

EV_India Market Segmentation

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1. Abstract

This report presents a detailed segmentation analysis of the Indian electric vehicle (EV) market. Using the K-means clustering algorithm, distinct market segments were identified, providing valuable insights into consumer preferences and behavior. The findings aim to guide stakeholders in making informed decisions regarding product development, marketing strategies, and future investments in the EV sector. This analysis also explores potential improvements in the segmentation process and provides an estimate of the overall market size.

2. Introduction

The Indian EV market is experiencing rapid growth due to increasing environmental awareness, supportive government policies, and technological advancements. As a diverse market with varying consumer preferences and behaviors, understanding the different segments within this market is essential. Effective segmentation enables businesses to tailor their products and marketing efforts to meet the specific needs of each segment, thereby enhancing customer satisfaction and market share.

3. Problem Statement

Despite the growing interest and investment in the Indian EV market, it remains a challenge to identify and understand the distinct consumer segments. Without proper segmentation, companies risk misallocating resources and missing opportunities to effectively target and serve different customer groups. This report aims to address this challenge by identifying and analyzing the key segments within the Indian EV market, providing actionable insights for stakeholders.

4. Data Collection and Preprocessing

The dataset was cleaned and normalized to ensure consistency and remove any anomalies. This step included handling missing values, scaling numerical features, and encoding categorical variables.

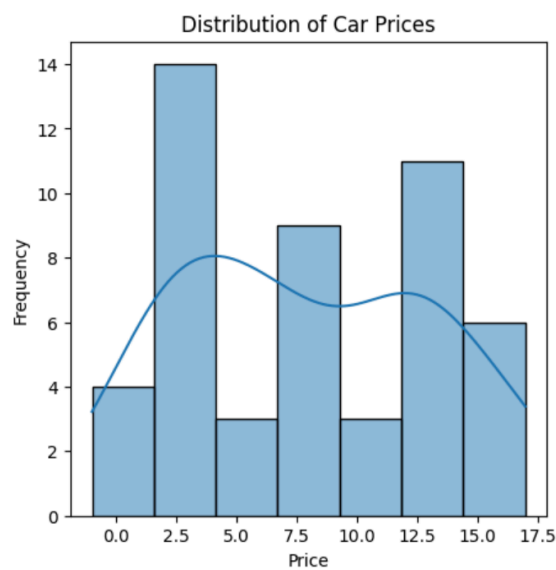
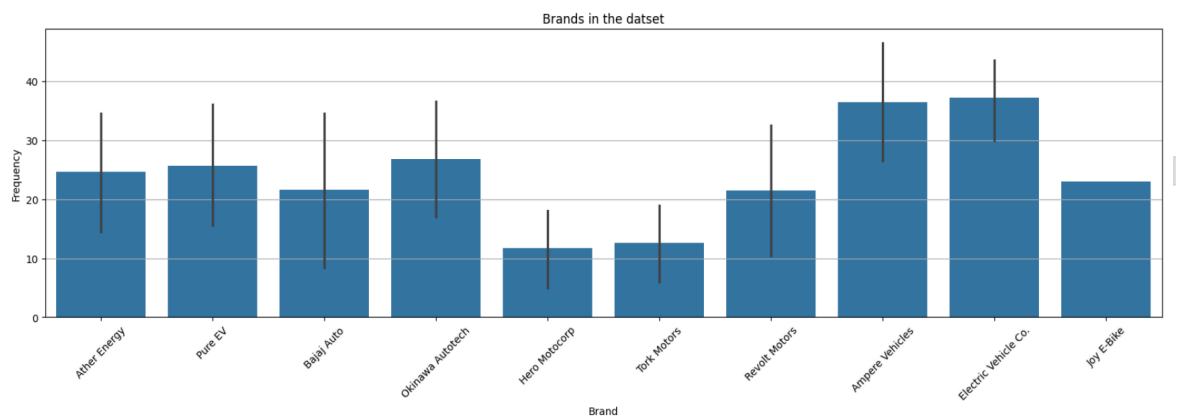
5. Vehicle Specification segmentation

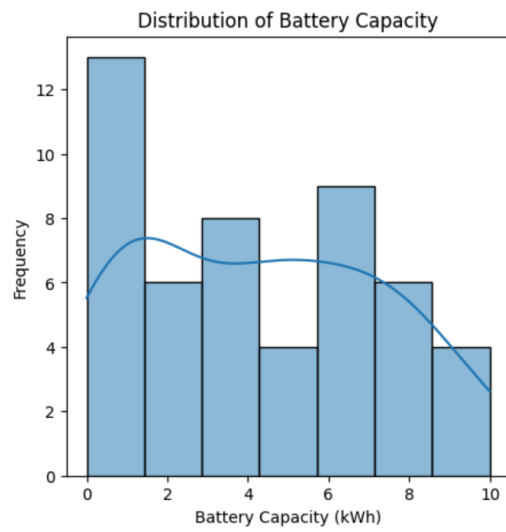
There are various ways of market segmentation. First, we are going to see market segmentation on the basis of different specifications of EV vehicles.

	id	Model	Manufacturer	Vehicle Type	Battery Capacity (kwh)	Range per Charge (km)	Charging Time	Price	Power or (HP kW)	Top Speed (km/h)	Year of Manufacture
0	1	Aura 300 Plus	Ather Energy	Scooter	2.9	116	4.5	129000.0	6.0	80.0	2021.0
1	2	Pure EV Epluto 7G	Pure EV	Scooter	2.7	120	3.0	109000.0	5.0	80.0	2021.0
2	3	Bajaj Chetak Electric	Bajaj Auto	Scooter	4.0	95	5.0	150000.0	4.0	60.0	2020.0
3	4	Okinawa iPraise Pro	Okinawa Autotech	Scooter	2.5	100	3.0	85000.0	3.0	60.0	2021.0
4	5	Hero Electric Opto EV	Hero Motocorp	Scooter	2.2	75	3.0	75000.0	3.0	60.0	2021.0

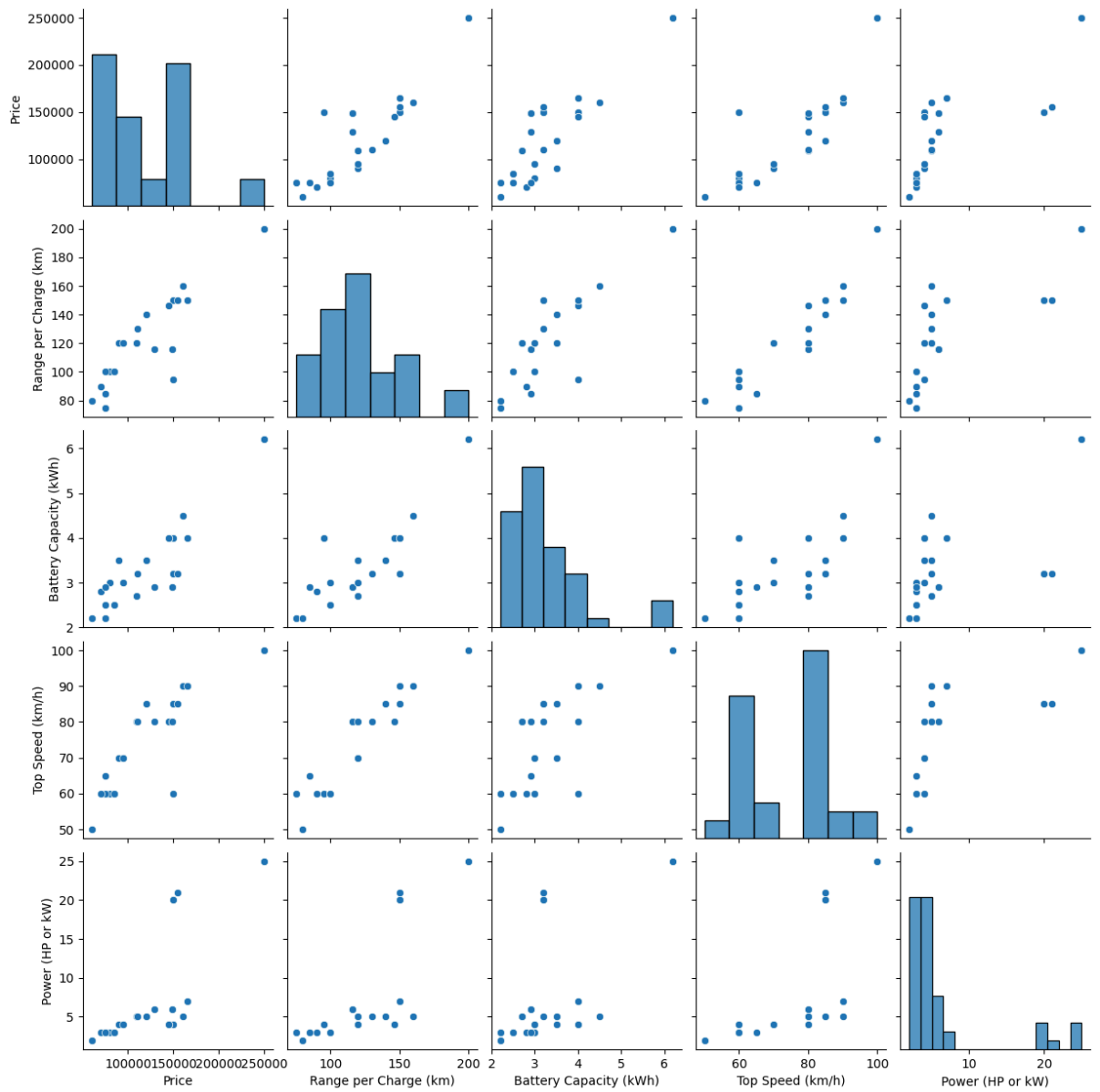
Data Visualisation

Data visualization was performed to better know about data. Following are some of the plots depicting various feature relations





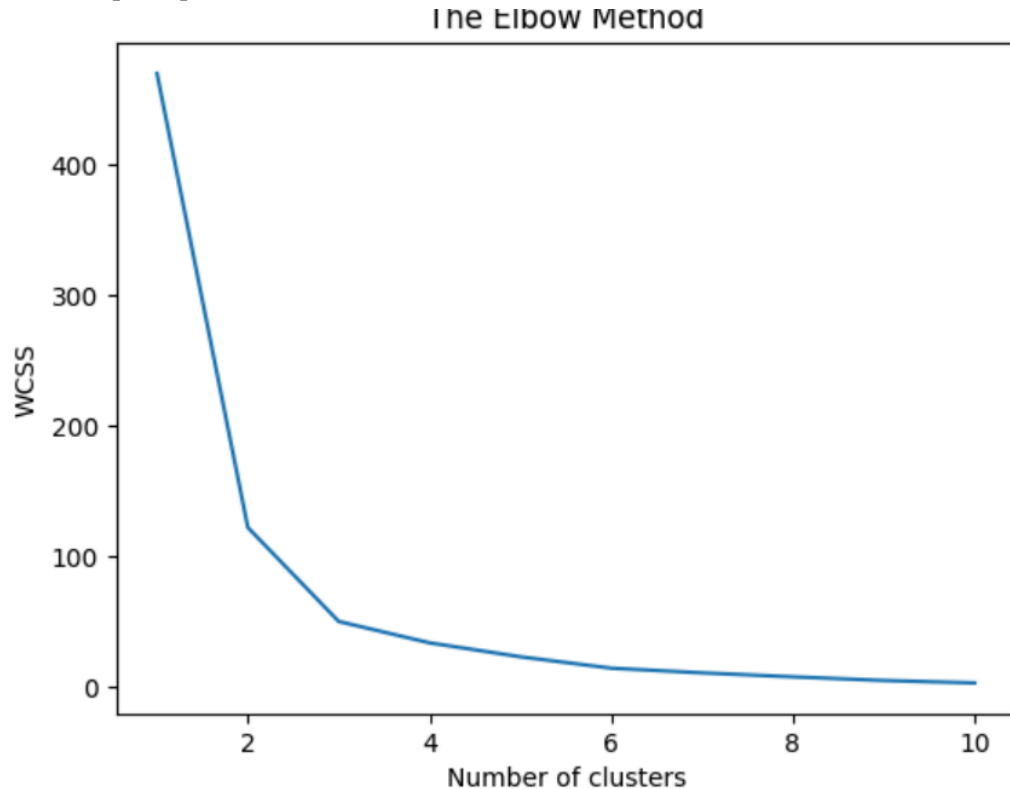
Other pair plots for the data



K-Means Clustering

The K-means algorithm was applied to the preprocessed dataset. The optimal number of clusters was determined using the Elbow Method, which involved plotting the within-cluster sum of squares against the number of clusters and identifying the "elbow point."

The elbow point plot is as shown below



Insights

The analysis of the vehicle specification dataset reveals that Indian EV customers show a marked preference for models that balance efficiency and advanced features. Consumers tend to favor EVs with moderate to high battery range, indicating the importance of extended driving distance per charge. Vehicles with robust safety features, user-friendly infotainment systems, and modern design aesthetics are highly favored. Customers are also strongly inclined towards EVs that offer quick charging capabilities and reliable after-sales service. This preference pattern suggests that the target market segment values not only the environmental benefits of EVs but also the convenience, safety, and advanced technological integrations that enhance the overall driving experience.

6. Possible Improvements

Improvements with Additional Time & Budget

To enhance the segmentation analysis, the following improvements are recommended:

- Datasets Collection:

- Collect more granular data on consumer demographics, psychographics, and vehicle usage patterns.
- Key columns to include: income levels, environmental attitudes, technology adoption rates, vehicle performance metrics, and detailed purchase behavior.
- Additional ML Models:
 - Explore advanced segmentation models such as Hierarchical Clustering, Gaussian Mixture Models (GMM), and DBSCAN.
 - Utilize ensemble learning techniques to combine the strengths of multiple models for more refined segments.

7. Estimated Market Size

The estimated market size for the Indian EV market, non-segmented, is projected to be around 3 million units by 2025. This estimation is based on current growth trends, government incentives, and increasing consumer awareness about electric vehicles.

8. Conclusion

The segmentation analysis of the Indian EV market, based on vehicle specification data, highlights a clear preference among consumers for electric vehicles that offer a balanced combination of efficiency, safety, and advanced technological features. The most favored specifications include moderate to high battery range, robust safety features, user-friendly infotainment systems, modern design aesthetics, quick charging capabilities, and reliable after-sales service. These insights indicate that the target market segment values the practical benefits of extended driving range and convenience, alongside the enhanced driving experience provided by advanced technology and safety features. By focusing on these key specifications, manufacturers and marketers can better cater to consumer demands, optimize their product offerings, and effectively capture and expand their market share in the burgeoning Indian EV market.