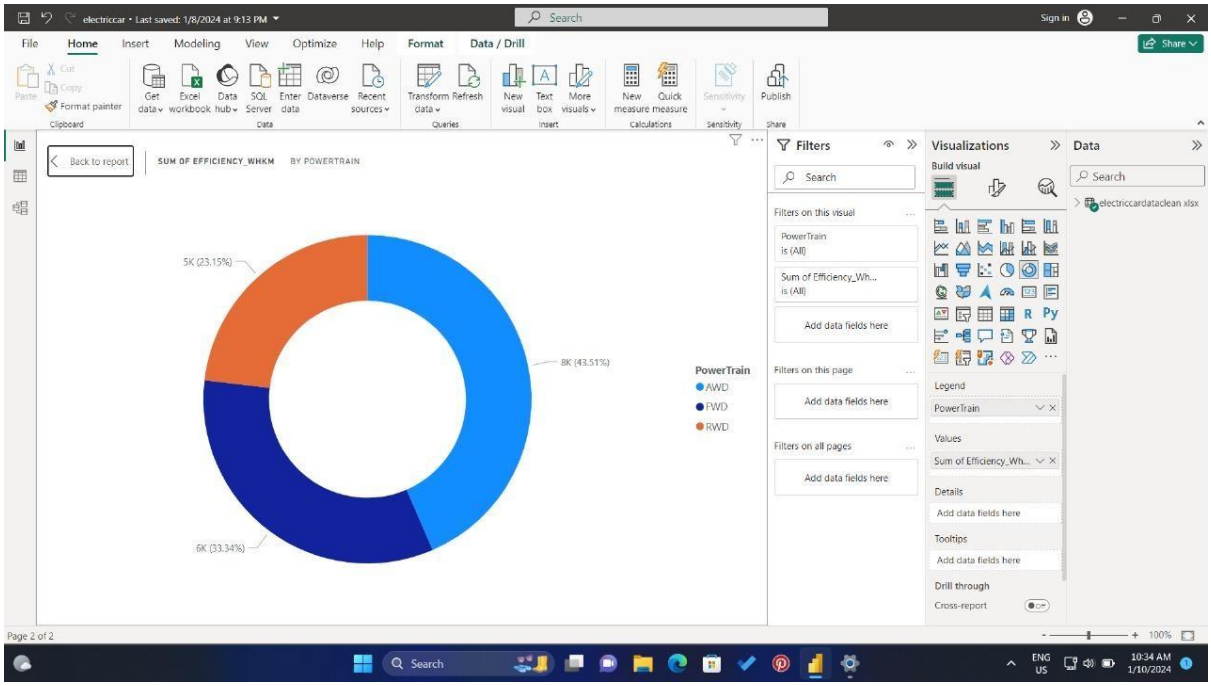
A donut chart is a visualization tool that shows the relationship of parts to a whole. It's similar to pie chart, but the centre is blank to allow space for a label or icon.



Inference : Looking at the donut chart, it's clear that segment C is the biggest, making up about 30% of the total. Segment B is around 22%. In general, the chart shows how the data is spread among categories, indicating the count of prices in Euros.

DONUT CHART

(sum of Efficiency_WhKm by power train)



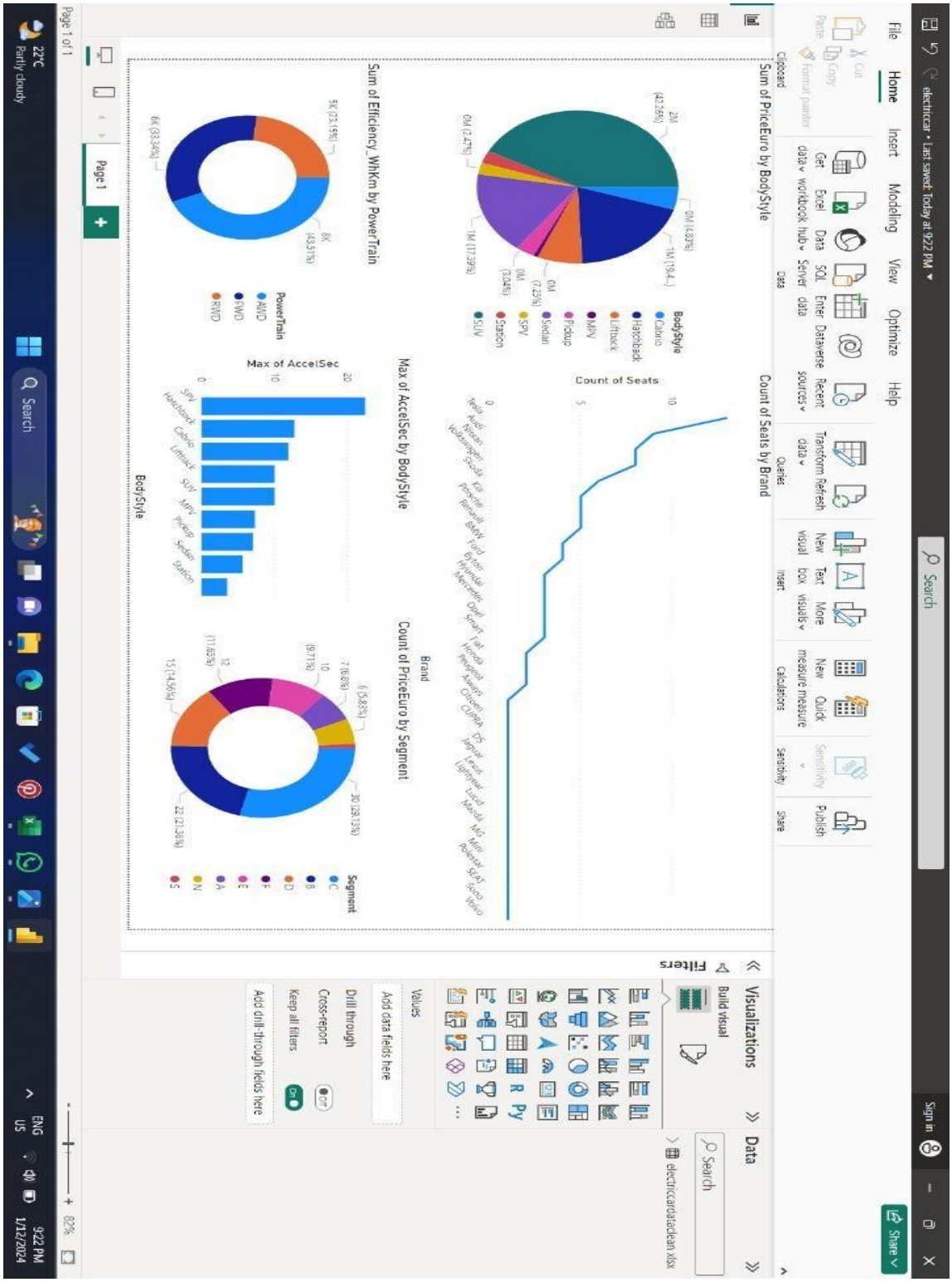
Inference : Looking at the donut chart, it's clear that AWD has the highest PowerTrain i.e, 8K , FWD has PowerTrain of 6K and RWD has the PowerTrain of 5K.

AWD- All Wheel Drive

FWD- Front Wheel Drive

RWD- Rear Wheel Drive

Overall visualisation of charts in Power BI



PYTHON

Python is a high-level, general-purpose, and interpreted programming language used in various sectors including machine learning, artificial intelligence, data analysis, web development, and many more. Python is known for its ease of use, powerful standard library, and dynamic semantics.

Python packages used in our dataset :

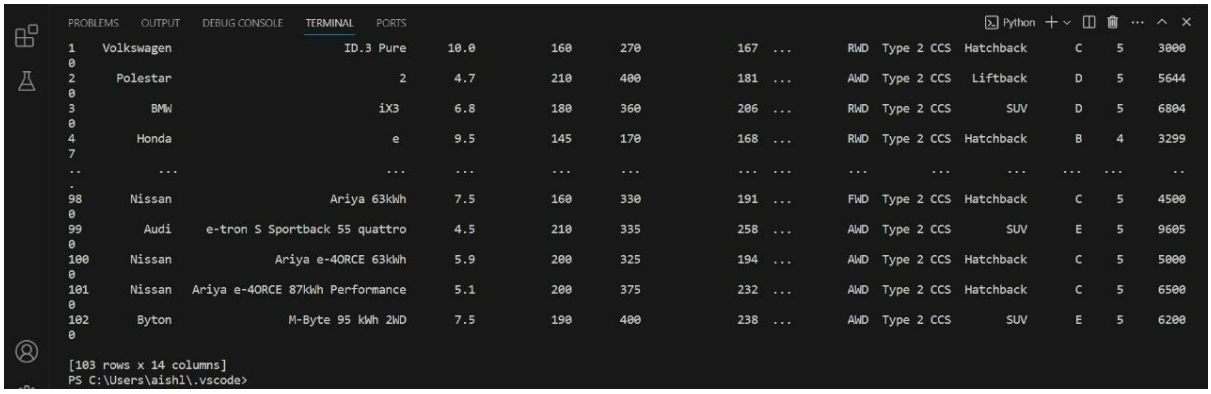
- **pandas** : Pandas is a Python library for data analysis. It provides high-performance, easy-to-use data structures and data analysis tools for working with structured (tabular, multidimensional, potentially heterogeneous) and time series data.
  Syntax : import pandas as pd
- **matplotlib** : Matplotlib is a Python library for creating static, animated, and interactive visualizations in Python. It is used for creating high-quality plots and graphs, facilitating data analysis, exploration, and presentation.
  Syntax : import matplotlib.pyplot as plt
- **numpy** : Numpy is a general-purpose array-processing package. It provides a high-performance multidimensional array object, and tools for working with these arrays. It is the fundamental package for scientific computing with Python.
  Syntax : import numpy as np

Program 1: Displaying the dataset.

```
import numpy as np
import pandas as pd

df=pd.read_csv('"C:/Users/aishl/OneDrive/Desktop/ElectricCarData_Clean.csv"')
print(df)
```

Output :



Program 2: What is the Probability of choosing an electric vehicle with more than five seats?

```
import pandas as pd
data = {'BodyStyle': ['Sedan', 'Hatchback', 'SUV', 'Sedan', 'SUV'],
    'Seats': [5, 5, 7, 4, 5]
}
electric_vehicles = pd.DataFrame(data)
# Probability of choosing an electric vehicle with more than five seats.
total_vehicles = len(electric_vehicles)
more_than_five_seats_vehicles = len(electric_vehicles[electric_vehicles['Seats'] > 5])
probability_more_than_five_seats = more_than_five_seats_vehicles / total_vehicles
print("Probability of choosing an electric vehicle with more than five seats :
",probability_more_than_five_seats)
```

Output :

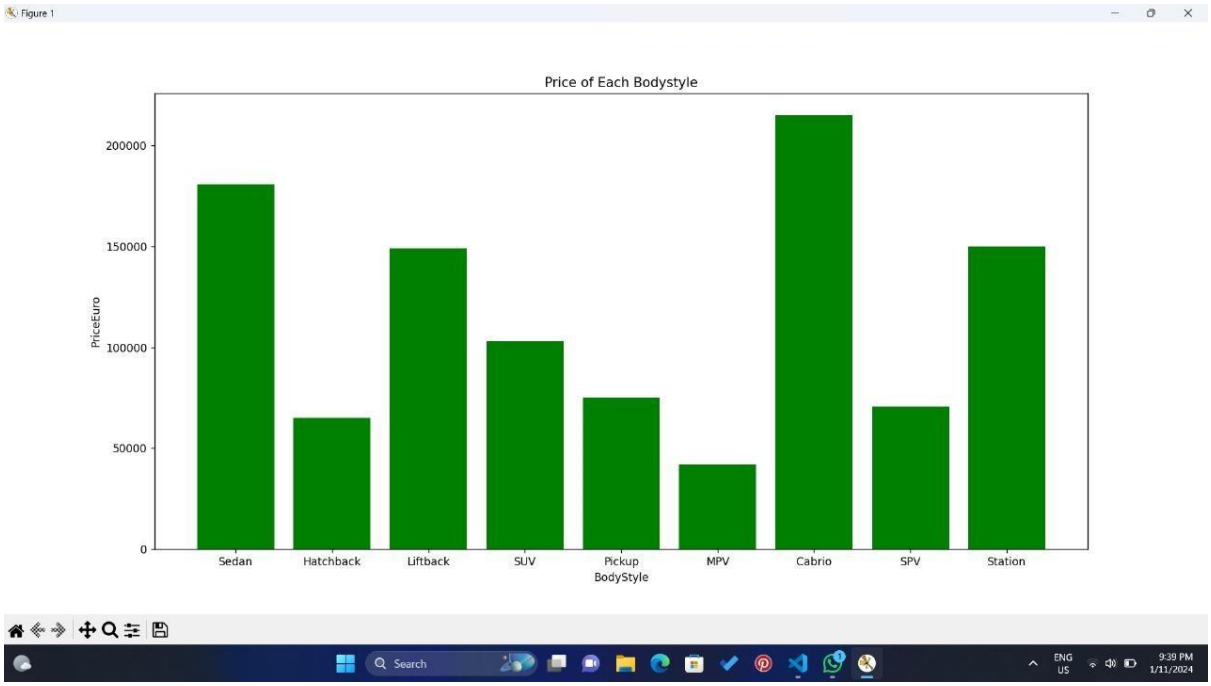

16
17
PROBLEMS 1
OUTPUT
DEBUG CONSOLE
TERMINAL
PORTS
Python
PS C:\Users\aishl\.vscode> & C:/Users/aishl/AppData/Local/Programs/Python/Python312/python.exe c:/Users/aishl/.vscode/electric_car/seats.py
Probability of choosing an electric vehicle with more than five seats : 0.2
PS C:\Users\aishl\.vscode>

Program 3: Plot a bar graph using bar() of price based on bodystyle.

```
import matplotlib.pyplot as plt
import pandas as pd

data=pd.read_csv('"C:/Users/aishl/OneDrive/Desktop/ElectricCarData_Clean.csv"')
df = pd.DataFrame(data)
X = df['BodyStyle']
Y = df['PriceEuro']
# Plot the data using bar() method
plt.bar(X, Y, color='g')
plt.title("Price of Each Bodystyle")
plt.xlabel("BodyStyle")
plt.ylabel("PriceEuro")
plt.show()
```

Output :



Conclusion

In conclusion, electric cars are more efficient and produce fewer emissions than gasoline engines do.

Currently, battery-electrics have a driving range of 80 to more than 300 miles, with ranges increasing as new models are introduced.

The rise of electric vehicles in India is still in its early stages, but there are signs that this trend is changing.