**231501076**

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

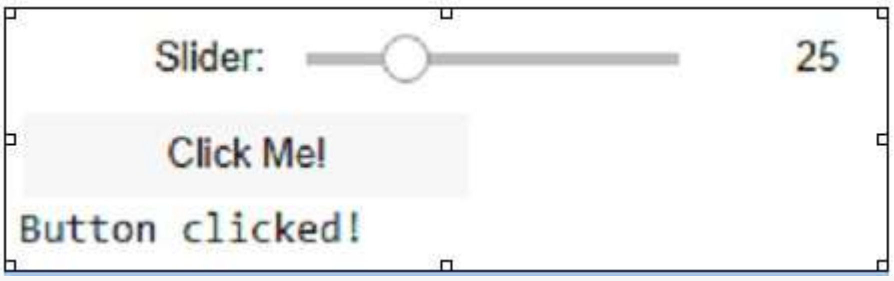
**Create a new notebook for Python**

**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!
```

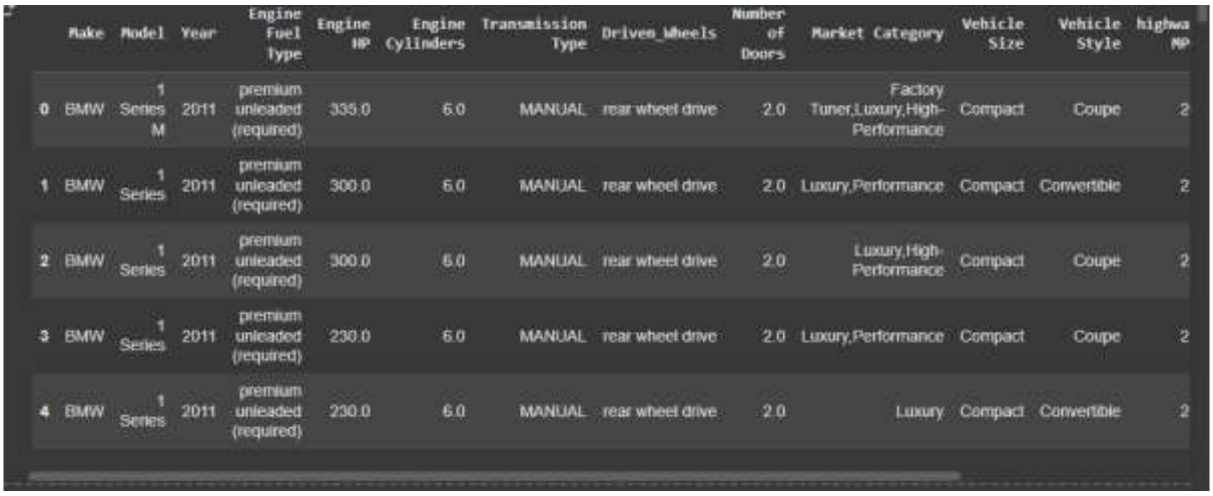
## Ex NO: 2 EDA-Data Import and Export

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

**Handling different data formats**

**Export a DataFrame to an Excel file.**

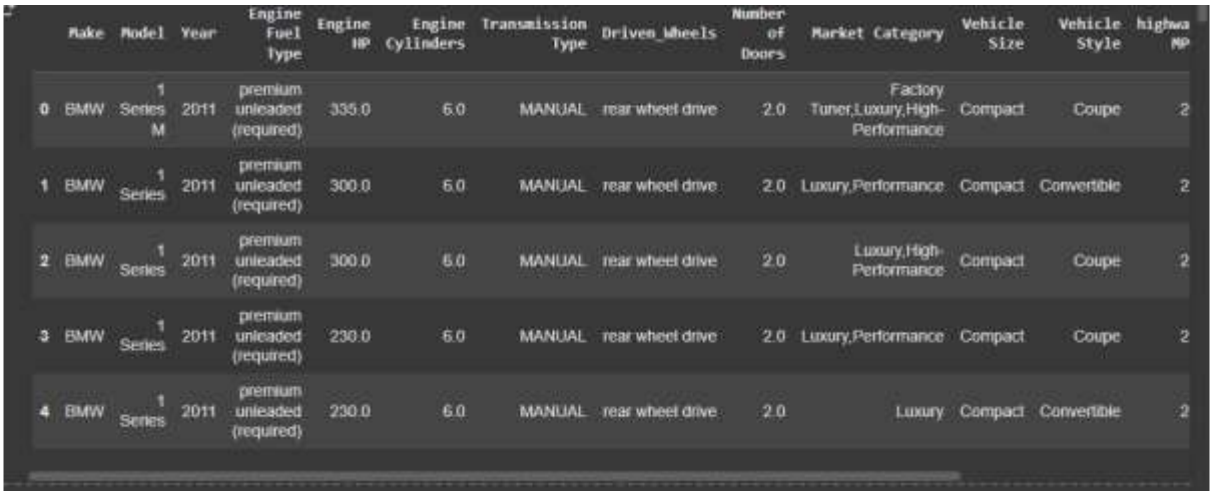
```
import pandas as pd

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()

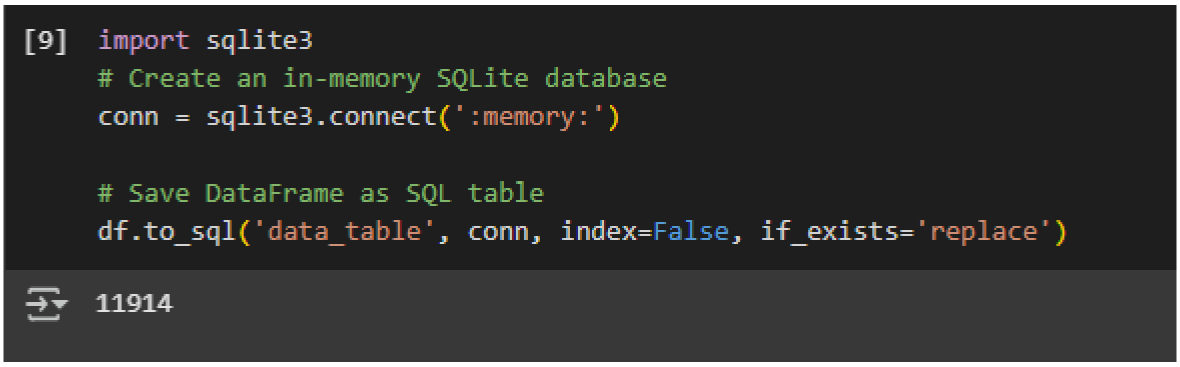


| | Make | Model | Year | Engine Fuel Type | Engine HP | Engine Cylinders | Transmission Type | Driven_Wheels | Number of Doors | Market Category | Vehicle Size | Vehicle Style | highwa MP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | BMW | 1 Series M | 2011 | premium unleaded (required) | 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')



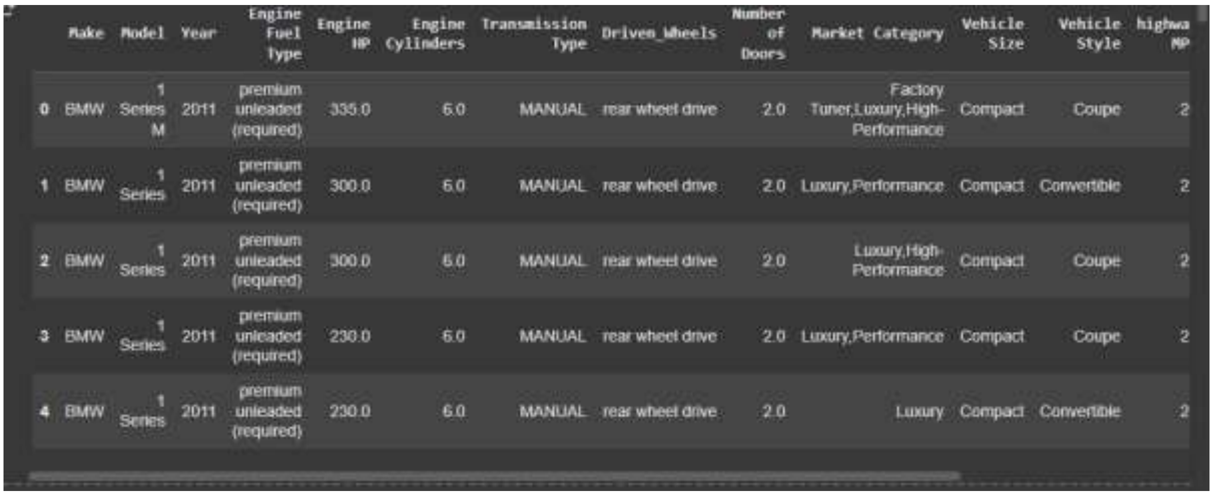
```
[9]  import sqlite3
     # Create an in-memory SQLite database
     conn = sqlite3.connect(':memory:')

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

```
11914
```

query = "SELECT * FROM data_table LIMIT 5;"

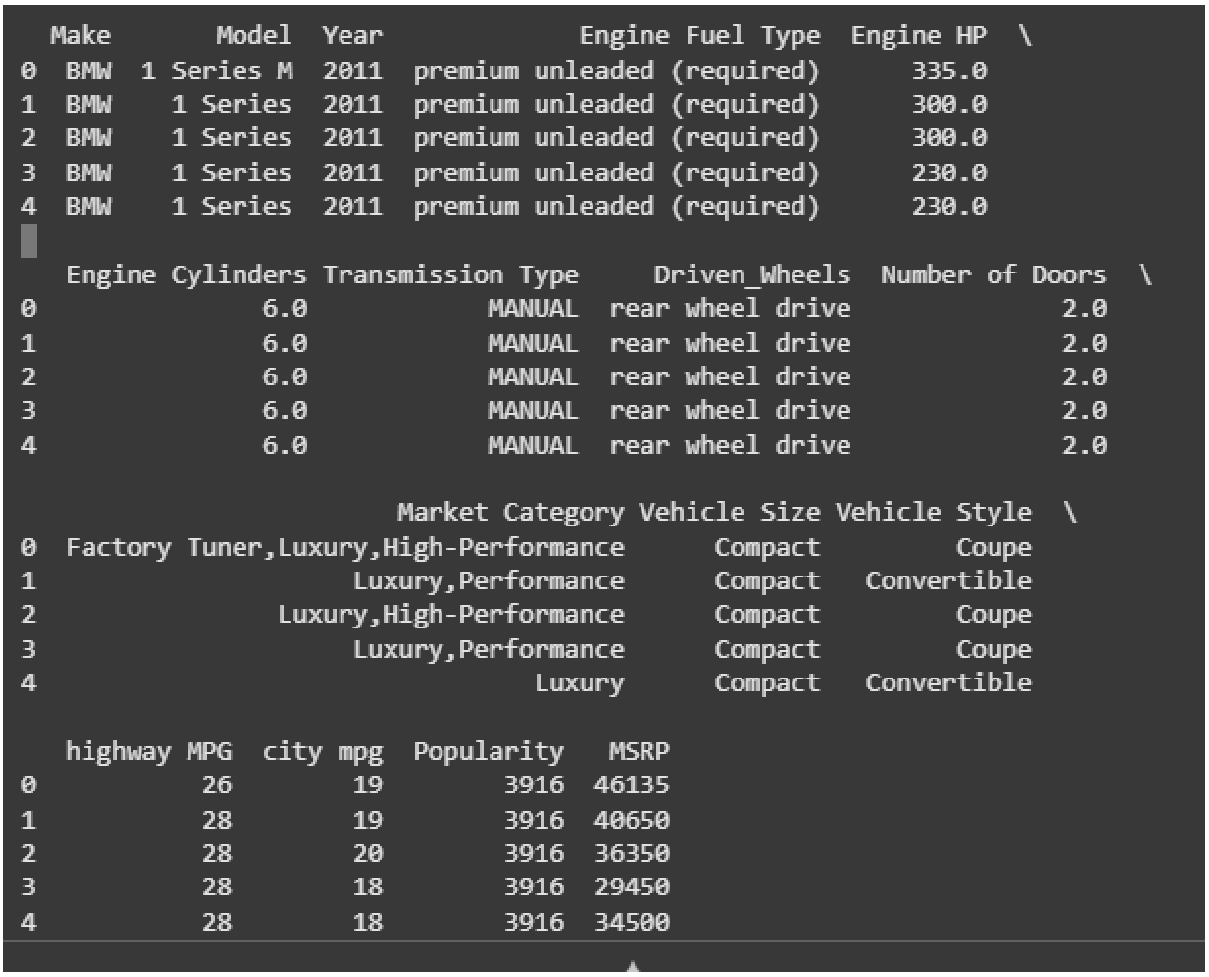
result = pd.read_sql_query(query, conn)

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())
```

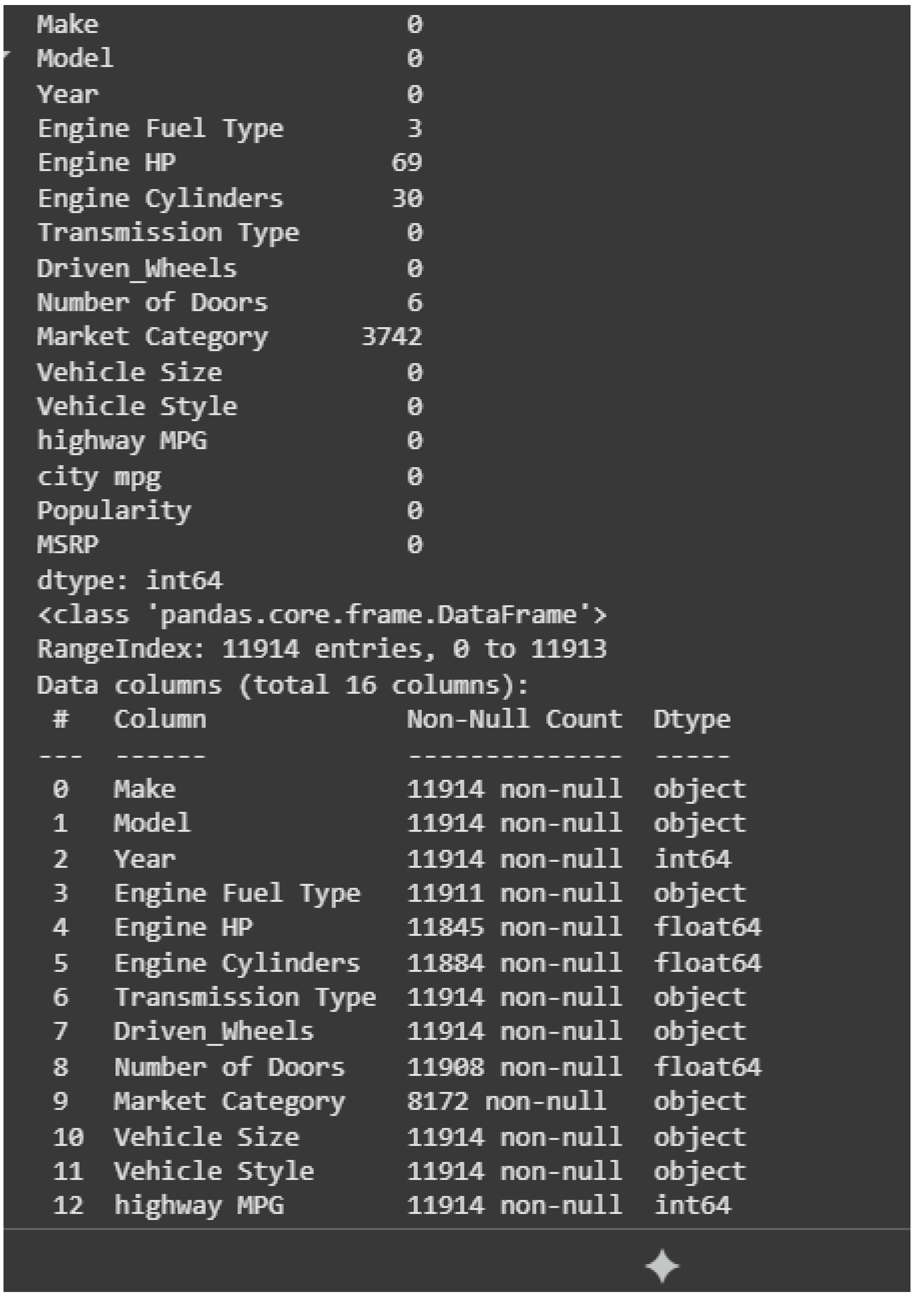


```
  Make       Model  Year            Engine Fuel Type  Engine HP  \
0  BMW  1 Series M  2011  premium unleaded (required)      335.0
1  BMW    1 Series  2011  premium unleaded (required)      300.0
2  BMW    1 Series  2011  premium unleaded (required)      300.0
3  BMW    1 Series  2011  premium unleaded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

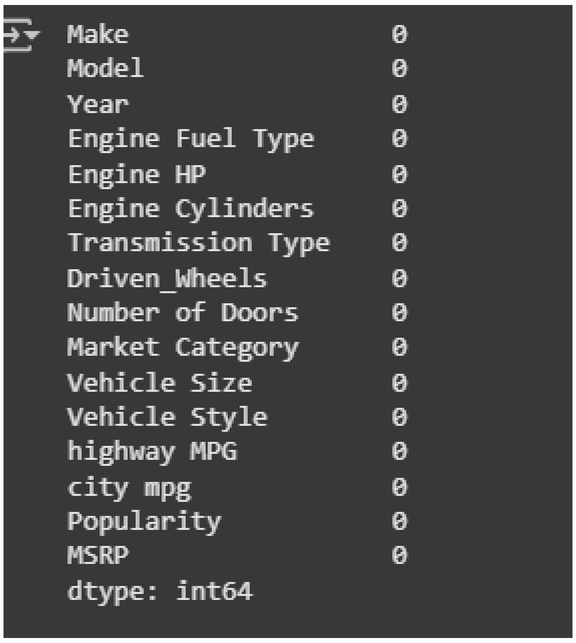
- **Handling missing values: detection, filling, and dropping**
- **Removing duplicates and unnecessary data**
- **Data type conversion and ensuring consistency**
- **Normalize data (e.g., standardization, min-max scaling).**

```
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
```

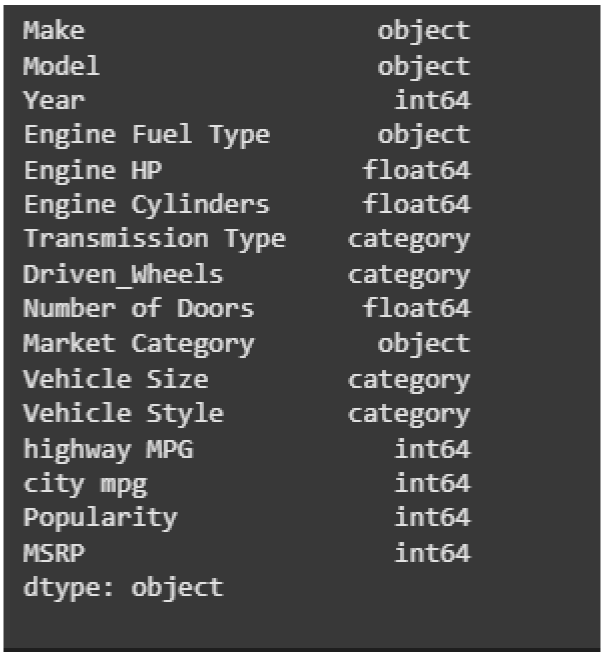
```
df.dropna(inplace=True)

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

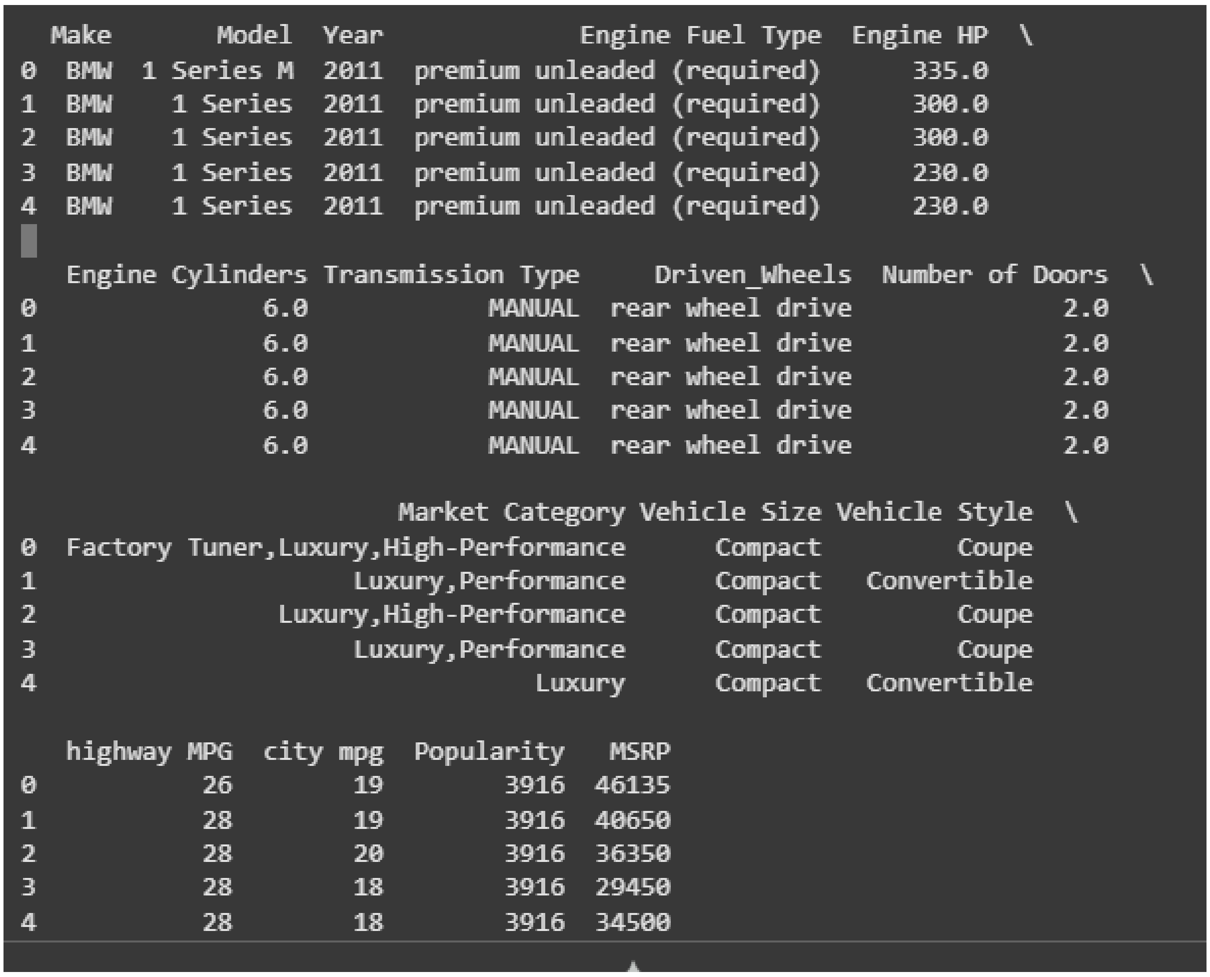
**_ Viewing and inspecting DataFrames**

** Filtering and subsetting data using conditions**

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

**(range, variance, standard deviation)**

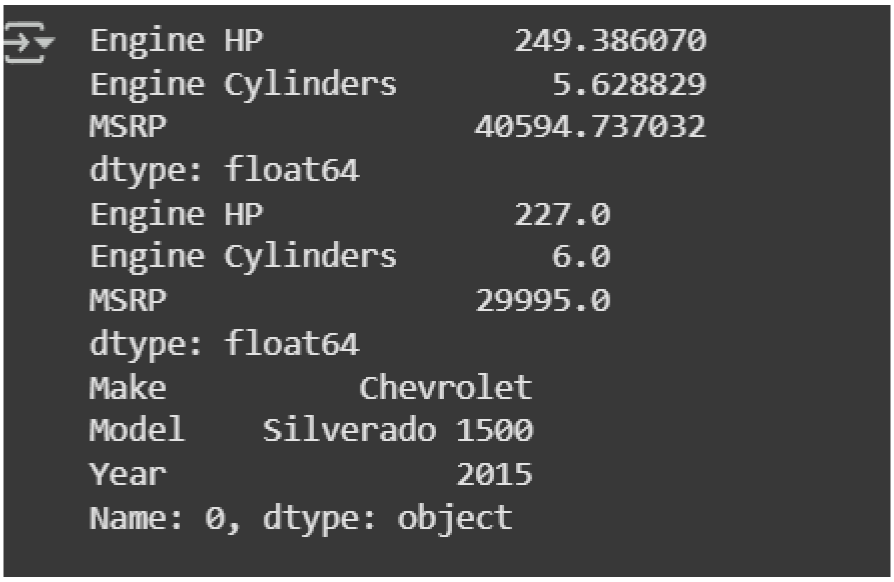
```
import pandas as pd


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
```

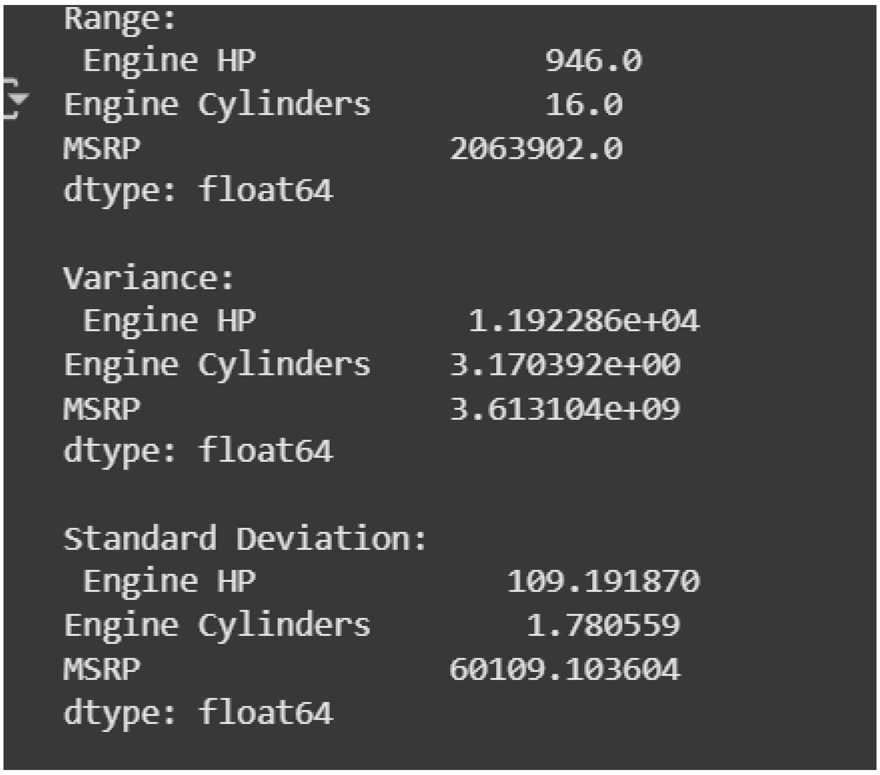
```
car_after_2015 = df[df['Year'] > 2015]
high_hp_cars = df[df['Engine HP'] > 300]
selected_columns = df[['Make', 'Model', 'MSRP']]
luxury_cars = df[df['Market Category'].str.contains('Luxury', na=False)]
```

```
print(df[['Engine HP', 'Engine Cylinders', 'MSRP']].mean())
print(df[['Engine HP', 'Engine Cylinders', 'MSRP']].median())
print(df[['Make', 'Model', 'Year']].mode().iloc[0])
```



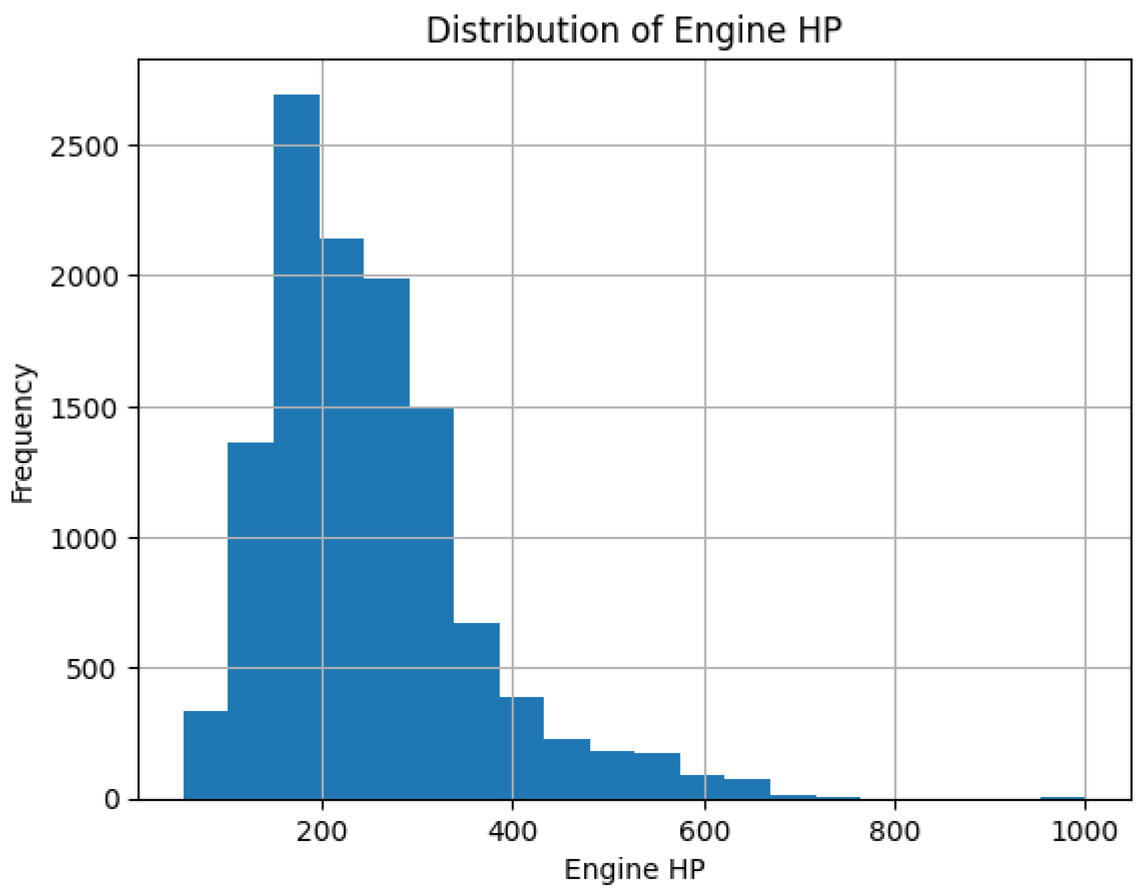
```
Engine HP             249.386070
Engine Cylinders        5.628829
MSRP                40594.737032
dtype: float64
Engine HP             227.0
Engine Cylinders        6.0
MSRP                29995.0
dtype: float64
Make           Chevrolet
Model     Silverado 1500
Year                2015
Name: 0,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

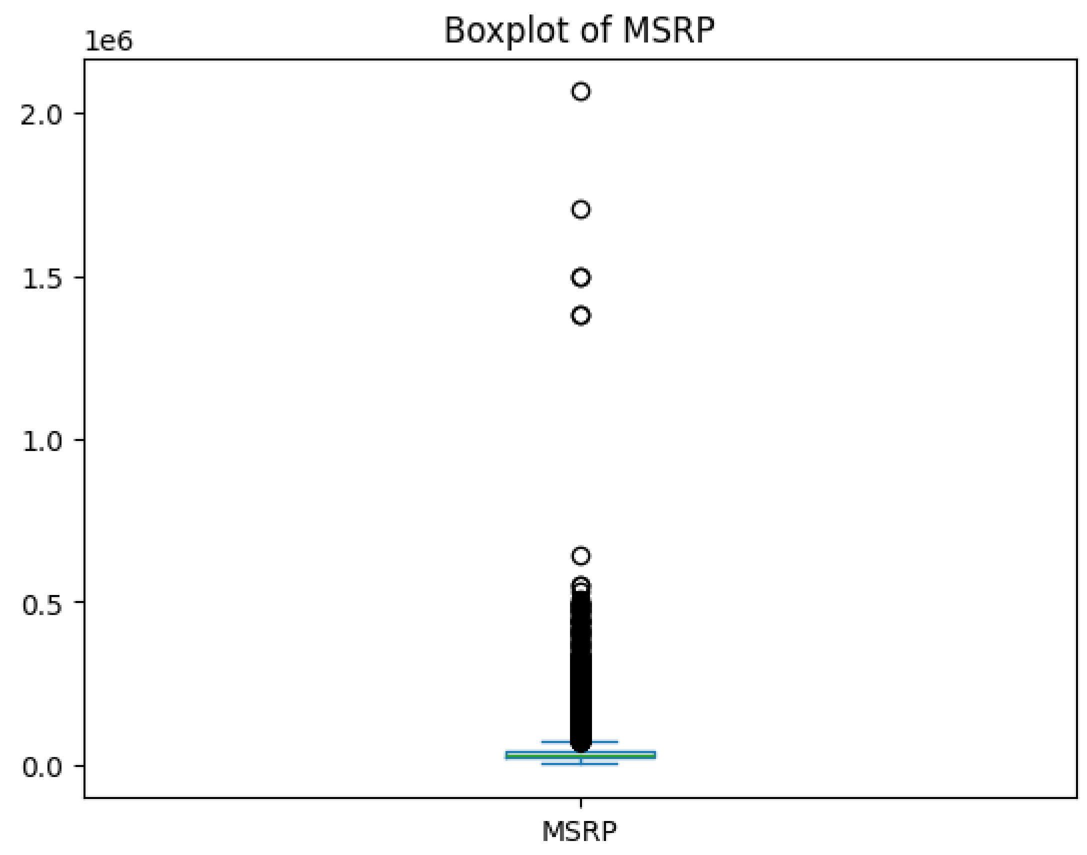
```
range_values = df[['Engine HP', 'Engine Cylinders', 'MSRP']].max() - df[['Engine HP', 'Engine Cylinders', 'MSRP']].min()
print("Range:\n", range_values)
print("Variance:\n", df[['Engine HP', 'Engine Cylinders', 'MSRP']].var())
print("Standard Deviation:\n", df[['Engine HP', 'Engine Cylinders', 'MSRP']].std())
```



```
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



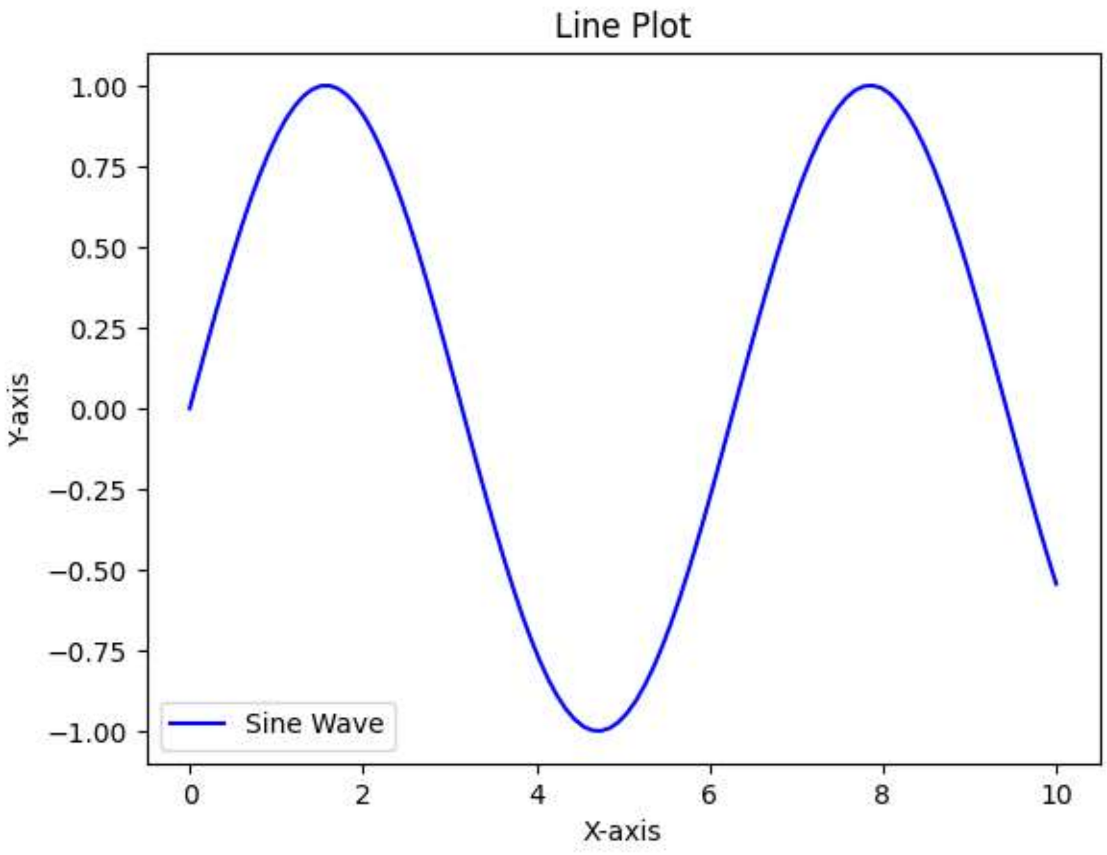
## EX NO : 5 EDA – DATA VISUALIZATION

```
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()
```

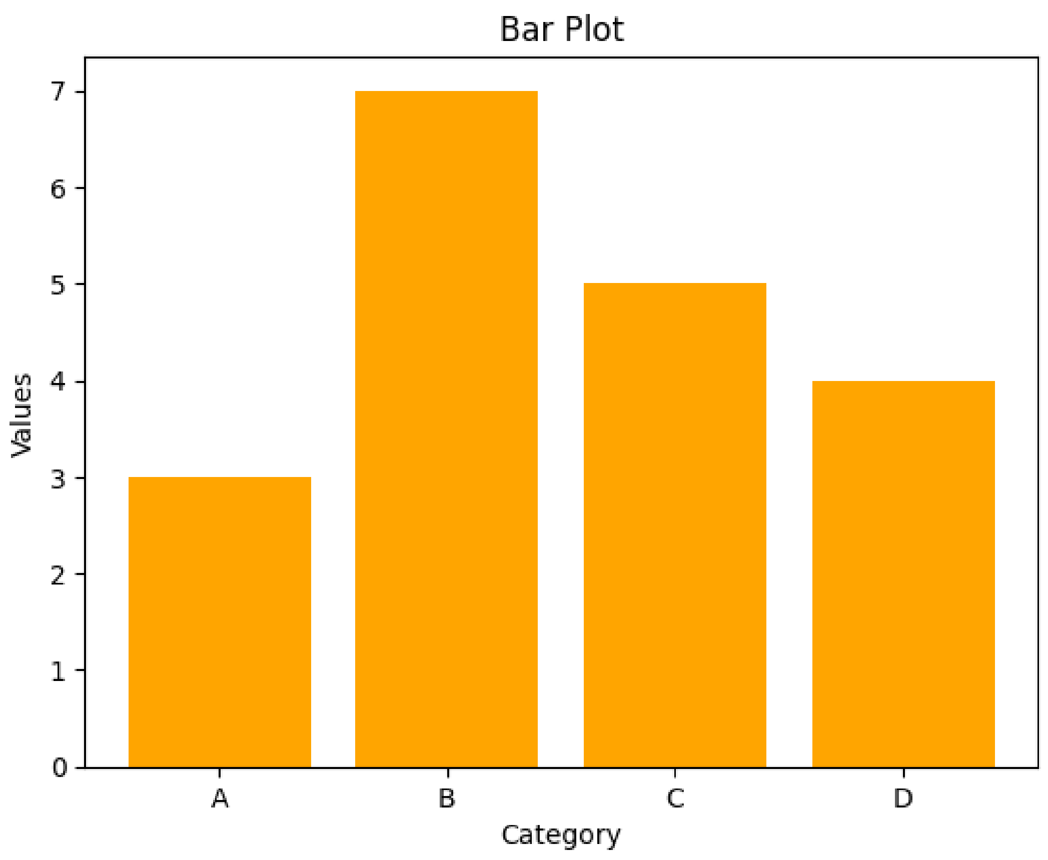
### LINE CHART:

```
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()
```



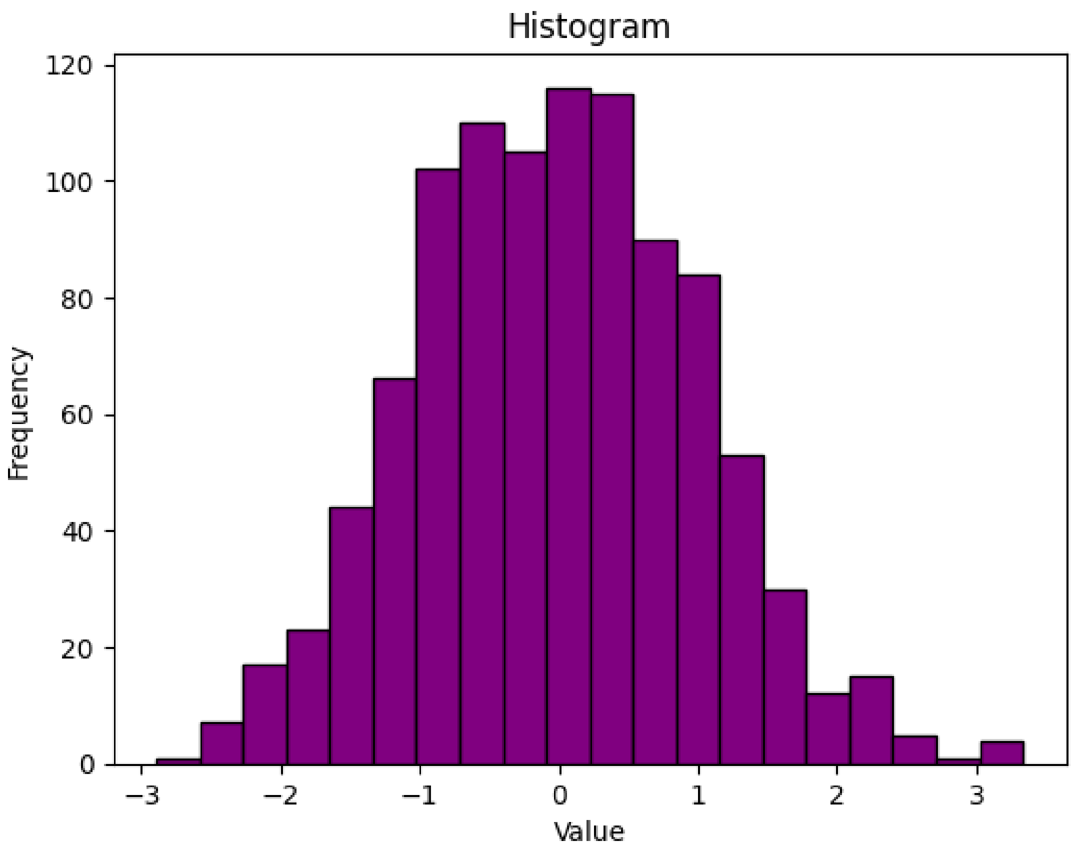
## BAR CHART:

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