

EV'S MARKET SEGMENTATION

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EV MARKET

The electric vehicle (EV) market in India is experiencing remarkable growth and is poised for further expansion in the coming years. This growth can be attributed to a combination of government support, infrastructure development, increasing consumer demand, and a competitive landscape.

The Indian government has been actively promoting EV adoption through various policy measures and incentives. The Faster Adoption and Manufacturing of Electric Vehicles (FAME) scheme, launched in 2015, provides financial incentives to buyers of electric and hybrid vehicles. The scheme has undergone revisions and extensions to encourage greater EV adoption. Additionally, the government has implemented measures such as lower GST rates and tax benefits for EV manufacturers and buyers.

The availability of charging infrastructure is crucial for the widespread adoption of EVs. In recent years, significant investments have been made in the development of charging infrastructure across the country. Public and private entities are setting up charging stations in various locations, including public spaces, commercial buildings, and residential complexes. The government has also mandated the installation of EV charging stations at fuel stations to ensure a comprehensive charging network.

The demand for EVs in India has been steadily increasing as more consumers become aware of the environmental and economic benefits of electric mobility. Sales of EVs, including two-wheelers and four-wheelers, have witnessed significant year-on-year growth. Lower

operating costs, reduced maintenance requirements, and favorable government policies are some of the factors contributing to the rising demand.

The competitive landscape in the Indian EV market is evolving rapidly. Domestic automobile manufacturers have entered the EV segment and are launching electric models to cater to the growing demand. At the same time, international companies are either partnering with Indian firms or establishing their own manufacturing units to tap into the market potential. This competition is driving innovation, technological advancements, and pricing competitiveness, benefitting consumers and the industry as a whole.

Battery technology and manufacturing play a critical role in the growth of the EV market. India has been actively working on establishing a robust battery manufacturing ecosystem to reduce dependence on imports and lower battery costs. The government has introduced initiatives to promote battery cell manufacturing and attract investments in this sector. Several companies have already announced plans to set up battery manufacturing facilities in India, which will further boost the local EV industry.

PROBLEM STATEMENT

To identify the most feasible market entry strategy for an electric vehicle (EV) company in India, it is crucial to conduct a segmentation analysis of the EV market based on factors such as region, price, type of vehicles, and other relevant parameters. The objective is to identify the segments with the highest potential for product usage, considering variables such as state, fuel type, kilometer driven, and selling price. By understanding the different segments and their characteristics, the company can develop a targeted strategy that aligns with the specific needs and preferences of potential customers in the Indian EV market. This will help maximize market penetration and optimize resource allocation, ultimately ensuring a successful entry and sustained growth in the highly competitive EV market in India.

DATA COLLECTION

Data from various websites was collected to conduct a segmentation analysis of the electric vehicle (EV) market in India. The sources used for extracting the relevant information include:

1. Dataset1:- https://drive.google.com/file/d/1GIdb0-ciOmCn1Pv-ErH_94s2WPM-IR_x/view?usp=drivesdk
2. Dataset2:-
<https://drive.google.com/file/d/1tkUgQIRiO5O5eFuQtzqCUfksFym9i3Er/view?usp=drivesdk>

By referring to these sources, we aim to analyze the EV market based on segmentation variables such as region, price, type of vehicles (e.g., 2-wheelers, 3-wheelers, 4-wheelers, etc.), and other relevant parameters. This data will serve as a foundation for identifying the

most suitable market entry strategy, focusing on the segments that are most likely to utilize EVs based on factors like state, fuel type, kilometer driven, and selling price.

DATA PREPROCESSING

- 1. Data Cleaning: Remove any duplicate or irrelevant data points from the dataset. Handle missing data by either imputing values or removing the incomplete records, depending on the extent of missingness and the impact on the analysis.*
- 2. Data Integration: If data is collected from multiple sources, integrate the datasets into a single cohesive dataset. Ensure that the variables across different sources are aligned and properly matched.*
- 3. Data Transformation: Transform the data if necessary to make it suitable for analysis. This may involve converting variables into appropriate formats (e.g., converting categorical variables into numerical representations) or normalizing variables to ensure they are on a consistent scale.*
- 4. Feature Engineering: Create new features or derive meaningful insights from the existing variables to enhance the analysis. This could involve creating new variables based on existing ones, aggregating data at different levels, or performing calculations to derive relevant metrics.*

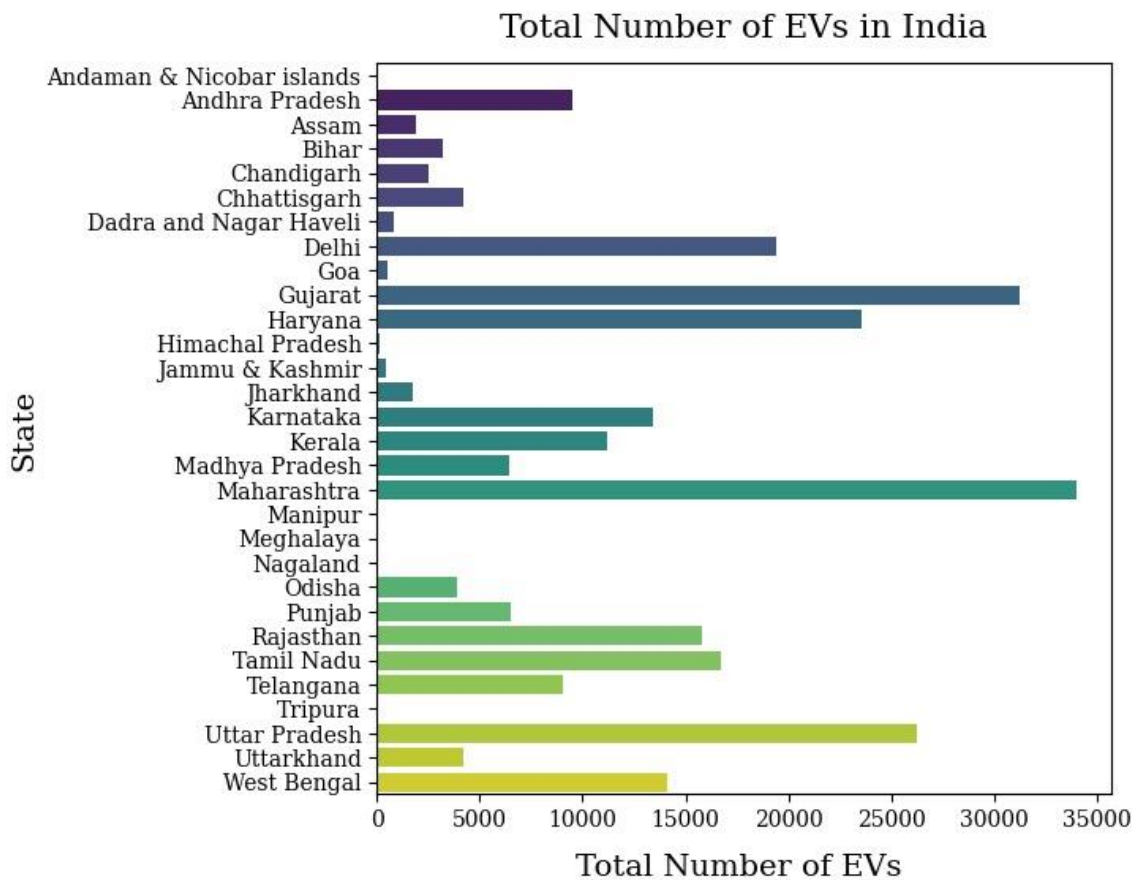
- 5. Data Encoding: Encode categorical variables using techniques such as one-hot encoding or label encoding to represent them in a numerical format suitable for analysis.*
- 6. Outlier Detection and Treatment: Identify and handle outliers in the data to avoid their undue influence on the analysis. This can be done through various statistical methods or domain knowledge.*
- 7. Data Splitting: Split the dataset into training and testing subsets if necessary. The training set can be used for model development, while the testing set can be used for model evaluation and validation.*

By performing these data preprocessing steps, the collected data will be prepared for segmentation analysis, ensuring that any biases or inconsistencies in the data are addressed, and the analysis results are accurate and reliable.

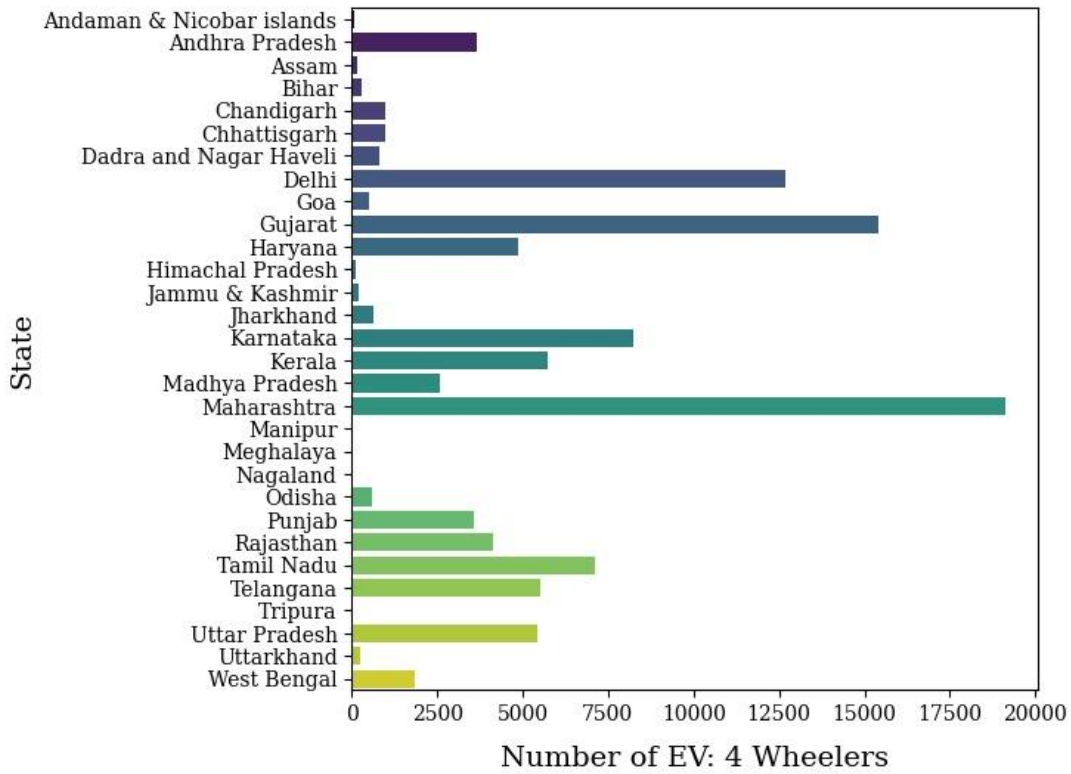
DATA ANALYSIS

Data analysis is a crucial process that involves examining, cleaning, transforming, and interpreting collected data to extract meaningful insights and make informed decisions. In the context of the electric vehicle (EV) market in India, data analysis helps identify key market segments based on variables such as region, price, vehicle type, and more. By applying statistical techniques and segmentation methods,

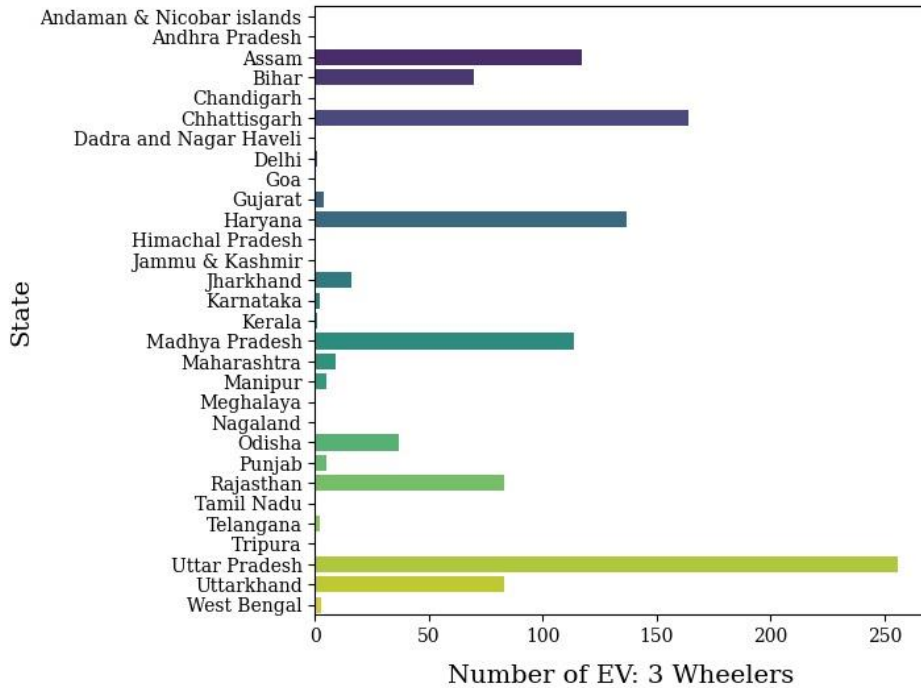
businesses can uncover market trends, estimate market size, develop customer profiles, and compare segments. This analysis guides the formulation of a feasible market entry strategy that targets the most promising customer segments. Data analysis plays a vital role in understanding the EV market landscape, identifying opportunities, and optimizing decision-making for successful market entry and growth.



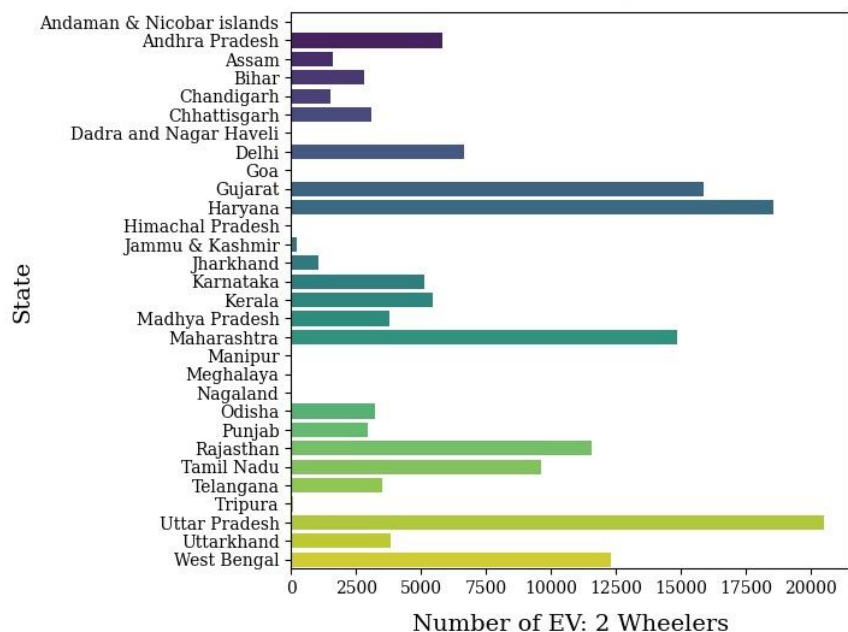
Statewise Electric Vehicles (4 Wheelers) in India



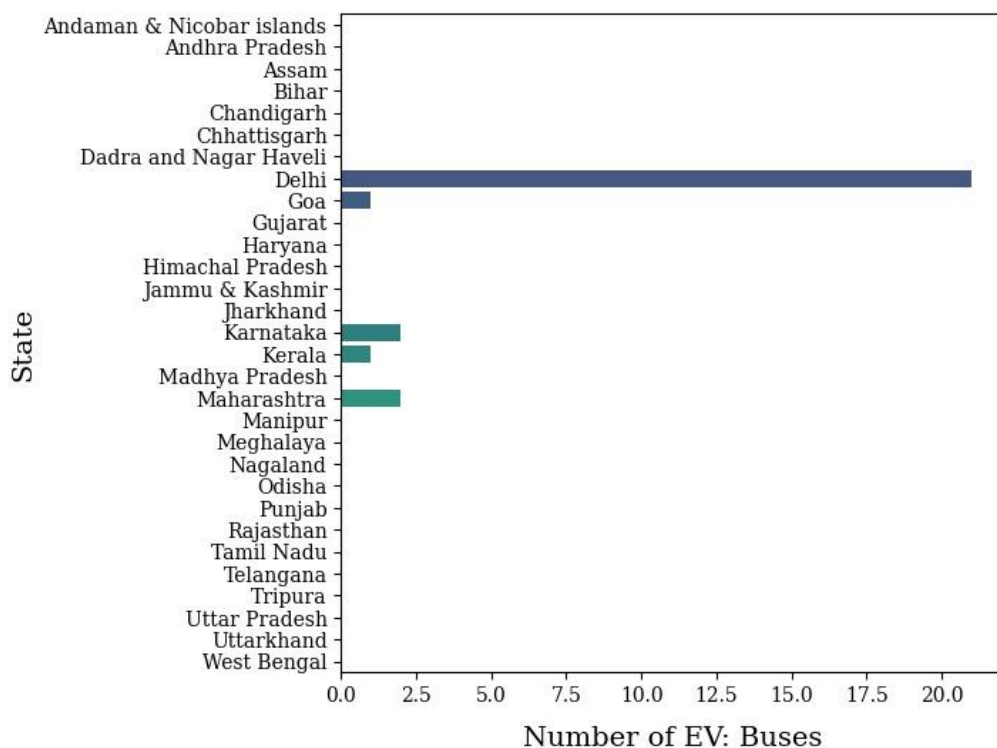
Statewise Electric Vehicles (3 Wheelers) in India

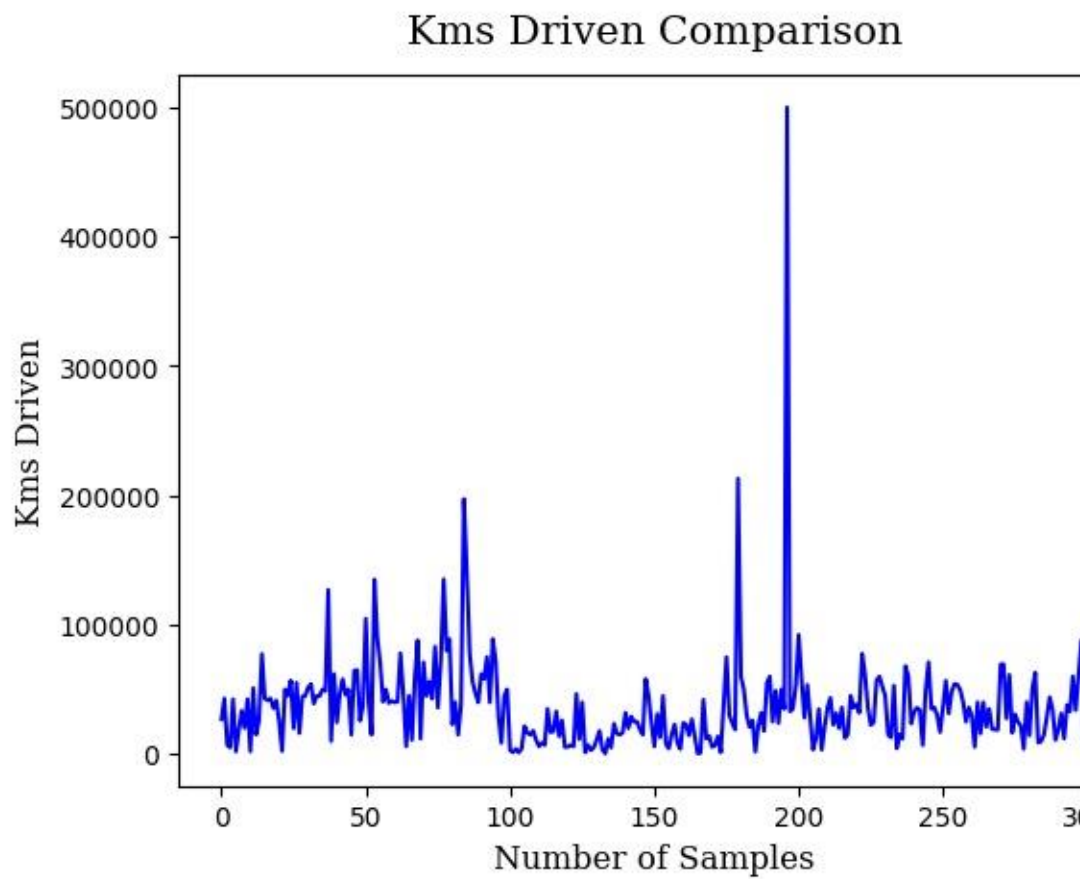
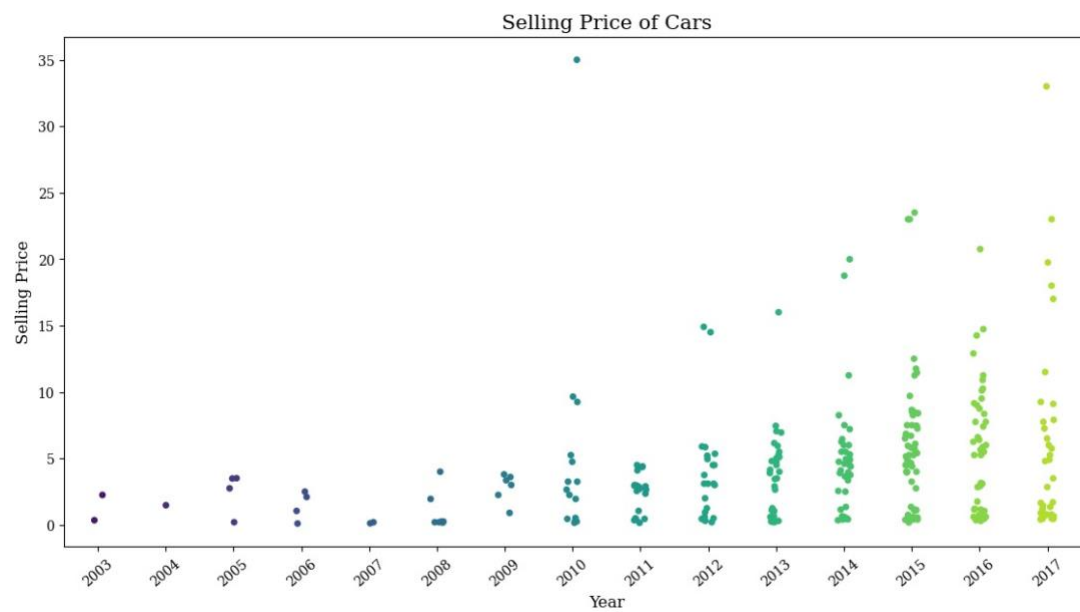


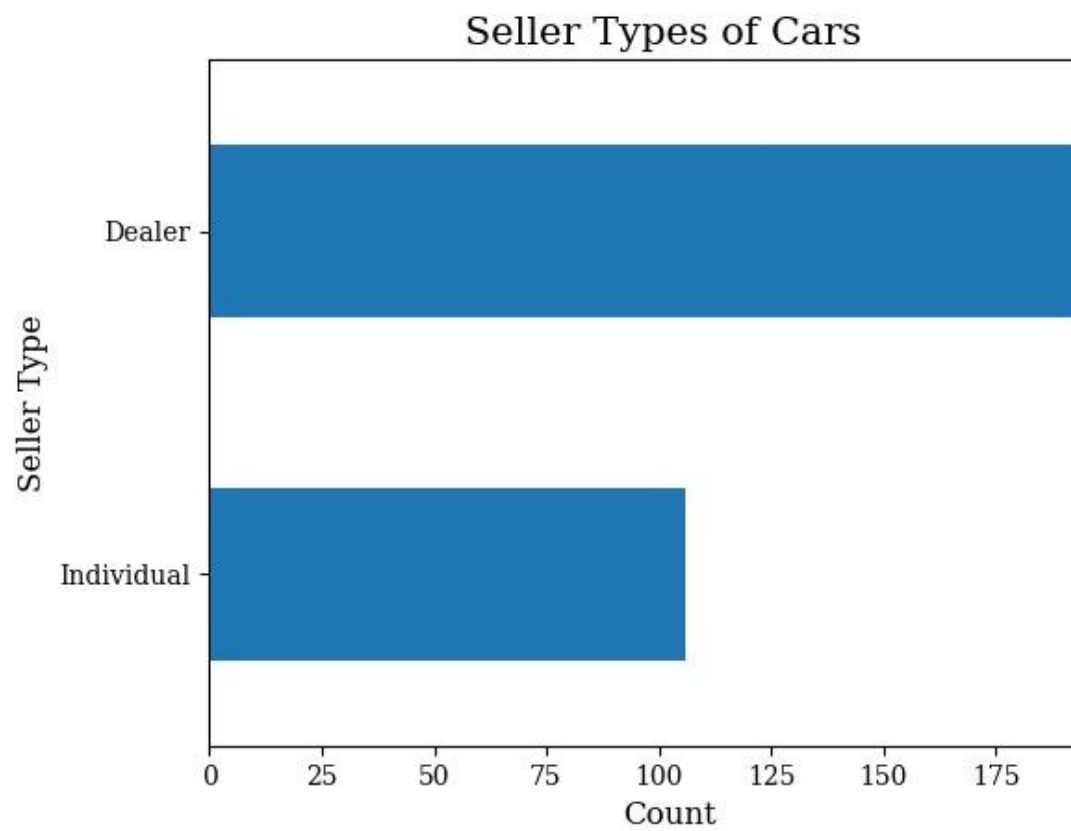
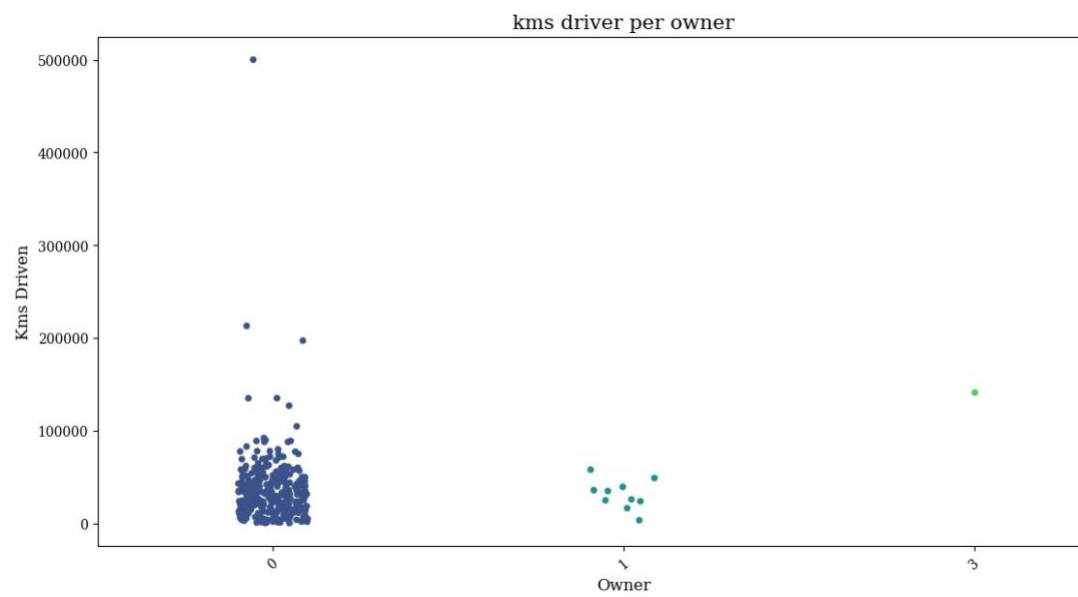
Statewise Electric Vehicles (2 Wheelers) in India

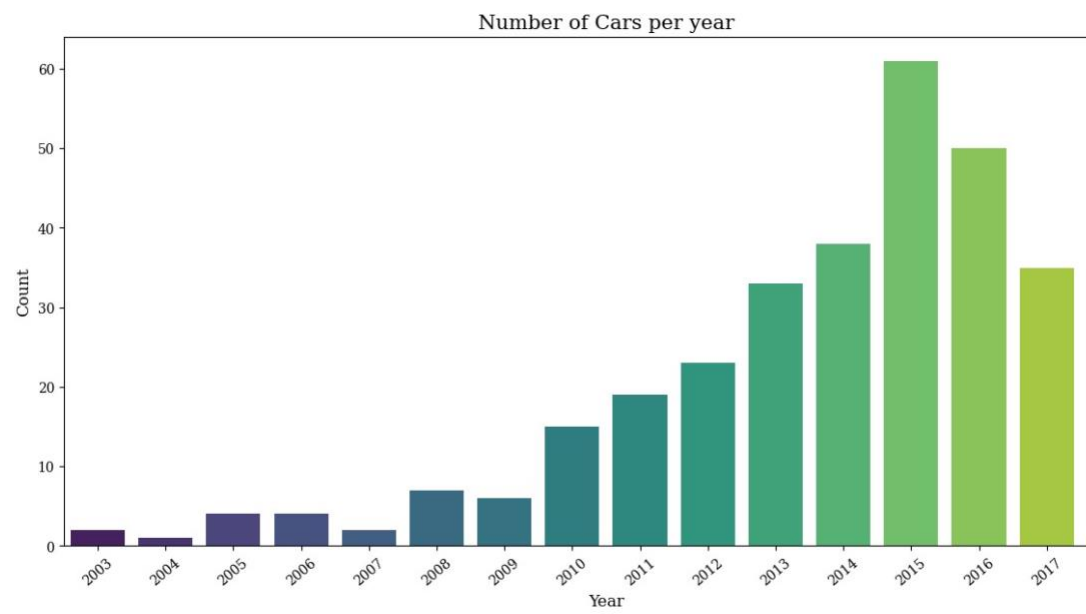


Statewise Electric Buses in India

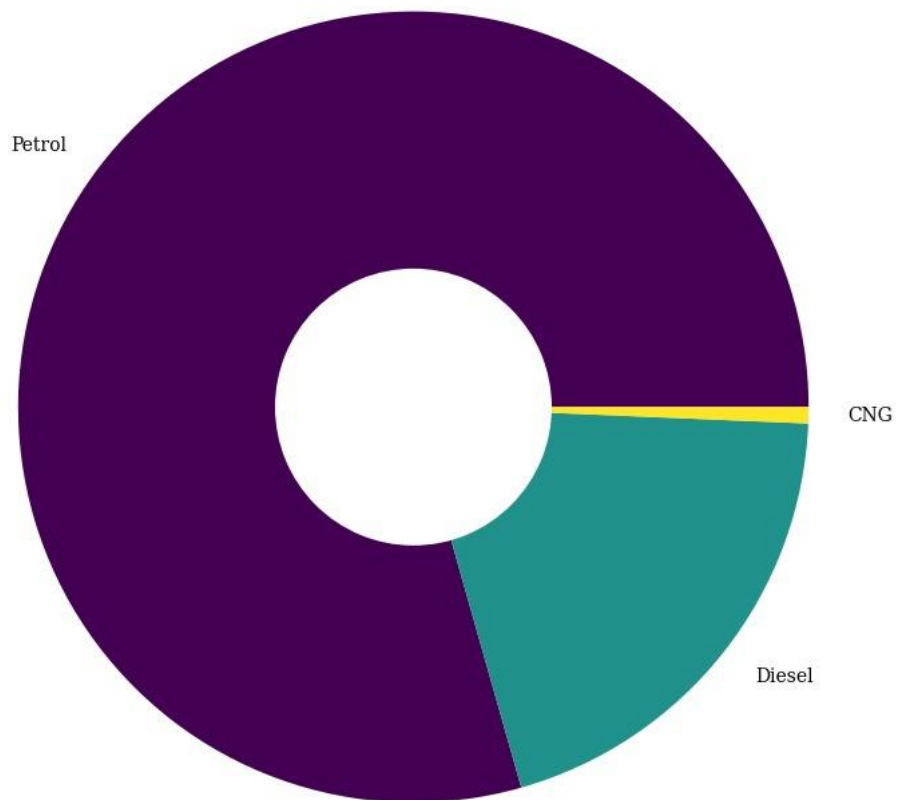








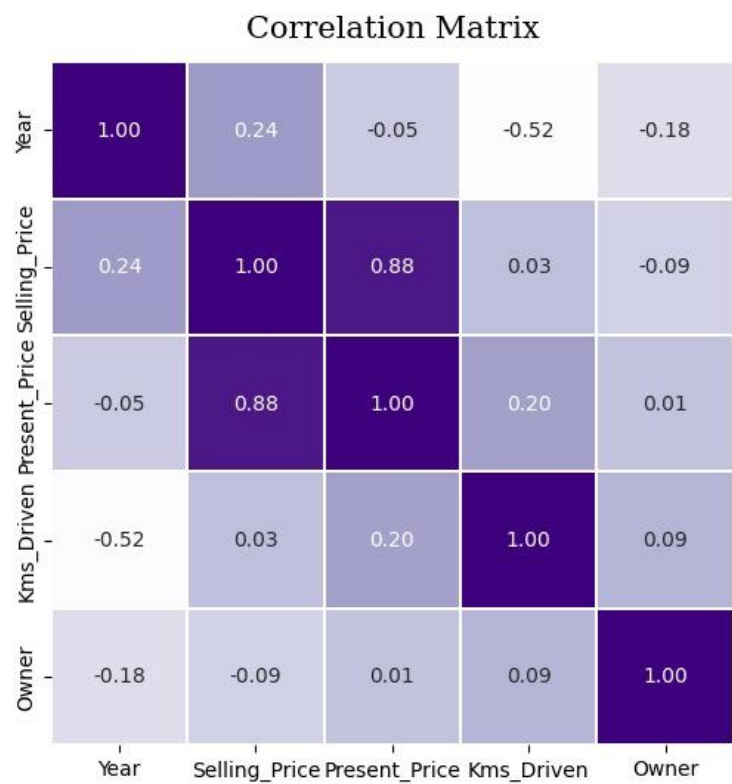
Cars with different fuel types



SEGMENT EXTRACTION

Segment extraction using k-means clustering is a powerful technique to group data points in the electric vehicle (EV) market in India based on variables such as region, price, and vehicle type. By preprocessing and preparing the dataset, determining the appropriate number of clusters, and applying the k-means algorithm, distinct segments can be identified. The resulting clusters can be interpreted and evaluated to understand their characteristics and create segment profiles. Leveraging these insights, businesses can develop targeted market entry strategies tailored to each segment’s specific needs and preferences, considering factors like state, fuel type, kilometer driven, and selling price. This approach facilitates more focused marketing efforts and improves the chances of success in the dynamic and competitive EV market in India.

CORRELATION METRICS OF DATASETS

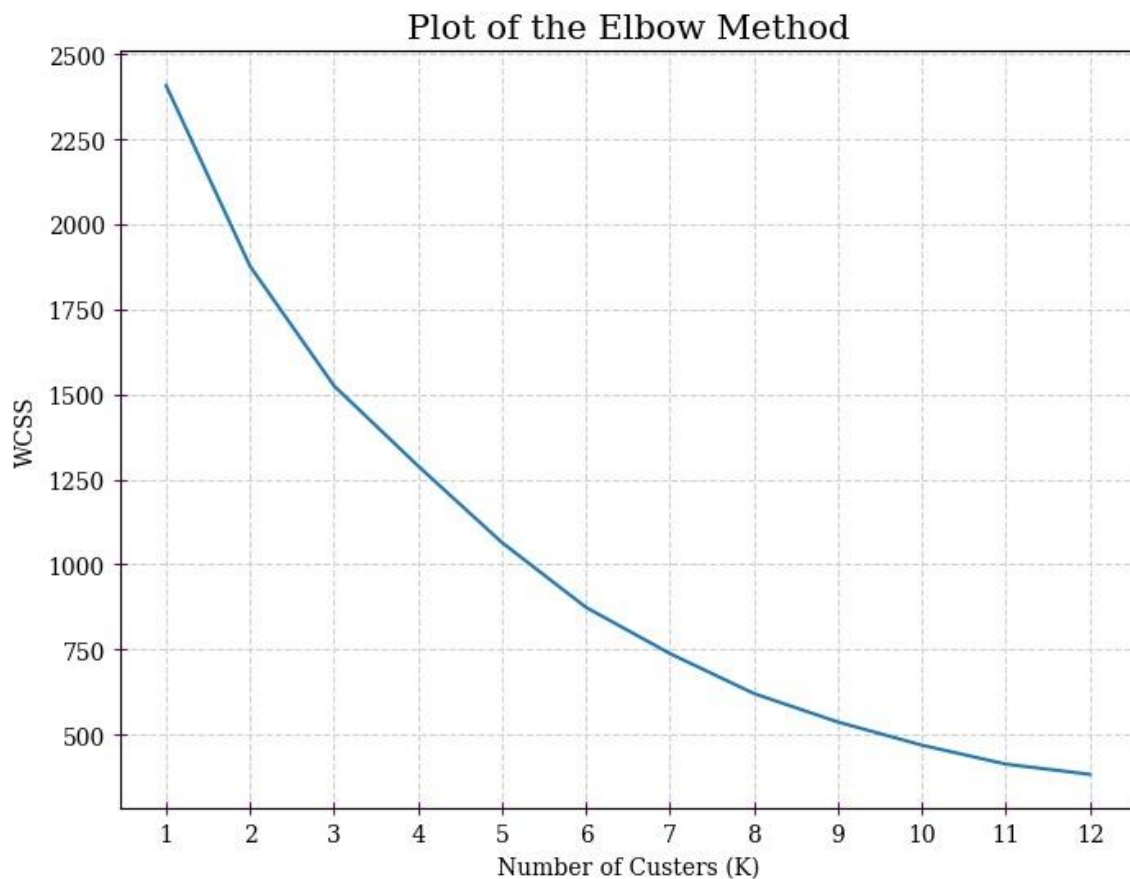


Correlation Matrix

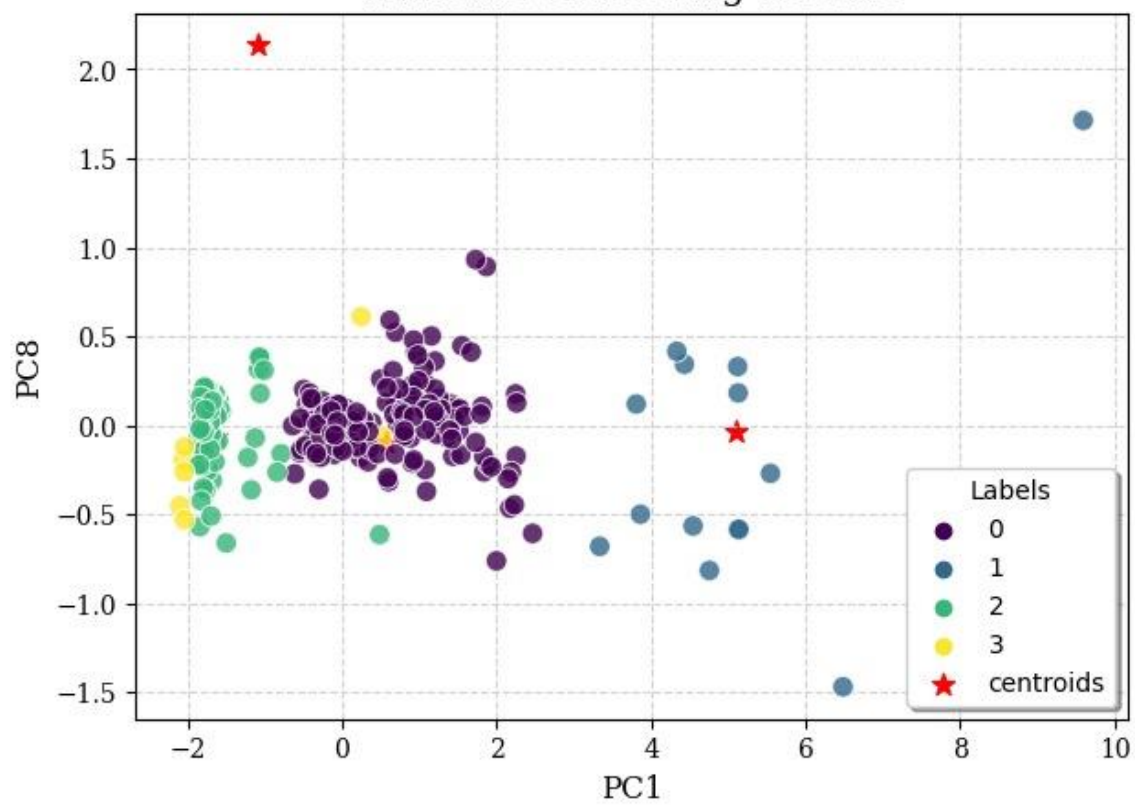
Sl. No	1.00	0.26	0.30	0.31	0.28	0.24	0.26	0.09	0.28	0.30	0.26
Two Wheelers (Category L1 & L2 as per Central Motor Vehicles Rules	0.26	1.00	0.96	0.98	0.92	0.92	0.98	0.76	0.99	0.98	0.93
Two Wheelers (Category L2 (CMVR))	0.30	0.96	1.00	0.99	0.95	0.95	0.97	0.75	0.99	0.99	0.96
Two Wheelers (Max power not exceeding 250 Watts)	0.31	0.98	0.99	1.00	0.95	0.95	0.98	0.77	0.99	1.00	0.96
Three Wheelers (Category L5 slow speed as per CMVR)	0.28	0.92	0.95	0.95	1.00	0.94	0.89	0.69	0.93	0.95	0.97
Three Wheelers (Category L5 as per CMVR)	0.24	0.92	0.95	0.95	0.94	1.00	0.91	0.71	0.94	0.95	0.99
Passenger Cars (Category M1 as per CMVR)	0.26	0.98	0.97	0.98	0.89	0.91	1.00	0.82	0.99	0.98	0.91
Buses	0.09	0.76	0.75	0.77	0.69	0.71	0.82	1.00	0.80	0.77	0.71
Total in state	0.28	0.99	0.99	0.99	0.93	0.94	0.99	0.80	1.00	1.00	0.95
total two wheelers	0.30	0.98	0.99	1.00	0.95	0.95	0.98	0.77	1.00	1.00	0.96
total three wheelers	0.26	0.93	0.96	0.96	0.97	0.99	0.91	0.71	0.95	0.96	1.00
Sl. No	Two Wheelers (Category L1 & L2 as per Central Motor Vehicles Rules	Two Wheelers (Category L2 (CMVR))	Two Wheelers (Max power not exceeding 250 Watts)	Three Wheelers (Category L5 slow speed as per CMVR)	Three Wheelers (Category L5 as per CMVR)	Passenger Cars (Category M1 as per CMVR)	Buses	Total in state	total two wheelers	total three wheelers	

ELBOW METHOD

The Elbow method is used to determine the optimal number of clusters (K) in k-means clustering. It involves calculating the Within-Cluster Sum of Squares (WCSS) for different values of K, ranging from 1 to 12. WCSS represents the sum of squared distances between each data point and the centroid within a cluster. As K increases, the WCSS value decreases. When plotting the WCSS against the number of clusters, the graph typically forms an elbow shape. The elbow point on the graph indicates the optimal K value, where the WCSS starts to level off and the improvement in clustering performance becomes marginal. It signifies a balance between clustering accuracy and simplicity, providing the optimal number of clusters for the given dataset.



K-Means Clustering Results



POTENTIAL SALE

After analyzing the EV dataset, several potential sales opportunities in the EV market can be identified. These opportunities arise from understanding customer preferences and market dynamics. Based on the analysis, the following potential sales avenues can be explored:

- 1. Urban Commuters: Target urban areas with high population density and heavy traffic congestion. Position EVs as an ideal solution for daily commuting, offering benefits such as lower operating costs, reduced emissions, and convenient charging infrastructure. Emphasize the advantages of EVs in terms of maneuverability, efficiency, and reduced noise pollution.*
- 2. Environmentally Conscious Consumers: Focus on environmentally conscious consumers who prioritize sustainability and seek to reduce their carbon footprint. Highlight the green benefits of EVs, including zero tailpipe emissions, lower greenhouse gas emissions, and reduced dependence on fossil fuels. Showcase how EVs align with their values and contribute to a cleaner and greener future.*
- 3. Fleet Operators: Target commercial fleet operators, such as taxi companies, ride-sharing services, and delivery services. Showcase the economic advantages of EVs, including lower fuel and maintenance costs. Demonstrate how switching to EVs can contribute to their bottom line while also meeting their sustainability goals. Provide solutions for charging infrastructure and fleet management to address their specific needs.*

4. *Government and Institutional Buyers: Government organizations, municipalities, and institutions often have sustainability targets and may offer incentives or grants for EV adoption. Engage with these buyers by showcasing the potential cost savings, environmental benefits, and alignment with their green initiatives. Provide tailored solutions that meet their procurement requirements and provide comprehensive support.*
5. *Early Technology Adopters: Target tech enthusiasts and early technology adopters who are eager to embrace the latest innovations. Highlight the advanced features, smart connectivity options, and futuristic appeal of EVs. Leverage digital marketing channels and tech-focused events to reach this audience and position EVs as cutting-edge vehicles.*
6. *Collaborations with Infrastructure Providers: Collaborate with charging infrastructure providers, energy companies, or real estate developers to create integrated solutions. Offer bundled packages that include home charging stations, access to public charging networks, and renewable energy options. These collaborations can enhance the overall EV ownership experience and provide added value to customers.*

By capitalizing on these potential sales opportunities and tailoring marketing strategies accordingly, businesses can effectively penetrate the EV market and increase sales. It is crucial to continuously monitor market trends, customer preferences, and technological advancements to adapt and stay competitive in this rapidly evolving industry.

