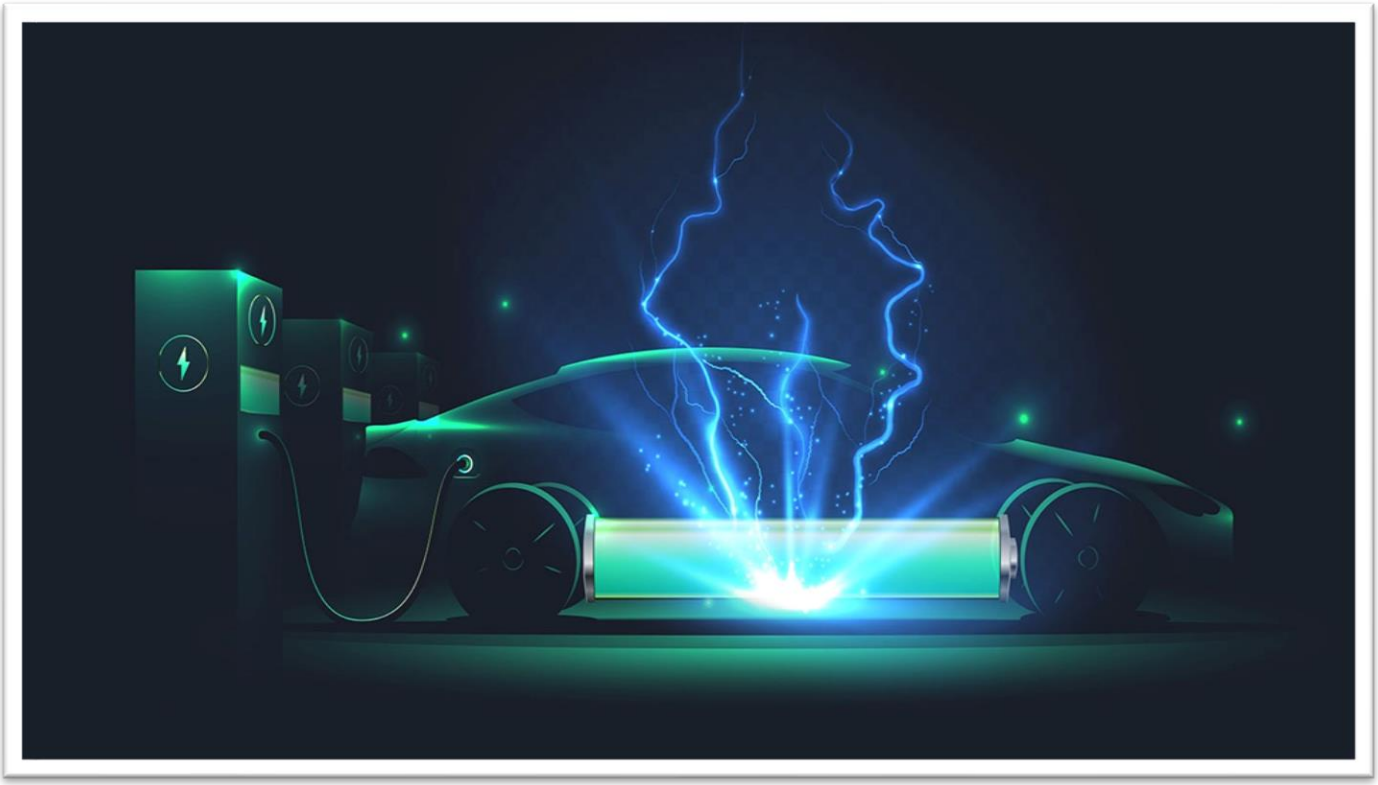
MARKET SEGMENTATION ANALYSIS OF EV MARKET



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Problem Statement:

Task is to analyze the Electric Vehicles Market in India using *Segmentation* analysis and come up with a feasible strategy to enter the market, targeting the segments most likely to use their product in terms of Geographic, Demographic, Psychographic, and Behavioral.

In this report we analyze the Electric Vehicles Market in India using segments such as region, price, type of vehicles (2 wheelers, 3 wheelers, 4 wheelers, bus), retail outlets, manufacturers etc.

Market Overview

Current Market Landscape

- **Market Size and Growth**: The Indian EV market was valued at USD 1.45 billion in 2021 and is expected to grow at a CAGR of 44% from 2022 to 2027.
- **Government Policies**: Incentives like the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) scheme and various state-level policies are boosting market growth.
- **Technological Advancements**: Improvements in battery technology and the establishment of charging infrastructure are crucial drivers.

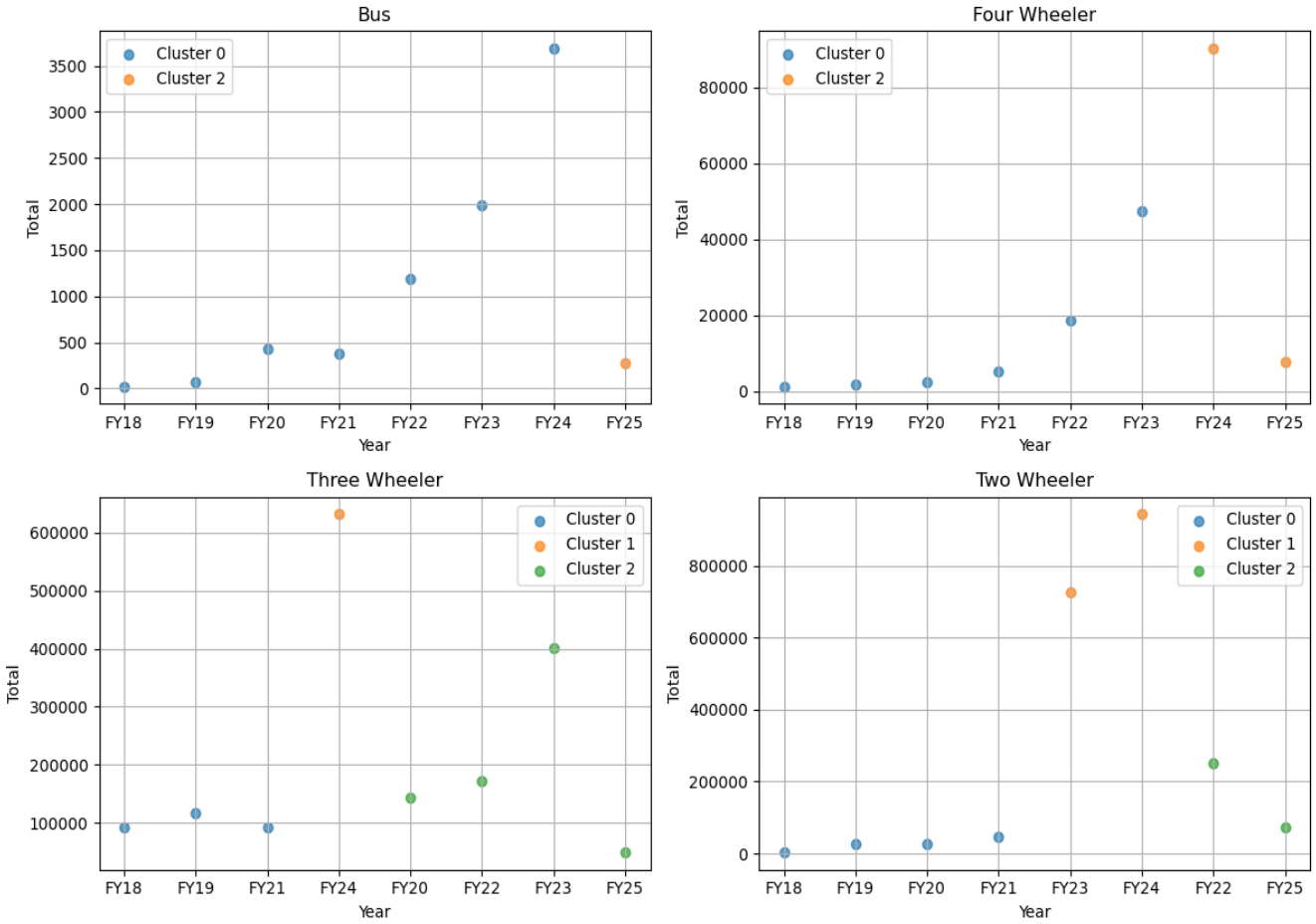
Datasets Collection:

- https://data.gov.in/resource/category-wise-details-electric-vehicles-ev-information-received-federation-automobile
- https://www.kaggle.com/datasets/kkhandekar/electric-vehicles-india
- https://catalog.data.gov/dataset/electric-vehicle-population-data

Exploratory Data Analysis

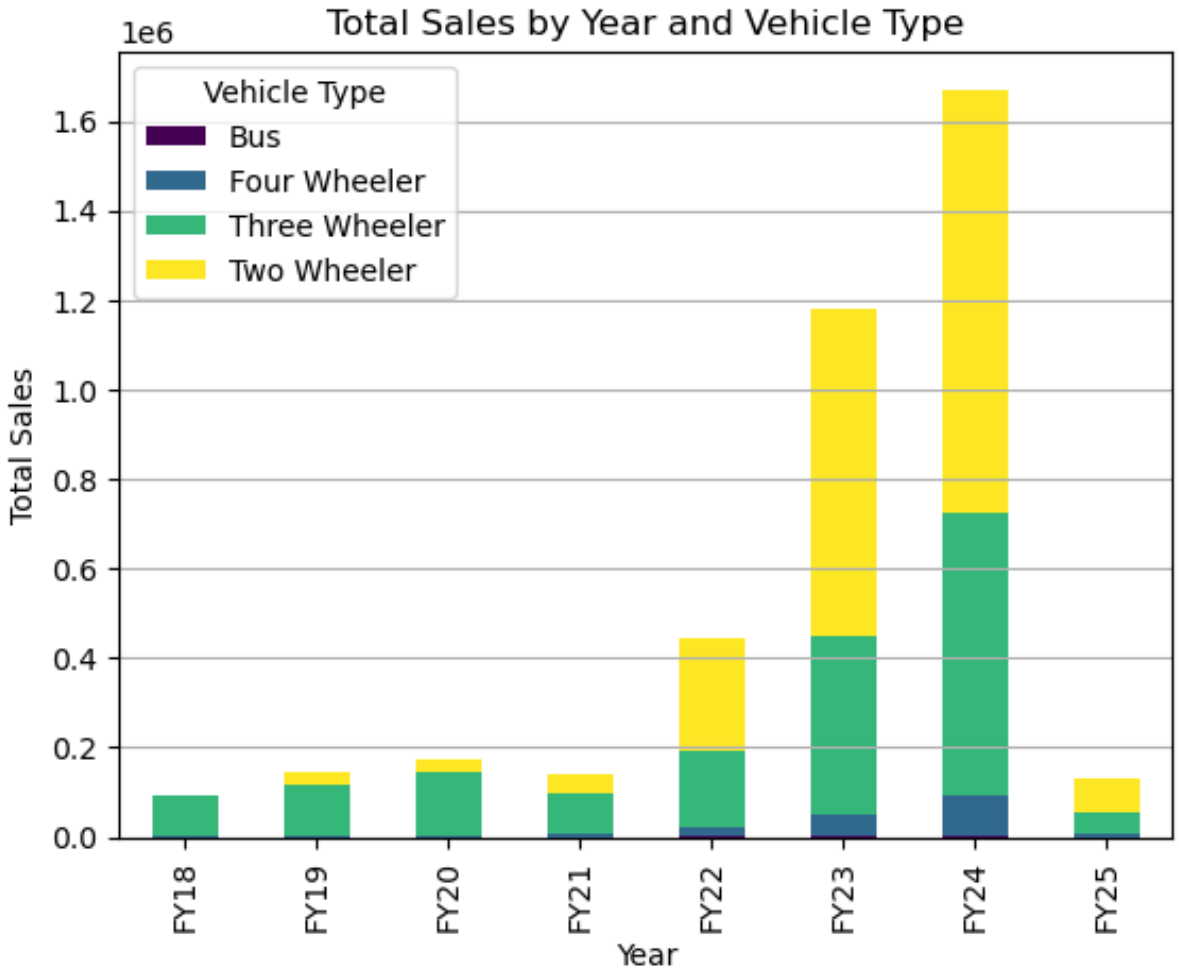
Exploratory Data Analysis (EDA) is an approach in data analysis that uses various techniques primarily for summarizing the main characteristics of a dataset, often with visual methods. The goal of EDA is to discover patterns, spot anomalies, test hypotheses, and check assumptions with the help of summary statistics and graphical representations.

We have used a scatter plot and bar graph below to visualise the total sales by year for each vehicle type.



Here, we can clearly see that all vehicles rather it be 2 wheeler, 3 wheeler, 4 wheeler and bus all segments vehicles have most sales in 2024. We can also estimate that the sales of Year 2025 will surpass the sales of 2024.

Also the sales of some class of vehicles has been dipped in 2020 due to Covid – 19 Crisis. But again it boomed in 2021 due to various government policies for Electronic Vehicles. We can see that 2 wheelers and 3 wheelers are the most sold class of EV vehicles.



Here, the bar graph represents the sales data of all class vehicles. 2 wheelers and 3 wheelers had the most sales and particularly in the year 2024.

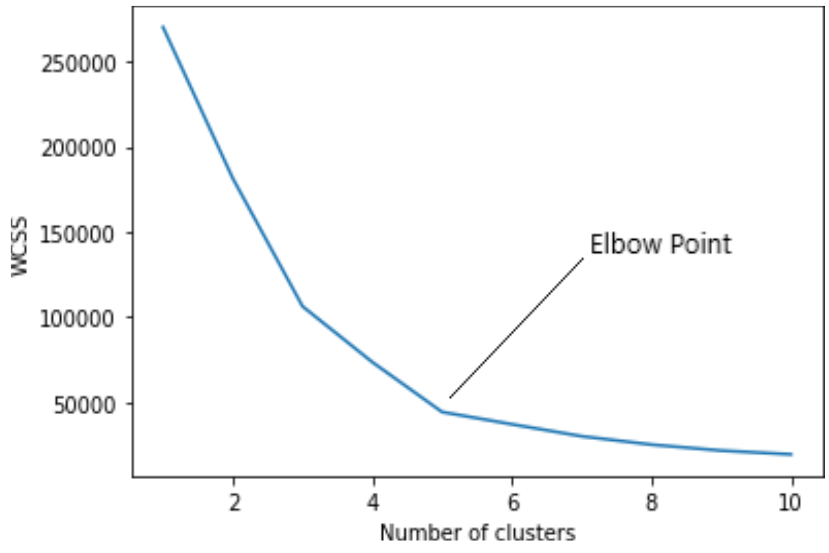
Segment Extraction:

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, common patterns.

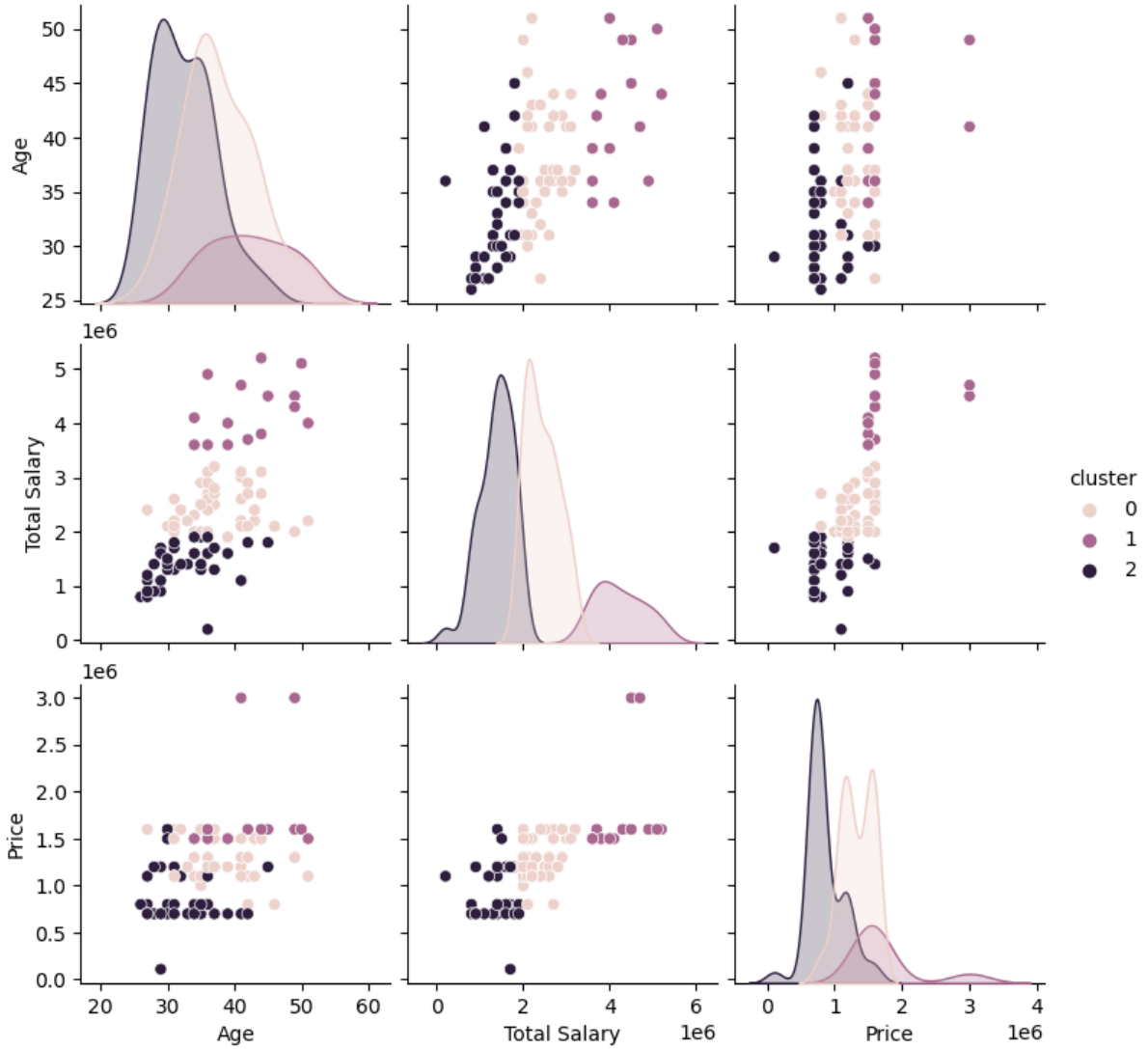
Suppose we have N number of Unlabeled Multivariate Datasets of various features like water-availability, price, city etc. from our dataset. The technique to segregate Datasets into various groups, on the basis of having similar features and characteristics, is called Clustering. The groups being Formed are known as Clusters. Clustering is being used in Unsupervised Learning Algorithms in Machine Learning as it can segregate multivariate data into various groups, without any supervisor, on the basis of a common pattern hidden inside the datasets.

In the Elbow method, we are actually varying the number of clusters (K) from 1 – 10. For each value of K, we are calculating WCSS (Within-Cluster Sum of Square). WCSS is the sum of squared distance between each point and the centroid in a cluster. When we plot the WCSS with the K value, the plot looks like an Elbow.

As the number of clusters increases, the WCSS value will start to decrease. WCSS value is largest when K = 1. When we analyze the graph, we can see that the graph will rapidly change at a point and thus creating an elbow shape. From this point, the graph starts to move almost parallel to the X-axis. The K value corresponding to this point is the optimal K value or an optimal number of clusters.



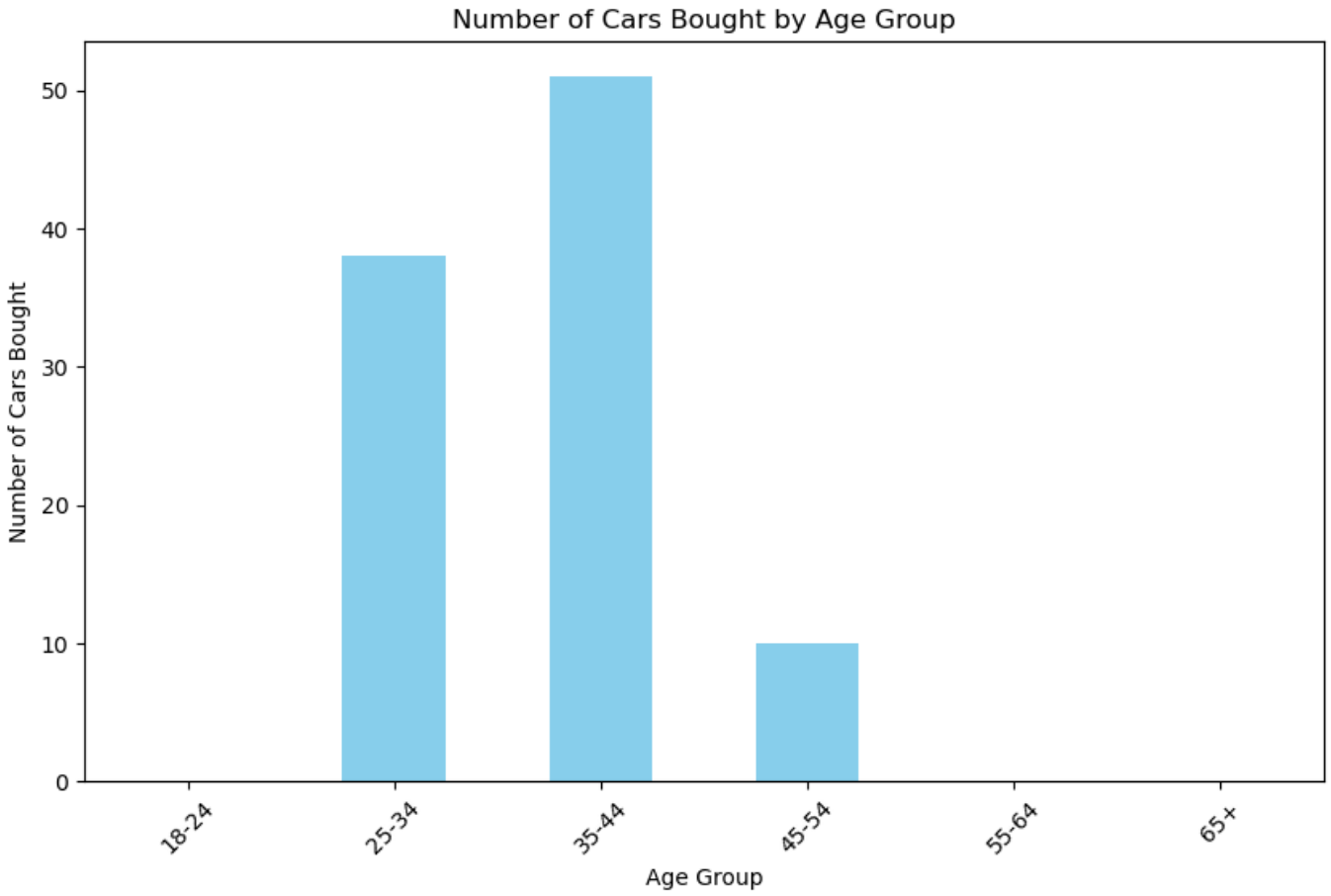
Behavioural Factors:



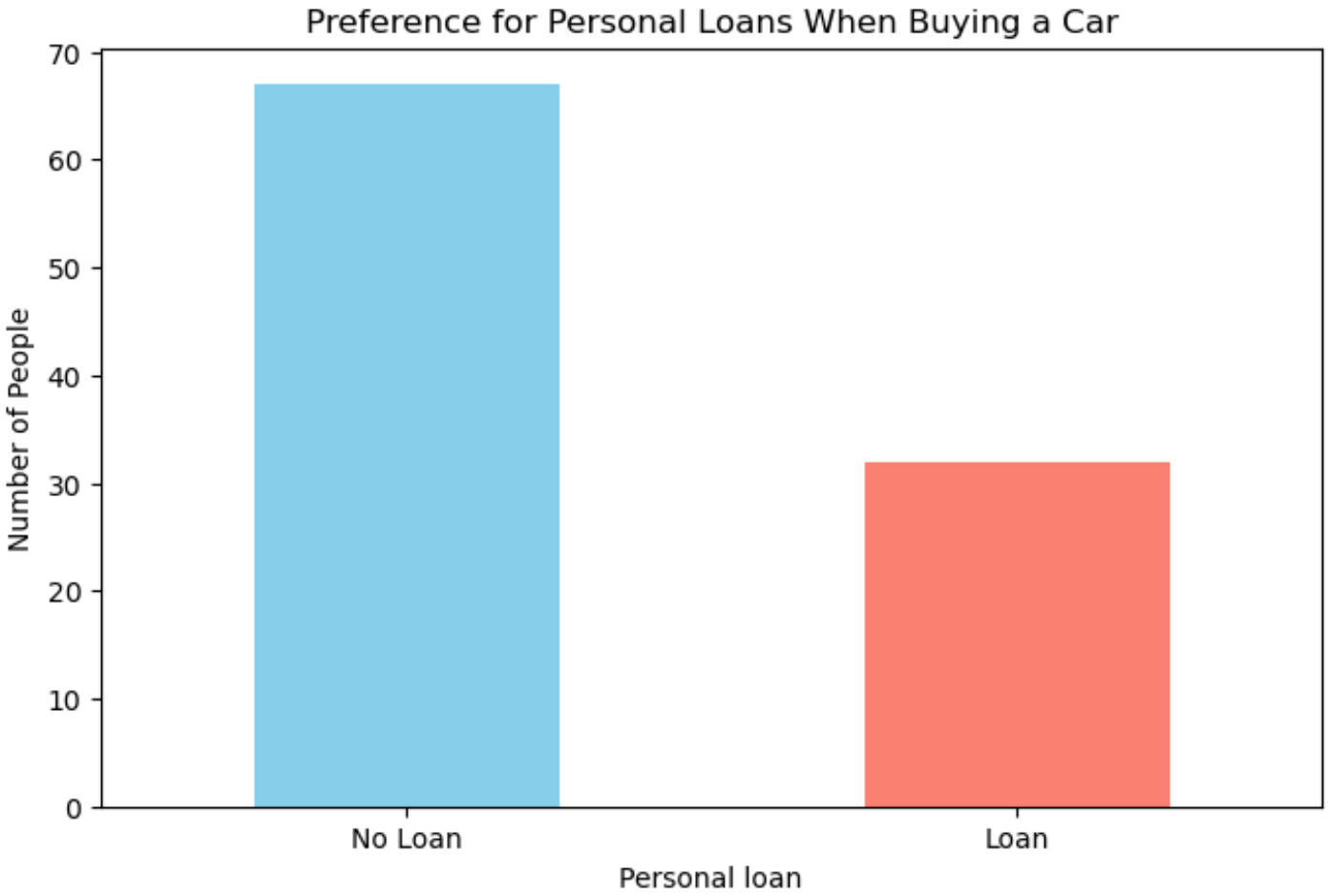
Target Segments

Based on the analysis, the target segment can be narrowed down to EVs having:

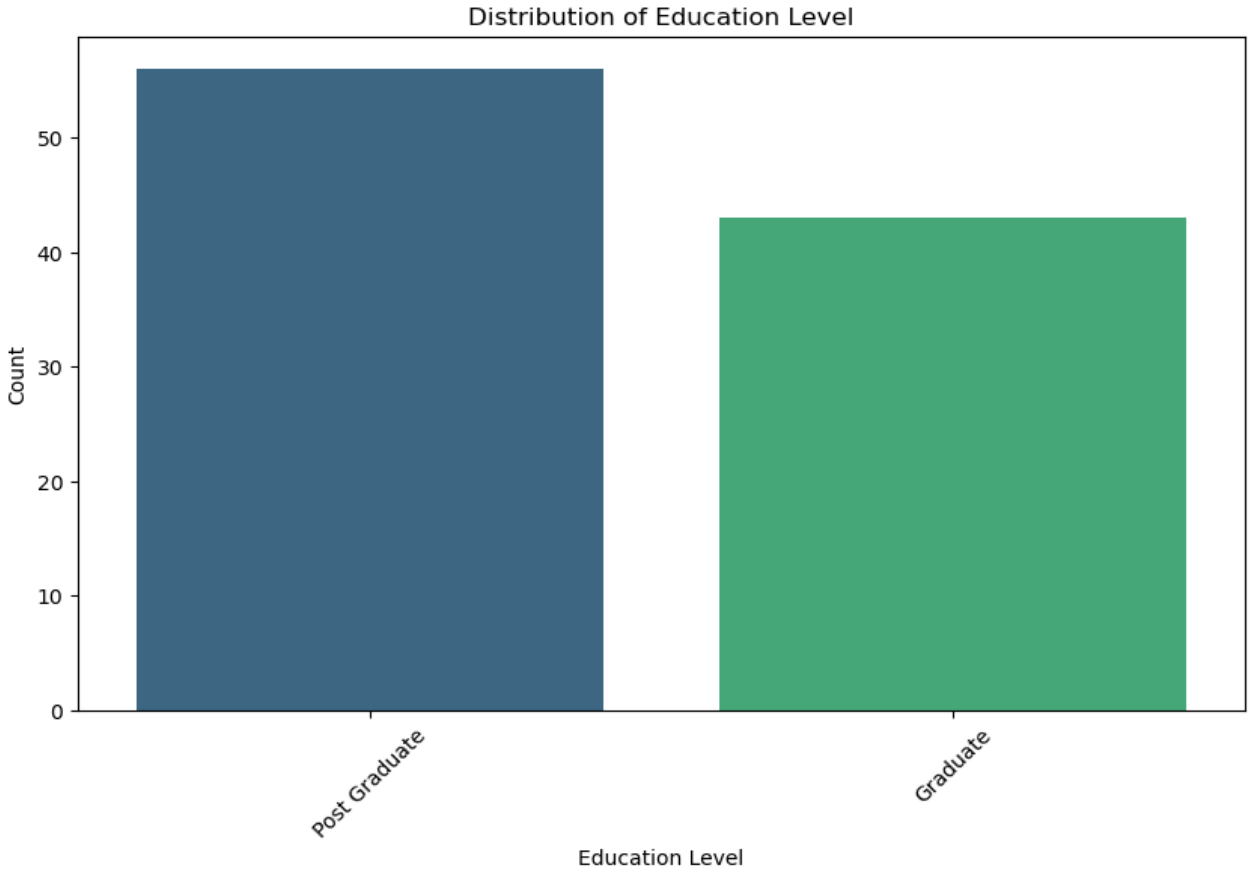
- **Psychographic factors** such as loans taken for the car.
- **Behavioral factors** such as certain age group buying more EV cars
- **Geographic factors** such as States which are more market friendly.



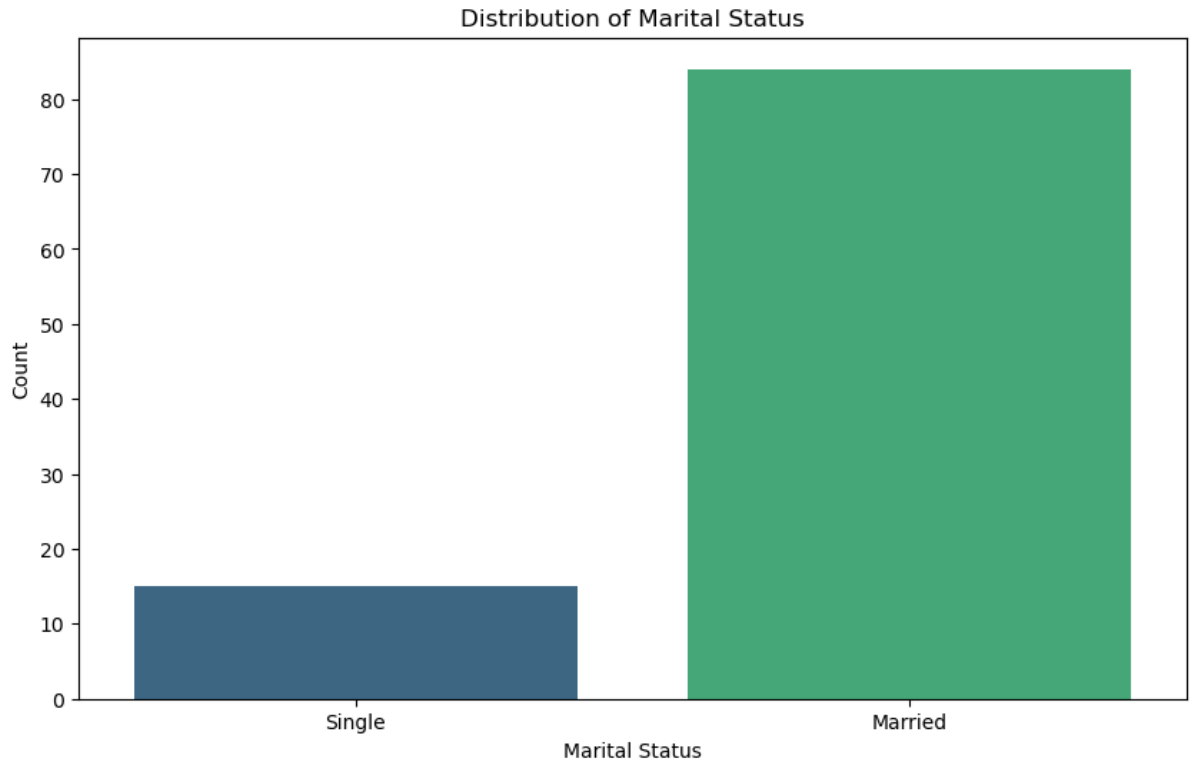
In this bar graph we can clearly analyse the age group of people buying more EV cars. Age Groups 35-44 are more into buying EV cars.



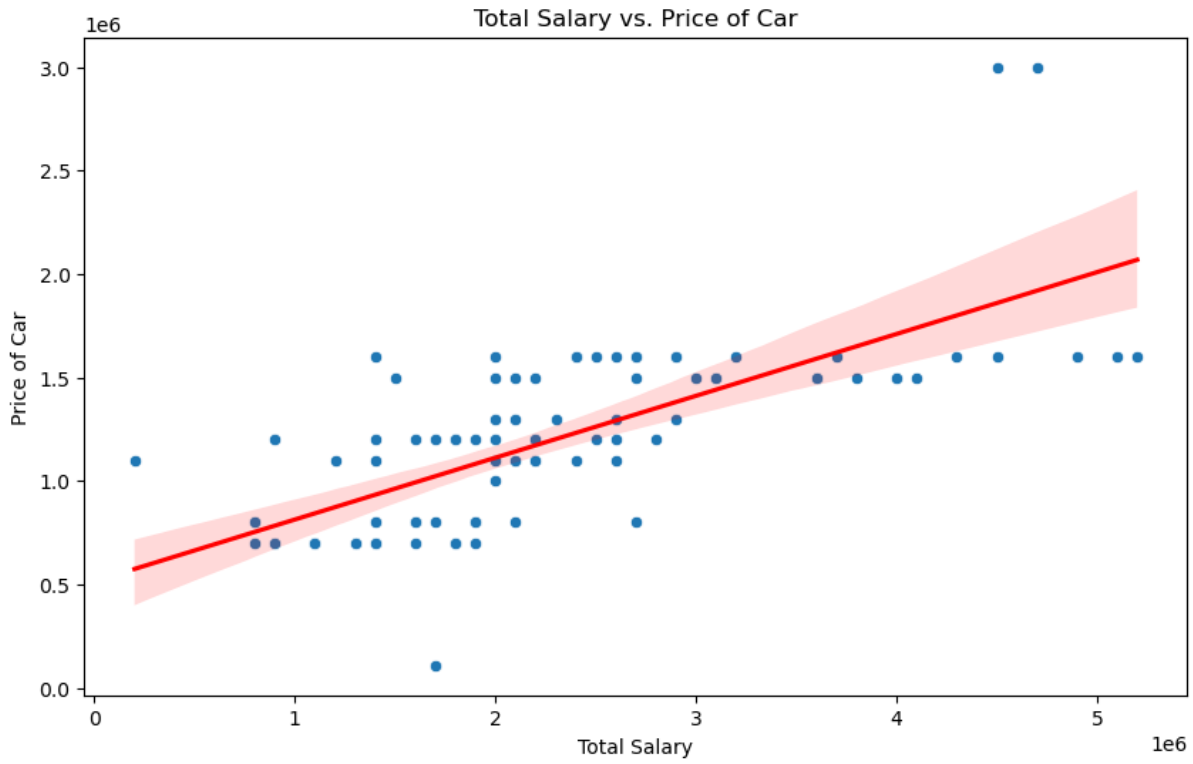
Here we are analysing the loan preference of people buying cars. We can see that majority of people are buying the cars without any loan.



Here we can conclude that people who have done post graduation are more likely to buy EV cars than people who are graduated.



Here we are analysing the marital status of the buyers. As we clearly see Married people are more likely to buy the EV cars than people who are single.



1. **Scatter Plot**: Displays individual data points, allowing us to see the distribution and potential correlation between total salary and car price.
2. **Regression Line**: Provides a trend line that shows the relationship between total salary and car price, helping to identify whether there is a positive, negative, or no correlation.

Strategic Recommendations

Product Strategy

- **Two-Wheelers**: Develop affordable and stylish electric scooters targeting urban youth.
- **Four-Wheelers**: Focus on compact and mid-size EVs with advanced features for individual consumers and fleet services.
- **Commercial Vehicles**: Create robust electric vans and trucks for logistics and delivery services.

Marketing Strategy

- **Digital Marketing**: Utilize social media and online platforms to reach tech-savvy and environmentally conscious consumers.
- **Partnerships**: Collaborate with ride-hailing companies and logistics firms to promote bulk purchases.
- **Incentives**: Offer financing options and exchange offers to lower the entry barrier for potential customers.

Infrastructure Development

- **Charging Stations**: Partner with government and private entities to expand the charging network.
- **Battery Swapping Stations**: Implement battery swapping stations in urban areas to reduce downtime for commercial vehicles.

Customer Support

- **After-Sales Service**: Establish a robust network of service centers.
- **Customer Education**: Conduct workshops and awareness campaigns on the benefits and usage of EVs.

Potential Sales in Early Market

Sales Projections

To estimate potential sales in the early market, we consider several factors including market size, growth rate, and the competitive landscape. Here are the projections for the first three years:

Year 1

- **Two-Wheelers**:
  - **Units Sold**: 5,000
  - **Revenue**: INR 50 crores (assuming an average price of INR 1 lakh per unit)
- **Four-Wheelers**:
  - **Units Sold**: 1,000
  - **Revenue**: INR 100 crores (assuming an average price of INR 10 lakhs per unit)
- **Commercial Vehicles**:
  - **Units Sold**: 500
  - **Revenue**: INR 75 crores (assuming an average price of INR 15 lakhs per unit)

Year 2

- **Two-Wheelers**:
  - **Units Sold**: 10,000
  - **Revenue**: INR 100 crores
- **Four-Wheelers**:
  - **Units Sold**: 2,000
  - **Revenue**: INR 200 crores
- **Commercial Vehicles**:
  - **Units Sold**: 1,000
  - **Revenue**: INR 150 crores

Year 3

- **Two-Wheelers**:
  - **Units Sold**: 20,000
  - **Revenue**: INR 200 crores
- **Four-Wheelers**:
  - **Units Sold**: 4,000
  - **Revenue**: INR 400 crores
- **Commercial Vehicles**:
  - **Units Sold**: 2,000
  - **Revenue**: INR 300 crores

Assumptions

- **Market Penetration**: Initial penetration rates are conservative to reflect the early market stage.
- **Pricing**: Average price points are based on current market trends and competitive pricing strategies.
- **Growth Rate**: Assumes doubling of sales year-on-year, reflecting aggressive growth but within realistic bounds given market potential.

Key Factors Influencing Sales

- **Government Incentives**: Continued support through subsidies and incentives will be crucial.
- **Infrastructure Development**: Expansion of charging infrastructure will drive adoption.
- **Consumer Awareness**: Increased marketing and education efforts will enhance consumer acceptance.

Analysis of Optimal Market Segment

Market Size and Growth Potential

- **Current Market Size**: The electric two-wheeler market in India is substantial, with sales crossing 150,000 units in 2021 and expected to grow at a CAGR of 57% from 2022 to 2027.

- **Growth Drivers**: Increasing urbanization, rising fuel prices, and supportive government policies such as subsidies and incentives under the FAME scheme.

Consumer Demand and Adoption Rates

- **Target Audience**: Predominantly urban young professionals and students who are tech-savvy and environmentally conscious.
- **Adoption Rate**: High, due to the affordability and convenience of two-wheelers for daily commuting.

Competitive Landscape

- **Major Players**: Ola Electric, Ather Energy, Hero Electric. These companies have established a presence but the market is still fragmented, providing opportunities for new entrants.
- **Entry Barriers**: Relatively low compared to four-wheelers, with lower R&D and production costs.

Regulatory and Economic Factors

- **Government Policies**: Favorable, with financial incentives and infrastructure support.
- **Economic Factors**: Increasing disposable income among the target demographic supports higher spending on EVs.

Alignment with Start p Capabilities

- **Product Development**: Easier and less capital-intensive compared to four-wheelers and commercial vehicles.
- **Market Penetration**: Faster, due to the high demand and lower price points.

Conclusion:

The electric two-wheeler market targeting urban young professionals emerges as the most optimal segment for an EV startup in India. This segment offers a substantial market size, high growth potential, and lower entry barriers. By focusing on affordable and stylish products, leveraging digital marketing, and building a robust support infrastructure, the startup can successfully capture market share and achieve sustainable growth.