231501165

Surweesh SP

EX NO: 1 Setting up the Python environment and libraries- Juypter Notebook

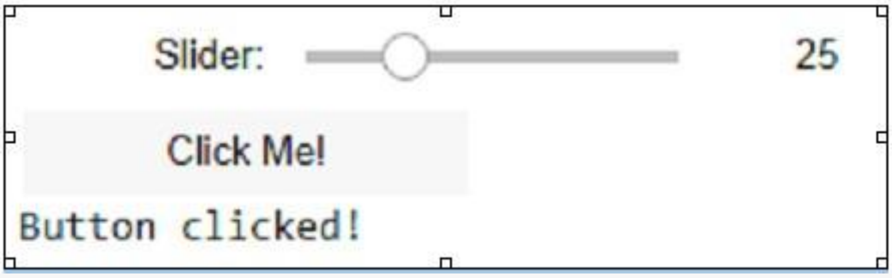
Create a new notebook for Python

Write and execute Python code

Create new cells for code and Markdown

Demonstrate the application of Jupyter Widgets, Jupyter AI

```
import ipywidgets as widgets
from IPython.display import display
slider = widgets.IntSlider(description='Slider:', min=0, max=100,
value=25)
display(slider)
button = widgets.Button(description="Click Me!")
display(button)
def on_button_click(b):
    print("Button clicked!")


button.on_click(on_button_click)
```



```
Button clicked!
```

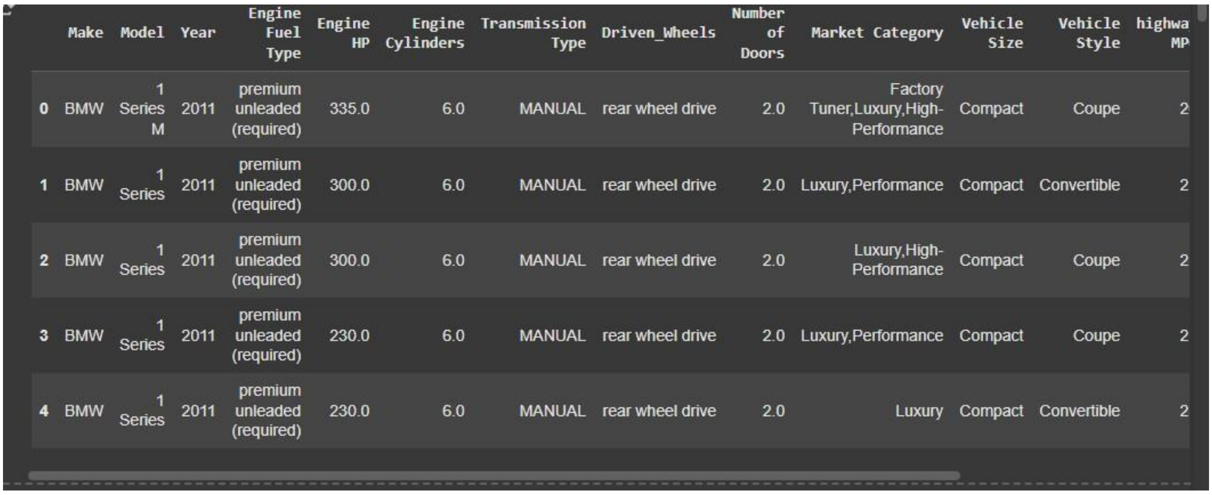
EXP NO:2 EDA-Data Import and Export

Importing data from CSV, Excel, SQL databases, and web scraping

Handling different data formats

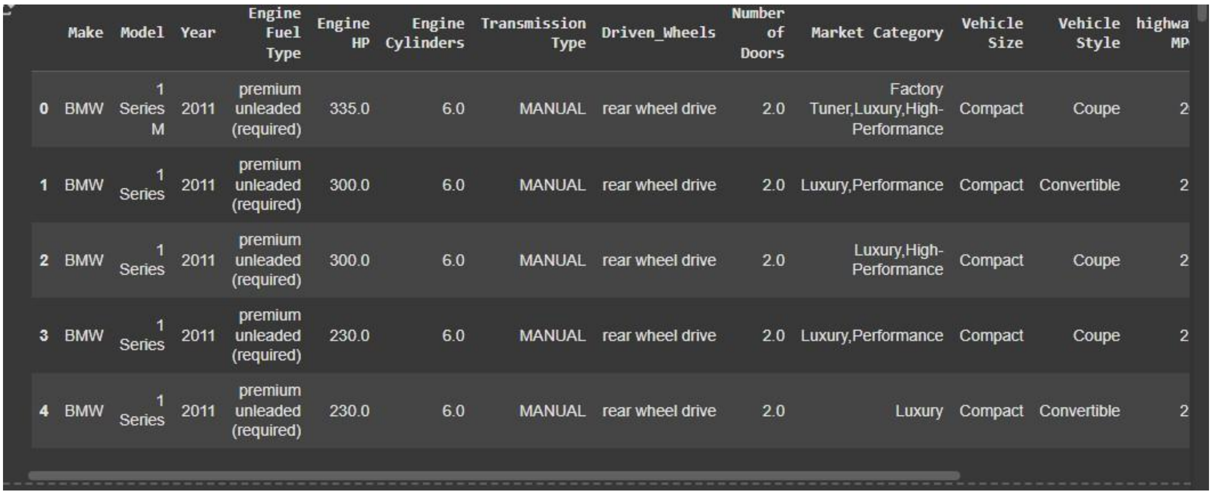
Export a DataFrame to an Excel file.

```
import pandas as pd

df_csv = pd.read_csv('/content/data.csv')

df_csv.head()
```



	Make	Model	Year	Engine Fuel Type	Engine HP	Engine Cylinders	Transmission Type	Driven_Wheels	Number of Doors	Market Category	Vehicle Size	Vehicle Style	highwa MP
0	BMW	1 Series M	2011	premium unleaded (required)	335.0	6.0	MANUAL	rear wheel drive	2.0	Factory Tuner,Luxury,High-Performance	Compact	Coupe	2
1	BMW	1 Series	2011	premium unleaded (required)	300.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,Performance	Compact	Convertible	2
2	BMW	1 Series	2011	premium unleaded (required)	300.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,High-Performance	Compact	Coupe	2
3	BMW	1 Series	2011	premium unleaded (required)	230.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,Performance	Compact	Coupe	2
4	BMW	1 Series	2011	premium unleaded (required)	230.0	6.0	MANUAL	rear wheel drive	2.0	Luxury	Compact	Convertible	2

```
df_excel = pd.read_excel('/content/data.xlsx')
df_excel.head()
```

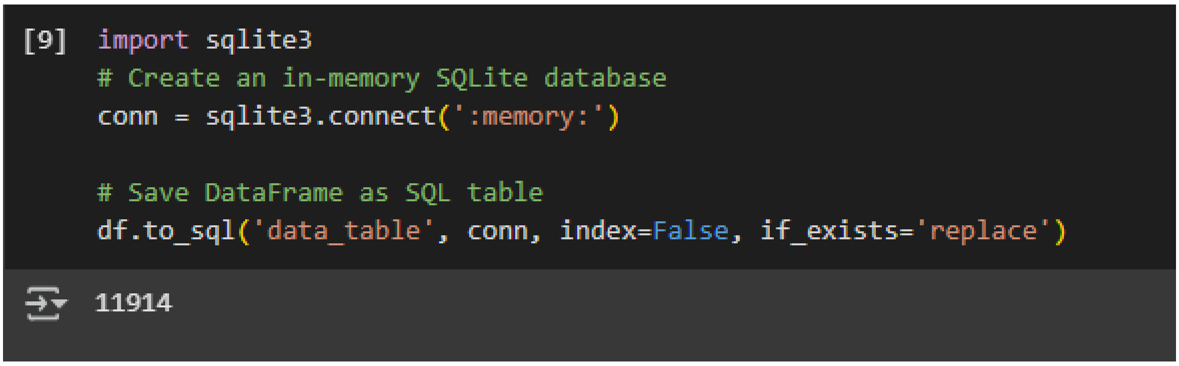


	Make	Model	Year	Engine Fuel Type	Engine HP	Engine Cylinders	Transmission Type	Driven_Wheels	Number of Doors	Market Category	Vehicle Size	Vehicle Style	highwa MP
0	BMW	1 Series M	2011	premium unleaded (required)	335.0	6.0	MANUAL	rear wheel drive	2.0	Factory Tuner,Luxury,High-Performance	Compact	Coupe	2
1	BMW	1 Series	2011	premium unleaded (required)	300.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,Performance	Compact	Convertible	2
2	BMW	1 Series	2011	premium unleaded (required)	300.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,High-Performance	Compact	Coupe	2
3	BMW	1 Series	2011	premium unleaded (required)	230.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,Performance	Compact	Coupe	2
4	BMW	1 Series	2011	premium unleaded (required)	230.0	6.0	MANUAL	rear wheel drive	2.0	Luxury	Compact	Convertible	2

import sqlite3

conn = sqlite3.connect(':memory:')

df.to_sql('data_table', conn, index=False, if_exists='replace')

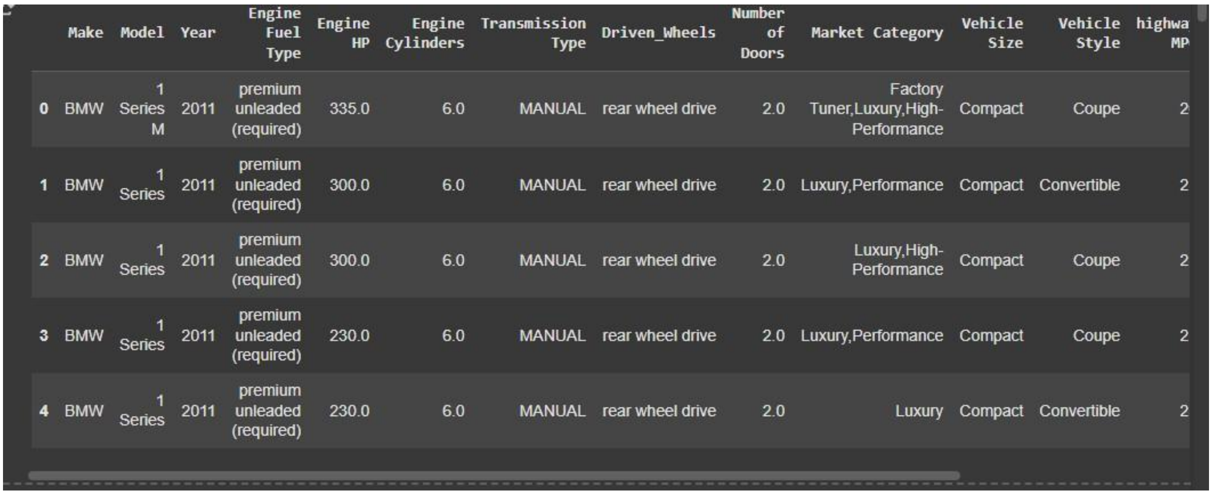


```
[9]  import sqlite3
     # Create an in-memory SQLite database
     conn = sqlite3.connect(':memory:')

     # Save DataFrame as SQL table
     df.to_sql('data_table', conn, index=False, if_exists='replace')

     11914
```

query = "SELECT * FROM data_table LIMIT 5;"

result = pd.read_sql_query(query, conn)

result

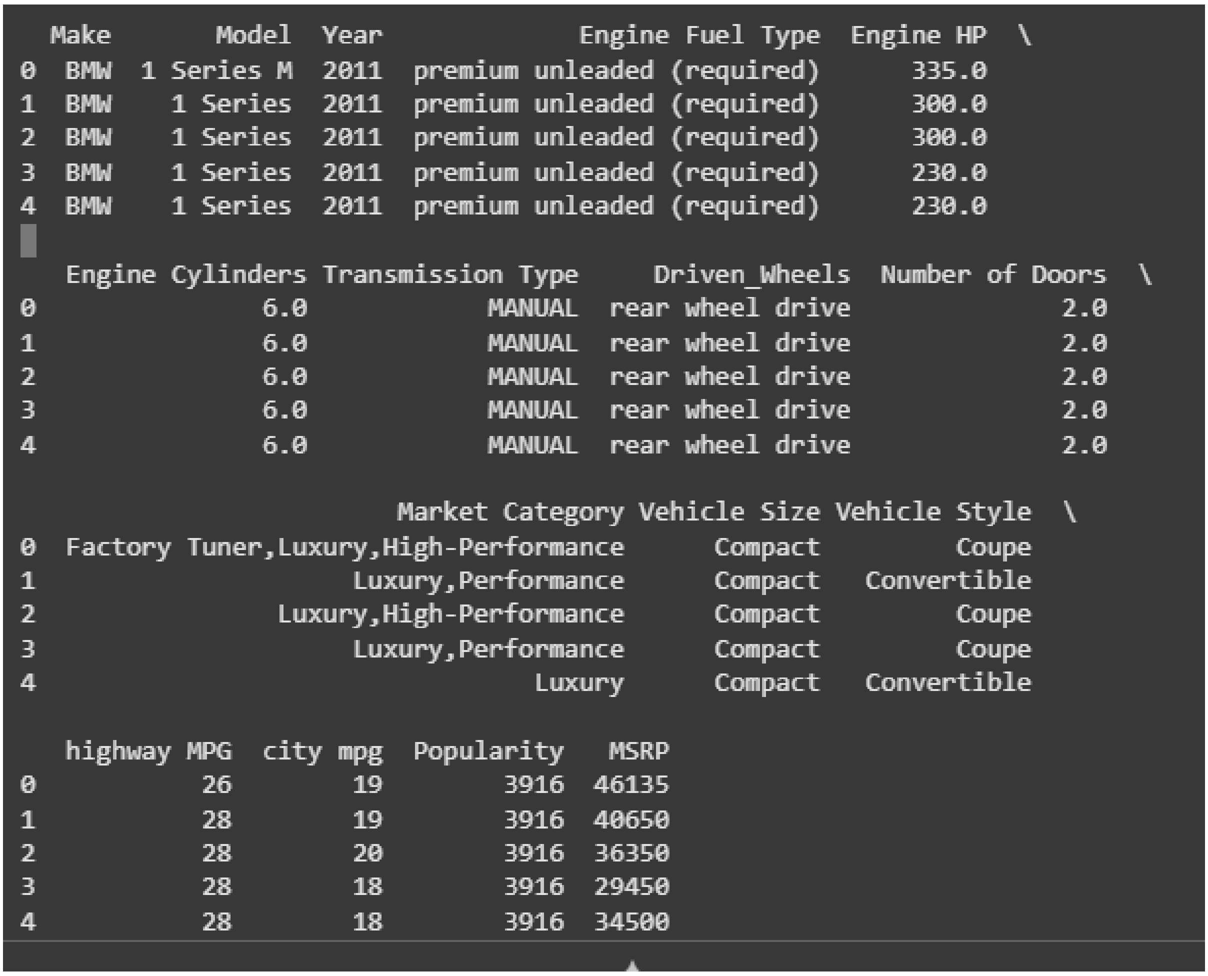


	Make	Model	Year	Engine Fuel Type	Engine HP	Engine Cylinders	Transmission Type	Driven_Wheels	Number of Doors	Market Category	Vehicle Size	Vehicle Style	highwa MP
0	BMW	1 Series M	2011	premium unleaded (required)	335.0	6.0	MANUAL	rear wheel drive	2.0	Factory Tuner,Luxury,High-Performance	Compact	Coupe	2
1	BMW	1 Series	2011	premium unleaded (required)	300.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,Performance	Compact	Convertible	2
2	BMW	1 Series	2011	premium unleaded (required)	300.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,High-Performance	Compact	Coupe	2
3	BMW	1 Series	2011	premium unleaded (required)	230.0	6.0	MANUAL	rear wheel drive	2.0	Luxury,Performance	Compact	Coupe	2
4	BMW	1 Series	2011	premium unleaded (required)	230.0	6.0	MANUAL	rear wheel drive	2.0	Luxury	Compact	Convertible	2

df.to_html('data.htm', index=False)

df_scraped = pd.read_html('data.htm')[0]

print(df_scraped.head())

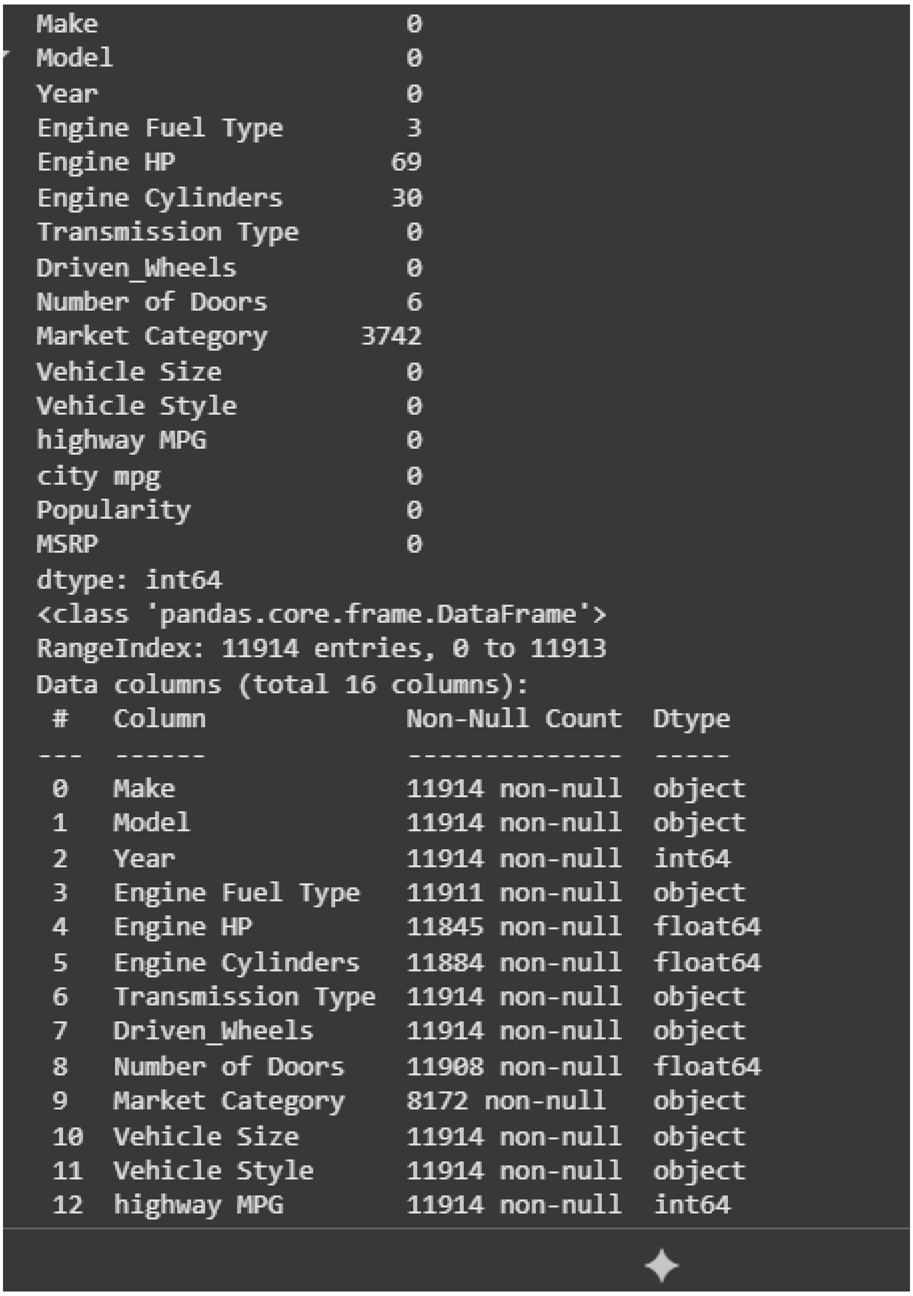


```
  Make       Model  Year             Engine Fuel Type  Engine HP  \
0  BMW  1 Series M  2011  premium unleaded (required)      335.0   
1  BMW    1 Series  2011  premium unleaded (required)      300.0   
2  BMW    1 Series  2011  premium unleaded (required)      300.0   
3  BMW    1 Series  2011  premium unleaded (required)      230.0   
4  BMW    1 Series  2011  premium unleaded (required)      230.0   

   Engine Cylinders Transmission Type     Driven_Wheels  Number of Doors  \
0               6.0            MANUAL  rear wheel drive              2.0   
1               6.0            MANUAL  rear wheel drive              2.0   
2               6.0            MANUAL  rear wheel drive              2.0   
3               6.0            MANUAL  rear wheel drive              2.0   
4               6.0            MANUAL  rear wheel drive              2.0   

                        Market Category Vehicle Size Vehicle Style  \
0  Factory Tuner,Luxury,High-Performance      Compact         Coupe   
1                     Luxury,Performance      Compact   Convertible   
2                Luxury,High-Performance      Compact         Coupe   
3                     Luxury,Performance      Compact         Coupe   
4                                 Luxury      Compact   Convertible   

   highway MPG  city mpg  Popularity   MSRP  
0           26        19        3916  46135  
1           28        19        3916  40650  
2           28        20        3916  36350  
3           28        18        3916  29450  
4           28        18        3916  34500  
```

EX NO: 3 EDA-Data Cleaning

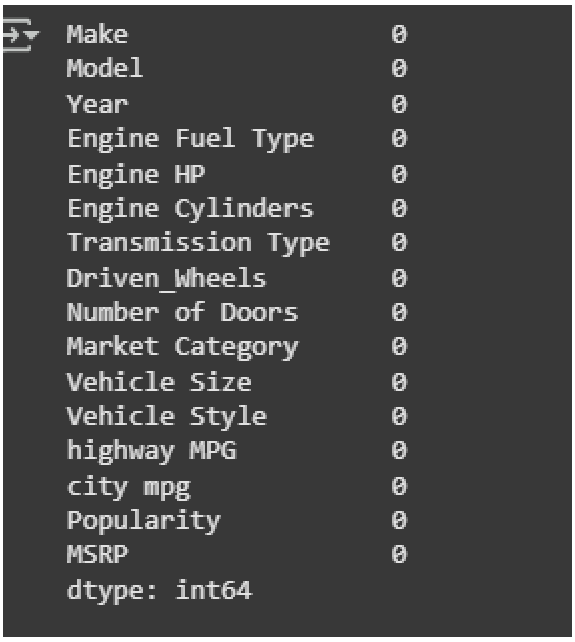
- **Handling missing values: detection, filling, and dropping**
- **Removing duplicates and unnecessary data**
- **Data type conversion and ensuring consistency**
- **Normalize data (e.g., standardization, min-max scaling).**

```
import pandas as pd

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

print(df.isnull().sum())

print(df.info())
```



```
Make                    0
Model                   0
Year                    0
Engine Fuel Type        3
Engine HP              69
Engine Cylinders       30
Transmission Type       0
Driven_Wheels           0
Number of Doors         6
Market Category      3742
Vehicle Size            0
Vehicle Style           0
highway MPG             0
city mpg                0
Popularity              0
MSRP                    0
dtype: int64
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 11914 entries, 0 to 11913
Data columns (total 16 columns):
 #   Column             Non-Null Count  Dtype  
---  ------             --------------  -----  
 0   Make               11914 non-null  object 
 1   Model              11914 non-null  object 
 2   Year               11914 non-null  int64  
 3   Engine Fuel Type   11911 non-null  object 
 4   Engine HP          11845 non-null  float64
 5   Engine Cylinders   11884 non-null  float64
 6   Transmission Type  11914 non-null  object 
 7   Driven_Wheels      11914 non-null  object 
 8   Number of Doors    11908 non-null  float64
 9   Market Category    8172 non-null   object 
 10  Vehicle Size       11914 non-null  object 
 11  Vehicle Style      11914 non-null  object 
 12  highway MPG        11914 non-null  int64  
```

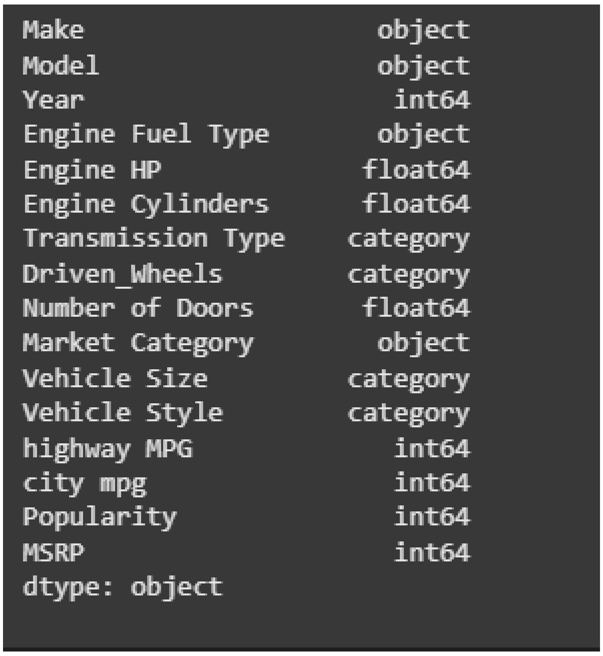
```
df.dropna(inplace=True)
print(df.isnull().sum())
```



```
Make                 0
Model                0
Year                 0
Engine Fuel Type     0
Engine HP            0
Engine Cylinders     0
Transmission Type    0
Driven_Wheels        0
Number of Doors      0
Market Category      0
Vehicle Size         0
Vehicle Style        0
highway MPG          0
city mpg             0
Popularity           0
MSRP                 0
dtype: int64
```

```
df.drop_duplicates(inplace=True)
```

```
df['Make'] = df['Make'].str.title()
df['Model'] = df['Model'].str.title()
df['Transmission Type'] = df['Transmission Type'].astype('category')
df['Driven_Wheels'] = df['Driven_Wheels'].astype('category')
df['Vehicle Size'] = df['Vehicle Size'].astype('category')
df['Vehicle Style'] = df['Vehicle Style'].astype('category)
print(df.dtypes)
```



```
Make                    object
Model                   object
Year                     int64
Engine Fuel Type        object
Engine HP              float64
Engine Cylinders       float64
Transmission Type     category
Driven_Wheels         category
Number of Doors        float64
Market Category         object
Vehicle Size          category
Vehicle Style         category
highway MPG              int64
city mpg                 int64
Popularity               int64
MSRP                     int64
dtype: object
```

```
from sklearn.preprocessing import StandardScaler, MinMaxScaler

numeric_cols = ['Engine HP', 'Engine Cylinders', 'highway MPG', 'city mpg', 'Popularity',
'MSRP']

scaler = StandardScaler()i

df[numeric_cols] = scaler.ft_transform(df[numeric_cols])

# Min-Max Scaling (optional alternative)

# minmax = MinMaxScaler()

# df[numeric_cols] = minmax.fit_transform(df[numeric_cols])

df.to_csv('cleaned_dataset.csv', index=False)
```

EX NO: 4 EDA-Data Inspection and Analysis

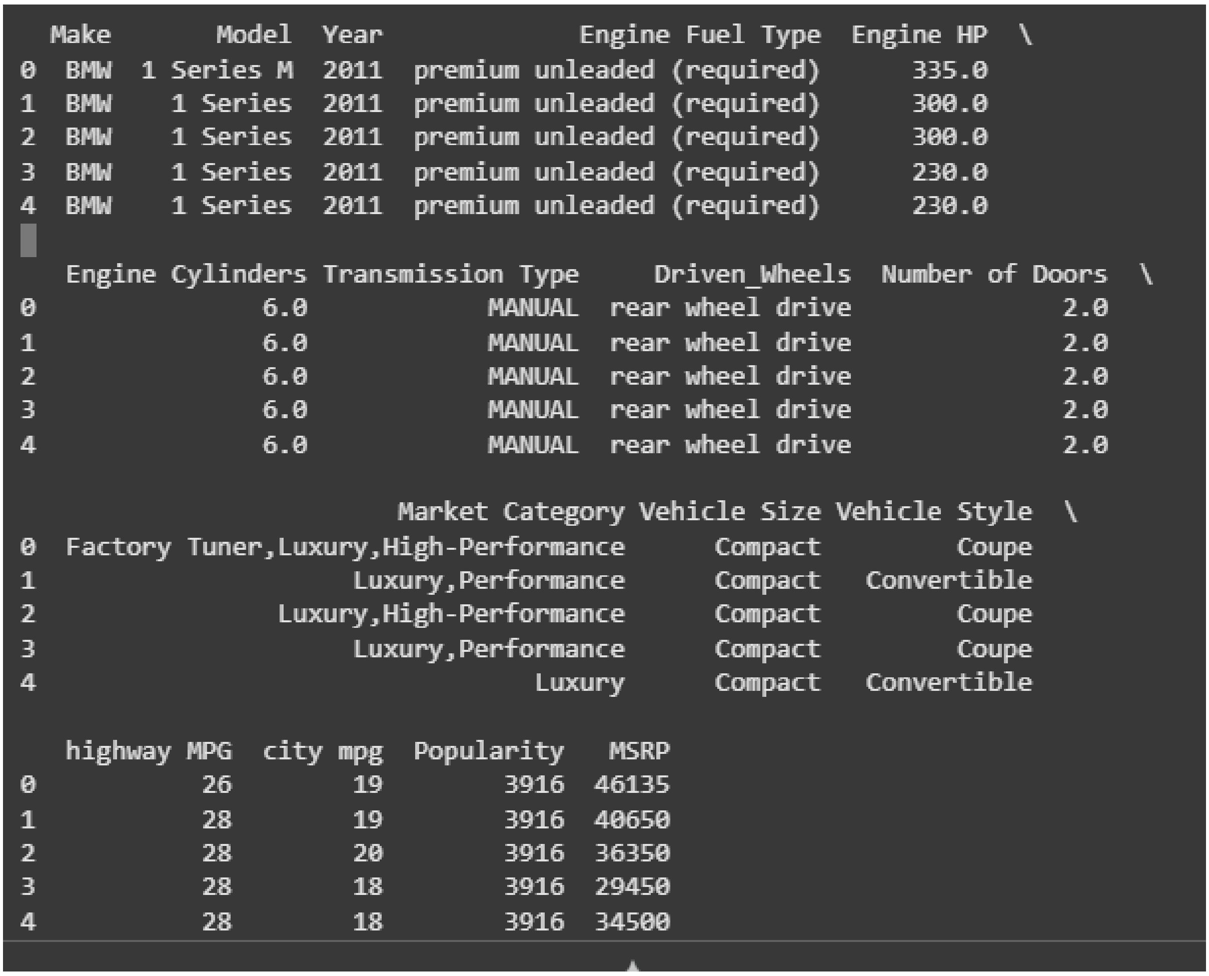
□ Viewing and inspecting DataFrames

□ Filtering and subsetting data using conditions

□ Descriptive statistics: measures of central tendency (mean, median, mode) and measures of dispersion

(range, variance, standard deviation)

```
import pandas as pd


df = pd.read_csv("data.csv")
print(df.head())
print("Rows:", df.shape[0], "Columns:", df.shape[1])
print(df.dtypes)
print(df.isnull().sum())
print(df.describe())
```



```
  Make       Model  Year             Engine Fuel Type  Engine HP  \
0  BMW  1 Series M  2011  premium unleaded (required)      335.0
1  BMW    1 Series  2011  premium unleaded (required)      300.0
2  BMW    1 Series  2011  premium unleaded (required)      300.0
3  BMW    1 Series  2011  premium unleaded (required)      230.0
4  BMW    1 Series  2011  premium unleaded (required)      230.0

   Engine Cylinders Transmission Type     Driven_Wheels  Number of Doors  \
0               6.0            MANUAL  rear wheel drive              2.0
1               6.0            MANUAL  rear wheel drive              2.0
2               6.0            MANUAL  rear wheel drive              2.0
3               6.0            MANUAL  rear wheel drive              2.0
4               6.0            MANUAL  rear wheel drive              2.0

                        Market Category Vehicle Size Vehicle Style  \
0  Factory Tuner,Luxury,High-Performance      Compact         Coupe
1                     Luxury,Performance      Compact   Convertible
2                Luxury,High-Performance      Compact         Coupe
3                     Luxury,Performance      Compact         Coupe
4                                 Luxury      Compact   Convertible

   highway MPG  city mpg  Popularity   MSRP
0           26        19        3916  46135
1           28        19        3916  40650
2           28        20        3916  36350
3           28        18        3916  29450
4           28        18        3916  34500
```

car_after_2015 = df[df['Year'] > 2015]

high_hp_cars = df[df['Engine HP'] > 300]

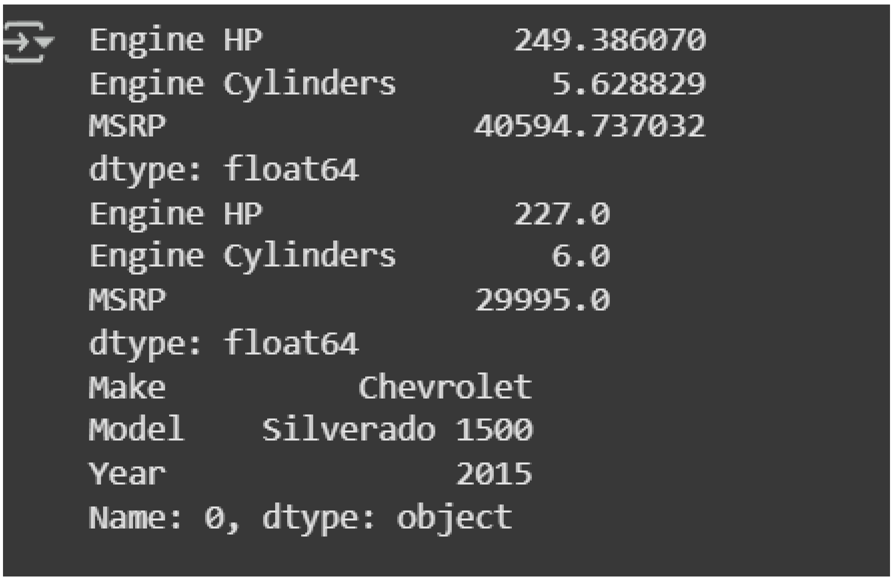
selected_columns = df[['Make', 'Model', 'MSRP']]

luxury_cars = df[df['Market Category'].str.contains('Luxury', na=False)]

print(df[['Engine HP', 'Engine Cylinders', 'MSRP']].mean())

print(df[['Engine HP', 'Engine Cylinders', 'MSRP']].median())

print(df[['Make', 'Model', 'Year']].mode().iloc[0])



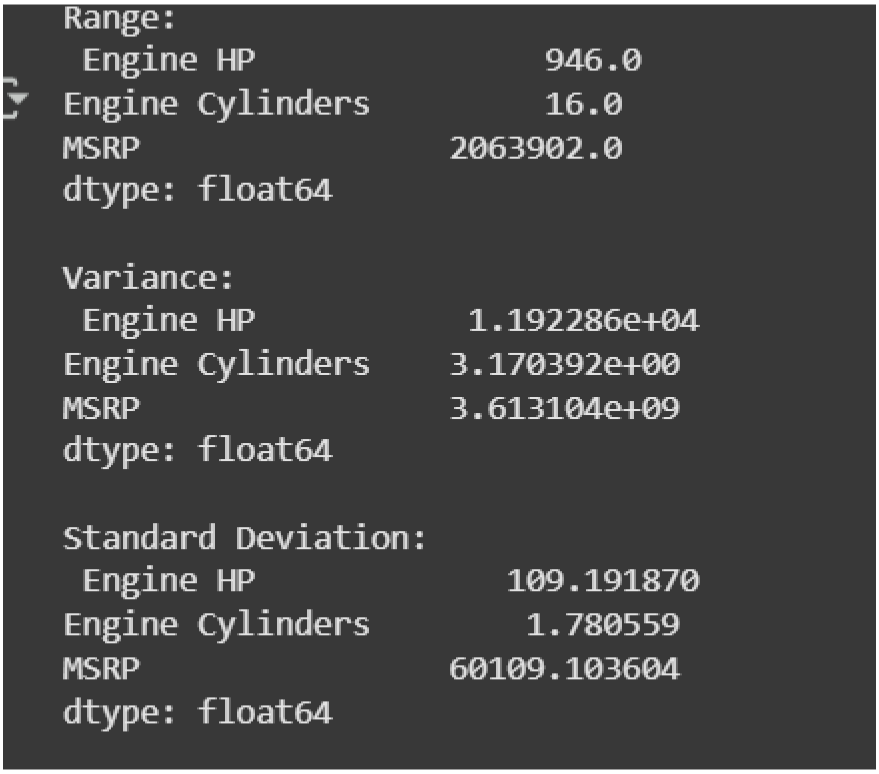
```
Engine HP               249.386070
Engine Cylinders          5.628829
MSRP                  40594.737032
dtype: float64
Engine HP               227.0
Engine Cylinders          6.0
MSRP                  29995.0
dtype: float64
Make            Chevrolet
Model      Silverado 1500
Year                 2015
Name: 0, dtype: object
```

range_values = df[['Engine HP', 'Engine Cylinders', 'MSRP']].max() - df[['Engine HP', 'Engine Cylinders', 'MSRP']].min()

print("Range:\n", range_values)

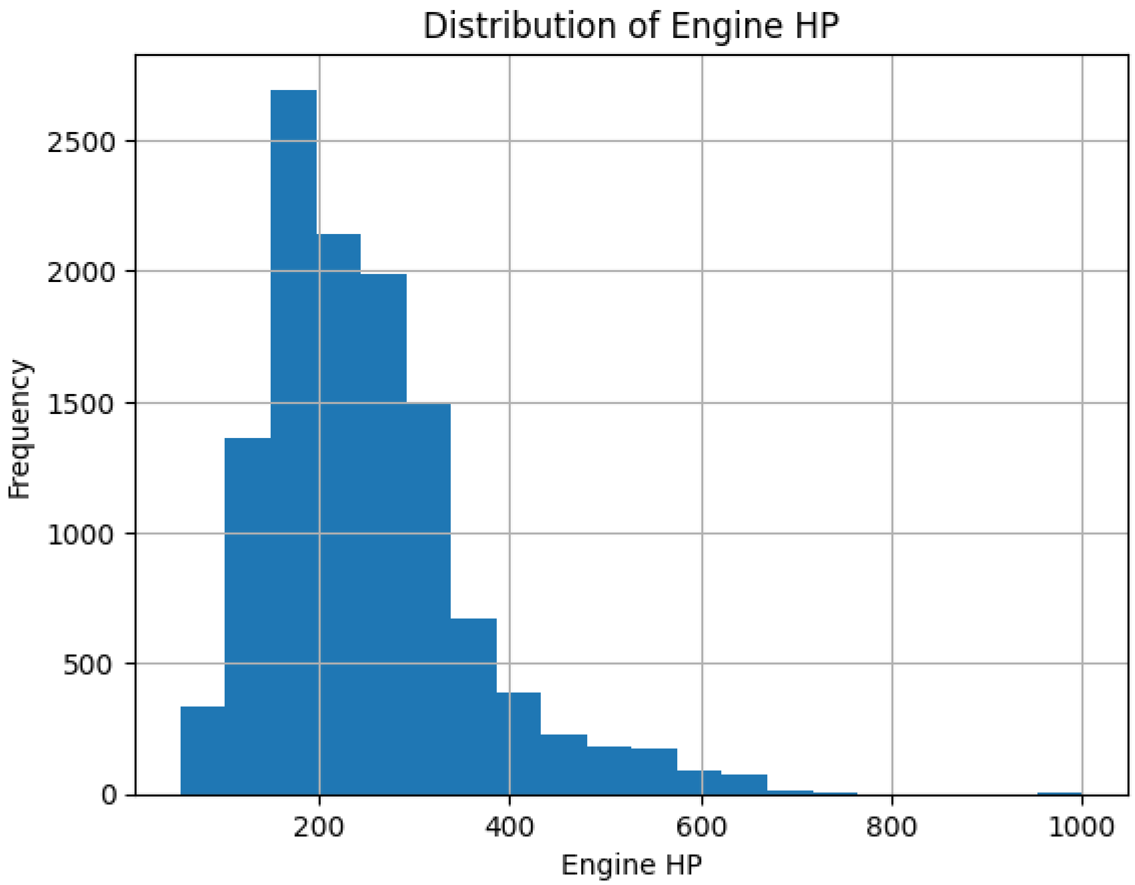
print("Variance:\n", df[['Engine HP', 'Engine Cylinders', 'MSRP']].var())

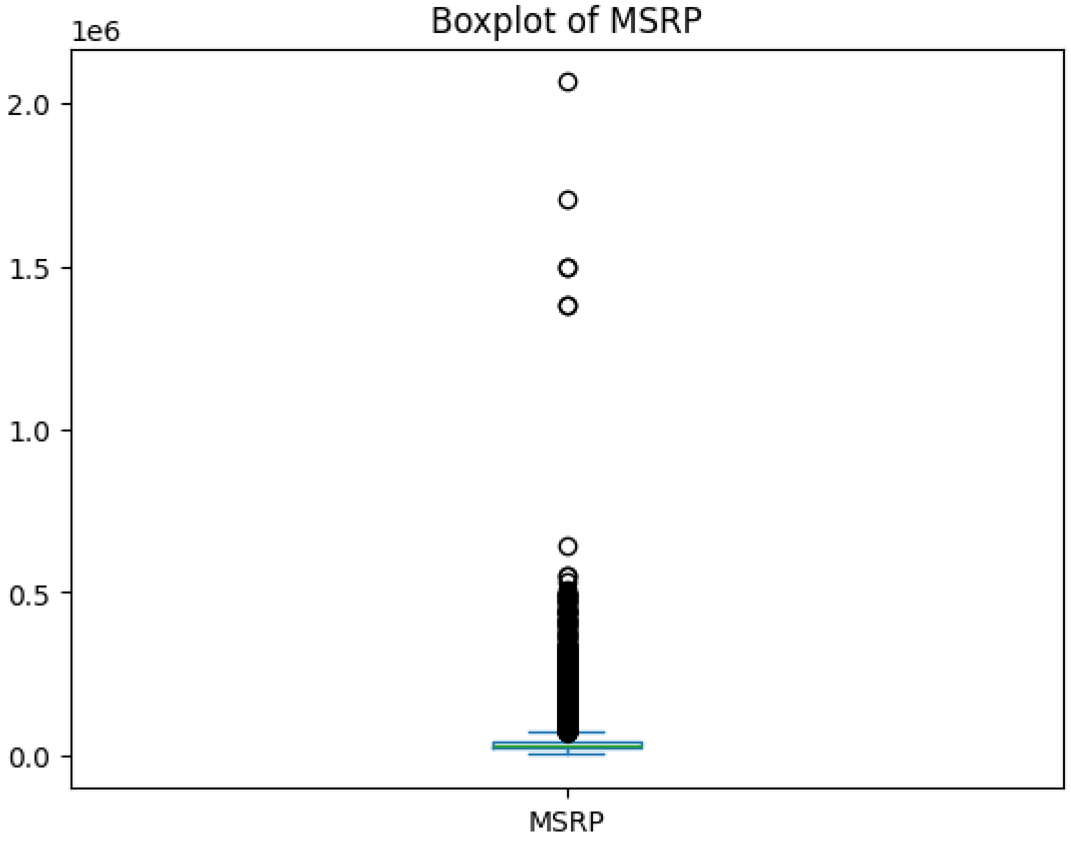
print("Standard Deviation:\n", df[['Engine HP', 'Engine Cylinders', 'MSRP']].std())



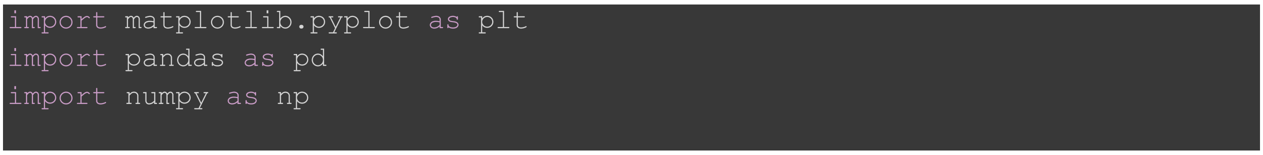
```
Range:
 Engine HP               946.0
Engine Cylinders          16.0
MSRP                 2063902.0
dtype: float64

Variance:
 Engine HP           1.192286e+04
Engine Cylinders    3.170392e+00
MSRP                3.613104e+09
dtype: float64

Standard Deviation:
 Engine HP             109.191870
Engine Cylinders         1.780559
MSRP                60109.103604
dtype: float64
```

```
import matplotlib.pyplot as plt


# Histogram of Engine HP
df['Engine HP'].dropna().hist(bins=20)
plt.title("Distribution of Engine HP")
plt.xlabel("Engine HP")
plt.ylabel("Frequency")
plt.show()


# Boxplot of MSRP
df['MSRP'].dropna().plot(kind='box')
plt.title("Boxplot of MSRP")
plt.show()
```

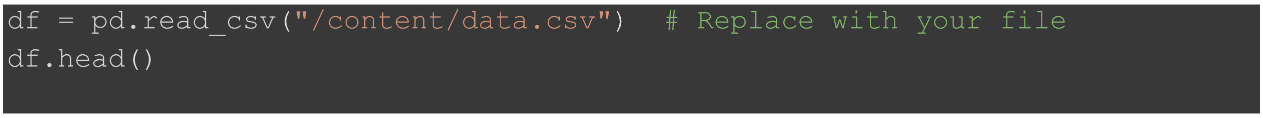

Distribution of Engine HP
Frequency
2500
2000
1500
1000
500
0
200
400
600
800
1000
Engine HP


Boxplot of MSRP
1e6
2.0
1.5
1.0
0.5
0.0
MSRP

EX NO : 5 EDA – DATA VISUALIZATION

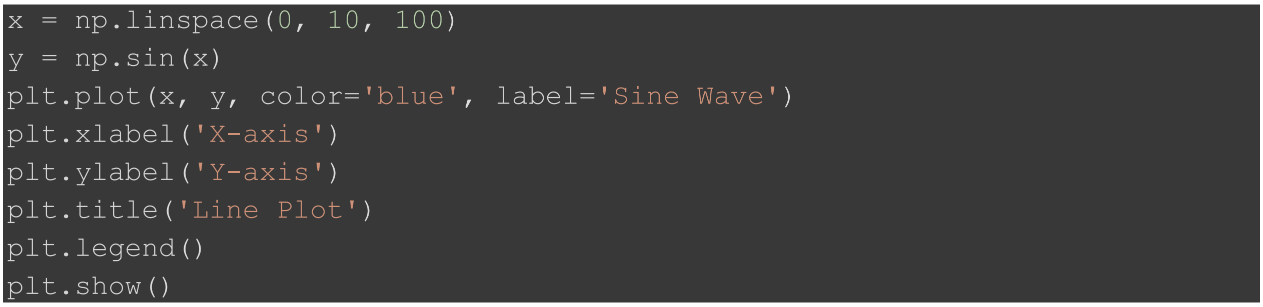


```
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
```

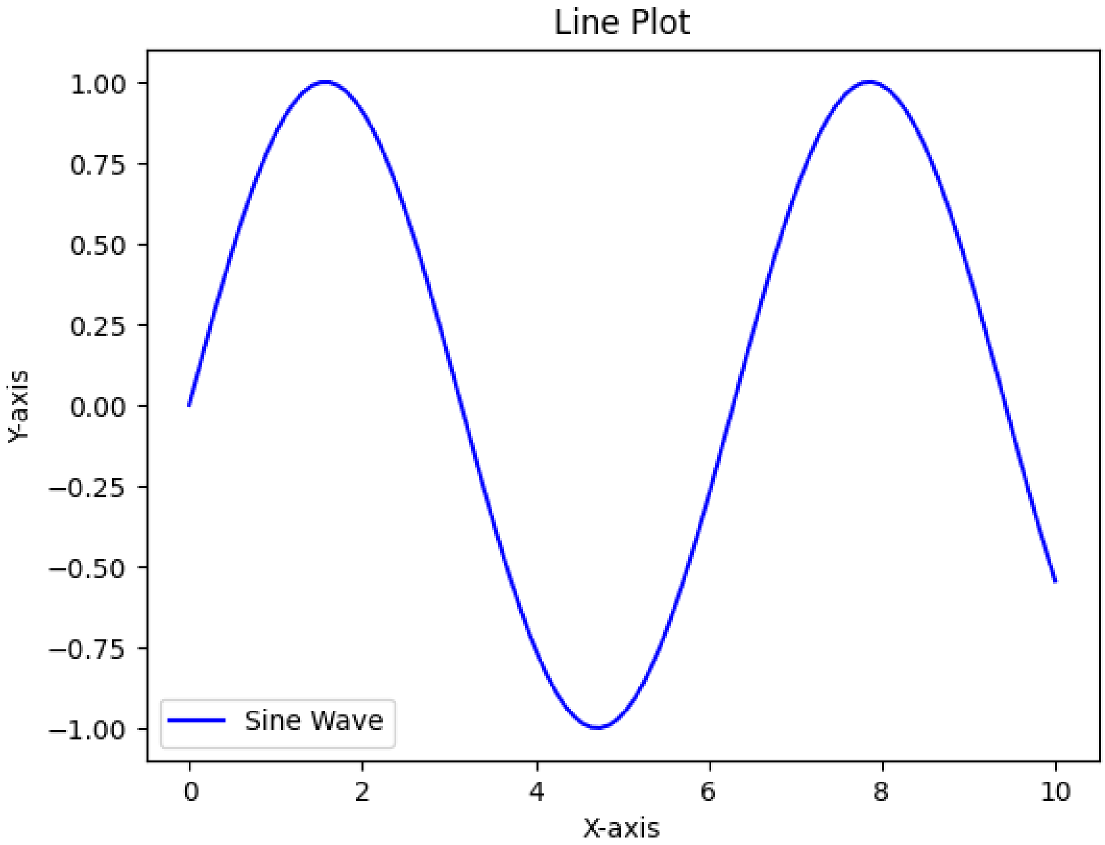


```
df = pd.read_csv("/content/data.csv")  # Replace with your file
df.head()
```

LINE CHART:

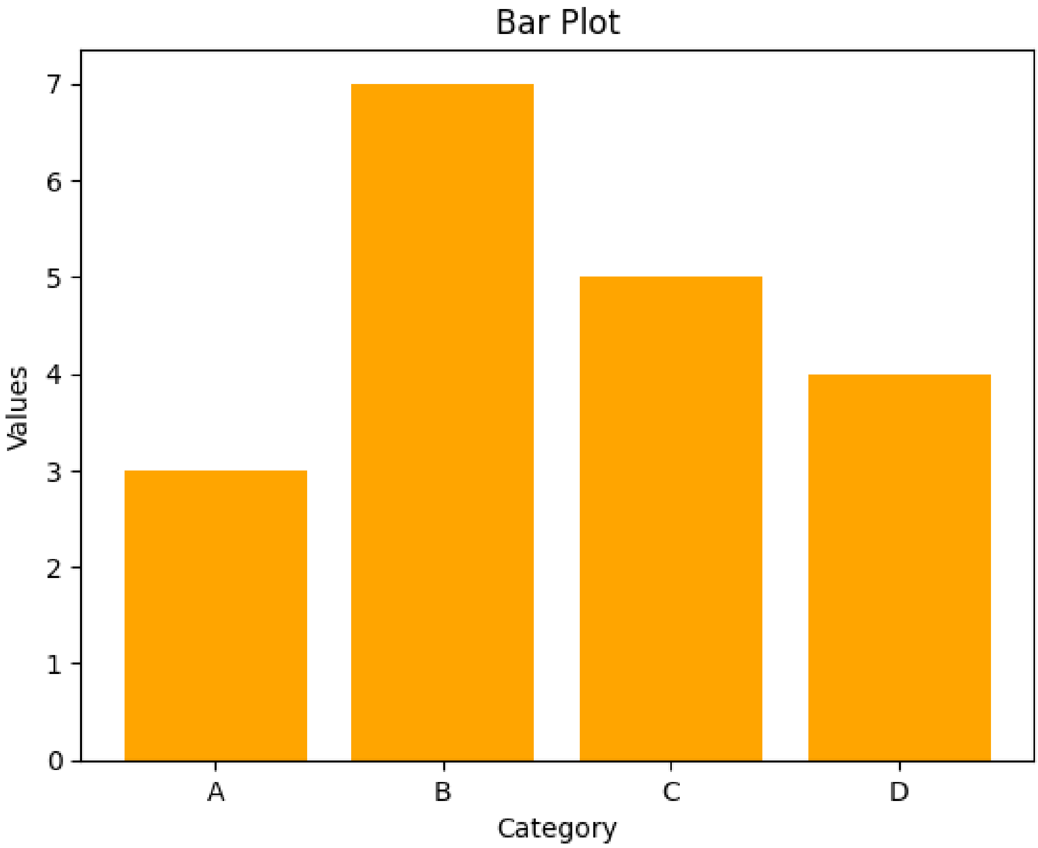


```
x = np.linspace(0, 10, 100)
y = np.sin(x)
plt.plot(x, y, color='blue', label='Sine Wave')
plt.xlabel('X-axis')
plt.ylabel('Y-axis')
plt.title('Line Plot')
plt.legend()
plt.show()
```



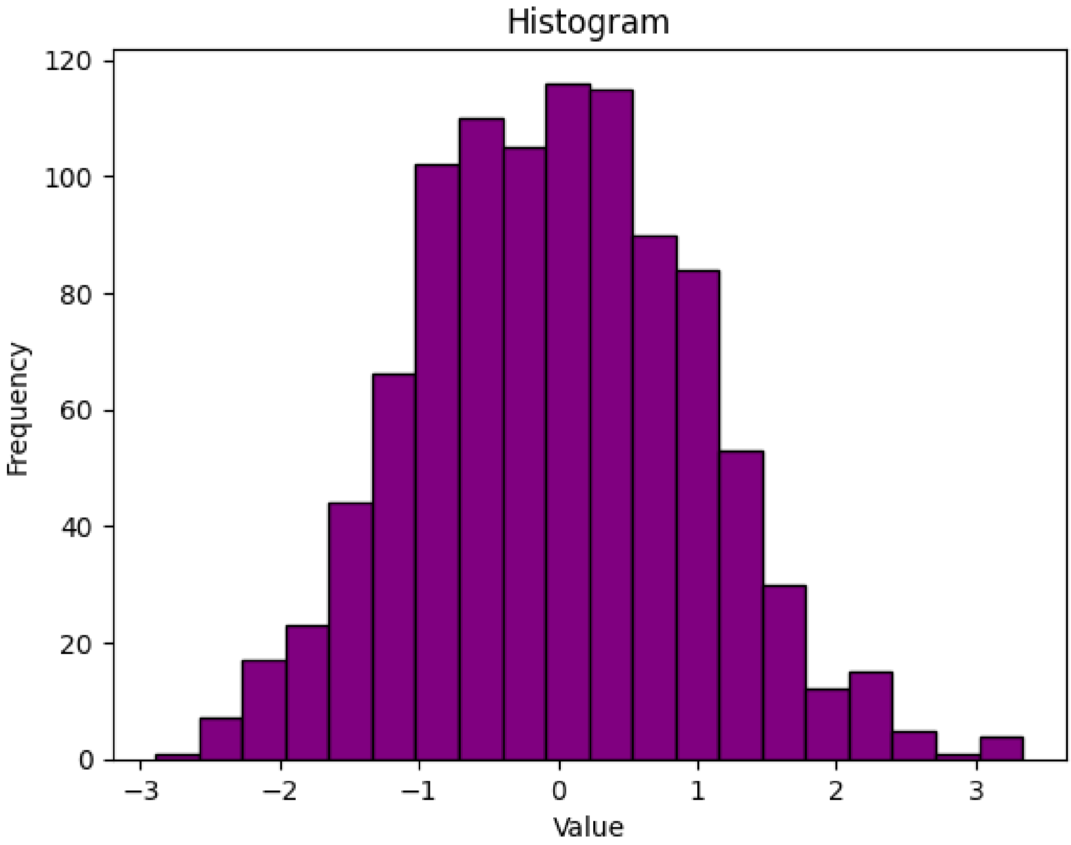
BAR CHART:

```
categories = ['A', 'B', 'C', 'D']
values = [3, 7, 5, 4]
plt.bar(categories, values, color='orange')
plt.xlabel('Category')
plt.ylabel('Values')
plt.title('Bar Plot')
plt.show()
```



HISTOGRAM:

```
data = np.random.randn(1000)
plt.hist(data, bins=20, color='purple', edgecolor='black')
plt.xlabel('Value')
plt.ylabel('Frequency')
plt.title('Histogram')
plt.show()
```


Histogram
Frequency
0
20
40
60
80
100
120
−3
−2
−1
0
1
2
3
Value