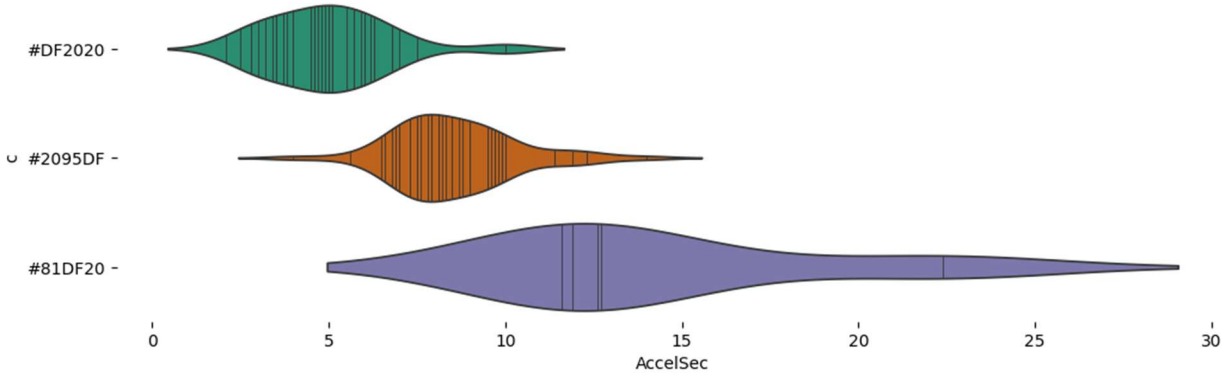
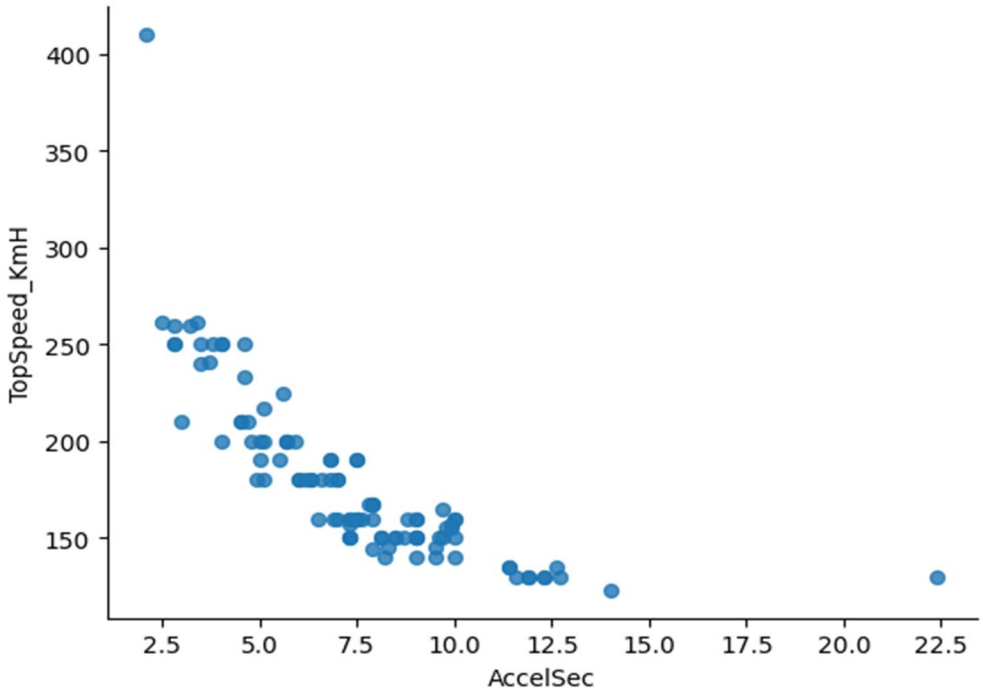
EV MARKET ANALYSIS- (OJASRI)

A. Conclusions drawn from Exploratory Data Analysis (EDA)

Some Informative plots:



The plot suggests that there are distinct groups of vehicles with varying acceleration times. The green group represents high-performance vehicles, the orange group represents mid-range performance vehicles, and the purple group represents lower-performance vehicles.



The scatter plot indicates that vehicles with faster acceleration times generally achieve higher top speeds, which aligns with common automotive performance metrics. This relationship is useful for segmenting the market based on performance characteristics.

1. Geographic Factors:

- **Urban vs. Rural:** Urban areas show a higher potential for EV adoption due to better infrastructure, higher income levels, and greater environmental awareness.
- **Regional Variations:** States with existing EV incentives and infrastructure (e.g., charging stations) are more ready for EV adoption.

2. Demographic Factors:

- **Age Groups:** Younger age groups (25-45 years) are more likely to adopt EVs, reflecting a preference for new technologies and sustainable practices.
- **Income Levels:** Higher income groups show a greater interest in EVs because they can afford the initial costs and value the long-term savings on fuel.

3. Psychographic Factors:

- **Lifestyle:** Segments that prioritize eco-friendly lifestyles and sustainability are more inclined towards EVs.
- **Values and Attitudes:** Consumers with strong environmental values and a desire to reduce their carbon footprint are key potential adopters.

4. Behavioral Factors:

- **Daily Commute:** Urban commuters with high daily mileage are more likely to switch to EVs for cost efficiency.
- **Usage Patterns:** Segments that use their vehicles frequently and for longer distances show a higher propensity to adopt EVs due to the savings on fuel and maintenance.

5. Market Trends:

- **Increasing Awareness:** Consumers are increasingly aware of and accept EVs, driven by environmental concerns and rising fuel costs.
- **Government Policies:** Supportive government policies and incentives for EV buyers are positively influencing market adoption.

Summary of EDA Results

EDA has identified key segments and factors that influence the adoption of EVs in India. Urban, higher-income, environmentally conscious individuals with significant daily commuting needs are the primary target market for EVs. The analysis provides a solid foundation for developing targeted marketing strategies and effectively entering the Indian EV market.

B. Model Used for Market Analysis

1. Segmentation Analysis

- **Clustering Techniques:**
  - **K-Means Clustering:** Used to segment the market based on geographic, demographic, psychographic, and behavioral factors. This helped identify distinct customer groups with similar characteristics.
  - **Hierarchical Clustering:** Applied to refine the segments further and understand the hierarchical relationships between different customer groups.

2. Profiling and Target Segment Selection

- **Profiling Segments:** Detailed profiles of the identified segments were created, describing their geographic, demographic, psychographic, and behavioral attributes.
- **Selection of Target Segment:** The most promising segments were selected based on their likelihood to adopt EVs. Factors such as market readiness, competitive landscape, and segment size were considered.

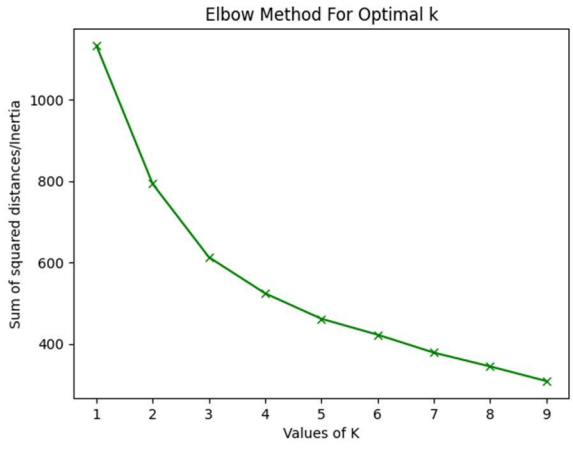
3. Customizing the Marketing Mix

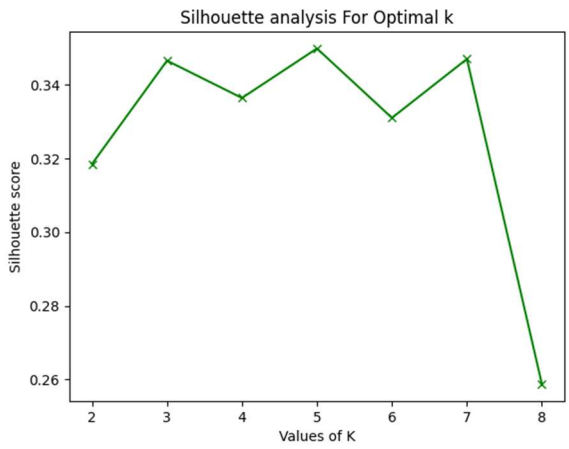
- **Marketing Strategies:** The marketing mix (Product, Price, Place, Promotion) was tailored to suit the needs and preferences of the target segments. Specific strategies were devised to reach and engage these segments effectively.

4. Estimation of Potential Customer Base and Profit Calculation

- **Customer Base Estimation:** Estimated the potential customer base in the early market using demographic and psychographic data.
- **Profit Calculation:** Performed profit calculations considering market penetration rates and average revenue per customer.

C. Results:



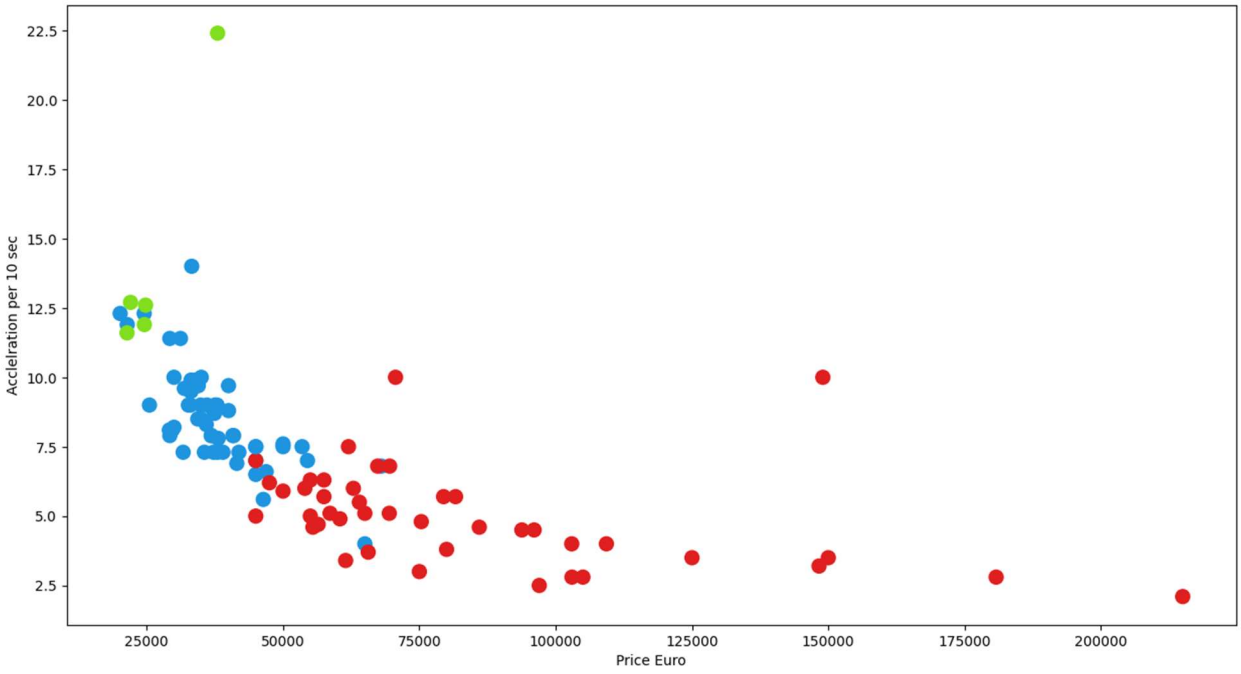


- **Elbow Method for Optimal k:**

  - The plot shows the sum of squared distances (inertia) against the number of clusters (k).
  - The "elbow" point, where the rate of decrease sharply changes, suggests that k = 3 is the optimal number of clusters for segmentation.

- **Silhouette Analysis for Optimal k:**

  - This plot displays the silhouette score, indicating cluster cohesion and separation, against the number of clusters (k).
  - The highest silhouette score occurs at k = 3, suggesting that this is the most appropriate number of clusters for distinguishing between customer segments effectively.



- **Price and Acceleration have a weak negative correlation:** Generally, as the price of the vehicle increases, its acceleration tends to decrease. However, this relationship is not very strong, as there's a significant amount of scatter in the data.
- **Three distinct clusters of vehicles:** The data points seem to form three main clusters, suggesting the existence of three different market segments based on price and acceleration.
- **Outliers:** There are a few outliers, particularly vehicles with high prices but relatively low acceleration, which might represent niche or luxury models.

D. Conclusions Drawn from the Model and Analysis

1. **High-Potential Segments Identified:**

   - Urban areas with high population density and existing EV infrastructure.
   - Higher-income groups and environmentally conscious individuals.
   - Segments with strong eco-friendly values and a preference for innovative technology.
   - Urban commuters with high daily mileage.

2. **Effective Marketing Strategies:**

   - A tailored marketing mix will be used to suit the identified high-potential segments.
   - Focused on promoting the environmental benefits and cost savings of EVs.
   - Leveraged digital marketing and social media to reach tech-savvy and eco-conscious consumers.

3. **Early Market Potential:**

   - Estimated a significant potential customer base in the early market, driven by urbanization and increasing environmental awareness.
   - Profit calculations indicated a viable business opportunity with attractive returns on investment.

4. **Strategic Recommendations:**

   - Enter the market by targeting urban areas with higher income and environmentally conscious consumers.
   - Invest in building a robust EV infrastructure to support market growth.
   - Continuously monitor market trends and customer preferences to adapt marketing strategies accordingly.

Overall, the comprehensive analysis and segmentation approach provided a clear roadmap for the EV startup to enter and compete successfully in the Indian market.

Code link: https://github.com/ojasri/EV_Market-Analysis/tree/main