◢ **Assessment Report**
on

Vehicle Emission Classification and Analysis

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Introduction

Air pollution caused by vehicle emissions is a major global concern. One of the most significant pollutants is CO_2 (carbon dioxide). Analyzing CO_2 emission levels can help in categorizing vehicles based on their environmental impact. This report aims to classify vehicles based on their CO_2 emissions and visualize the data to understand emission trends based on vehicle type, engine size, and fuel type.

Methodology

1. **Data Loading**: The dataset containing vehicle emission details was loaded using pandas.

2. **Data Cleaning**: Null values in the 'co2_emissions' column were removed.

3. **Classification Function**: A custom function was developed to classify CO2 emissions into categories such as 'Zero Emission', 'Low', 'Moderate', etc.

4. **Data Visualization**: Various plots were used to visualize emission patterns, including:

   - Count Plot
   - Histogram
   - Boxplot by Fuel Type
   - Pie Chart
   - Heatmap
   - Scatter Plot

Code

```python
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

df = pd.read_csv('/content/vehicle_emissions.csv')

def classify_emission(co2):
    if co2 == 0:
        return 'Zero Emission'
    elif co2 <= 100:
        return 'A - Low'
    elif co2 <= 120:
        return 'B - Moderate'
    elif co2 <= 160:
        return 'C - Average'
    elif co2 <= 200:
        return 'D - High'
    else:
        return 'E - Very High'

df = df.dropna(subset=['co2_emissions'])
df['predicted_emission_category'] = df['co2_emissions'].apply(classify_emission)

# Example Visualization
sns.countplot(data=df, x='predicted_emission_category', palette='coolwarm')
plt.show()
```
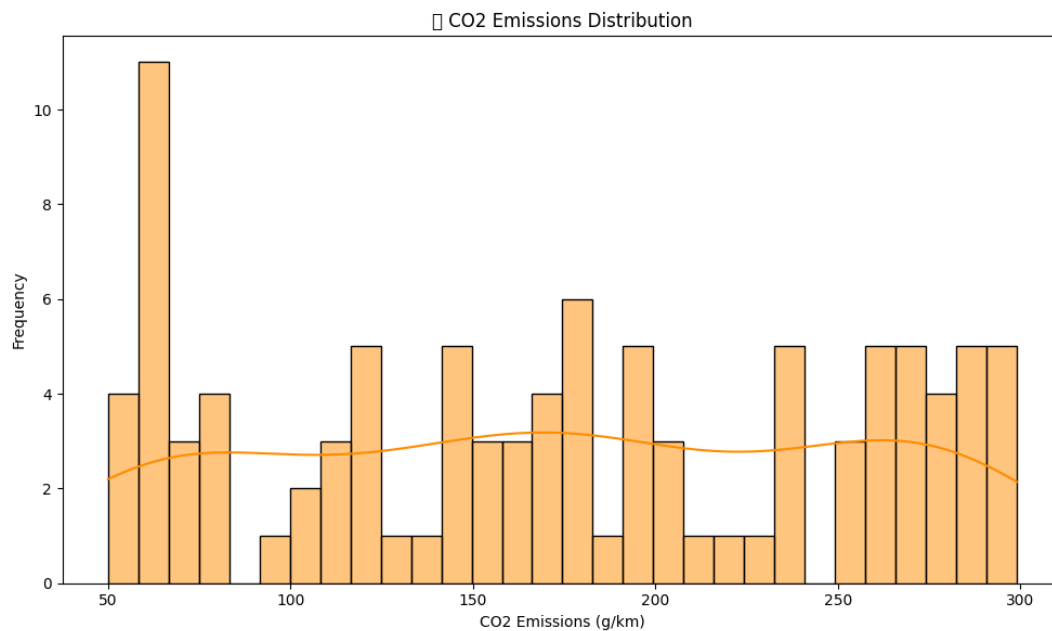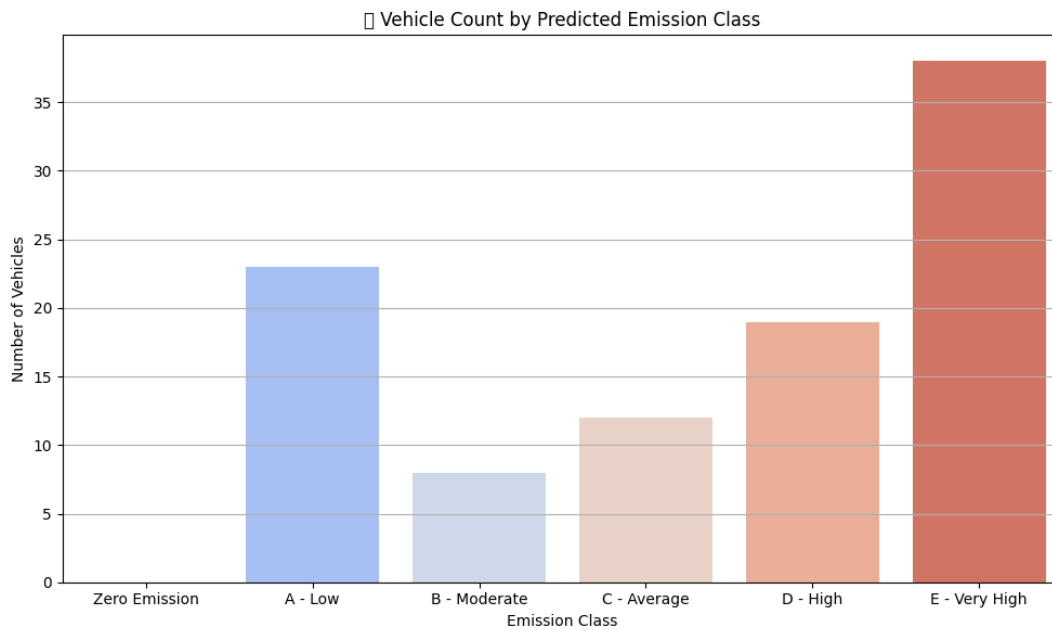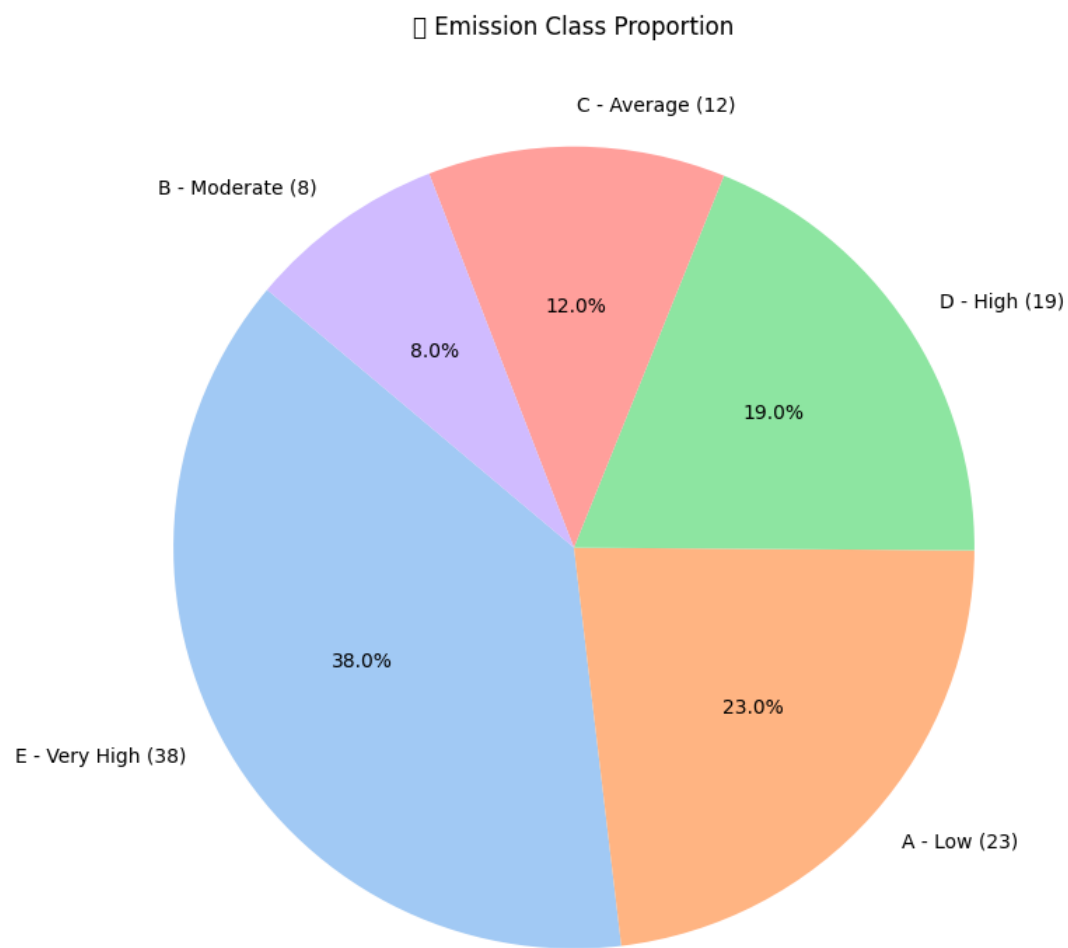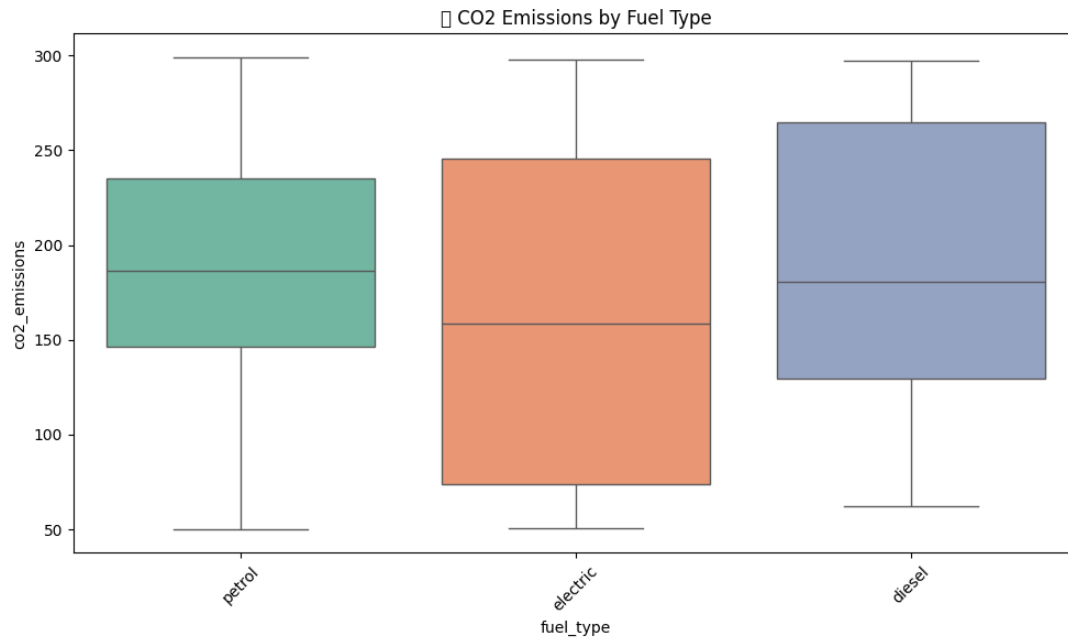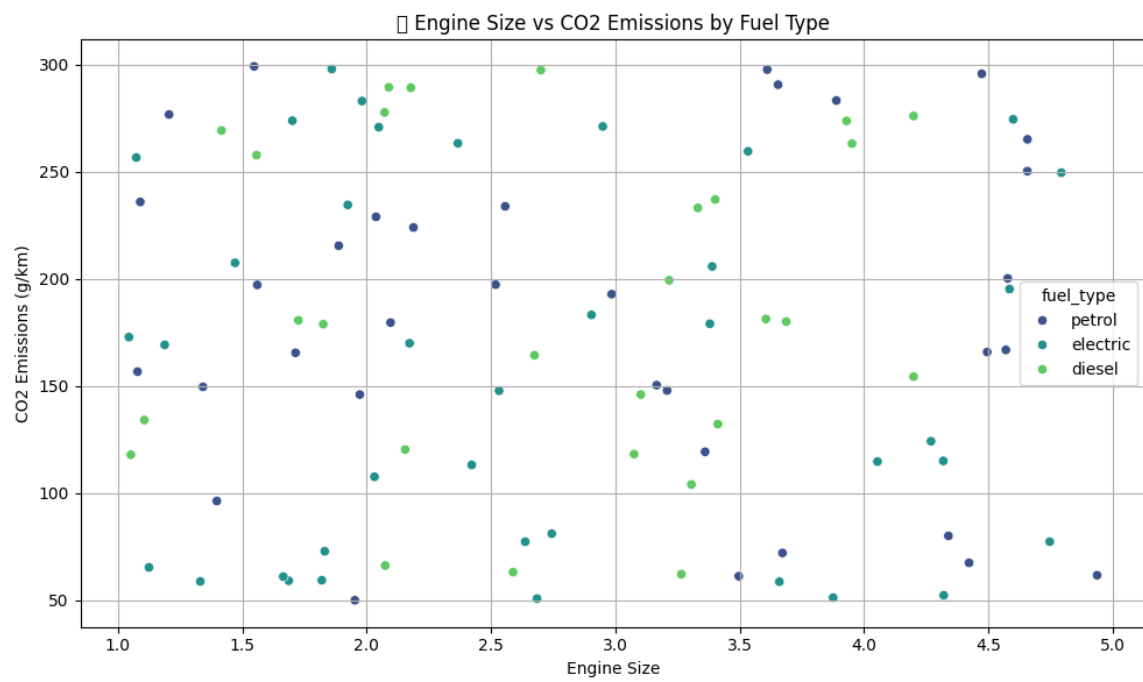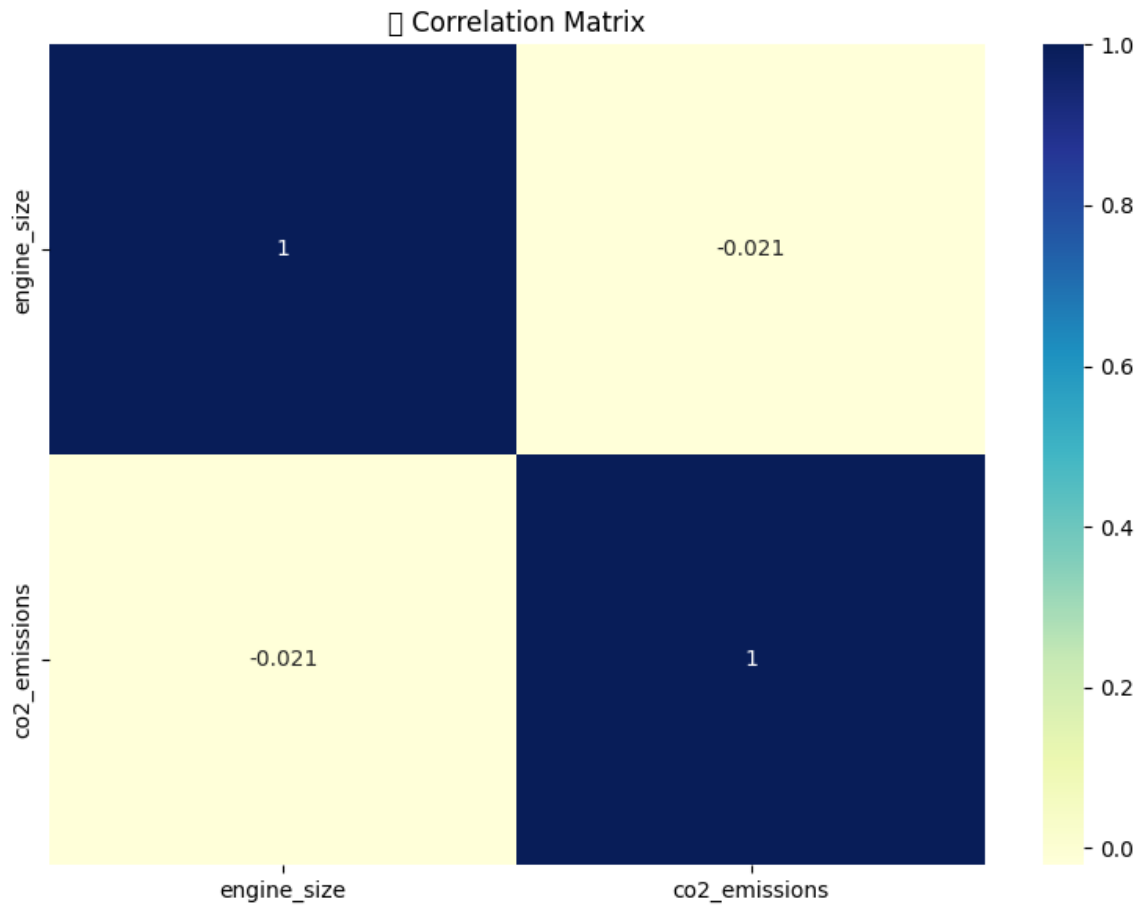
Output / Results

The following plots were generated from the dataset to help understand the emission trends. Each visualization provides insights into how vehicles emit CO2 based on different attributes.

CO2 Emissions by Fuel Type

Emission Class Proportion

Correlation Matrix

Engine Size vs CO2 Emissions by Fuel Type

References / Credits

- Dataset Source: Government of Canada Open Data Portal or other public vehicle datasets.
- Python Libraries: pandas, matplotlib, seaborn, plotly.
- Visualization techniques inspired by official documentation and tutorials.
- Code and logic inspired by classroom concepts and lab activities.