EV Market Segmentation Analysis Report

BY

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EV MARKET SEGMENTATION

Contents

0.1 Introduction

Electric Vehicle (EV) market segmentation involves dividing the broader EV market into distinct groups of consumers based on various characteristics, preferences, and behaviors. This segmentation helps companies understand and target specific consumer needs more effectively, optimizing their marketing strategies, product development, and overall market approach.

Market segmentation in the EV industry typically considers several key factors:

- Demographic Variables: Age, income, education level, and family size can influence EV purchasing decisions. For instance, younger consumers may prioritize technology and sustainability, while higher-income groups might focus on luxury and performance features.
- Geographic Locations: Urban vs. rural areas can have different adoption rates of EVs due to factors like charging infrastructure availability and driving distances. Urban areas may see higher adoption due to shorter commutes and better access to charging stations.
- Psychographic Aspects: Lifestyle, values, and environmental consciousness play a significant role. Environmentally conscious consumers are more likely to adopt EVs for their lower carbon footprint, while tech-savvy individuals may be attracted to the advanced features of EVs.
- Behavioral Patterns: Usage frequency, brand loyalty, and purchasing criteria, such as total cost of ownership or government incentives, also influence consumer segments. Frequent long-distance drivers may prioritize battery range, while others might focus on cost savings from lower fuel and maintenance expenses.

By identifying and analyzing these segments, businesses can tailor their offerings to meet the unique demands of different customer groups. This targeted approach not only enhances customer satisfaction but also drives competitive advantage and market growth in the rapidly evolving landscape of electric mobility. Moreover,

understanding market segmentation helps in strategic decision-making, from designing marketing campaigns to developing new models that cater to the specific needs of each segment.

As the EV market continues to grow, segmentation becomes increasingly important for capturing market share and fostering customer loyalty. Companies that leverage detailed market segmentation can better anticipate trends, respond to consumer demands, and innovate effectively in the dynamic EV market.

0.2 Problem Statement

The electric vehicle (EV) market is rapidly expanding, driven by advancements in technology, environmental concerns, and supportive government policies. However, the diverse nature of potential EV consumers presents a significant challenge for manufacturers and marketers. The broad spectrum of consumer preferences, ranging from budget-conscious buyers to tech-savvy early adopters and environmentally focused individuals, makes it difficult to design and market EVs effectively.

The primary problem is the lack of detailed understanding of the various segments within the EV market. Without precise market segmentation, companies struggle to tailor their products and marketing strategies to meet the unique needs and preferences of different consumer groups. This leads to inefficient use of resources, lower customer satisfaction, and missed opportunities for growth.

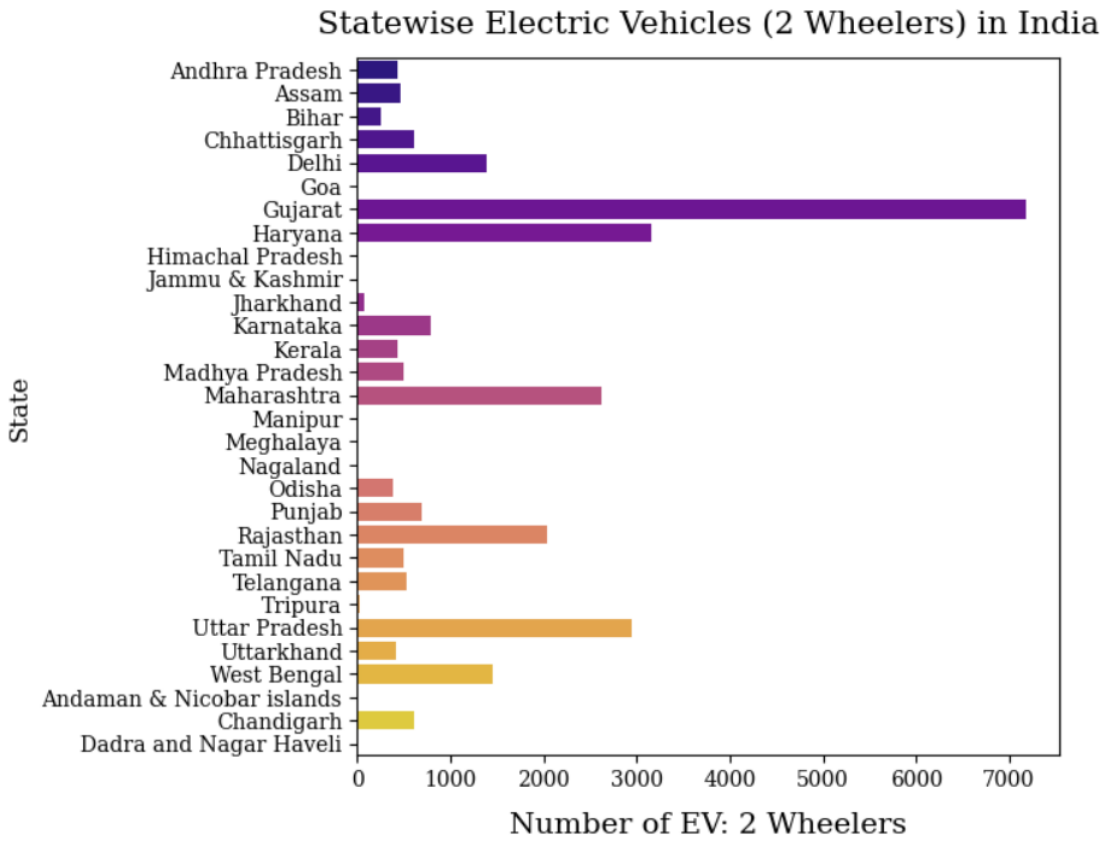
To address this issue, there is a need for comprehensive market segmentation that considers demographic, geographic, psychographic, and behavioral factors. By identifying distinct consumer segments and understanding their specific characteristics, companies can develop targeted strategies to enhance product appeal, optimize marketing efforts, and increase market penetration.

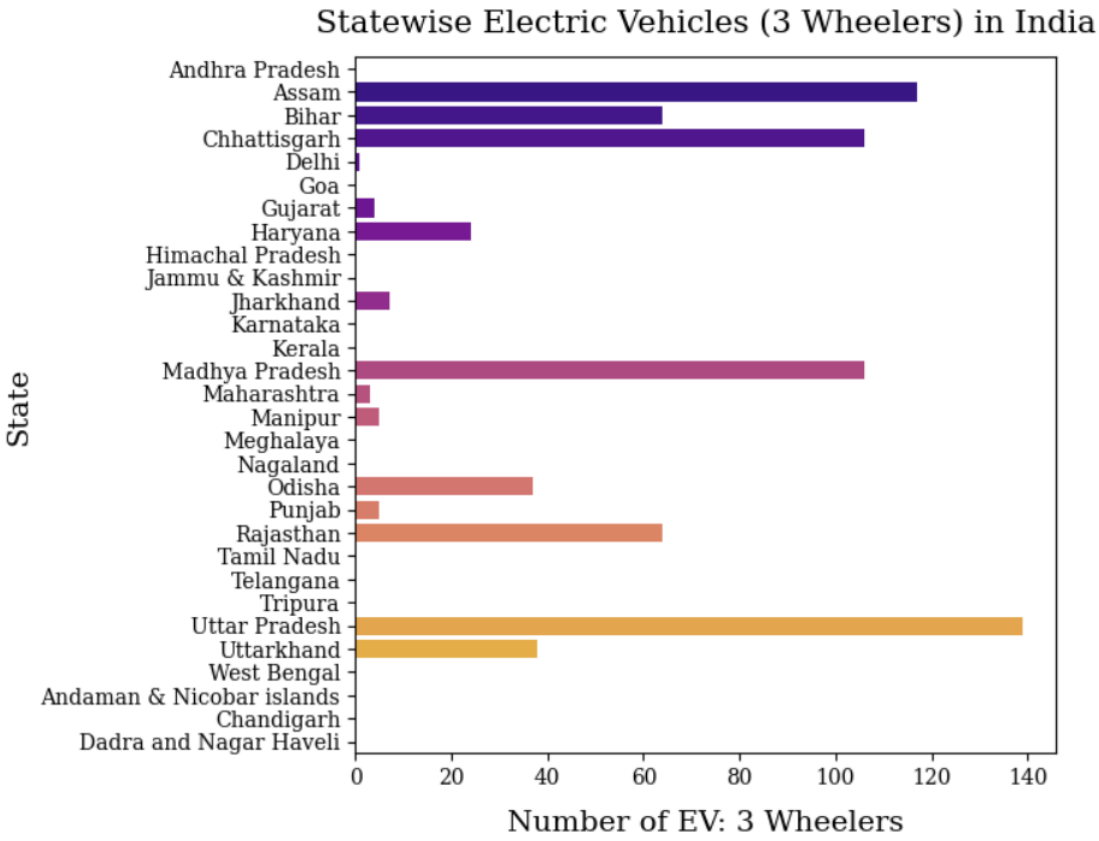
The challenge lies in collecting and analyzing relevant data to accurately define these segments and translating these insights into actionable business strategies. Successfully addressing this problem will enable companies to better serve their customers, achieve competitive advantage, and drive sustainable growth in the burgeoning EV market.

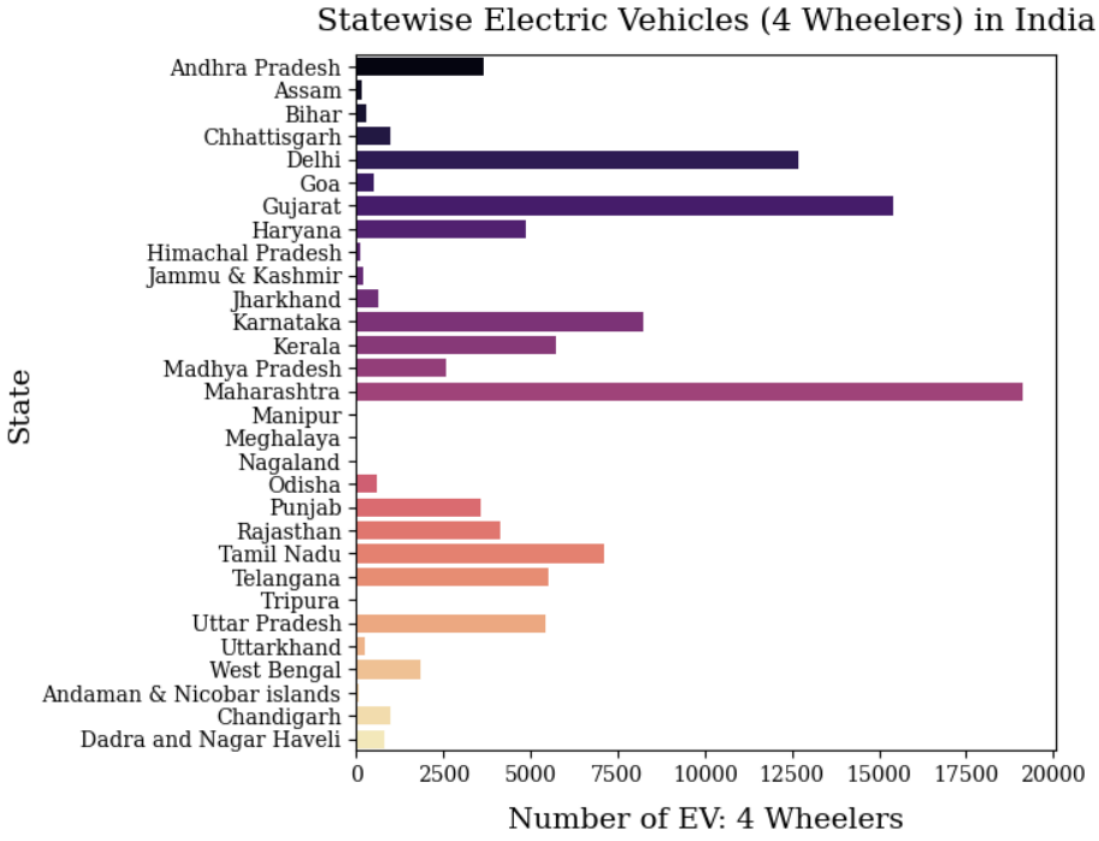
0.3 ML Model and Methodology

To segment the EV market, we utilized the KMeans clustering algorithm. This machine learning model is well-suited for identifying distinct groups within large datasets based on similarities in their features. Here's how we applied this methodology:

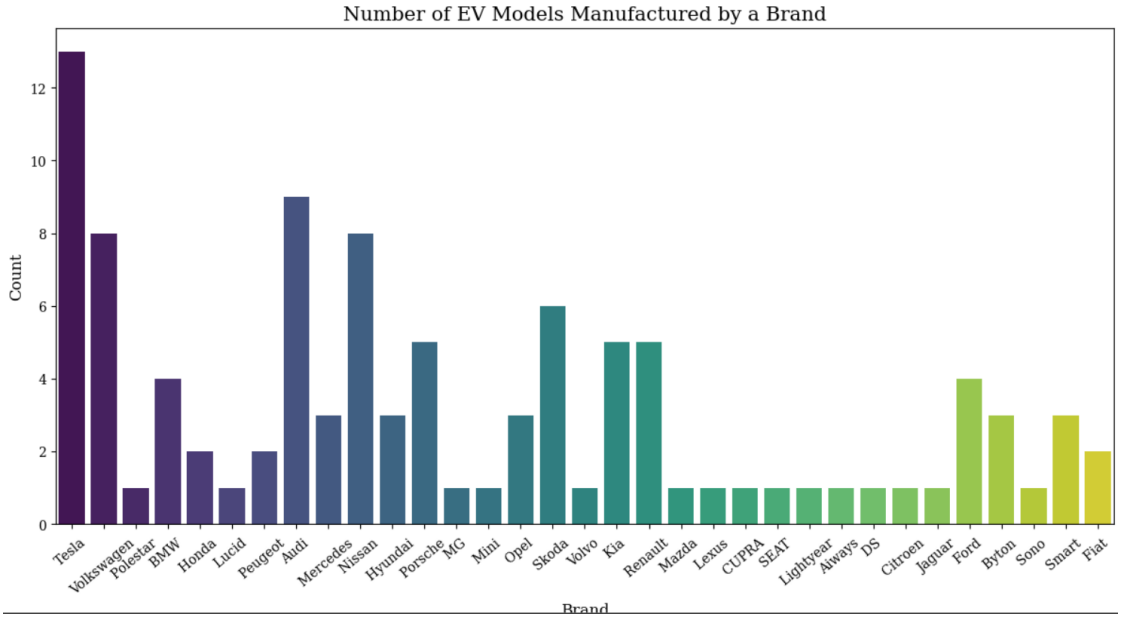
- Data Preparation: We analyzed three datasets:
  - Electric˙Car˙Data :Focused on 2-wheeler, 3-wheeler, and 4-wheeler EVs.

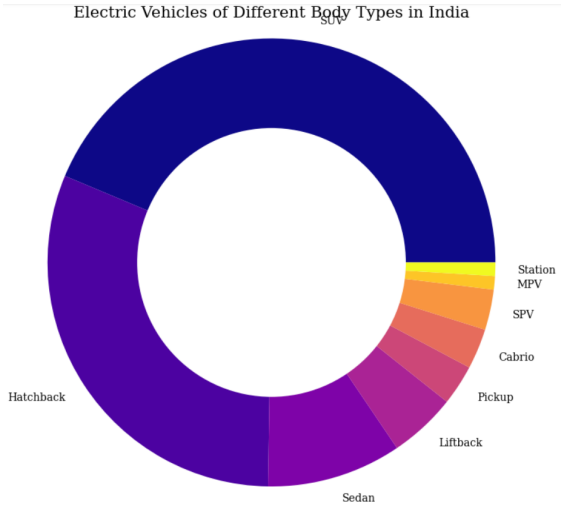


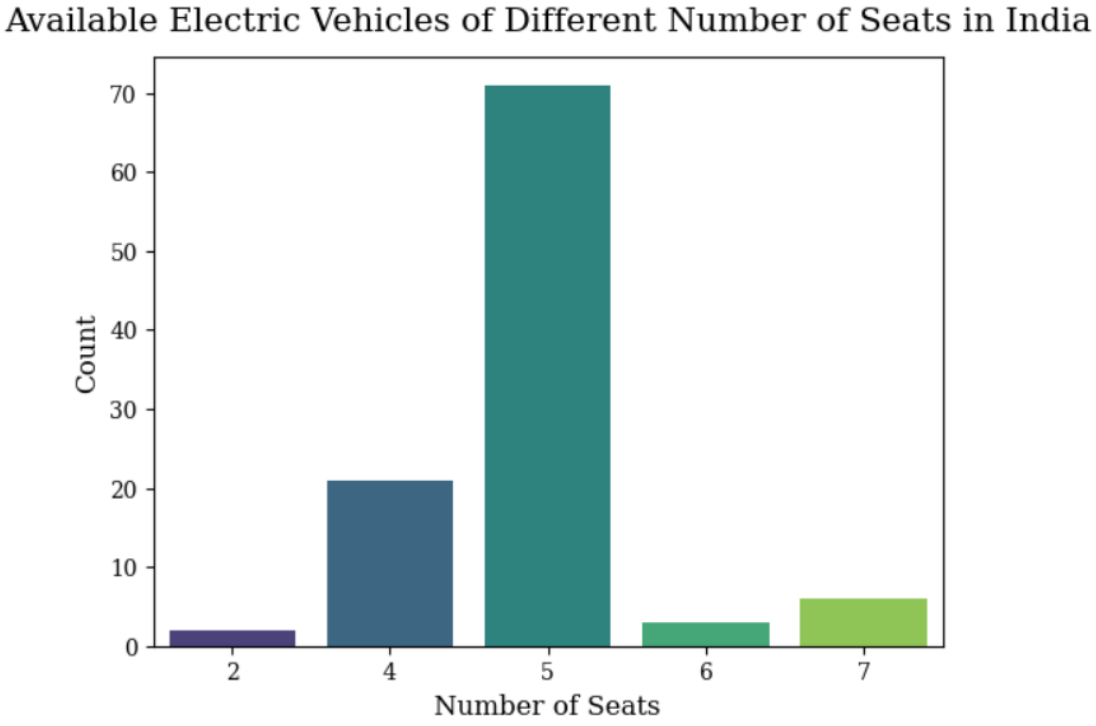

Statewise Electric Vehicles (3 Wheelers) in India
Andhra Pradesh
Assam
Bihar
Chhattisgarh
Delhi
Goa
Gujarat
Haryana
Himachal Pradesh
Jammu & Kashmir
Jharkhand
Karnataka
Kerala
Madhya Pradesh
Maharashtra
Manipur
Meghalaya
Nagaland
Odisha
Punjab
Rajasthan
Tamil Nadu
Telangana
Tripura
Uttar Pradesh
Uttarkhand
West Bengal
Andaman & Nicobar islands
Chandigarh
Dadra and Nagar Haveli
State
0
20
40
60
80
100
120
140
Number of EV: 3 Wheelers

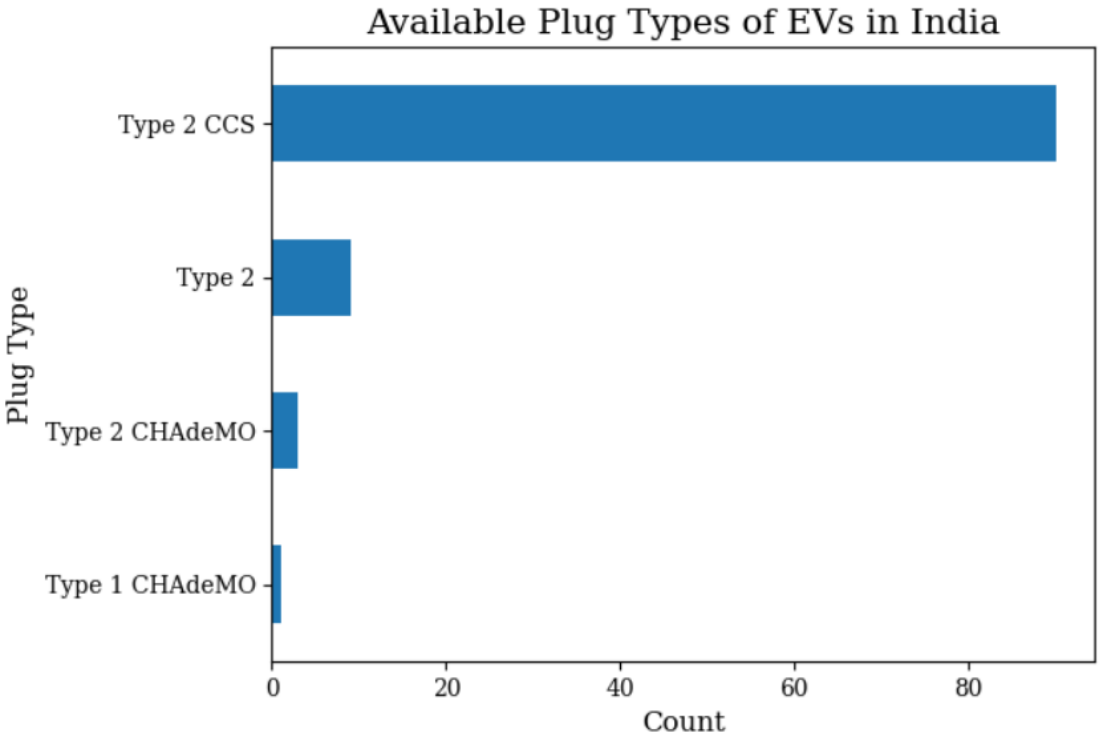

Statewise Electric Vehicles (4 Wheelers) in India
Andhra Pradesh
Assam
Bihar
Chhattisgarh
Delhi
Goa
Gujarat
Haryana
Himachal Pradesh
Jammu & Kashmir
Jharkhand
Karnataka
Kerala
Madhya Pradesh
Maharashtra
Manipur
Meghalaya
Nagaland
Odisha
Punjab
Rajasthan
Tamil Nadu
Telangana
Tripura
Uttar Pradesh
Uttarkhand
West Bengal
Andaman & Nicobar islands
Chandigarh
Dadra and Nagar Haveli
State
0
2500
5000
7500
10000
12500
15000
17500
20000
Number of EV: 4 Wheelers

- EV˙Stats:Provided insights on brands, body types, segments, number of seats, plug types, and speed.

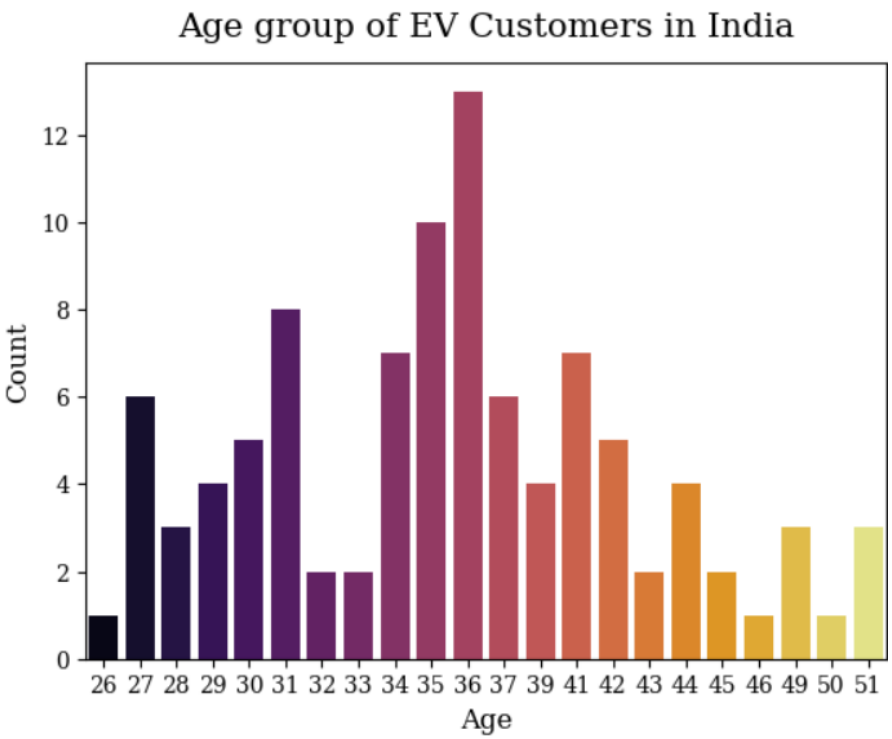


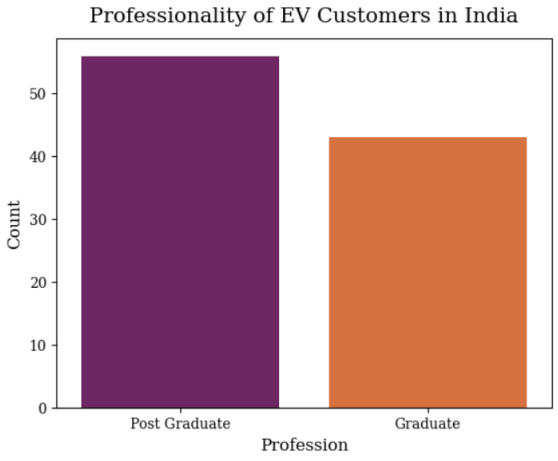



Available Electric Vehicles of Different Number of Seats in India
Count
0
10
20
30
40
50
60
70
2
4
5
6
7
Number of Seats


Available Plug Types of EVs in India
Plug Type
Type 2 CCS
Type 2
Type 2 CHAdeMO
Type 1 CHAdeMO
0
20
40
60
80
Count

- Indian automobile behavior: Examined customer demographics such as age group, income group, profession, and geography.





- Feature Analysis:
  - Correlation Matrix: To identify relationships between different features.
  - Principal Component Analysis (PCA): To reduce dimensionality while preserving variance.
  - The Elbow Method using Inertia: To determine the optimal number of clusters.
- Clustering:
  - Applied the KMeans algorithm to identify clusters within each dataset.
  - Visualized clusters to interpret and validate the results.

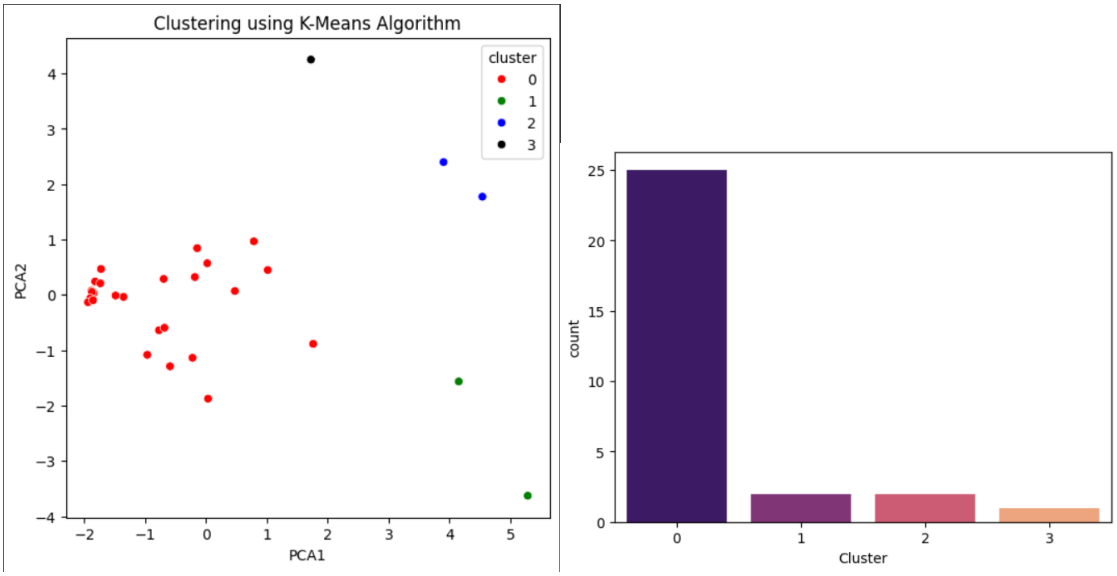


Figure 0.3.1: KMean Clustering of first EV_Stats dataset

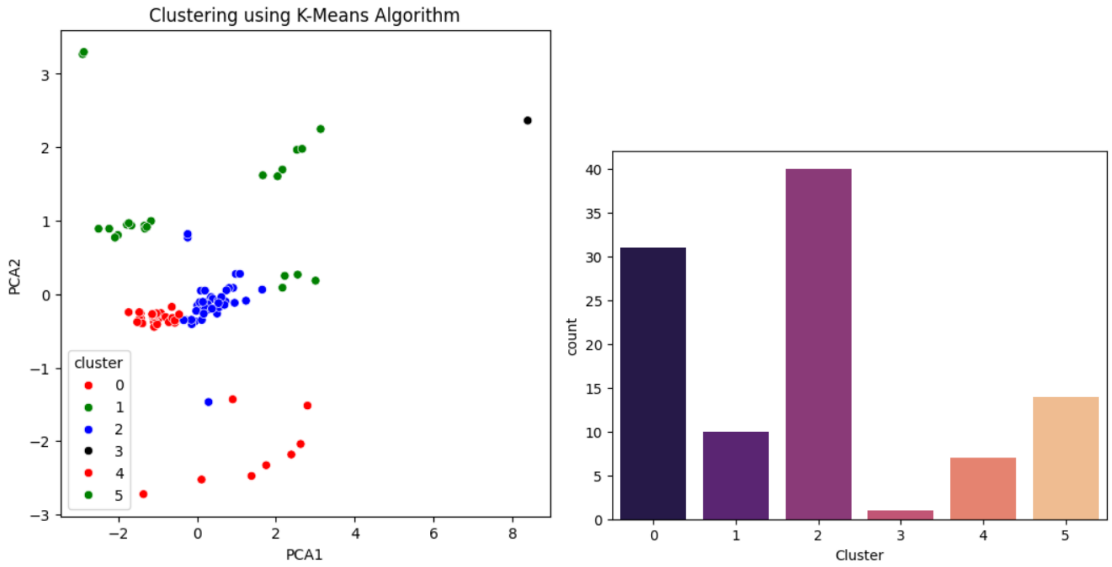


Figure 0.3.2: KMean Clustering of first EV_Cars_Dataset

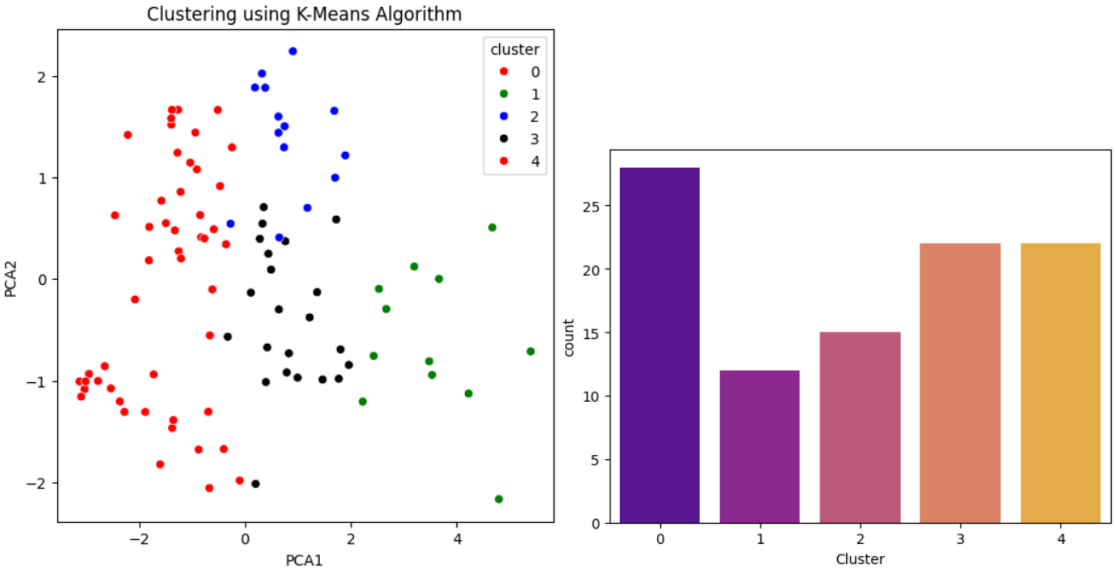


Figure 0.3.3: KMean Clustering of first Inidan_automobile_behaviour dataset

0.4 Conclusions and Insights

From our analysis, several key insights emerged:

- 2-Wheeler, 3-Wheeler, and 4-Wheeler EVs: Each category showed distinct market segments based on usage patterns, price sensitivity, and geographical preferences. For instance, 2-wheelers were more popular in urban areas due to their convenience in heavy traffic, while 4-wheelers appealed more to suburban families. Gujarat, Haryana, Maharshtra, Uttarpradesh, Rjasthan, are among the top states with the majority of EV 2- Wheelers while Goa, Himachal Pradesh, Manipur, Meghalaya, Nagaland with the least.
  Haryana, Uttarpradesh, Chattisgrah, Madhyapradesh, Assam are among the top states with the majority of EV 3-wheelers while the remaining states don't seem to depend on the same.
  Maharashtra, Delhi, Gujarat, Karnataka are among the top states with the majority of EV 4- wheelers while the remaining states have less number of EV 4- wheelers.

- Brands and Body Types: Preferences varied significantly by brand and body type. Luxury brands and SUVs tended to attract higher-income segments, while economy brands and compact cars were favored by budget-conscious consumers. Tesla, Audi, Volkswagen, Nissan, Skoda tops the list of EVs with the maximum number of models in the Indian automobile market. SUV and Hatchback body types form the majority while Station and MPV the minority.

- Number of Seats and Plug Types: Vehicles with more seats were preferred by larger families and commercial users, whereas the type of plug influenced decisions based on charging infrastructure availability. EVs with 5 sitters dominate the market while EVs with 2 sitters are less in number.Based on the number of seats, Tesla, Mercedes and Nissan have the maximum number of seats and Smart the minimum. EVs with plus type of 'Type 2 CCS' seem to dominate the market.

- Number of Seats and Plug Types: Vehicles with more seats were preferred by larger families and commercial users, whereas the type of plug influenced decisions based on charging infrastructure availability. Based on acceleration, EVs from Renault, Seat and Smart are the top performers while Tesla, Lucid and Porsche dont make it to the same. Based on speed parameter, EVs from Tesla, Lucid and Porsche are the top performers while Renault, Smart and SEAT dont make it to the same.

- Customer Demographics: Age, income, profession, and geography played crucial roles in segmenting the market. Younger consumers were more inclined towards technologically advanced and eco-friendly options, while higher-income groups prioritized features and luxury. Post graduated, Salaried, Mid-aged young professionals are the top customers of EV Market.

These insights highlighted the diversity within the EV market and underscored the importance of targeted strategies for different consumer segments.

0.5 Future Improvements with Additional Time and Budget

Given additional time and budget, we would enhance the market segmentation project by:

- Expanding Datasets: Collecting more comprehensive data with additional columns such as customer purchase history, brand loyalty scores, environmental awareness levels, detailed vehicle usage patterns, and specific feature preferences.

- Incorporating Advanced ML Models: Exploring other machine learning models like DBSCAN for density-based clustering, hierarchical clustering for nested segment analysis, and Gaussian Mixture Models for probabilistic clustering.

- Integrating External Data: Purchasing data from industry reports, consumer surveys, and market research firms to enrich our analysis. This could include macroeconomic factors, detailed demographic data, and emerging market trends.

0.6 Estimated Market Size

The estimated market size for the EV domain (non-segmented) is projected to be significant, with global EV sales expected to reach approximately 12 million units by 2025. This growth is driven by increasing environmental regulations, technological advancements, and a shift in consumer preferences towards sustainable transportation options.

0.7 Top Variables for Optimal Market Segments

Based on our analysis, the top four variables/features for creating the most optimal market segments in the EV domain are:

- Income Level: Influences purchasing power and preference for luxury vs. economy models
- Geography: Determines infrastructure availability, usage patterns, and regional preferences.
- Age: Affects preferences for technology, performance, and environmental consciousness.
- Vehicle Usage Pattern: Differentiates between personal, commercial, and occasional use, impacting feature and performance requirements.

0.8 conclusion

This report provides a comprehensive overview of our EV market segmentation project, highlighting the methods used, key insights gained, potential improvements, market size, and critical variables for segmentation. These findings will inform strategic decisions and help tailor marketing efforts to effectively target distinct consumer groups within the EV market.