Feynn Labs: project2

Market Segmentation Analysis of Electric Vehicles Market in India

Done By:

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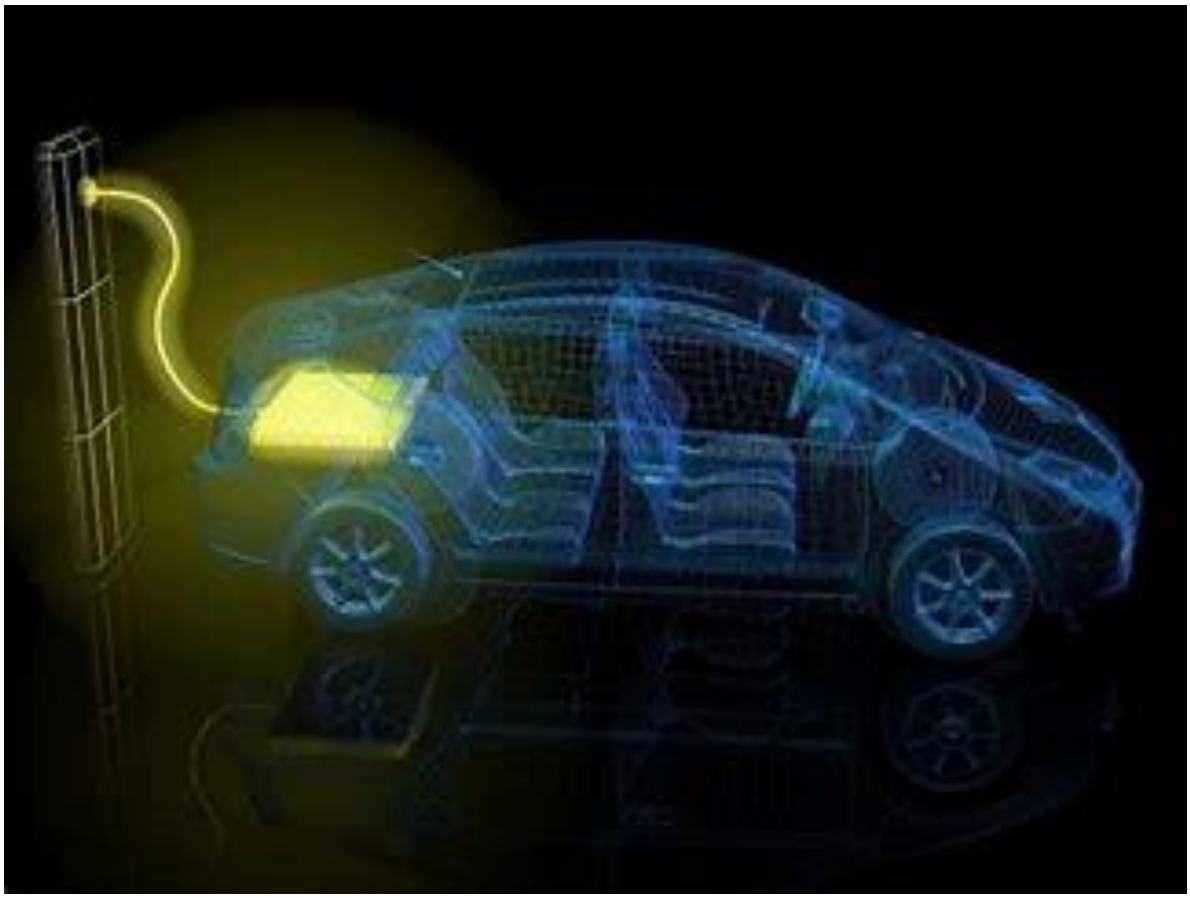


Problem Statement:

This study focuses on the Electric Vehicle (EV) market in India. It aims to create a strategic entry plan for an EV startup by analyzing market segmentation
Key steps include:
- Identifying suitable customer and vehicle segments.
- Examining geographic, demographic, psychographic, and behavioral factors.
Important areas of analysis are:
- Regional trends in EV adoption.
- Consumer affordability and preferences.
- Buying behavior and availability of charging infrastructure.
The goal is to use data-driven insights to recommend the most viable market segment. This approach will help ensure maximum adoption, business profitability, and long-term sustainability in India's changing EV mark.

Fermi Estimation

By the end of 2026, around 12-15% of India's population is expected to own electric vehicles. Given that India's projected population in 2025 is 1.45 billion, approximately 60% (0.87 billion) falls within the working-age group (18-60 years). With an estimated 48% employment rate, this results in 418 million employed individuals. Among them, around 55 million belong to the middle class and above, making them potential EV buyers. Assuming 10% of these individuals purchase an EV, the estimated number of EV owners would reach 15-20 million by 2026. Estimating Population Growth (2023-2025):
P(2022) = 1.44185 billion
P(2023) = 1.454 billion
P(2024) = 1.467 billion
P(2025) = 1.48 billion (projected)

Average annual population increase ≈ 13 million
Assuming A(x) remains constant every year:

Using the employment formula:

Analyzing population growth trends, India's population increased steadily from 1.441 billion in 2022 to a projected 1.48 billion by 2025, with an annual growth rate of approximately 13 million. Using employment estimation formulas, the employment rate in 2026 is expected to stabilize at 48%, meaning 200 million people will be employed. Out of these, only a fraction can afford EVs, leading to an estimated 20 million EV users by the end of 2026. This analysis highlights the growing adoption of EVs in India, driven by increasing affordability, government incentives, and infrastructure development.

Data Sources and Collection

India Electric Vehicle Report 2023 by Bain & Company: This report provides an in-depth analysis of India's EV market, including adoption rates, market trends, and future projections. Plug-in electric vehicles in India - Wikipedia

India Electric Vehicle Market Size & Share Report by Grand View Research: Offers comprehensive data on market size, growth rates, and key drivers influencing the EV market in India. India Electric Vehicle (EV) Market Size & Share Report, 2030 .

sources like the FAME India website, MoRTH's VAHAN Dashboard, and reports from SIAM (Society of Indian Automobile Manufacturers) for vehicle sales and production data. Industry reports from Bain & Company (India EV Report 2023), Fortune Business Insights (EV Market Report), and Mordor Intelligence provide valuable insights. Company reports from Tata Motors (Investor Relations) and Ola Electric (Official Website) can help understand market trends. News platforms like **Reuters,** Economic Times Auto, and **Financial Times** cover the latest industry developments. These sources will help you collect comprehensive data for market segmentation analysis.

Performing Pre-Processing and Exploratory Data Analysis (EDA)

Understanding the Data

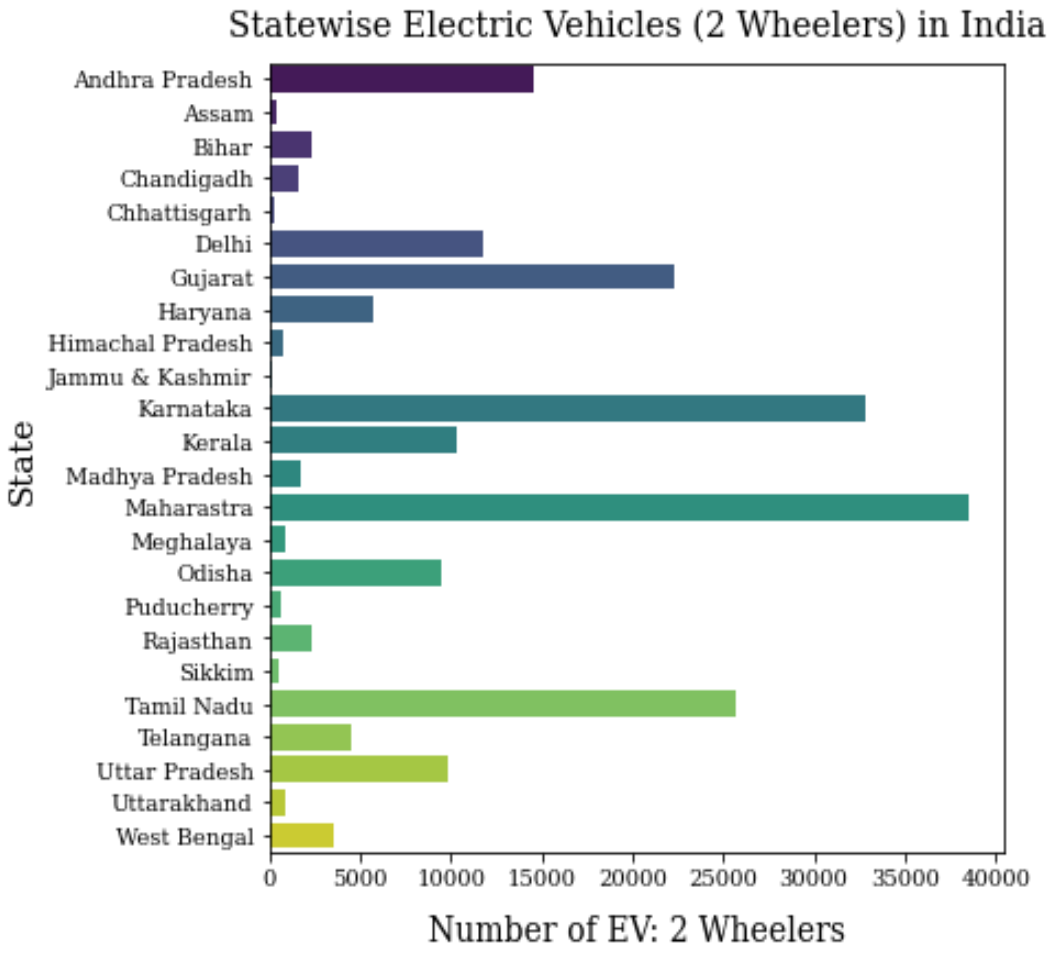
Before starting EDA, ensure the dataset contains relevant attributes such as:

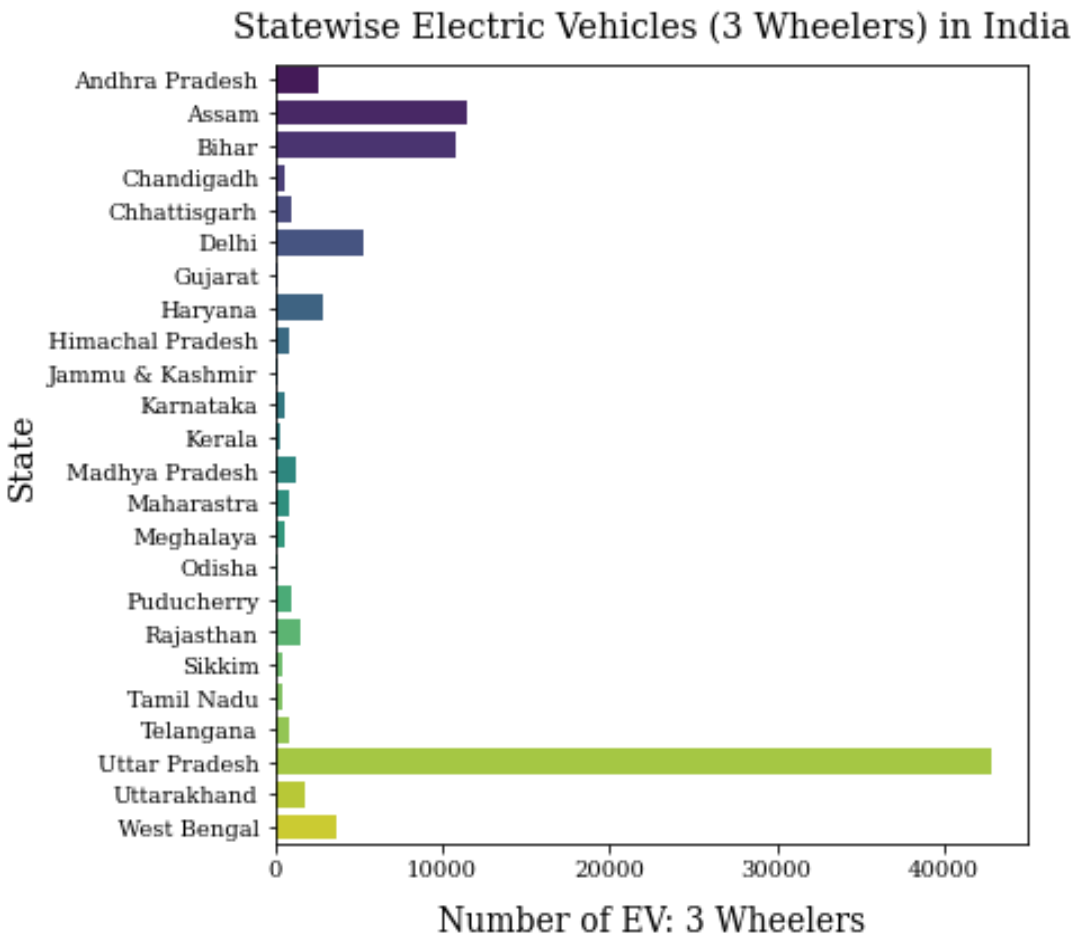
- EV Sales Data: Year, Manufacturer, Model, Sales Volume, Market Share
- Vehicle Specifications: Battery Capacity, Range per Charge, Charging Time, Price
- Consumer Demographics: Age, Location, Income Level, Purchase Intent

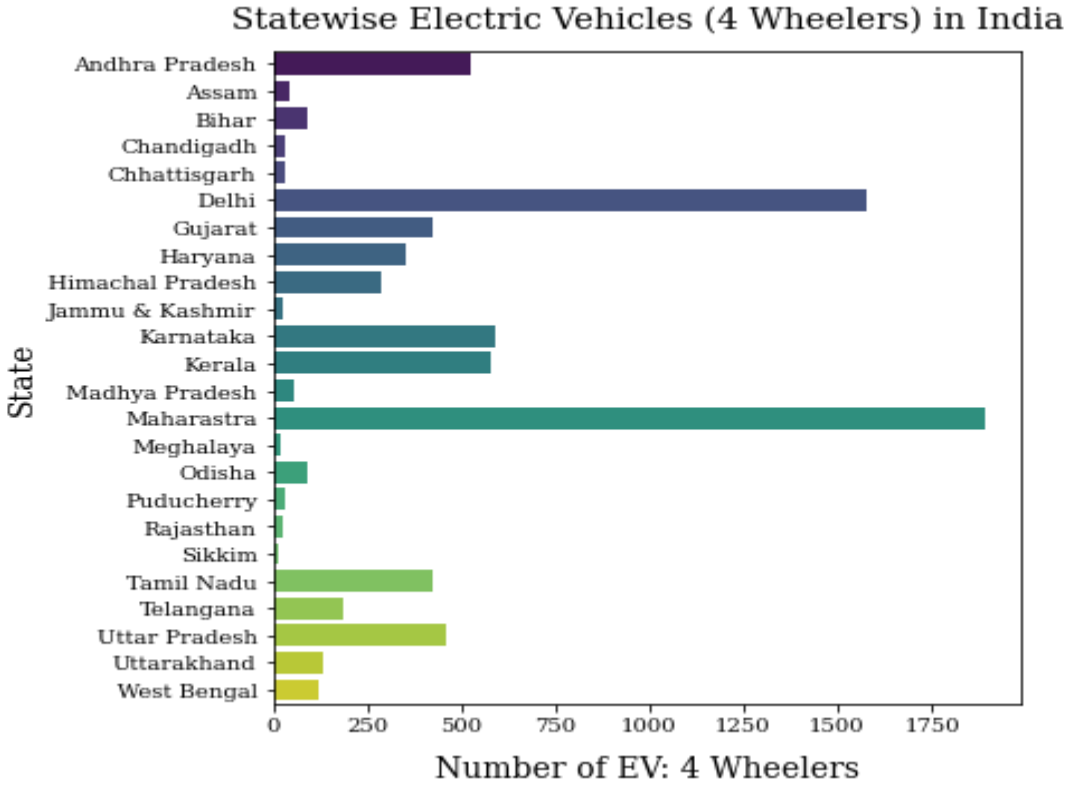
- Infrastructure Data: Charging Station Availability, Charging Speed, Government Incentives
- Market Trends: Growth Rate, Demand Forecast, Competitor Analysis

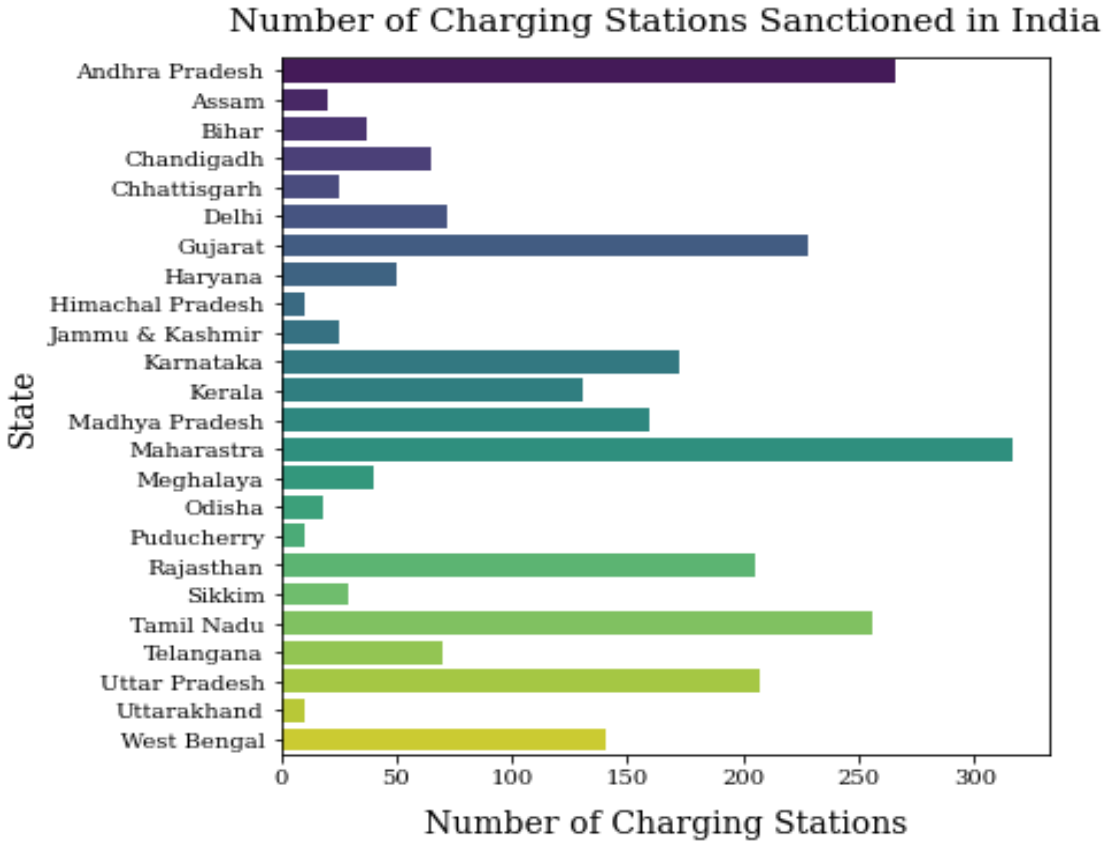
Data Cleaning & Preprocessing

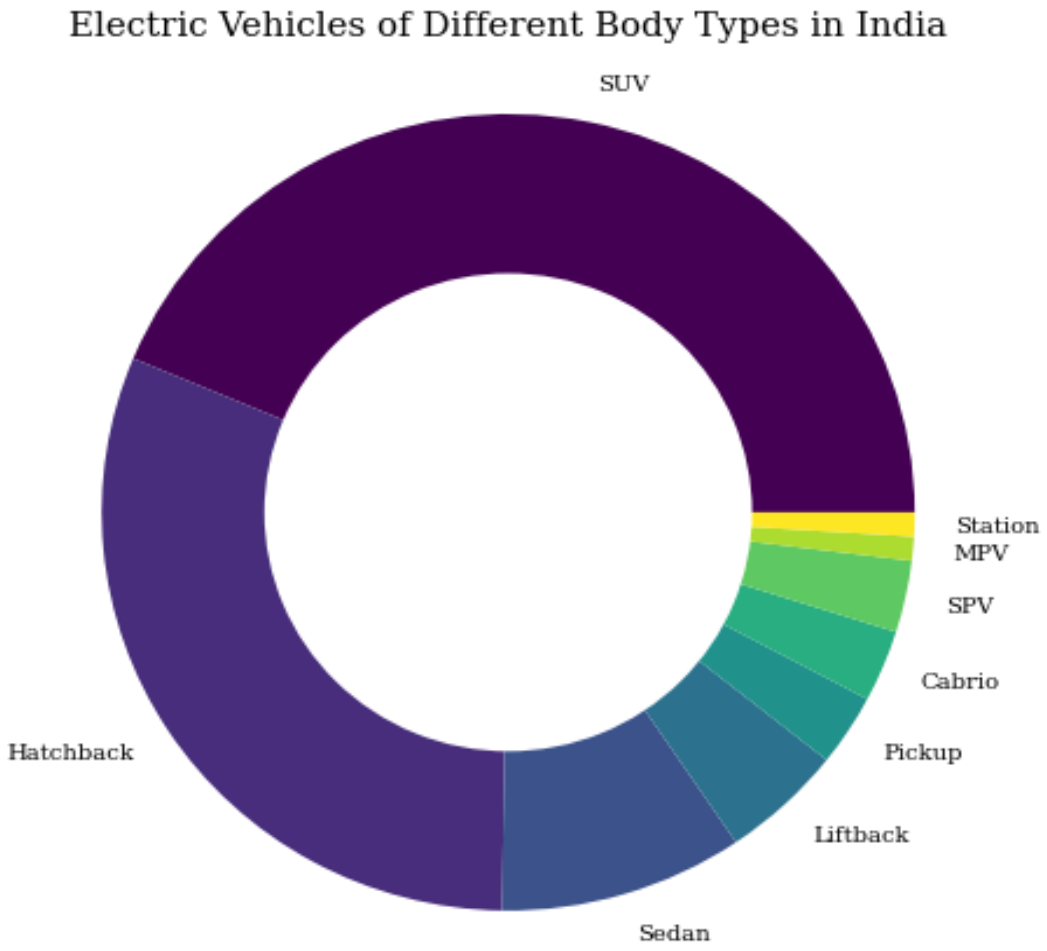
- Handle missing values (e.g., impute with mean/median or drop rows).
- Convert categorical data (like Manufacturer, State) using *one-hot encoding*.
- Check for duplicates and remove them.
- Convert date columns to datetime format if applicable.
- Normalize/scale numerical variables for better visualization.

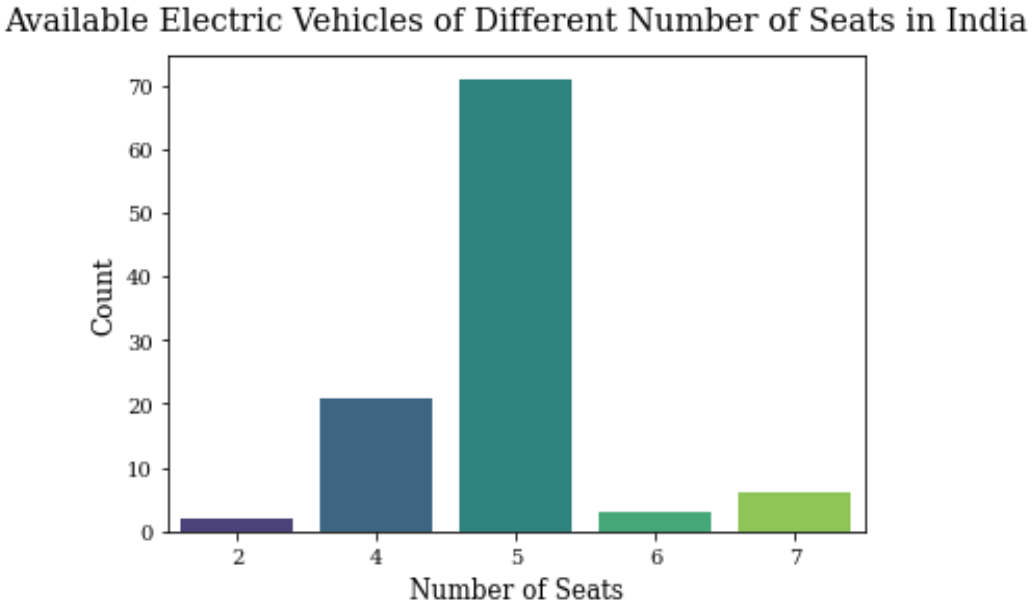


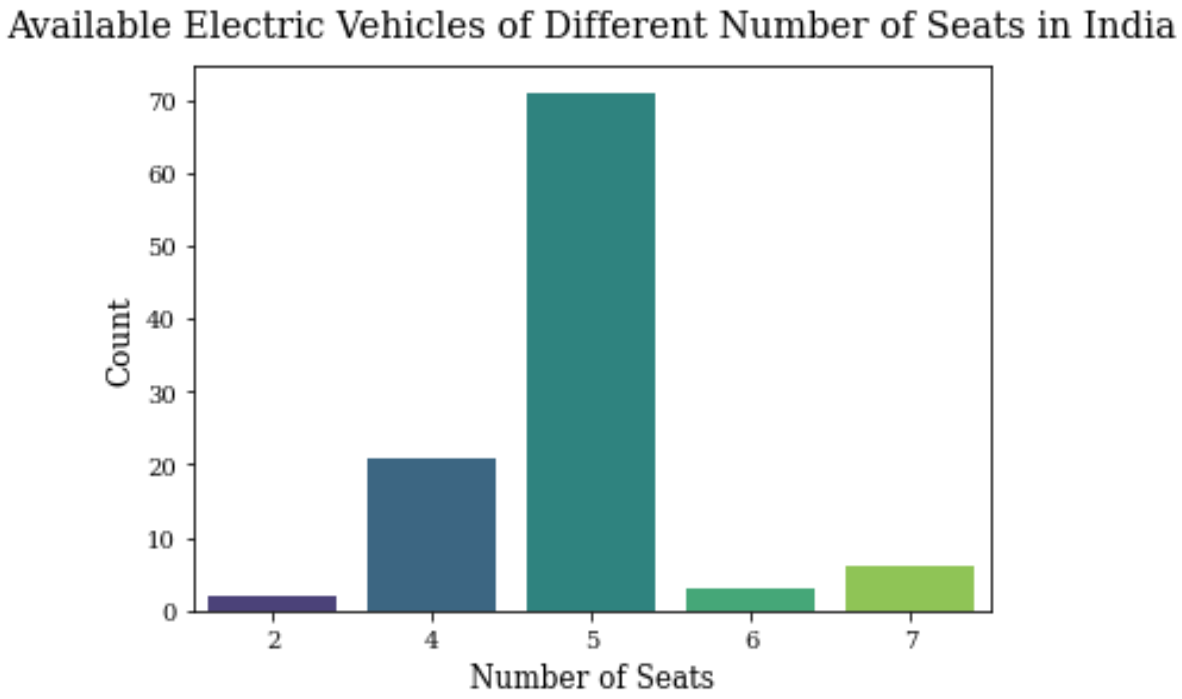

Statewise Electric Vehicles (3 Wheelers) in India
Andhra Pradesh
Assam
Bihar
Chandigadh
Chhattisgarh
Delhi
Gujarat
Haryana
Himachal Pradesh
Jammu & Kashmir
Karnataka
Kerala
Madhya Pradesh
Maharastra
Meghalaya
Odisha
Puducherry
Rajasthan
Sikkim
Tamil Nadu
Telangana
Uttar Pradesh
Uttarakhand
West Bengal
State
0
10000
20000
30000
40000
Number of EV: 3 Wheelers


Statewise Electric Vehicles (4 Wheelers) in India
Andhra Pradesh
Assam
Bihar
Chandigadh
Chhattisgarh
Delhi
Gujarat
Haryana
Himachal Pradesh
Jammu & Kashmir
Karnataka
Kerala
Madhya Pradesh
Maharastra
Meghalaya
Odisha
Puducherry
Rajasthan
Sikkim
Tamil Nadu
Telangana
Uttar Pradesh
Uttarakhand
West Bengal
State
0
250
500
750
1000
1250
1500
1750
Number of EV: 4 Wheelers


Number of Charging Stations Sanctioned in India
State
Andhra Pradesh
Assam
Bihar
Chandigadh
Chhattisgarh
Delhi
Gujarat
Haryana
Himachal Pradesh
Jammu & Kashmir
Karnataka
Kerala
Madhya Pradesh
Maharastra
Meghalaya
Odisha
Puducherry
Rajasthan
Sikkim
Tamil Nadu
Telangana
Uttar Pradesh
Uttarakhand
West Bengal
0
50
100
150
200
250
300
Number of Charging Stations


Electric Vehicles of Different Body Types in India
SUV
Station
MPV
SPV
Cabrio
Pickup
Liftback
Sedan
Hatchback


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



Segment Extraction:

K-Means Clustering is one of the most popular Unsupervised Machine Learning Algorithms used for solving classification problems. K-Means segregates the unlabeled data into various groups, called clusters, based on having similar features and common patterns.

Suppose we have *N* number of unlabeled multivariate datasets of various features like water availability, price, city, etc., from our dataset. The technique to segregate datasets into various groups, on the basis of having similar features and characteristics, is called **Clustering**.

The groups being formed are known as **Clusters**. Clustering is widely used in Unsupervised Learning Algorithms in Machine Learning as it can segregate multivariate data into various groups, without any supervisor, based on a common pattern hidden inside the datasets.

Profiling Potential Segments

Geographical Segmentation

Urban Areas: Delhi, Mumbai, Bangalore, and Pune cities, with better infrastructure, higher disposable income, and growing awareness of environmental sustainability.
Rural Areas: Growing markets where the adoption of EVs may rise,
though they face problems like fewer charging stations and low income levels.

Income Groups

High Income Users: They can be potential buyers for high-end electric vehicles from brands

like Tata Motors, MG Motors, and also Hyundai.
Middle-Income Consumers: Attracted to affordable, mass-market EVs from brands like Mahindra Electric and Tata Motors.
Low-Income Consumers: Are an untapped source in rural areas,
especially now that electric two-wheelers, like Ola Electric, are affordable.

Product-type segmentation

Electric Two-Wheelers: The fastest-growing segment in India, targeting young consumers, daily commuters, and eco-conscious riders. Key players include Ola Electric, Ather Energy, and Hero Electric.
Electric Cars: Growing in urban areas, with players like Tata Motors (Tata Nexon EV), Mahindra Electric, and Hyundai (Kona EV) catering to different price ranges.
Electric Commercial Vehicles: for delivery, transport, and logistics. Companies are focused on commercial EVs- Tata Motors, Ashok Leyland, and Mahindra Electric.

Target Segments:

Based on a detailed market analysis, the ideal target segment for electric vehicles (EVs) can be defined by the following factors:

Psychographic Factors: Consumers who prioritize comfort and value for money in their vehicle choices. These buyers seek a balance between luxury and affordability, making them more inclined toward EVs that offer premium features at a competitive price.
Behavioral Factors: Acceleration performance-conscious customers with a viable price range.
This target market includes the customers who would like to be driven by strong acceleration and cost-effectiveness in their purchase decision.
Geographic Factors: The states that are more EV-friendly, which essentially means that governments have incentives and better charging infrastructure available,
and high adoption rates for electric vehicles.

Customizing the Market Mix

A structured 4Ps (**Product, Price, Place, Promotion**) strategy is essential to growth in the market.
Product: The EV should be designed for powerful performance, comfort,
and intelligent technology to answer consumer expectations. Further differentiation must be achieved by AI-driven safety features and exceptional battery efficiency.

Price: Stick to the price bracket of ₹20–30 lakh, provide EMI schemes, leasing plans, and subsidies from the government to attract consumers. Dynamic
pricing must be undertaken according to the trends in the market.
Place- Focus on friendly states with proper infrastructure. Develop dealership networks and strengthen online sales. Partner with fleet operators and corporate buyers.

Promotion- Use the power of digital marketing, partnerships with influencers, and targeted ads for increased awareness. Emphasize cost savings and performance benefits by offering incentives with engaging content.
Companies should be able to adapt to market challenges, conduct SWOT analyses, and invest in R&D for continuous improvement. A strategic approach will ensure maximized sales and a strong market presence.

Potential Sales in the Early Market

Purchasing a vehicle is a major milestone, especially for families looking for comfort, convenience, and affordability. Our insights help customers find the best EV options at competitive prices based on various factors like location and market trends.

To accelerate EV adoption in India, key focus areas include:

1. **Retrofitting Public Transport** – Converting buses, taxis, and three-wheelers to hybrid/electric models to reduce emissions and infrastructure load.
2. **Government Incentives** – Subsidies, tax benefits, and price-gap reduction strategies to make EVs more affordable.
3. **Charging Infrastructure** – Expansion of grid-connected, renewable, and private charging stations at petrol pumps, bus stops, and public spaces.
4. **Electrical Propulsion System (EPS)** – Encouraging domestic manufacturing of EPS, battery tech, and motor systems to reduce reliance on imports.
5. **Skilled Workforce Development** – Training certified professionals and technicians for EV maintenance and innovation.
6. **Consumer Awareness** – Extensive advertising, digital promotions, and educational programs to highlight benefits like lower emissions, cost savings, smooth driving experience, and proven global adoption.

With strong policies, infrastructure, and market support, India's EV segment in the **₹20–30 lakh range** is set for rapid growth, driving sustainability and innovation.

The MOST OPTIMAL MARKET SEGMENTS:

India's **EV industry** is experiencing rapid growth, driven by increasing government incentives, rising fuel prices, improved charging infrastructure, and consumer demand for sustainability. Leading companies such as Tata Motors, Hero Electric, Ather Energy**,** Ashok Leyland, Hyundai, and Tesla are accelerating competition in this sector.

Sustainability & Cost Efficiency – The zero-emission vehicle trend is being fueled by increasing environmental concerns, increasing petrol/diesel costs, and lower long-term maintenance costs of EVs.

Localized Manufacturing & Partnerships: Companies should really focus on local production to earn PLI and reduce imports. Collaboration in technology related to batteries, motor systems, and EV components will grow exponentially.

Commercial Fleet & Last-Mile Delivery Boom: As rise in e-commerce, food delivery, and urban logistics demands contribute significantly towards growth of electric two-wheelers and three-wheelers and is also highly profitable.

Charging Infrastructure Growth – The ecosystem of EV charging is expanding fast, with investments from both the public and private sectors in fast-charging stations, battery swapping networks, and renewable-powered charging hubs.

Strategic Market Expansion – First, companies need to establish themselves in metro cities like Delhi, Mumbai, Bengaluru, Chennai, and Hyderabad and then expand to tier-2 cities. This will ensure that the supply chain networks are robust, infrastructure is available, and early market penetration takes place.

The India EV industry will grow exponentially, driven by robust government support, increasing consumer adoption, and an expanding infrastructure. Companies that invest in localized production, strategic partnerships, and sustainable supply chains will lead the future of the Indian EV market.