**Correlation Analysis:** Investigated relationships between city MPG, highway MPG, and factors like engine displacement and cylinder count, revealing negative correlations indicative of larger engines leading to lower fuel efficiency.

**Visualization:** Employed scatter plots and bar graphs to illustrate connections between city MPG, engine displacement, and fuel types. This highlighted the inverse relationship between engine size and fuel efficiency, as well as variations in MPG across different fuels.

**Machine Learning:** Constructed a linear regression model predicting city MPG based on engine displacement. Model efficacy was assessed using mean squared error (MSE) and R-squared values to offer insights into its predictive performance.

**Insights:**

**Factors Impacting Efficiency**: Engine size and fuel type emerged as pivotal factors influencing fuel economy, with smaller engines and alternative fuels often associated with higher MPG. Consumer Considerations: Recommended consumers prioritize vehicles with smaller engines and alternative fuel options for improved fuel efficiency, while emphasizing the importance of weighing performance trade-offs. Policy Implications: Advocated for policy incentives promoting fuel-efficient technologies and alternative fuels to curb emissions and enhance fuel economy, benefiting consumers and the environment. Industry Perspective: Proposed that automakers focus on hybrid and electric vehicle development to align with consumer preferences for fuel-efficient options and meet regulatory standards. Limitations and Assumptions:

**Data Limitations**: Acknowledged potential dataset biases or inaccuracies that may impact analysis outcomes. Simplifying Assumptions: Acknowledged the linear regression model's simplification of complex variable relationships. Generalization: Recognized the analysis's limited applicability to all vehicle types and driving scenarios. Documentation and Reporting:

Thorough documentation outlines data preprocessing, analytical methods, and machine learning techniques employed. A comprehensive report synthesizes the approach, findings, and conclusions, supplemented with visualizations and code snippets. Structured documentation ensures clarity and accessibility for stakeholders. In sum, this analysis furnishes invaluable insights into vehicle fuel economy, empowering stakeholders with informed decision-making capabilities in the automotive industry.

**Columns in dataset**

 vehicle\_id: Unique ID for each vehicle.

 year: Year of vehicle manufacture.

 make: Vehicle manufacturer.

 model: Vehicle model.

 class: Vehicle type (e.g., sedan, SUV, truck).

 drive: Drive system (e.g., front-wheel drive, all-wheel drive).

 transmission: Transmission system type.

 transmission\_type: Transmission classification (e.g., automatic, manual).

 engine\_index: Engine index.

 engine\_descriptor: Engine description.

 engine\_cylinders: Number of engine cylinders.

 engine\_displacement: Engine displacement.

 turbocharger: Presence of turbocharger.

 supercharger: Presence of supercharger.

 fuel\_type: Primary fuel type.

 city\_mpg\_ft1: City MPG in miles per gallon (ft1).

 unrounded\_city\_mpg\_ft1: Unrounded city MPG (ft1).

 city\_mpg\_ft2: City MPG in miles per gallon (ft2).

 unrounded\_city\_mpg\_ft2: Unrounded city MPG (ft2).

 annual\_fuel\_cost\_ft1: Annual fuel cost based on MPG (ft1).

 annual\_fuel\_cost\_ft2: Annual fuel cost based on MPG (ft2).

 tailpipe\_co2\_ft1: Tailpipe CO2 emissions in grams/mile (ft1).

 tailpipe\_co2\_in\_grams\_mile\_ft1: Tailpipe CO2 emissions (ft1).

 tailpipe\_co2\_ft2: Tailpipe CO2 emissions in grams/mile (ft2).

 tailpipe\_co2\_in\_grams\_mile\_ft2: Tailpipe CO2 emissions (ft2).

 fuel\_economy\_score: Vehicle fuel economy score.

 ghg\_score: Vehicle greenhouse gas (GHG) emissions score.

 ghg\_score\_alt\_fuel: Alternative fuel GHG emissions score.