MARKET SEGMENTATION ANALYSIS OF ELECTRIC VEHICLES IN INDIA

By

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1. Abstract :

As an Electric Vehicle (EV) Startup, our primary goal is to strategically enter the Indian EV market by identifying the most suitable vehicle/customer segments for our products. In this market segment analysis, we will employ a comprehensive segmentation approach, considering geographic, demographic, psychographic, and behavioral factors, as well as other category-based segments based on the availability of data. By exploring various datasets, we aim to gain insights into the different segments' characteristics and preferences, enabling us to tailor our EV offerings to the most promising markets. The analysis will culminate in a feasible strategy to enter the Indian EV market, focusing on the segments that show the highest potential for EV adoption and usage. Through this targeted approach, we aim to position our EV startup for success and contribute to the sustainable growth of the Indian electric mobility sector.

2. Problem Statement :

Our Electric Vehicle Startup is at the crucial stage of deciding which vehicle/customer segments to target in the Indian EV market. To ensure a successful market entry and sustainable growth, we need to conduct a thorough market segment analysis. This analysis should encompass geographic, demographic, psychographic, and behavioral segments, while also considering category-based segments based on the data available to us. Our objective is to identify the segments that are most likely to embrace electric vehicles and align our EV offerings to meet their specific needs and preferences. Through this comprehensive approach, we will devise a feasible and targeted strategy to enter the Indian EV market, positioning our startup for long-term success in this rapidly evolving industry.

3. Fermi Estimation

Fermi Estimation is a quick and approximate method used to make reasonable estimations based on simple assumptions and rough data. Let's use Fermi Estimation to estimate the market segmentation of electric vehicles in India.

- Total Population of India: Approximately 1.4 billion people (as of 2021).
- Proportion of Population with Driving License: Assume around 30% of the population has a valid driving license.
- Proportion of Urban Population: Assume around 35% of the total population resides in urban areas.
- Electric Vehicle Adoption Rate: Assume the current electric vehicle adoption rate in India is 3% (as of 2021).
- Segment-wise Distribution:
- Electric Two-Wheelers: Assume two-wheelers account for 80% of all electric vehicles.

- Electric Cars: Assume electric cars account for 15% of all electric vehicles.

- Electric Three-Wheelers: Assume three-wheelers account for the remaining 5% of all electric vehicles.

- Electric Commercial Vehicles: The electric commercial vehicle market is gradually evolving as fleet operators and logistics companies recognize the economic and environmental benefits of electric mobility.

Key Challenges and Opportunities:

- Despite the growing interest in electric vehicles, several challenges persist in the Indian market:

- High Initial Cost: The higher upfront cost of EVs compared to conventional vehicles remains a significant barrier to mass adoption.

- Limited Charging Infrastructure: The inadequate charging infrastructure across the country poses a challenge for consumers, particularly for long-distance travel.

- Range Anxiety: Concerns about the limited driving range of electric vehicles have a psychological impact on potential buyers.

- Policy and Regulatory Uncertainty: The EV industry relies heavily on government policies and incentives, and changes in regulations can impact market dynamics.

By understanding and addressing these challenges and opportunities, our Electric Vehicle Startup can develop a strategic approach to enter the Indian market and position ourselves as a key player in the evolving landscape of electric mobility in India.

4. Data Collection

Data that is used for analysis is CSV file : “ElectricCarData_Norm.csv”

5. Data Preprocessing

Libraries used :

1. Pandas - Used to work with the dataset
2. Matplotlib - Used for Visualization
3. Sklearn - Used to train the model
4. Seaborn - Used for Visualization
5. Mpl_toolkits - Used for 3D Visualization

6. Segment Extraction :

K-Means Clustering is used to extract the segments from the data

1. Unsupervised Learning: K-means doesn't require labeled data, making it ideal for segmenting the EV market where predefined segments may not exist.

2. Scalability: K-means efficiently handles large consumer datasets, essential in a data-rich environment like the EV market in India.

3. Simplicity: Its straightforward implementation allows for easy interpretation of resulting clusters, aiding decision-makers in tailoring strategies.

4. Flexibility: K-means permits the selection of the desired number of clusters, ensuring meaningful and representative segmentations.

5. Clarity in Grouping: K-means creates distinct and well-defined groups, enhancing the effectiveness of market segmentation.

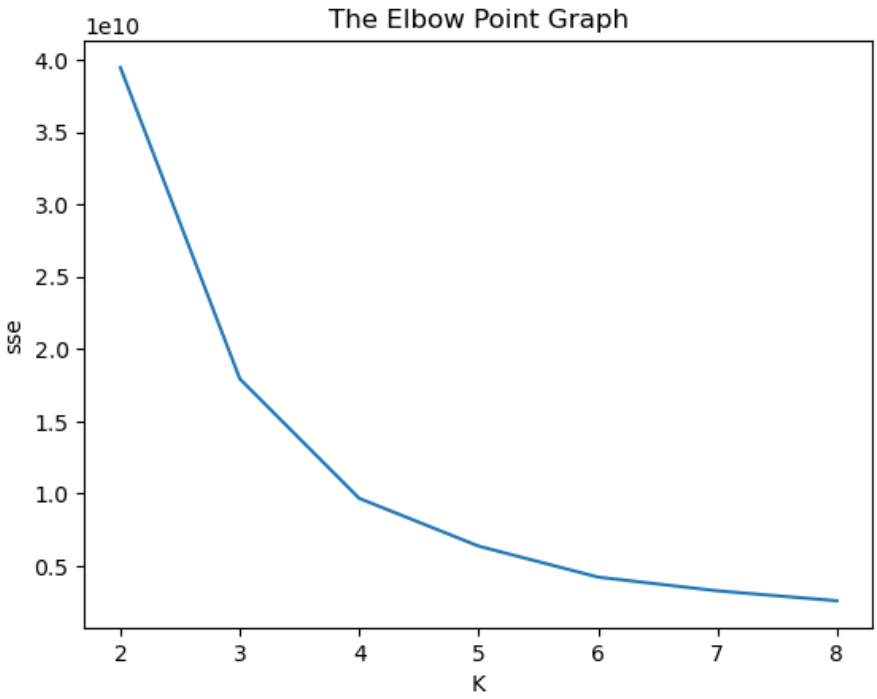
6. Segmentation Validation: Internal and external metrics enable assessment and validation of the quality and reliability of the clusters.

7. Speed and Performance: K-means' efficiency makes it suitable for real-time applications, facilitating quick responses to market dynamics.

8. Enhanced Marketing Strategies: The clear and interpretable clusters allow for targeted and tailored marketing efforts.

9. Identifying Consumer Patterns: K-means identifies patterns in consumer preferences, aiding in product development and positioning.

10. Strategic Decision-Making: K-means empowers EV startups to make data-driven decisions, optimizing market entry and growth strategies.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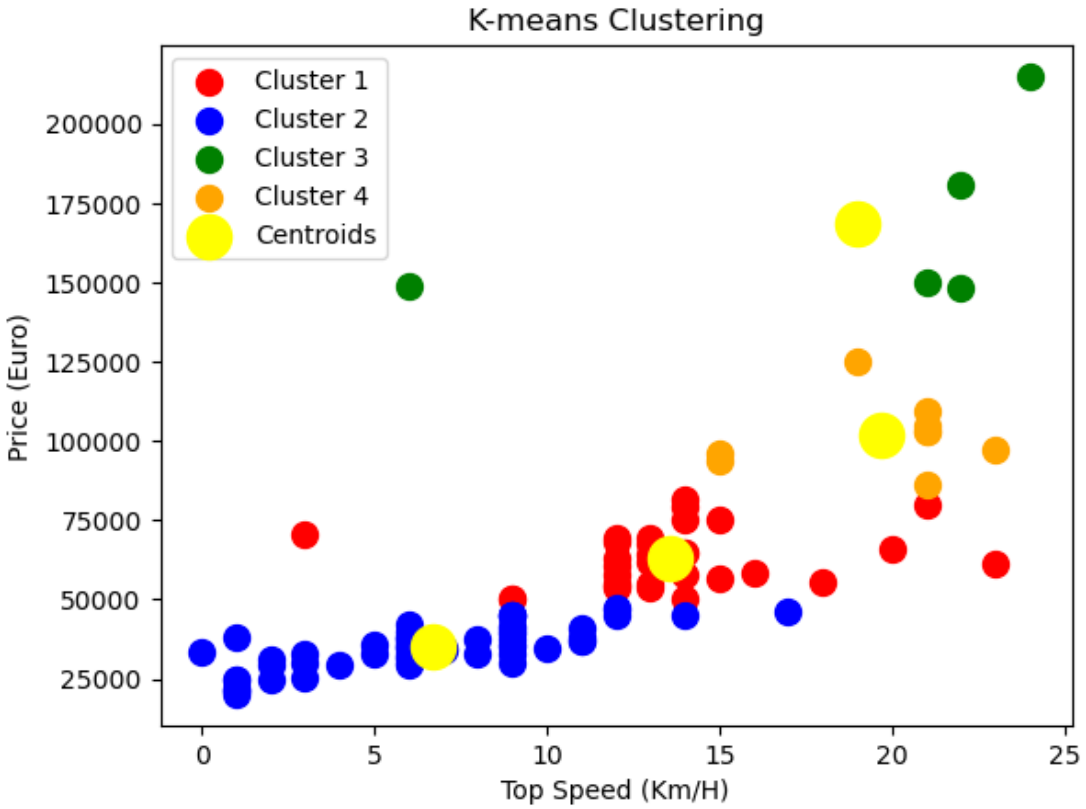
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Cluster 2
Cluster 3
Cluster 4
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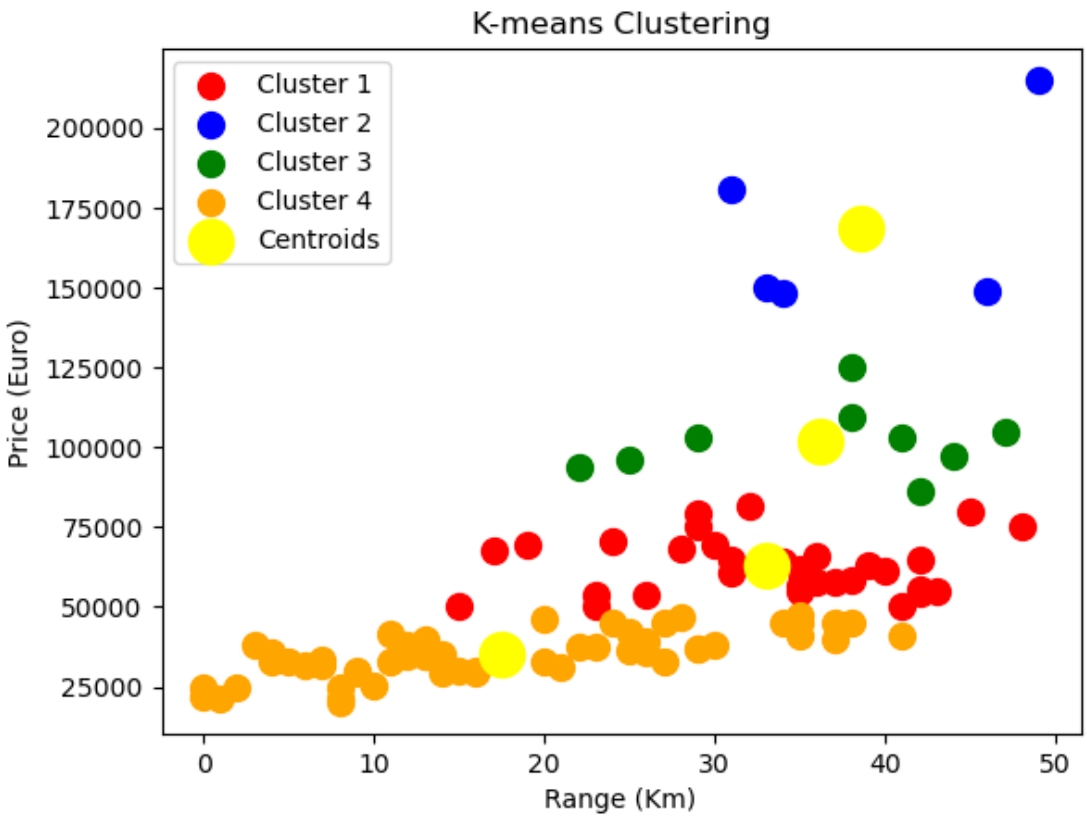
Top Speed (Km/H)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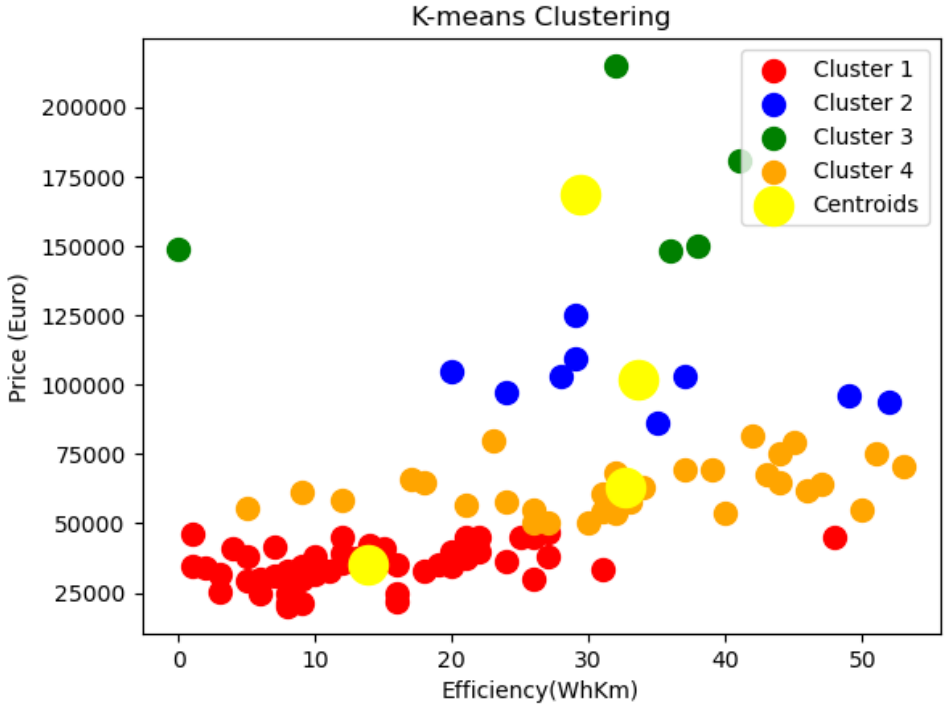
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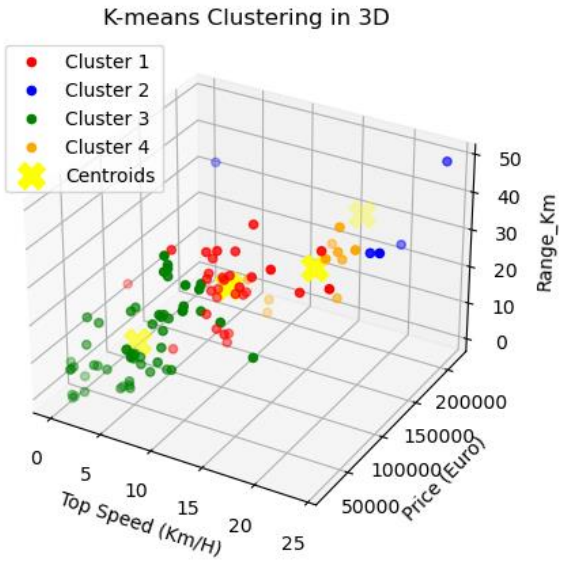


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Accuracy score of  SVC = 18.29268292682927
Accuracy score of  DecisionTreeClassifier = 100.0
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7. Potential Segments :

1. Range : Segment consists of consumers who prioritize long driving ranges, making them suitable for daily commutes and long-distance travel.

2. Top- Speed : This segment comprises consumers who prioritize high top speeds and acceleration, seeking an exhilarating driving experience.

3. Efficiency : This segment includes consumers who primarily use EVs for urban commuting and short trips.

8. Target Segment

After the analysis the target segment for electric vehicle in India can be Efficiency and Range.

Customizing the market mix:

Product:

- Offer diverse EV models, including two-wheelers, cars, and three-wheelers, to cater to various consumer preferences.
- Emphasize reasonable driving ranges to address range anxiety and meet the needs of urban and long-distance commuters.
- Provide user-friendly charging solutions, including home charging stations and public infrastructure, for added convenience.

- Highlight advanced features like regenerative braking and smart charging to appeal to tech-savvy consumers.

Price:

- Set competitive prices to attract cost-conscious consumers and position EVs as a long-term cost-effective transportation option.
- Offer flexible financing plans and affordable leasing options to increase accessibility for consumers on a budget.

Promotion:

- Utilize green marketing to emphasize the environmental benefits of electric vehicles and attract eco-conscious consumers.
- Utilize digital marketing and social media to reach tech-savvy consumers and urban dwellers effectively.
- Organize test drive events and demonstrations to allow potential consumers to experience the efficiency and performance of EVs firsthand.

9. MOST OPTIMAL MARKET SEGMENTS TO OPEN IN THE MARKET:

Based on the analysis the most optimal segments to target for Electrical Vehicles in India

- **Efficiency-Conscious Consumers:** This segment prioritizes energy conservation, cost savings, and environmental sustainability. They are attracted to EVs due to their high efficiency, reduced operating costs, and positive impact on the environment. Targeting this segment aligns with the growing eco-consciousness and desire for long-term savings in the Indian market.

- **Urban Commuters and City Dwellers:** This segment represents a significant portion of the Indian population who use vehicles for daily commuting within cities. EVs with moderate driving range and efficient charging solutions are particularly appealing to this group as they offer practical, eco-friendly, and cost-effective solutions for city driving.

- **Cost-Saving Conscious Consumers:** This segment is financially prudent and seeks to minimize transportation expenses. They view EVs as a viable option for long-term cost savings due to reduced fuel expenses and lower maintenance costs compared to conventional vehicle

Github Link :

- GITHUB : Electric Vehical Analysis In India