MARKET SEGMENTATION ANALYSIS OF ELECTRIC VEHICLES MARKET IN INDIA

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Problem statement:

Task is to analyze the electric vehicles market in india using segmentation analysis answer come up with a feasible strategy to enter the market, targeting the segments most likely to use their product in terms of geographic demographic and beheviroal.

In this report we analyze the electric vehicle market in india using segments such as region, price, charging, facility, type of vehicles, retail, outlets, manufacture, body type, safety, plug types and much more.

1. Explain how and which ML model (algorithm) helped you in 2nd Project?

In the second project, the K-Means clustering algorithm was used to assist with market segmentation. This algorithm is particularly effective for grouping data into clusters based on similarities among data points. Here's how it contributed to the project:

The goal was to segment the market of electric vehicles (EVs) into distinct clusters to understand the distribution and characteristics of different EV types across various regions.

- **Process:**
    - **Data Preprocessing:** The datasets were first preprocessed to handle missing values, normalize features, and ensure consistency across different sources.
    - **Feature Selection:** Key features such as the number of 2-wheelers and 3-wheelers in different states were selected for clustering.
    - **Clustering with K-Means:** The K-Means algorithm was applied to the data. It works by initializing cluster centers and iteratively

assigning each data point to the nearest cluster center, then recalculating the centers based on the current assignments.

    - **Determination of Optimal Clusters:** The elbow method or silhouette score may have been used to determine the optimal number of clusters, ensuring meaningful segmentation.

- **Outcome:** The use of K-Means helped identify distinct market segments based on EV adoption in different states. This segmentation allows for targeted strategies in marketing, resource allocation, and policy-making, tailored to the specific needs and characteristics of each segment.

The clustering provided valuable insights into which states have higher EV penetration and helped in understanding regional differences in EV adoption.

2. Elaborate on the final conclusion & insights gained from the research/analysis work

Based on the analysis in the project, here are the final conclusions and insights gained:

1. **State-wise Distribution of EVs:**
    - **2-Wheelers:** Maharashtra, Gujarat, Tamil Nadu, Karnataka, and Andhra Pradesh were identified as the leading states in terms of the number of electric 2-wheelers. This suggests a higher adoption rate and possibly better infrastructure or incentives for these vehicles in these regions.
    - **3-Wheelers:** Uttar Pradesh, Assam, and Bihar showed the highest numbers of electric 3-wheelers. This indicates a potential market focus on commercial and shared transport solutions in these states.
2. **Market Segmentation:**
    - The segmentation revealed distinct clusters of states based on the type and number of EVs, suggesting regional preferences and market dynamics. These insights can be used to tailor marketing strategies and product offerings.
3. **Growth Opportunities:**
    - States with lower numbers of EVs, such as Assam, Himachal Pradesh, Sikkim, and Jammu & Kashmir, represent potential growth

opportunities. Understanding the barriers in these regions (such as lack of infrastructure or awareness) could guide strategic initiatives to boost EV adoption.

4. **Policy and Infrastructure Implications:**
    - The analysis highlights the importance of regional policies and infrastructure in driving EV adoption. States with higher adoption rates may have better charging infrastructure, government incentives, or public awareness campaigns.
5. **Data-Driven Decision Making:**
    - The clustering analysis provides a data-driven foundation for decision-making, allowing stakeholders to focus on areas with the highest potential impact and tailor their approaches based on regional characteristics.

These insights can guide stakeholders, including manufacturers, policymakers, and marketers, in developing targeted strategies to enhance EV adoption and address regional disparities.

3. How will you improve upon the Market Segmentation Project given additional time & some budget to purchase data? (in terms of Datasets collection - name what columns points you will search for & what additional ML models you would like to try)

To improve the Market Segmentation Project with additional time and budget for data acquisition, consider the following enhancements:

1. **DBSCAN (Density-Based Spatial Clustering of Applications with Noise):**
    - Useful for identifying clusters of varying shapes and sizes, particularly when dealing with noise in the data.
2. **Hierarchical Clustering**
    - Provides a tree-like representation of data clusters, allowing exploration of different levels of segmentation.
3. **Gaussian Mixture Models (GMM):**

- Allows for clustering based on probabilistic models, providing soft cluster assignments and capturing more complex cluster structures.

4. **Self-Organizing Maps (SOM):**
    - A type of neural network that can be used for clustering and visualizing high-dimensional data.

Implementation Strategy

- **Data Integration and Cleaning:** Ensure all new data sources are integrated into a cohesive dataset, with consistent formatting and handling of missing values.
- **Feature Engineering:** Create new features based on collected data, such as regional EV adoption scores, infrastructure quality indices, or consumer sentiment scores.
- **Model Evaluation:** Use techniques such as cross-validation and silhouette scores to evaluate the performance of different clustering models and select the most suitable approach.
- **Visualization and Reporting:** Enhance visualizations to better communicate insights and facilitate decision-making. Use tools like interactive dashboards to present findings to stakeholders

5. Name top 4 Variables/features which can be used to create most optimal Market Segments for your Market Domain?

Here are the top four simple variables/features to use for creating optimal market segments in the EV domain:

1. Location:
    - Where the EVs are used or sold (e.g., state or city).
2. Vehicle Type:
    - The category of the EV (e.g., 2-wheelers, cars).
3. Charging Stations:
    - Availability of charging points in the area.
4. User Demographics:
    - Basic info about users like age and income.

These variables help in understanding different market needs and planning accordingly.