Assessment Report

on

"Classify Vehicles Based on Engine Emissions"

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

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in

CSE(AIML)

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INTRODUCTION :

This project involves analyzing vehicle emissions data to uncover insights about CO2 emissions based on fuel type, engine size, and emission categories. Using Python libraries such as Pandas, Matplotlib, and Seaborn, multiple graphs were generated to visualize trends, distributions, and correlations within the dataset. The

visualizations help understand how different vehicle features contribute to CO2 emissions, which is crucial for policy-making and environmental impact assessment.

METHODOLOGY:

1. The dataset was first loaded using Pandas.

2. Seaborn and Matplotlib were used for creating various visualizations.

3. Visualizations include:

- Histogram to compare emission levels by fuel type.

- Scatter plot to observe the relationship between engine size and emissions.

- Box plot and violin plot to visualize the spread and distribution of emissions across categories.

- Bar chart for average emissions by fuel type.

- Correlation heatmap for understanding numeric relationships.

- KDE plot for density comparison among fuel types.

4. Each graph was created and commented clearly in Google Colab for reproducibility.

CODE :

```
import pandas as pd

import numpy as np

import matplotlib.pyplot as plt

import seaborn as sns
```

df = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/vehicle_emissions.csv')

print(df.head())

print(df.shape)

print(df.describe())

print(df.dtypes)

df.dropna(inplace=True)

value = 0

df.fillna(value, inplace=True)

 # Set seaborn style

sns.set(style="whitegrid")

In [16]:

#Histogram of CO2 Emissions by Fuel Type

plt.figure(figsize=(8, 6))

sns.histplot(data=df, x="co2_emissions", hue="fuel_type", element="step")

plt.title("Histogram of CO2 Emissions by Fuel Type")

plt.xlabel("CO2 Emissions (g/km)")

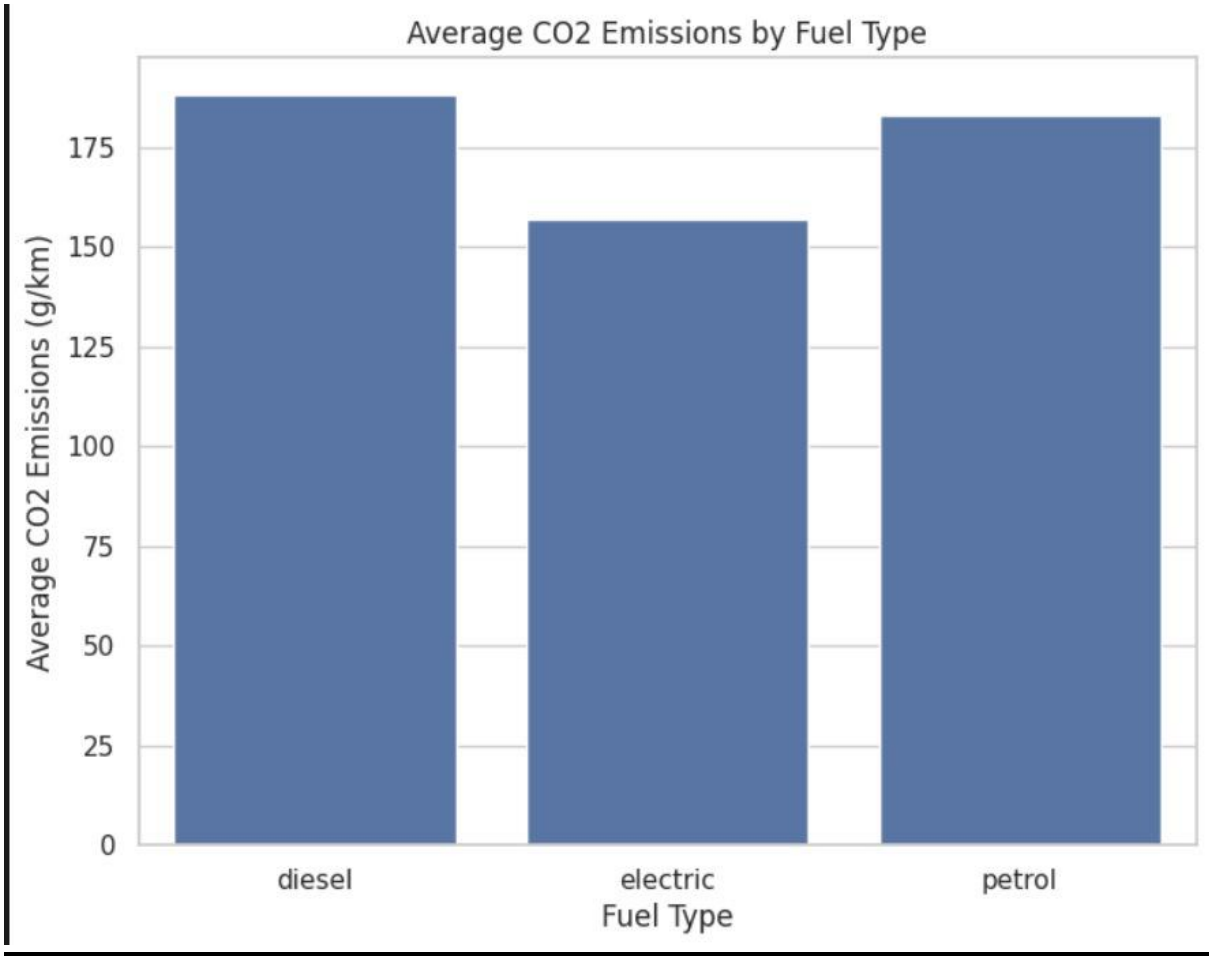
plt.ylabel("Count")

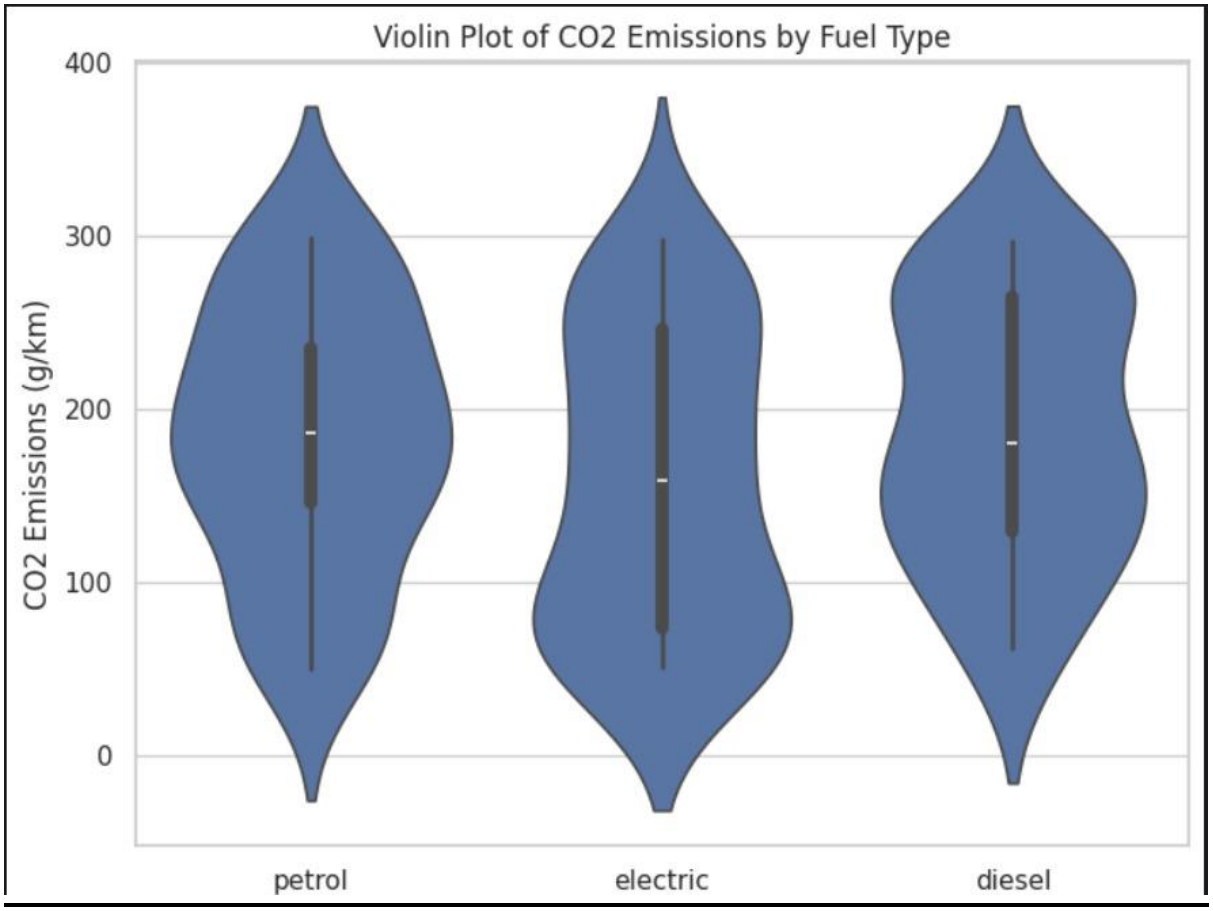
plt.show()

```
#Scatter Plot: Engine Size vs CO2 Emissions by Fuel Type
plt.figure(figsize=(8, 6))
sns.scatterplot(data=df, x="engine_size", y="co2_emissions", hue="fuel_type")
plt.title("Engine Size vs CO2 Emissions by Fuel Type")
plt.xlabel("Engine Size (L)")
plt.ylabel("CO2 Emissions (g/km)")
plt.show()

#Box Plot: CO2 Emissions by Emission Category
plt.figure(figsize=(8, 6))
sns.boxplot(data=df, x="emission_category", y="co2_emissions")
plt.title("CO2 Emissions by Emission Category")
plt.xlabel("Emission Category")
plt.ylabel("CO2 Emissions (g/km)")
plt.show()

#Bar Chart: Average CO2 Emissions by Fuel Type
avg_emissions = df.groupby("fuel_type")["co2_emissions"].mean().reset_index()

plt.figure(figsize=(8, 6))
sns.barplot(data=avg_emissions, x="fuel_type", y="co2_emissions")
```

```
plt.title("Average CO2 Emissions by Fuel Type")
plt.xlabel("Fuel Type")
plt.ylabel("Average CO2 Emissions (g/km)")
plt.show()

# Create a violin plot
plt.figure(figsize=(8, 6))
sns.violinplot(data=df, x="fuel_type", y="co2_emissions")

plt.title("Violin Plot of CO2 Emissions by Fuel Type")
plt.xlabel("Fuel Type")
plt.ylabel("CO2 Emissions (g/km)")
plt.show()
```

OUPUT :


Average CO2 Emissions by Fuel Type
Average CO2 Emissions (g/km)
0
25
50
75
100
125
150
175
diesel
electric
petrol
Fuel Type


Violin Plot of CO2 Emissions by Fuel Type
CO2 Emissions (g/km)
400
300
200
100
0
petrol
electric
diesel