ELECTRIC VEHICLE MARKET SEGMENTATION REPORT

DATA PRE-PROCESSING

Required libraries

To perform EDA and Regression algorithm on the collected data, the following Python libraries are

used:

1. Pandas: for data handling/manipulation

2. Matplotlib and Seaborn: for data visualization

3. Scikit-learn: for the Regression algorithm and some other algorithms like Random forest to evaluate the accuracy.

EXPLORATORY DATA ANALYSIS

Exploratory Data Analysis (EDA) is a initial step in data science projects. It involves analyzing and visualizing data to understand its key characteristics, uncover patterns, and identify relationships between variables refers to the method of studying and exploring patterns.

Machine learning models and algorithms used:

- **Baseline Model**: Linear Regression provided a straightforward and interpretable starting point.
- **Advanced Models**: Random Forest (or Gradient Boosting) helped capture complex relationships, often leading to better accuracy.

Ultimately, these models helped address the project's objectives by providing tools to evaluate performance and enhance the model for real-world prediction of Price and budget.

Summary of the conclusions and insights gained from this analysis on Indian automobile buying behaviour

The analysis aimed to understand key factors influencing automobile purchase behaviour, specifically predicting the Price of the chosen vehicle and the budget (Total Salary) that buyers allocate toward their purchase. The project demonstrated how specific demographic and financial factors, such as Salary, Wife Salary, Total Salary, and Age, significantly influence both Price and budget.

Using machine learning models like Linear Regression as a baseline and Random Forest as an advanced model, we found that:

- Linear Regression provided initial insights into the relationship strength between features and target variables. It helped establish a baseline for

performance metrics like Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE).

- Random Forest (or potentially Gradient Boosting) improved prediction accuracy by capturing non-linear relationships in the data, indicating that buyer behaviour does not strictly follow linear trends.

This analysis highlighted key financial and demographic factors driving automobile purchasing behaviour in India, offering actionable insights for the automobile industry to enhance targeting and personalize marketing strategies. With accurate price and budget prediction models, this approach lays a strong foundation for data-driven decision-making in automobile sales and marketing.

To produce more precise and actionable insights:

1. Purchase Enriched and Diverse Data Sources

- **Economic Data**: Incorporate macroeconomic data (e.g., inflation, interest rates, GDP growth) to better understand how economic conditions affect purchasing power and behaviour.
- **Consumer Behaviour Data**: Access consumer spending data to understand general spending patterns on luxury vs. budget items, which can help segment consumers based on their spending habits.
- **Geographic Data**: Obtain data on location-specific factors like urban/rural distinctions, access to public transportation, and regional vehicle preferences. These factors often influence car purchasing decisions and can enhance segmentation accuracy.
- **Real-Time Consumer Interaction Data**: Incorporate data from online consumer interactions, such as clicks on car listings, website behavior, and social media interactions. This can help identify emerging trends or shifts in consumer preferences.
- **Continuous Monitoring System**: Implement a dashboard to track key metrics (e.g., changes in segments, shifts in preferences). This would allow for a dynamic segmentation model that adapts to new trends and behaviors.
- **A/B Testing on Campaigns**: Run small-scale A/B tests within each segment to evaluate the effectiveness of personalized campaigns. Test various messages, offers, and channels, then refine based on performance data.
- **Continuous Learning**: Integrate feedback loops, where the outcomes of campaigns are used to update the segmentation model. This would help improve the model iteratively, adapting it based on real-world results.

By implementing these enhancements, we could expect:

- More accurate and detailed segmentation, allowing for highly targeted marketing strategies.
- Improved customer engagement through personalized messaging and offers.

- Better allocation of marketing resources, ensuring campaigns are focused on high-value segments with the highest likelihood of conversion.

To estimate the market size for the automobile market in India, we can consider several key metrics and recent data. Typically, market size estimation in the automobile sector considers factors like annual sales volume, average vehicle price, and projected growth rates.

Estimated Market Size for the Indian Automobile Industry (2024)

- **Annual Sales Volume:** India is one of the largest automobile markets in the world. Recent data suggests that annual vehicle sales (including passenger vehicles, commercial vehicles, and two-wheelers) in India are approximately 4.7 million units for passenger vehicles alone, with two-wheelers contributing another 15 million units.
- **Average Vehicle Price:**
  - ✓ Passenger Vehicles: The average price of a passenger vehicle in India is around INR 8-10 lakhs (~USD 10,000-12,000).
  - ✓ Two-Wheelers: Two-wheelers, which make up the bulk of unit sales, are priced on average at around INR 70,000-90,000 (~USD 850-1,100).
- **Market Value Calculation:**
  - ✓ Passenger Vehicle Market: If we consider 4.7 million units at an average price of INR 9 lakh, we get an estimated INR 4.23 trillion (~USD 51 billion).
  - ✓ Two-Wheeler Market: With approximately 15 million units at an average price of INR 80,000, we arrive at INR 1.2 trillion (~USD 14 billion).
- Commercial Vehicles and Others: This sector adds approximately INR 700 billion (~USD 8 billion).
- Total Market Size: Summing up these segments, the total estimated market size for the Indian automobile industry would be approximately INR 5.9 trillion (~USD 73 billion).

The current estimated market size for the Indian automobile sector is around INR 5.9 trillion (USD 73 billion), with strong growth potential driven by demographic and economic factors.