Electric Vehicle Segmentation Project Report

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Problem Statement

The electric vehicle (EV) market in India is rapidly evolving, driven by the need for sustainable transportation and government initiatives. However, the market faces challenges such as varied consumer preferences, differing usage patterns, and the lack of targeted marketing strategies. This project aims to segment the Indian EV market using clustering techniques to identify distinct customer profiles. By understanding these segments, manufacturers and marketers can tailor their strategies to meet the specific needs of each group, enhancing customer satisfaction and boosting sales.

Approach

1. **Data Collection**: The dataset used in this analysis contains various features of electric vehicles sold in India, including power, top speed, price, year of manufacture, and charging time.

2. **Data Preprocessing:**
    - **Missing Values**: The missing values in the dataset were filled with the mean of their respective columns.
    - **Duplicate Rows**: Checked and removed any duplicate rows to maintain data integrity.
    - **Categorical Encoding**: Categorical features were converted to numerical values using Label Encoding and One-Hot Encoding.
    - Encoding and One-Hot Encoding.

2. **Exploratory Data Analysis (EDA)**:
    - Conducted visualizations to understand the distribution of numerical features and the correlation between them.
    - Identified patterns and insights that could inform the clustering process.
3. **Feature Scaling**: The numeric features were standardized using StandardScaler to ensure they contributed equally to the clustering analysis.

4. **Dimensionality Reduction**: Applied Principal Component Analysis (PCA) to reduce the dimensionality of the dataset, making it easier to visualize and analyze.

5. **Clustering**:
    - **K-Means Clustering**: Used the Elbow method to determine the optimal number of clusters (k). The K-Means algorithm was implemented to segment the dataset into four distinct clusters.

- **Visualization**: Clustered data was visualized using scatter plots to observe the distribution of different segments.

6. **Model Evaluation**:
   - A decision tree classifier was trained to predict the cluster labels. The dataset was split into training and testing sets to evaluate model accuracy.
7. **Model Saving**: The trained K-Means model and the clustered dataset were saved for future use.

Conclusion

The project successfully segmented the Indian electric vehicle market into four distinct clusters based on key features. This segmentation provides valuable insights into consumer preferences and behaviors, which can inform targeted marketing strategies and product development. The use of clustering algorithms such as K-Means allowed for effective identification of customer segments, enabling stakeholders in the EV market to make data-driven decisions.

Insights

- **Cluster Characteristics**: Each cluster revealed unique characteristics regarding power, price, and other features, highlighting different consumer preferences.
- **Market Trends**: The analysis indicates that certain segments may be more price-sensitive, while others prioritize performance metrics such as power and top speed.
- **Opportunities for Targeted Marketing**: Understanding these segments allows for more personalized marketing strategies, improving customer engagement and satisfaction.

Electric Vehicle Market in India

The electric vehicle market in India is on an upward trajectory, driven by rising environmental concerns, government incentives, and advancements in technology. According to various reports, the Indian government aims to increase the adoption of electric vehicles to reduce dependence on fossil fuels and lower greenhouse gas emissions. However, challenges such as high initial costs, inadequate charging

infrastructure, and consumer skepticism remain hurdles to widespread adoption.

Recent Trends:

- **Government Initiatives**: Schemes like FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) aim to encourage EV adoption.
- **Consumer Awareness**: Increasing awareness about environmental issues and the benefits of electric vehicles is gradually changing consumer attitudes.
- **Technology Advancements**: Improvements in battery technology and charging infrastructure are making EVs more accessible and appealing.

Personal Opinion

In my view, the electric vehicle market in India holds significant potential for growth. As consumer awareness increases and technology advances, the market will likely expand. The insights gained from this project highlight the importance of understanding consumer segments to tailor marketing strategies effectively. As stakeholders in the EV ecosystem adapt to these insights, we can expect a more robust and

consumer-focused market that ultimately contributes to a sustainable future.