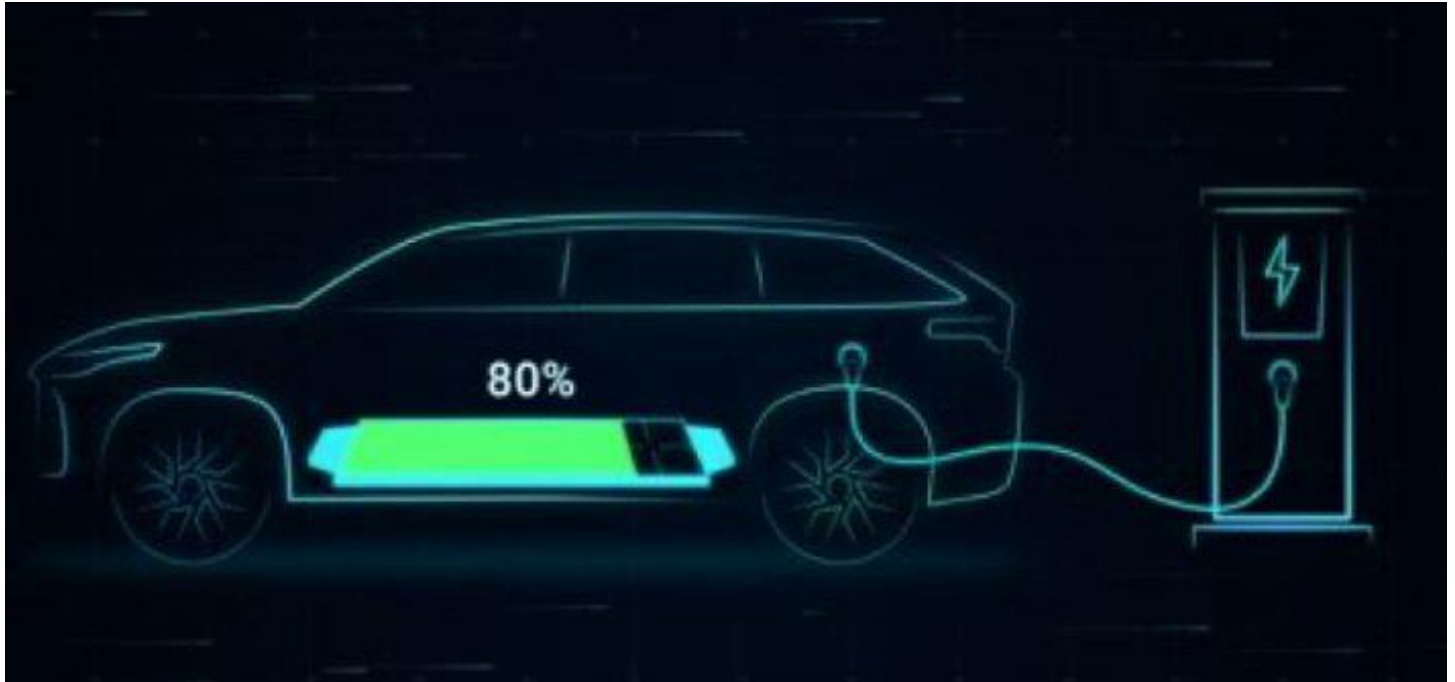# Market Segmentation Analysis of Electric Vehicles Market in India

PROJECT 2:   C M RITHIKA
                                                                                                    8.10.2023

Problem Statement:

The task is to analyze the Indian Electric Vehicles (EV) Market, employing segmentation analysis to devise an effective market entry strategy. This involves identifying and targeting key segments based on Geographic, Demographic, Psychographic, and Behavioural factors. Segmentation criteria include region, price, charging infrastructure, vehicle types, retail outlets, manufacturers, body types, safety features, plug types, and more. Analysis on componets like Geographic Segmentation,Demographic Segmentation,Psychographic Segmentation,Behavioural Segmentation,Product-specific Segmentation,Charging Infrastructure and Plug Types,Safety Features,Retail Outlets and Manufacturers and recommend a tailored strategy based on segmentation analysis.This concise approach aims to provide actionable insights for a targeted and successful entry into the Indian EV market.

Fermi Estimation:

1. Number of Electric Bicycles in a Theoretical Town:

   Town Population: 500,000

   Percentage of the population owning a bicycle: 30%

   Percentage of bicycle owners with electric bicycles: 8%

   Estimation:

   Number of bicycle owners = 500,000 * 30% = 150,000

   Number of electric bicycle owners = 150,000 * 8% = 12,000

2. Annual Production of E-Scooters in a Fictional Country:

   Total Country Population: 800 million

   Average Household Size: 3.5

   Percentage of Households with E-Scooters: 1 in 15

   Average E-Scooter Lifespan: 8 years

   Estimation:

   Number of Households = 800,000,000 / 3.5 = 228,571,429 households

   Number of E-Scooter-owning Households = 228,571,429 / 15 = 15,238,095 households

   Annual E-Scooter Production = 15,238,095 / 8 = 1,904,762 e-scooters per year

3. Global Count of Electric Skateboards:

   Total Global Population: 9 billion

   Assumed Percentage of the population owning a skateboard: 5%

   Assumed Percentage of skateboard owners with electric skateboards: 3%

   Estimation:

   Number of skateboard owners globally = 9,000,000,000 * 5% = 450,000,000

   Number of electric skateboard owners globally = 450,000,000 * 3% = 13,500,000

These approximations suggest there are around 13.5 million electric skateboards globally, emphasizing the diverse landscape of electric mobility beyond traditional cars.

Dataset sources:

Column explaination :-

DATASET 1 :-
1. Make: Car manufacturer or brand
2. . 2. Model: Specific car model or name.
3. 3. Price: Cost of the car in local currency.
4. 4. Year: Manufacturing year of the car.
5. 5. Transmission: Type of transmission system.
6. 6. Location: Geographical location of the car listing.
7. 7. Color: Exterior color of the car.
8. 8. Engine: Engine details, including displacement.
9. 9. Max Power: Maximum engine power in bhp and rpm.
10. 10. Max Torque: Maximum engine torque in Nm and rpm.
11. 11. Drivetrain: Type of drivetrain, e.g., FWD or AWD.
12. 12.Length: Overall car length in millimeters.
13. 13.Width: Overall car width in millimeters.
14. 14. Height: Overall car height in millimeters.
15. 15.Seating Capacity: Number of passengers the car can seat.
16. 16.Fuel Tank Capacity: Car's fuel tank capacity in liters or gallons

DATASET 2 :-

1. Brand: The car's manufacturer or brand, e.g., "Tesla."
2. Model: The specific model of the car, e.g., "Model 3 Long Range Dual Motor."
3. AccelSec: Time in seconds for the car to accelerate from 0 to 100 km/h.
4. TopSpeed_KmH: Maximum speed the car can reach in kilometers per hour.
5. Range_Km: Electric range of the car on a full charge in kilometers.
6. Efficiency_WhKm: Energy efficiency in watt-hours per kilometer.
7. FastCharge_KmH: Fast-charging rate in kilometers gained per hour of charging.
8. RapidCharge: Indicates if the car supports rapid charging (Yes/No).
9. PowerTrain: Type of powertrain used in the car.
10. PlugType: Type of charging plug or connector.
11. BodyStyle: The car's body style or configuration, e.g., "Sedan."
12. Segment: Market segment or class to which the car belongs.
13. Seats: Number of seats in the car. 14.PriceEuro: Price of the car in Euros (€).

Data Pre-processing and Segmentation extraction :

DATASET 1 :-

Libraries Used:

a. Numpy
b. Pandas
c. Scikit Learn
d. Seaborn

Exploratory Data Analysis:

The dataset provided a comprehensive view of car sales, covering engine power, torque, dimensions, seating capacity, and price. To conduct effective market segmentation for Electric Vehicles (EV), irrelevant columns like seller type, fuel type, owner, and kilometers driven were excluded. Rows with missing engine specifications and dimensions were removed for data consistency. Analyzing customer preferences for seating capacity revealed a strong inclination towards 5-seater cars.
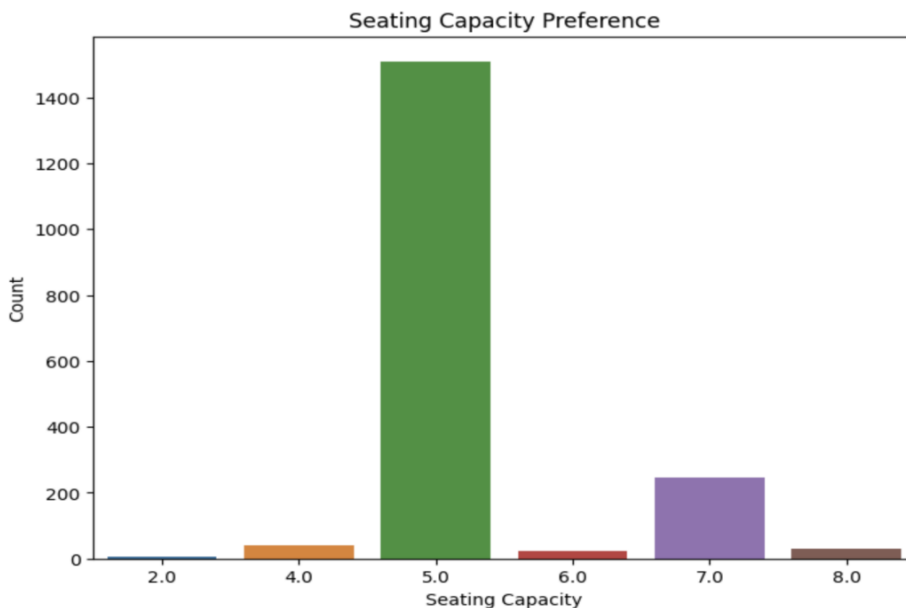

The even distribution of customers across all price ranges emphasized a diverse market for EVs, necessitating consideration of various price points in segmentation strategies.
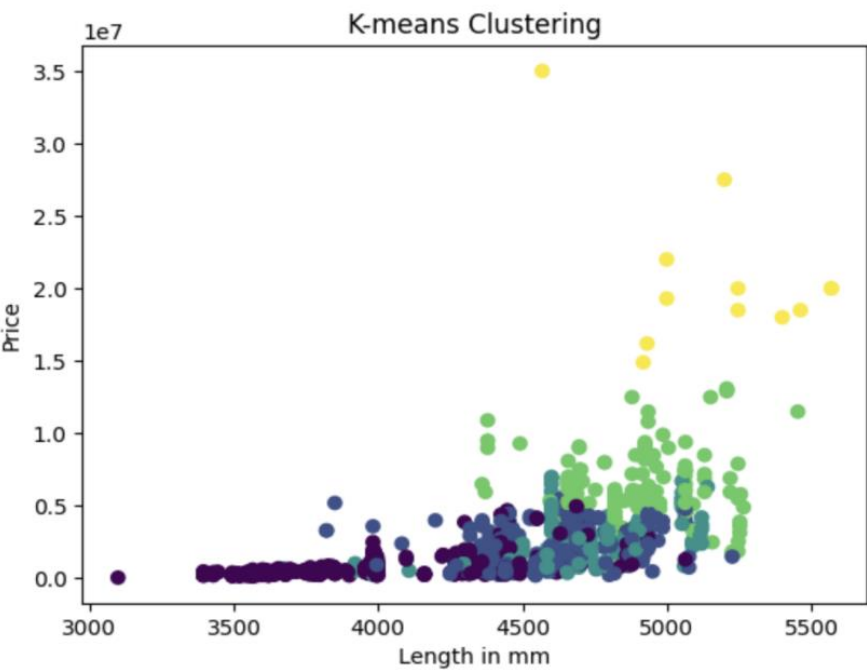
Price Range Preference
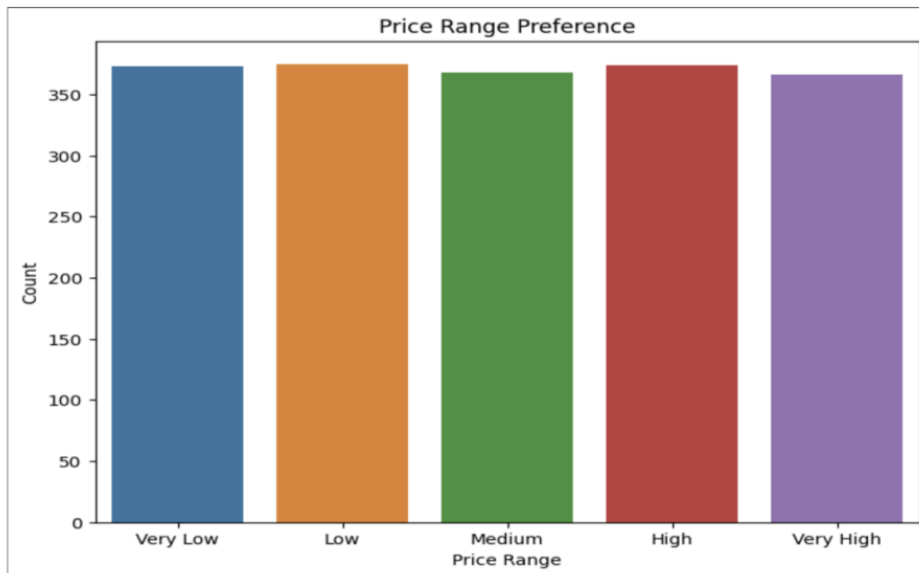
Segment Extraction:

K-means clustering with three clusters unveiled insights. Below 15 lakhs, 7-seater cars were popular, shifting to 5-seaters beyond 15 lakhs. The price and seating capacity dynamic underscored the importance of considering both factors in EV market segmentation.

K-means Clustering
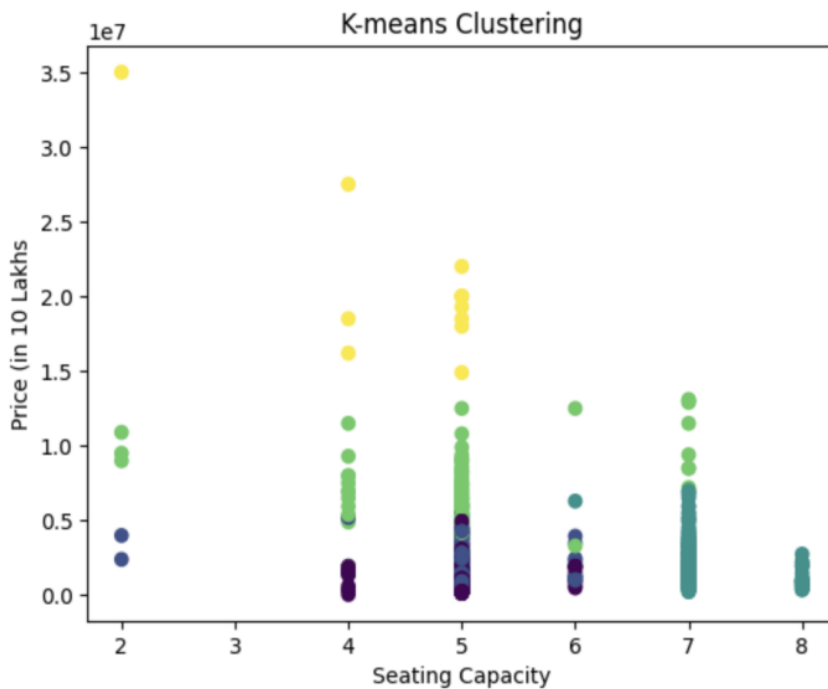
Visualizing price versus horsepower revealed four clusters, showcasing customer preferences below and above 10 lakhs. Analyzing car length versus price indicated a preference for affordability and compactness below 5 lakhs, while cars above 5 lakhs clustered around 4.5 to 5.5 meters for added comfort.

Analyzing car width versus price highlighted width preferences based on price ranges. Sub-5 lakhs favored wider cars, possibly for increased space, while above 5 lakhs associated width with comfort or luxury.
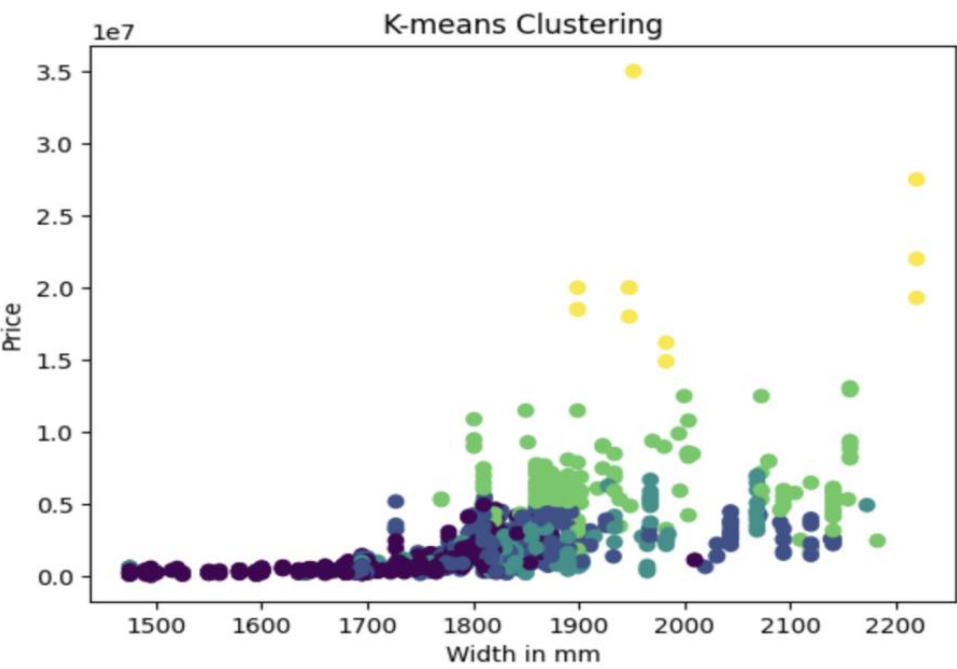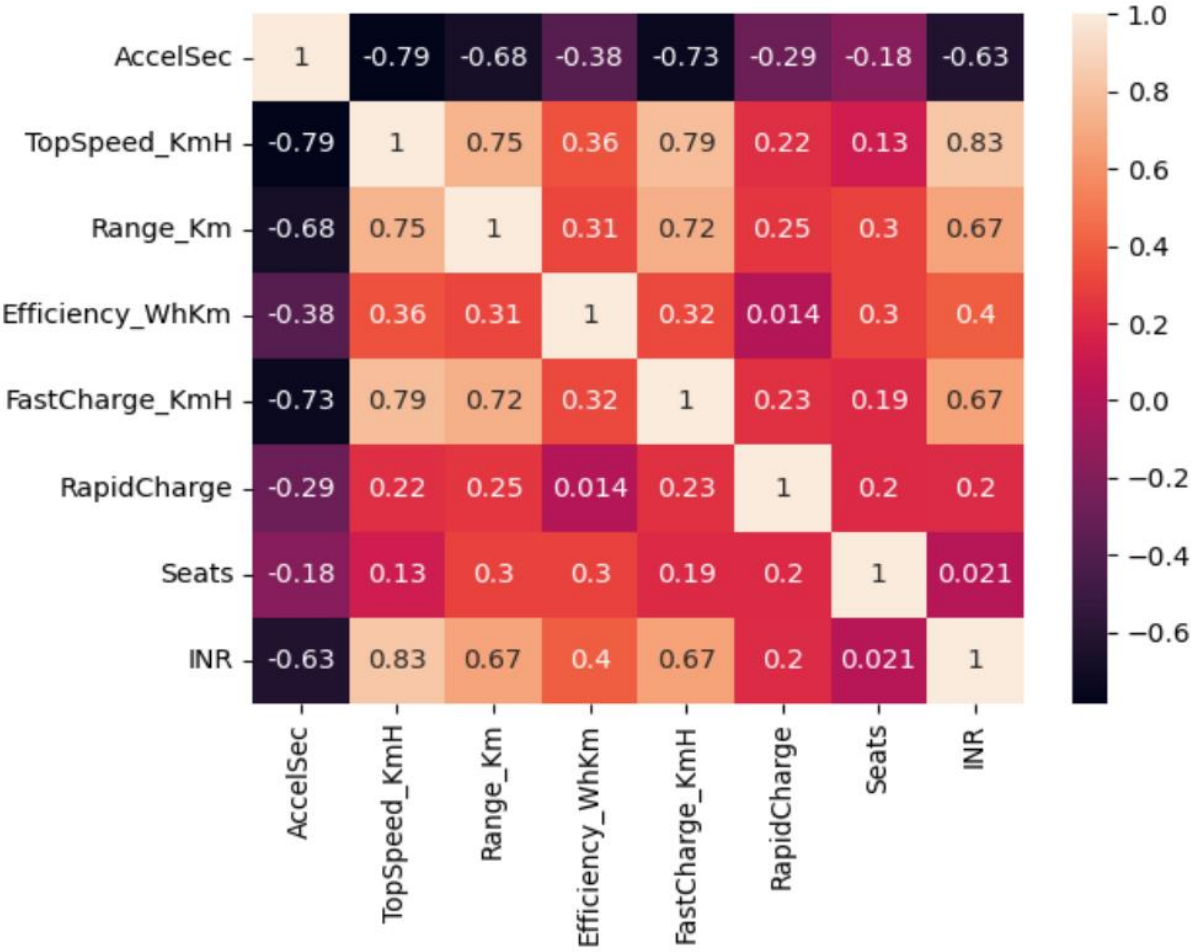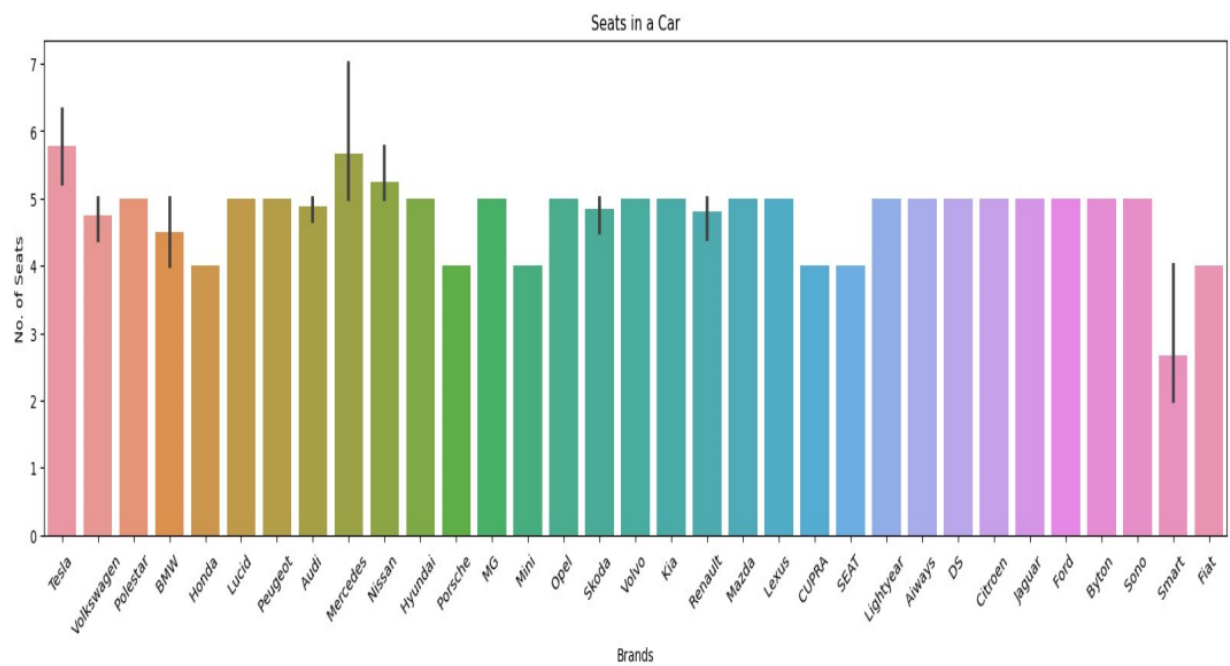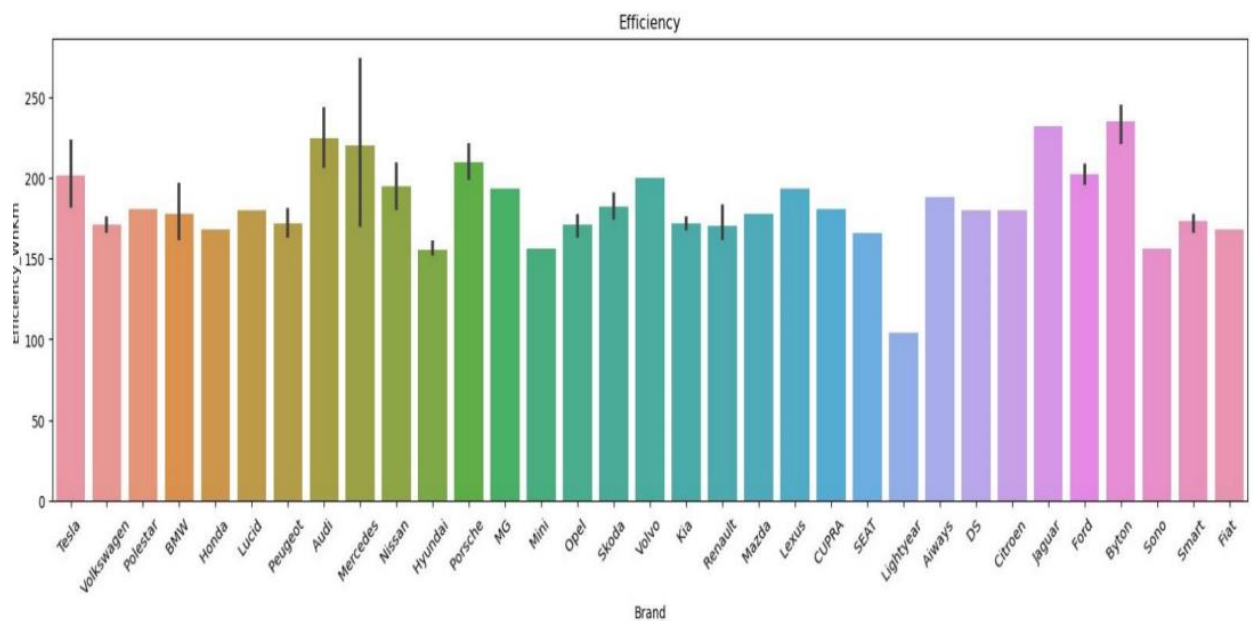
DATASET 2:

Libraries Used:

a. NumPy
b. Pandas
c. Scikit Learn
d. Seaborn
e. Matplotlib

Exploratory Data Analysis (EDA):

- **Correlation Matrix:** Examined relationships between variables using a correlation matrix. Strong correlations (coefficient > 0.7) signify robust associations between variables.

- **Bar Plot:** Employed bar plots to visually represent data using rectangular bars. Facilitated comparisons between categories, aiding in showcasing data distributions and relationships.

Efficiency

Seats in a Car

- **Pie Chart:** Utilized pie charts to convey part-to-whole relationships, offering a visually intuitive representation.

Body Style

Segment

C 29%
B 21%
15%
F 12%
E 10%
A 7%
N 6%
S 1%

No. of Seats

Seats

5 69%
4 20%
7 6%
6 3%
2 2%
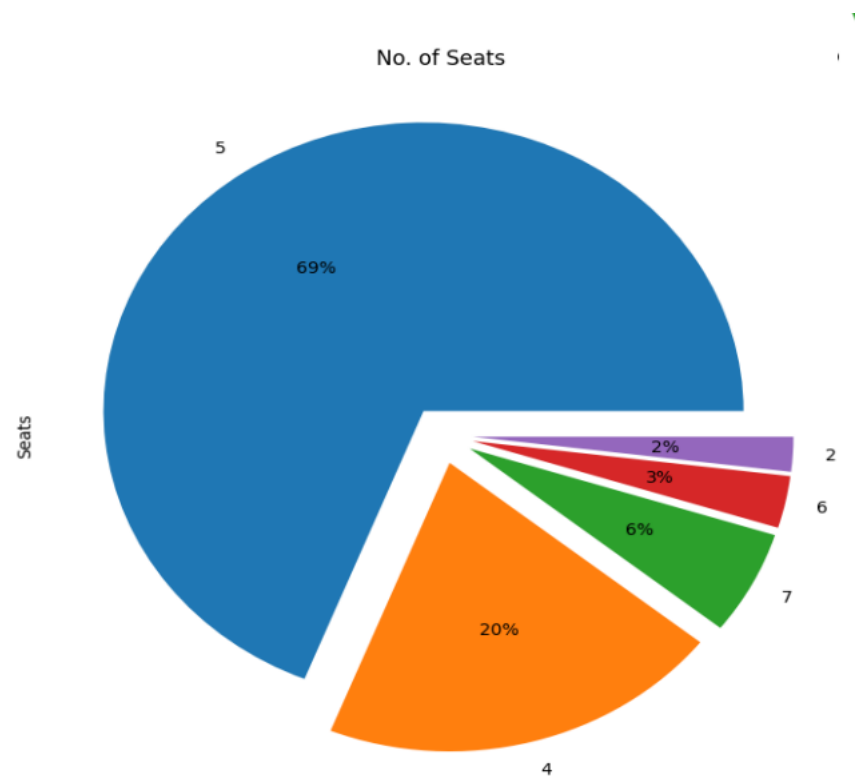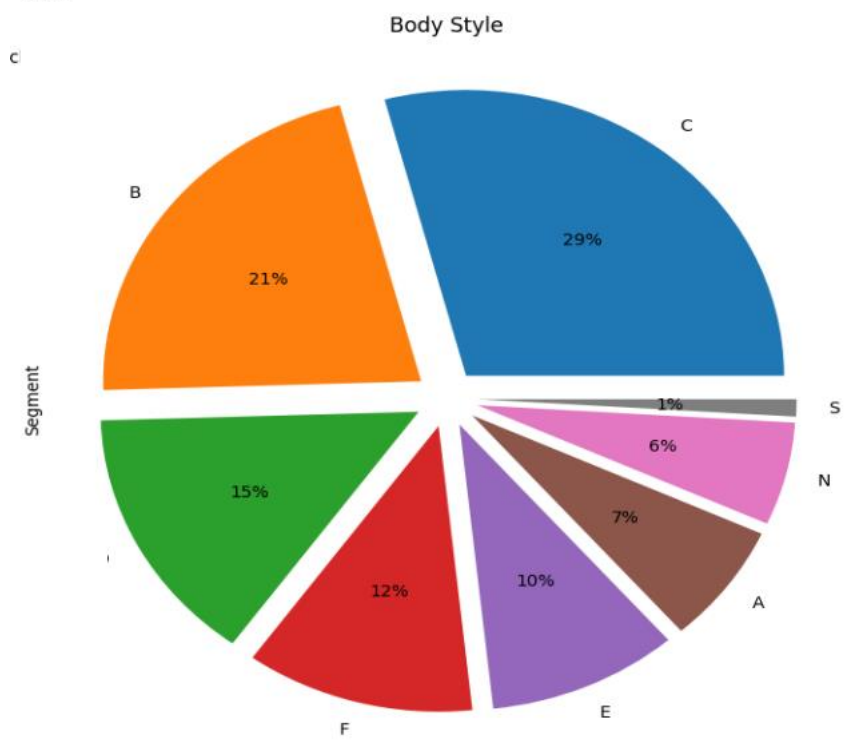
CONCLUSION:

In crafting our strategy for the Electric Vehicle (EV) market, we harmonized insights from a symphony of data. Segmentation revealed a vibrant 7-seater segment below 15 lakhs and advanced 5-seater options beyond 15 lakhs.Our strategy, akin to a painter's palette, blends product offerings, pricing, promotion, and distribution. We paint affordability and eco-friendliness in the 7-seater segment and sophistication in the 15 lakhs and above segment.Navigating with our compass of potential profits, we aim to create a masterpiece in the EV market—offering tailored segments, resonating with customers, and echoing with profits.