ELECTRIC VEHICLE MARKET SEGMENTATION ANALYSIS

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Market Segmentation of Electronic Vehicles in India Of Brands and Charging stations with Statewise analysis

Dataset Details: **EV_cars_India 2023 Brands , Charging stations , EV Stats**

1. Introduction

Electric vehicles (EVs) are becoming an increasingly popular mode of transportation worldwide due to their potential to reduce carbon emissions and dependence on fossil fuels. In India, the EV market has been gaining momentum over the past few years as the government and industry stakeholders take significant steps to promote sustainable mobility. Here is an overview of the current state of electric vehicles in India in 2023-24:

Government Initiatives and Policies

The Indian government has been proactive in promoting electric mobility through various policies and initiatives. The Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme, introduced in 2015, aims to increase the adoption of electric vehicles by providing incentives for EV purchases and developing charging infrastructure. The FAME II scheme, launched in 2019, has a budget of INR 10,000 crore (approximately $1.36 billion) and focuses on electrifying public transportation, including buses, three-wheelers, and two-wheelers.

Charging Stations and Infrastructure

One of the key challenges to the widespread adoption of EVs in India is the availability of charging infrastructure. However, significant progress has been made in recent years:

- **Public Charging Stations**: The government has set a target to establish charging stations every 25 km in urban areas and every 100 km on highways. Many companies are investing in charging infrastructure, and public-private partnerships are being formed to expand the network.
- **Home Charging**: Many EV owners install home charging stations to ensure convenient and easy access to charging. Manufacturers offer portable chargers with their vehicles, enabling users to charge their EVs at home.
- **Charging Network Expansion**: Various energy companies, oil corporations, and private enterprises are actively expanding the charging network across the country.

EV Stats and Market Overview

- **Vehicle Sales**: The adoption of electric vehicles in India has been steadily increasing, with sales of electric two-wheelers and three-wheelers leading the market. Electric four-wheelers are also gaining popularity, particularly in the premium and luxury segments.
- **Manufacturers**: Domestic and international automakers are investing in the Indian EV market. Companies such as Tata Motors, Mahindra & Mahindra, and Bajaj Auto have launched electric vehicles, while global brands like Tesla, Hyundai, and MG Motors are also making significant strides in the market.

Battery Technology: Advancements in battery technology, particularly in lithium-ion batteries, are driving the efficiency and performance of EVs. Indian manufacturers are also exploring local battery production to reduce dependency on im EV Stats and Market Overview

2}Fermi Estimation

2.1 Problem Statement

In 2023-24 , the market for electric vehicles (EVs) in India is experiencing rapid growth due to increased environmental awareness and government incentives. However, there is a lack of comprehensive understanding of the diverse market segments within the EV industry and the current state of charging infrastructure across the country. This knowledge gap presents challenges to automakers, energy companies, and policymakers who aim to effectively address the needs of different consumer groups and optimize charging station placement.

Key Challenges

1. Market Segmentation: The Indian EV market encompasses a wide range of consumer segments, including private car owners, commercial fleets, public transport operators, and delivery services. Understanding the unique needs and preferences of each segment is crucial for tailoring EV offerings and marketing strategies.

2. Charging Infrastructure: The availability and accessibility of charging stations vary across urban, suburban, and rural areas. An optimal distribution of charging infrastructure is essential to encourage EV adoption and address range anxiety among potential buyers.

3. Data Availability: There is a lack of detailed, up-to-date data on EV ownership trends, usage patterns, and charging station utilization rates. This data is necessary for making informed decisions about product development, market entry strategies, and infrastructure investments.

4. Regulatory Framework: Policymakers need to balance the interests of various stakeholders, including automakers, energy providers, and consumers, to create a supportive regulatory environment that encourages EV adoption and infrastructure development.

Objectives

- Identify Market Segments: Conduct market research to segment the EV market based on factors such as vehicle type, usage patterns, income levels, and geographic location.

- Analyze Charging Infrastructure: Assess the current state of charging stations across different regions and evaluate the coverage, availability, and accessibility of these stations for various market segments.

- Data Collection and Analysis: Gather data on EV ownership, usage, and charging habits from multiple sources, including surveys, industry reports, and public records. Analyze the data to identify trends and patterns.

- Strategic Recommendations: Based on the findings, provide recommendations for automakers, energy companies, and policymakers to tailor EV offerings, expand charging infrastructure, and develop supportive policies.

Expected Outcomes

- A comprehensive understanding of the different market segments within the Indian EV market in 2023, including their needs, preferences, and usage patterns.

- A detailed analysis of the current charging infrastructure, including gaps and opportunities for expansion.

- Strategic recommendations for industry players and policymakers to improve EV adoption and optimize charging station placement.

- Insights that guide future investments in EV products and infrastructure, fostering sustainable growth in the Indian EV mark

In our approach to Fermi Estimation for market segmentation and strategy formulation, we follow a systematic process aimed at leveraging data-driven insights to inform decision-making and maximize market potential for our Electric Vehicle Startup:

2.Data Sources

The data has been downloaded from Kaggle
https://www.kaggle.com/datasets/divyanshusingh18/ev-cars-india-2023

Data Pre-processing

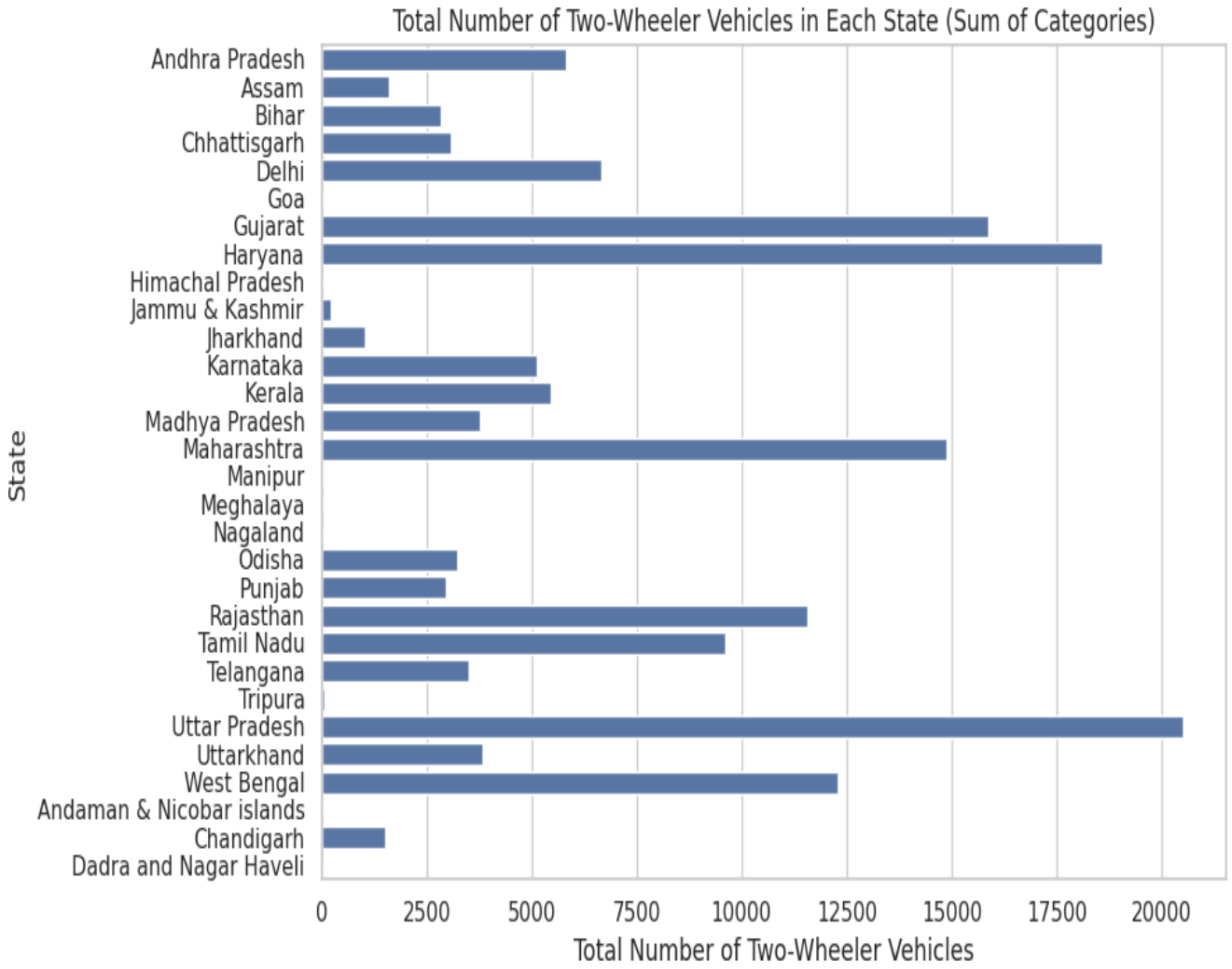
Libraries Used:

- Pandas
- Numpy
- Seaborn
- Matplotlib
- Scikit Learn`

 # RESULTS

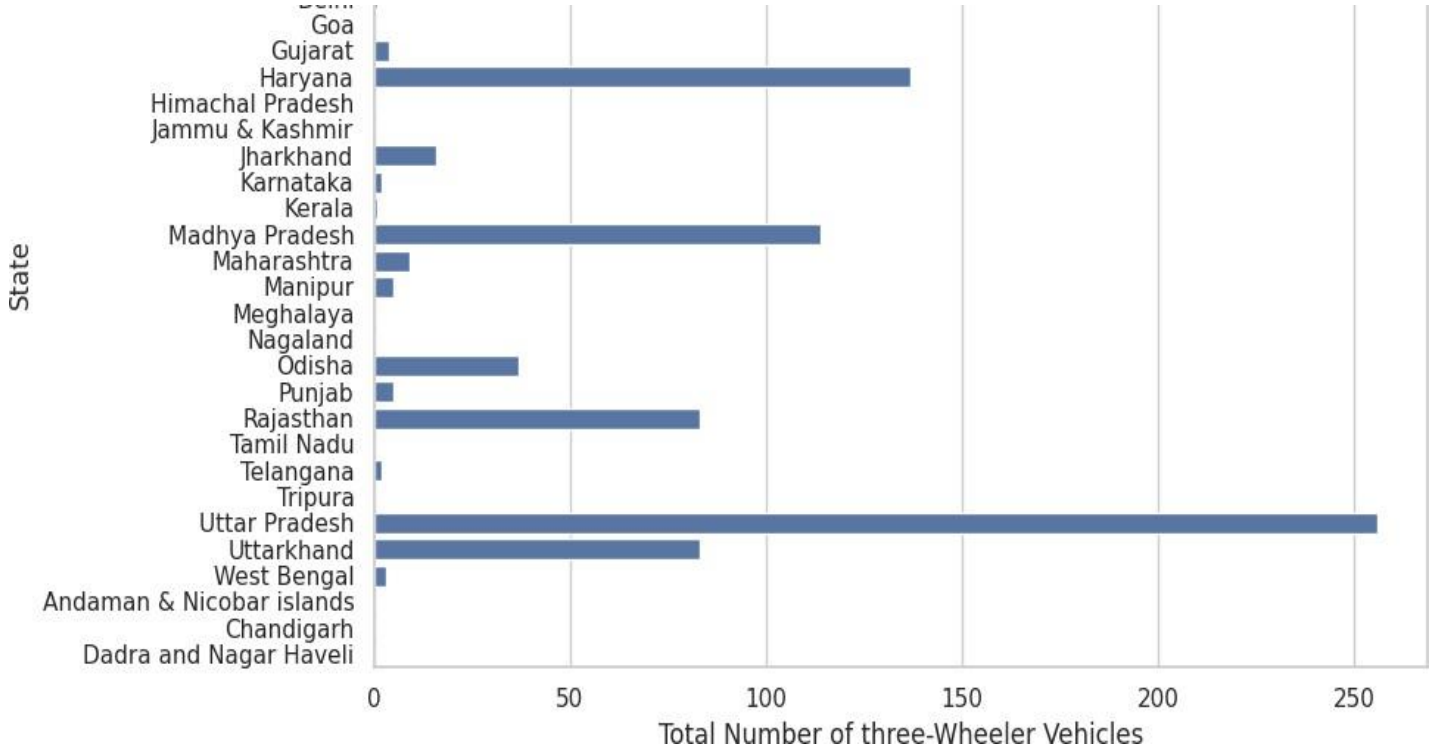
Analysis of 2 Wheeler EVs

UttarPradesh, Gujrat, Haryana are among the top states with the majority of EV 2Wvehicles, while the remaining states have less number .



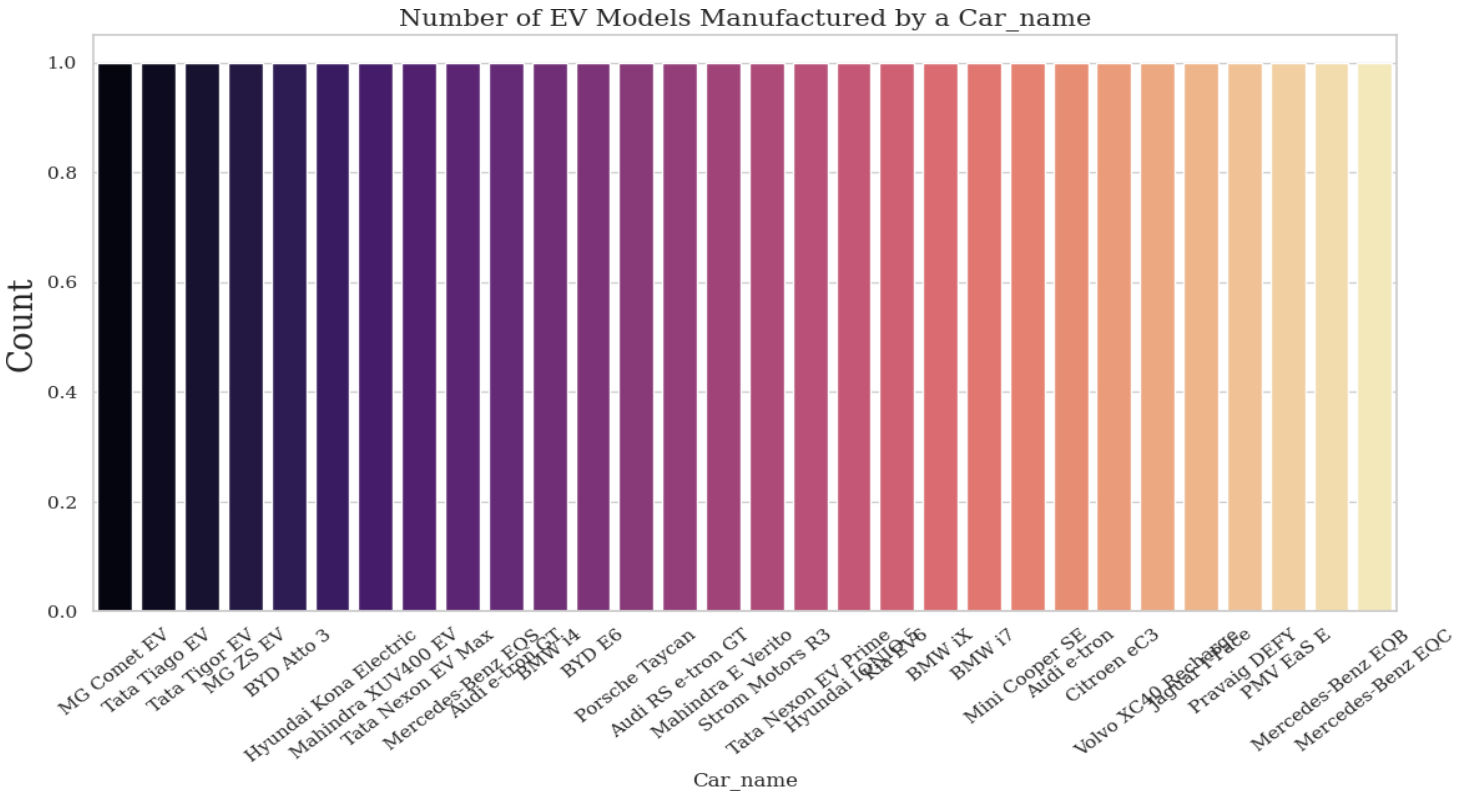
Analysis of 3 wheeler EV

Uttar Pradesh, Chattisgarh, Haryana are among the top states with the majority of EV 3W vehicles, while the remaining states have less number.

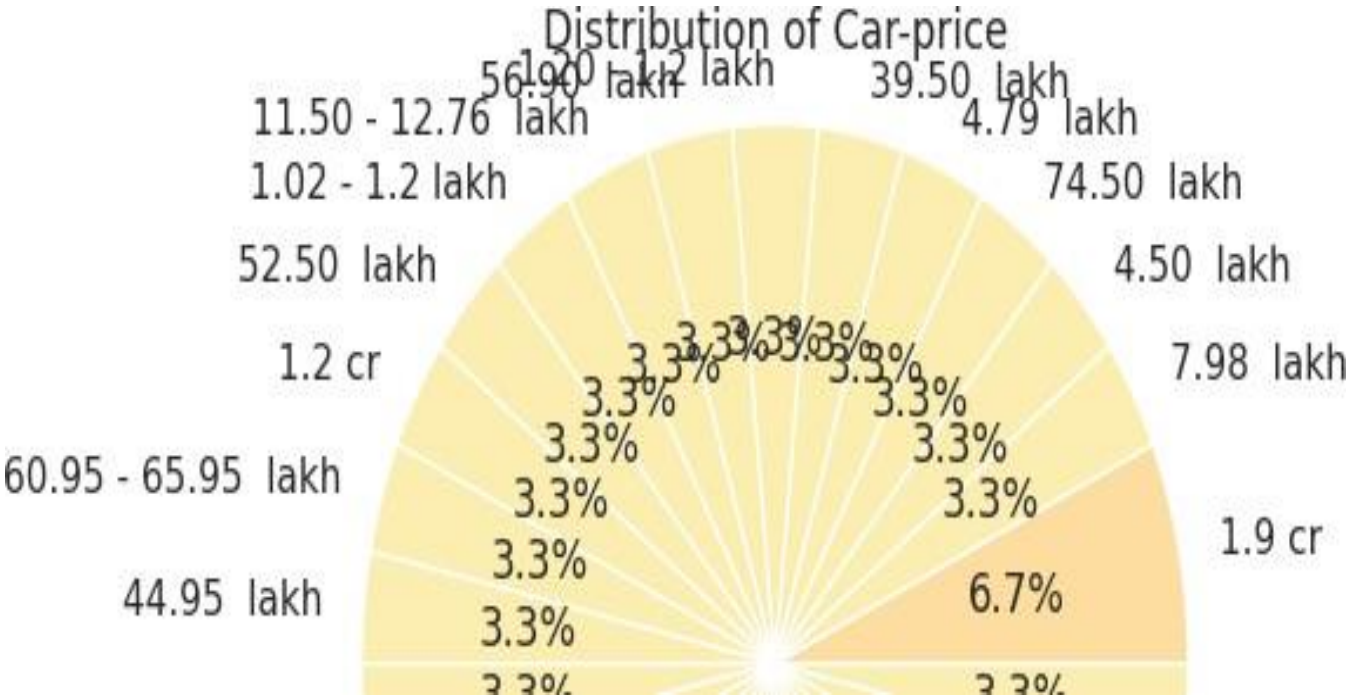


2. Segment Extraction

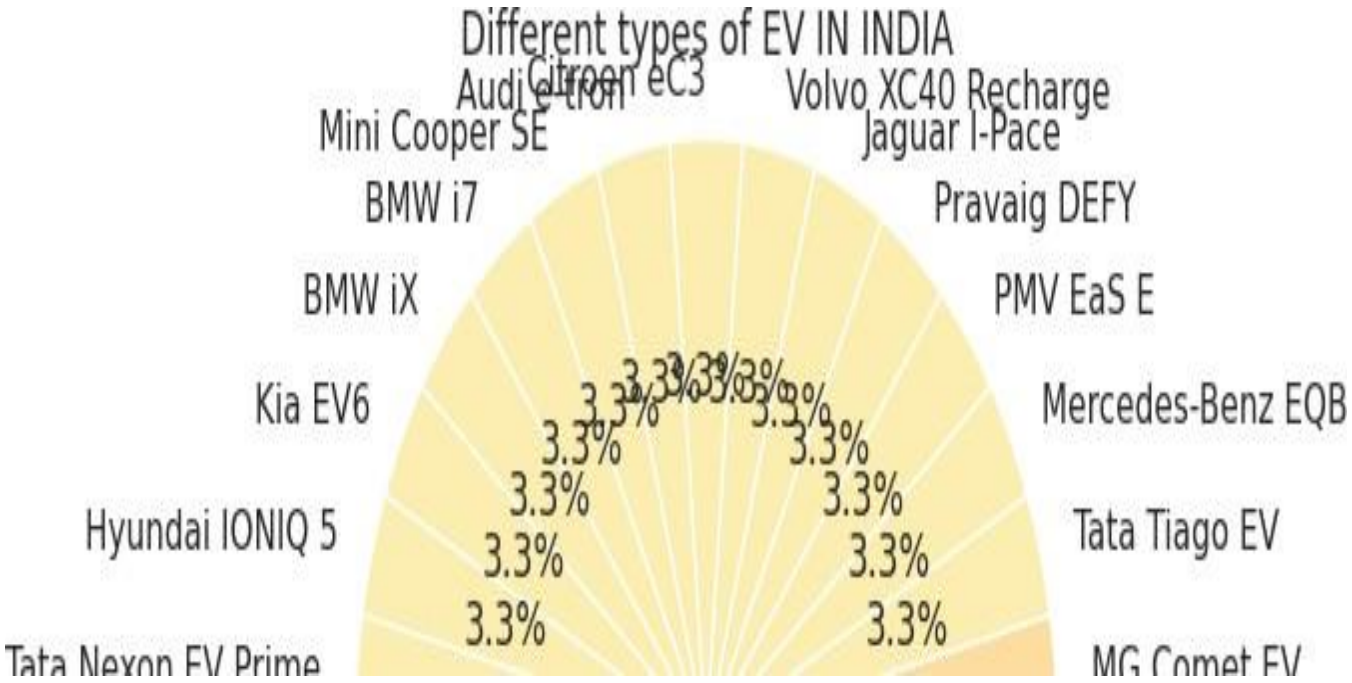
Brand wise EV analysis



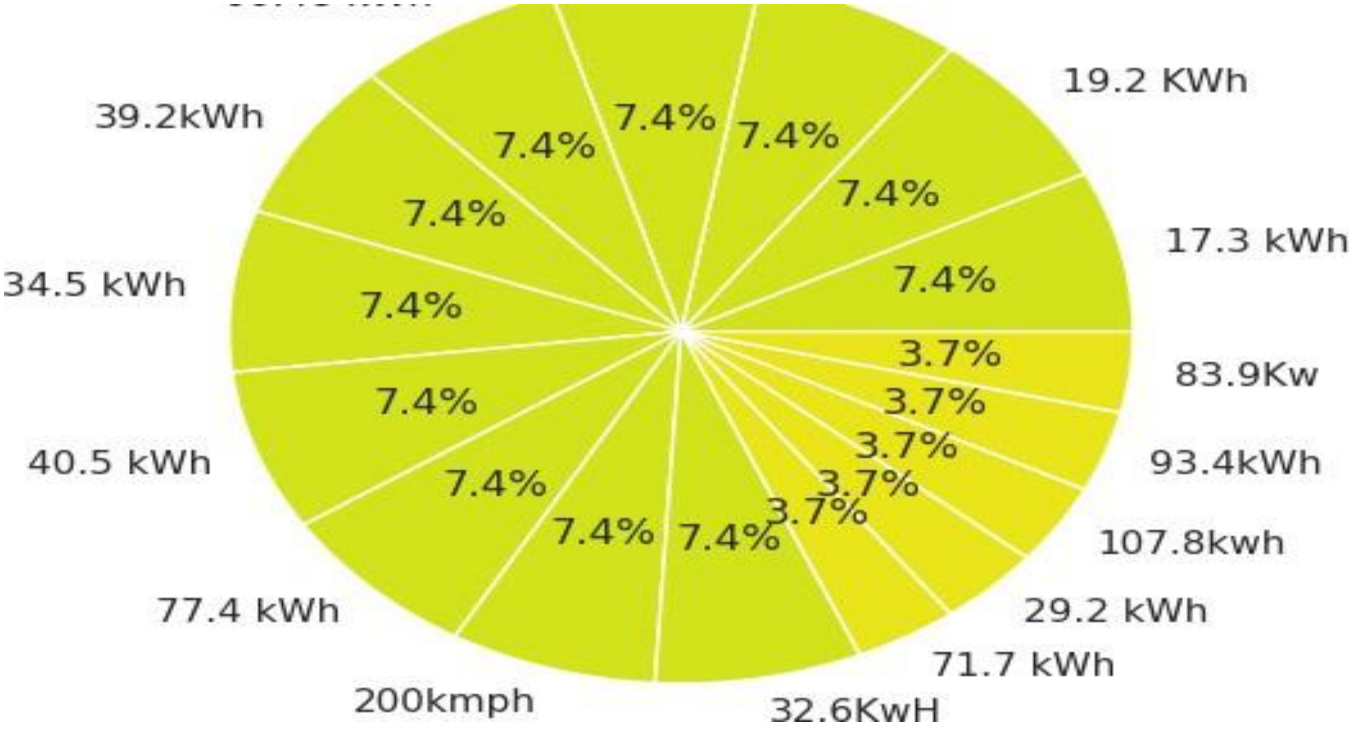
* ANALYSIS OF DISTRIBUTION OF DIFFERNT CAR PRICE IN EV



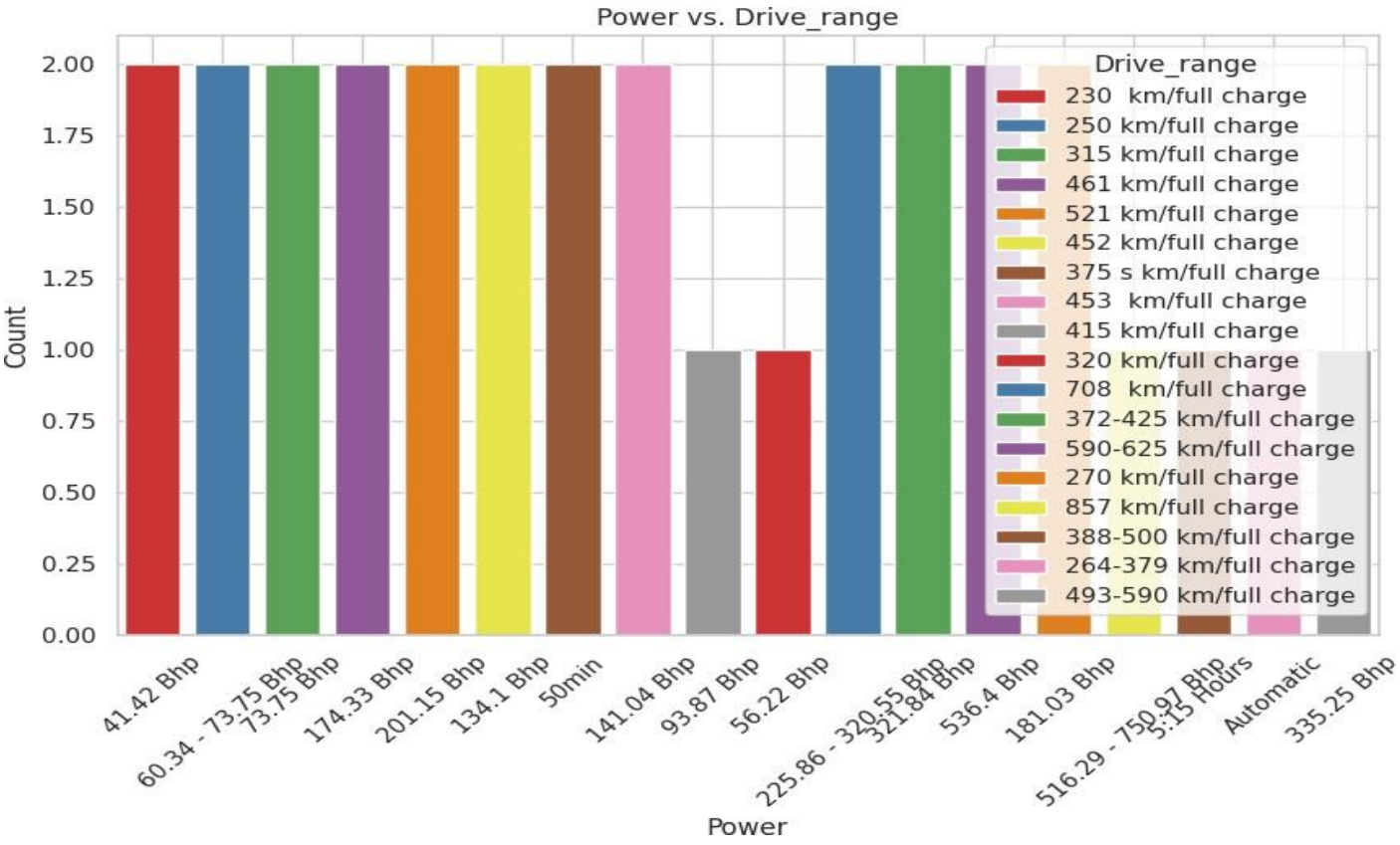
* EV available in india



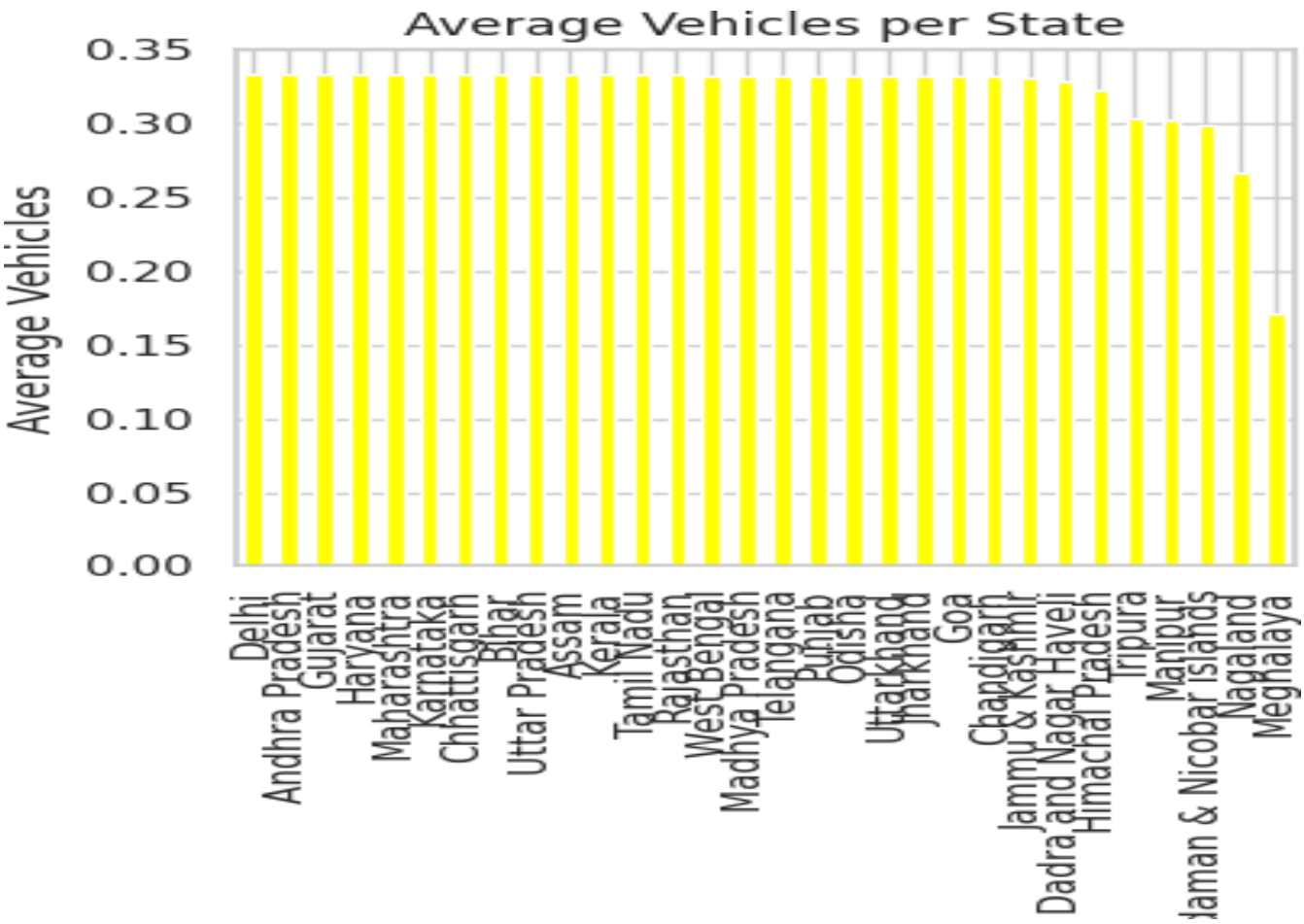
Electric Vehicles of Different Battery Capacity in India



Power vs. Drive_range



Bar plot for average vehicles per state



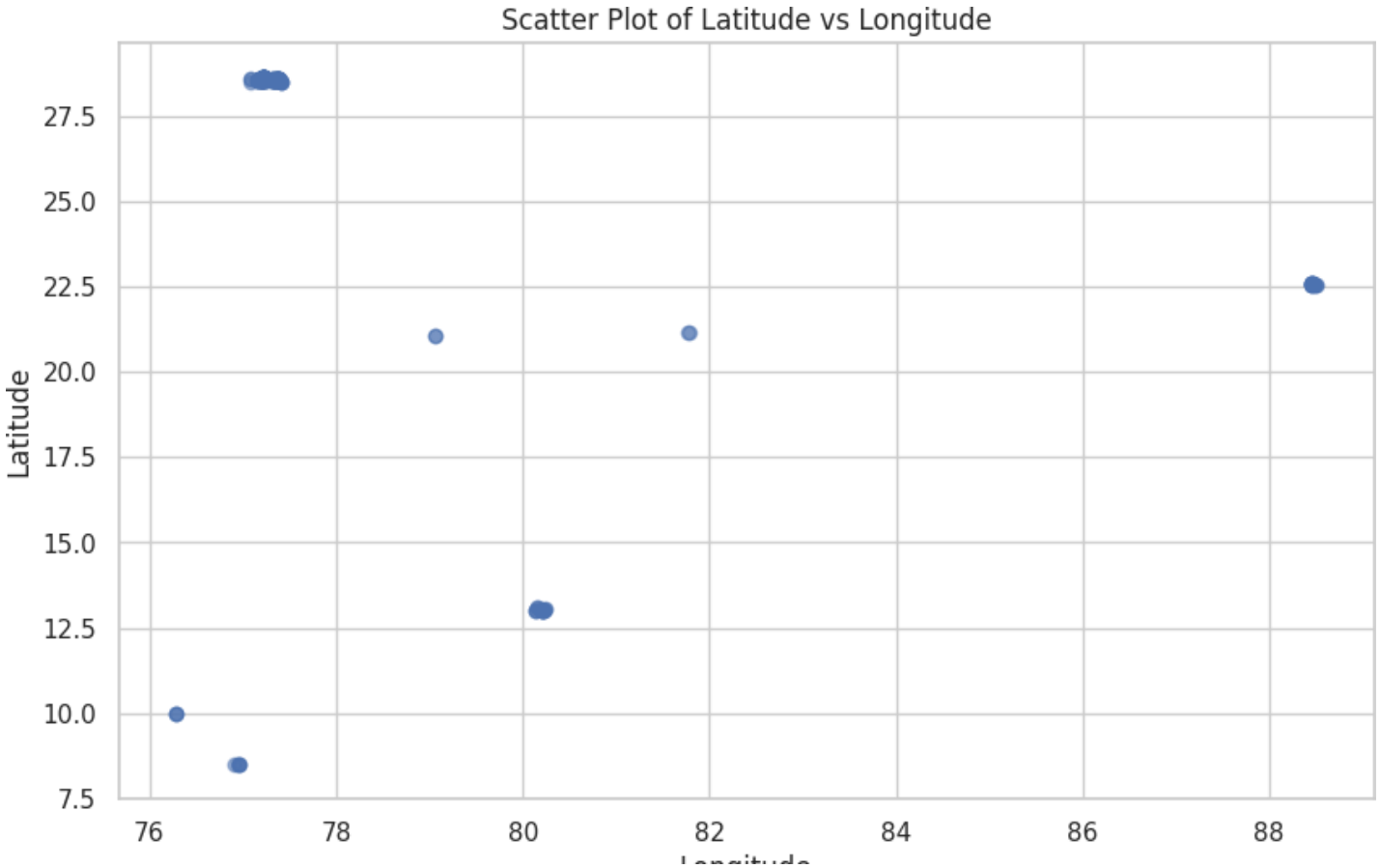
Strategies for EV Brands

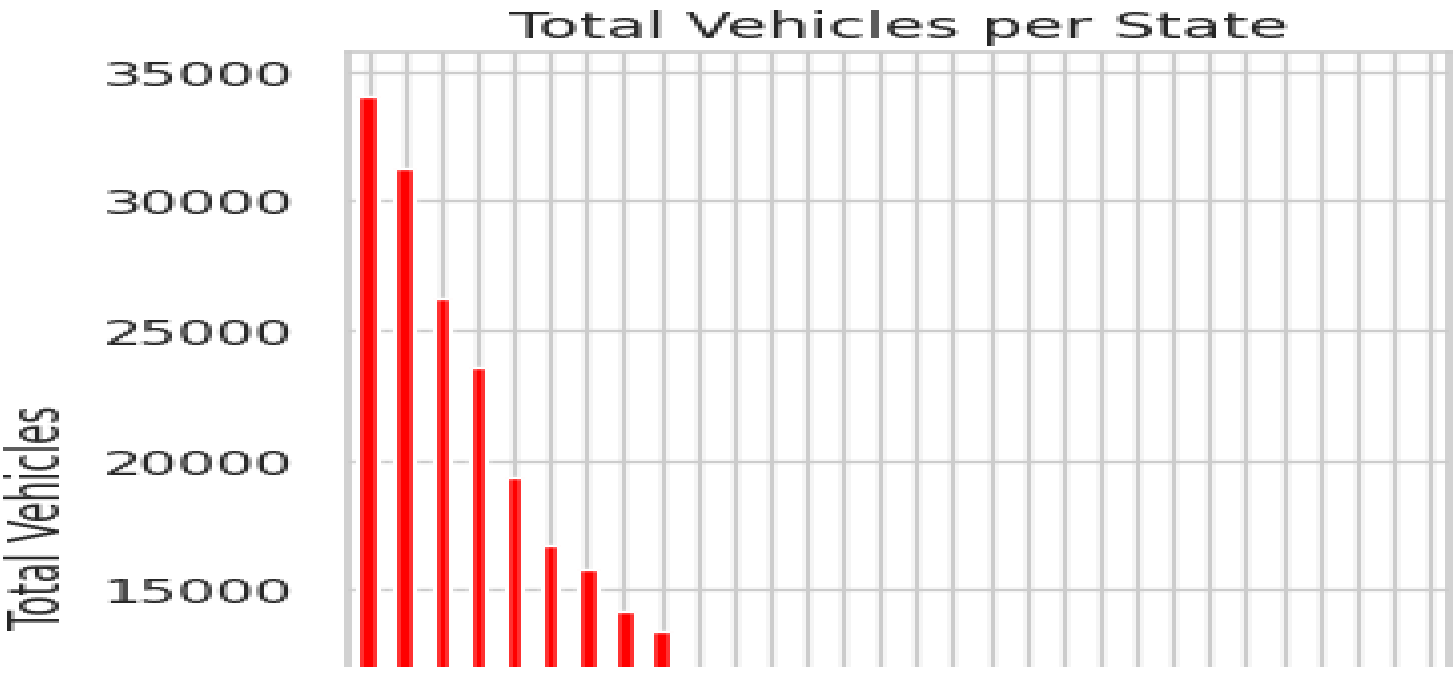
- Customization: Tailor EV offerings to the specific needs of each market segment, such as different range options and price points.
- Brand Partnerships: Collaborate with charging station operators and energy providers to expand infrastructure and offer bundled services.

By targeting these optimal market segments and focusing on high-potential states, EV brands can capitalize on India's growing demand for electric vehicles while ensuring that consumers have access to a reliable and convenient charging infrastructure.

3. Profiling Segments

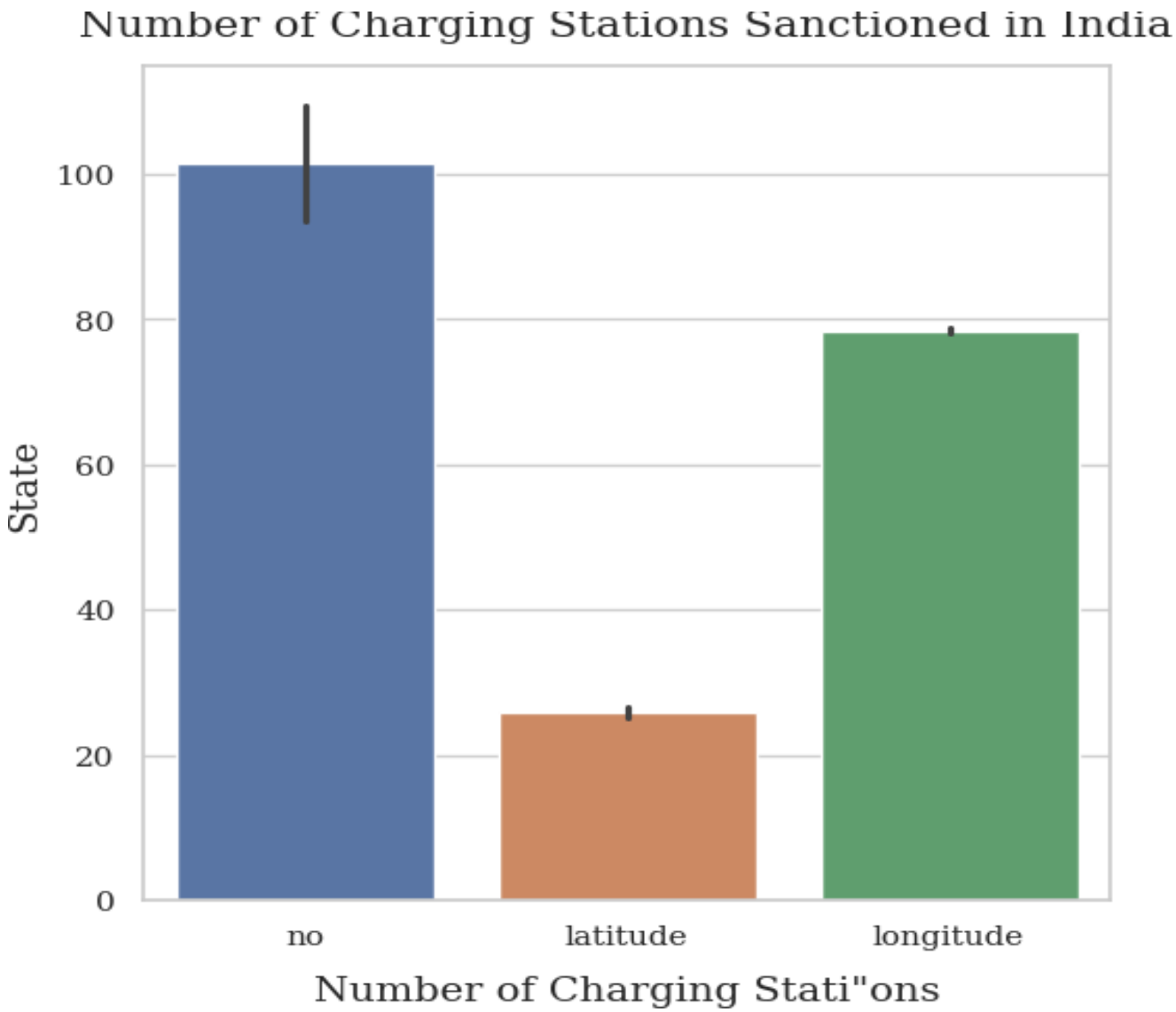
Scatter plot for Latitude and Longitude Charging Station in INDIA





Charging_Stations_Sanctioned

Charging stations sanctioned visualization from dataset

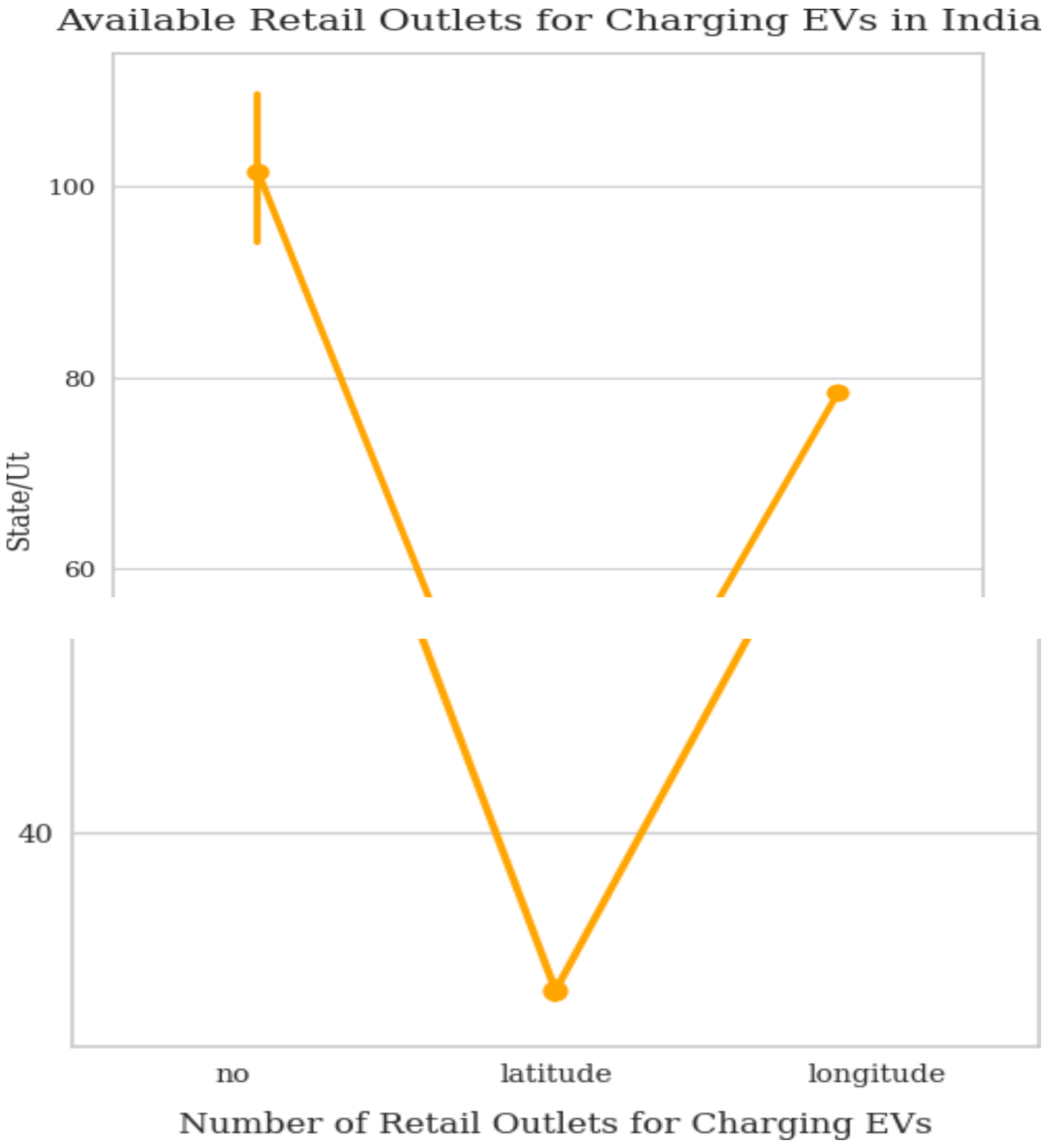


OBSERVATION

Observation: Maharashtra, Gujarat, Karnataka, Kerala, Uttar Pradesh, Rajasthan, and Andhra Pradhesh are among the top stateswith the majority of EV charging stations sanctioned while the remaining states have less number of the same.

Retail Outlets For Charging EVs In INDIA

Retail outlets visualization from dataset



4. Target Segment

In India, electric vehicle (EV) brands and charging station operators target specific market segments and focus on certain states to maximize their impact and achieve greater market penetration. Here's a brief overview of the target segments and states for EV brands and charging stations:

Target Segments for EV Brands

1. **Two-Wheelers**:
    - **Urban Commuters**: EV brands target individuals who use two-wheelers for short-distance daily commutes in cities and towns.
    - **Younger Consumers**: Brands focus on younger consumers who are more open to adopting new technologies and sustainable transportation options.

2. **Three-Wheelers**:
    - **Commercial Operators**: Brands target autorickshaw and other three-wheeler operators for passenger and cargo transport, offering lower operating costs and government incentives.
    - **Fleet Owners**: Larger fleet operators looking to transition to electric three-wheelers for cost savings and environmental compliance.

3. **Four-Wheelers**:
    - **Middle- to High-Income Urban Residents**: EV brands focus on offering premium electric cars to individuals and families seeking modern, sustainable, and stylish vehicles.
    - **Corporate Fleet Buyers**: Businesses and institutions looking to adopt EVs for corporate fleets to reduce operational costs and demonstrate corporate social responsibility.

5. Customizing the Market Mix

Customizing the market mix for electric vehicle (EV) brands in India in 2023 involves tailoring the product, price, place, and promotion aspects of the marketing strategy to meet the unique needs and preferences of different market segments and geographic areas. Here's a brief overview:

Product

- Vehicle Types: Offer a variety of EV types such as two-wheelers, three-wheelers, and four-wheelers to cater to different market segments.

Price

- Competitive Pricing: Set prices competitively to make EVs accessible to a broader range of consumers, considering government incentives and subsidies.

- Flexible Financing: Offer financing options, such as leasing and loan schemes, to lower the barrier to entry for potential buyers.

Place

- Distribution Channels: Establish a strong network of dealerships and service centers in high-demand areas, particularly in major cities and urban centers.

- Charging Infrastructure: Collaborate with charging station operators to ensure adequate coverage and access to charging facilities in key markets.

Promotion

- Targeted Marketing: Use localized advertising campaigns to raise awareness and promote EVs to specific consumer segments.

- Partnerships: Collaborate with local businesses and institutions to offer promotions and special deals to employees and customers.

By customizing the market mix in this way, EV brands can effectively address the diverse needs of the Indian market, driving greater adoption and satisfaction among consumers.

6. Optimal Market segments

Identifying the optimal market segments for electric vehicle (EV) brands in India in 2023 involves considering factors such as consumer preferences, vehicle types, and geographic locations, along with the distribution and availability of charging stations. Here's an overview of the optimal market segments and geographic focus for EV brands in India in 2023:

Optimal Market Segments

1.Two-Wheelers:

2. Three-Wheelers:

3. Four-Wheelers:

In brief, the optimal market segment for electric vehicles (EVs) and charging stations in India in 2023 is urban residents and commercial operators. This includes:

- Urban Residents: Middle- to high-income individuals and families living in major cities who are open to adopting electric two-wheelers, three-wheelers, and four-wheelers for their daily commutes.

- Commercial Operators: Fleet owners and drivers of three-wheelers and four-wheelers, such as autorickshaws and taxis, who are looking for lower operational costs and compliance with environmental regulations.

Focusing on these segments allows EV brands and charging station operators to capitalize on the growing demand for sustainable transportation in urban areas, where the population density and shorter commutes make EVs a practical choice.

7. Conclusion

Based on the above analysis and visualizations, it would be really helpful for any company which is looking to open up an EV startup in India . In this report the analysis of diferent datasets related to EV have been done on

1] Brands and models of EVs in India with their attributes

2] State wise distribution of 2,3,4 wheeler EV s and passenger cars in India

3] Electric Vehicle Charging Stations In INDIA Analysis.

-The study concludes that understanding the different segments in the Indian EV market is crucial for EV manufactures and marketers to effectively target their customers and promote adoption of EV in India. We have came up with conclusions are as follows related to EV

- Uttar Pradesh, Gujrat, Haryana are among the top states with the majority of EV 2W vehicles, while the remaining states haveless number
- Uttar Pradesh, Chattisgarh, Haryana are among the top states with the majority of EV 3W vehicles, while the remaining stateshave less number
- Delhi, Goa, Maharashtra, Kerela and Karnataka are among the only states with EV buses in India .
- Maharashtra, Gujarat, Karnataka, Kerala, Uttar Pradesh, Rajasthan, and Andhra Pradesh are among the top states with the majority of EV charging stations sanctioned while the remaining states have less number of the same.

8. Github

https://github.com/GAJANAN07/EV-Vehicle-market-segmentation

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