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

```
pip install pandas openpyxl
```

```
Defaulting to user installation because normal site-packages is not
writeable
Requirement already satisfied: pandas in c:\programdata\anaconda3\lib\
site-packages (2.2.2)
Requirement already satisfied: openpyxl in c:\programdata\anaconda3\
lib\site-packages (3.1.2)
Requirement already satisfied: numpy>=1.26.0 in c:\programdata\
anaconda3\lib\site-packages (from pandas) (1.26.4)
Requirement already satisfied: python-dateutil>=2.8.2 in c:\
programdata\anaconda3\lib\site-packages (from pandas) (2.9.0.post0)
Requirement already satisfied: pytz>=2020.1 in c:\programdata\
anaconda3\lib\site-packages (from pandas) (2024.1)
Requirement already satisfied: tzdata>=2022.7 in c:\users\akhil\
appdata\roaming\python\python312\site-packages (from pandas) (2025.2)
Requirement already satisfied: et-xmlfile in c:\programdata\anaconda3\
lib\site-packages (from openpyxl) (1.1.0)
Requirement already satisfied: six>=1.5 in c:\programdata\anaconda3\
lib\site-packages (from python-dateutil>=2.8.2->pandas) (1.16.0)
Note: you may need to restart the kernel to use updated packages.
```

```python
df = pd.read_excel("car_dataset.xlsx",engine='openpyxl')
```

```python
df.head()
```

```
  Source.Name  Car_ID    Brand    Model  Year  Kilometers_Driven
Fuel_Type  \
0    cars.csv       1   Toyota  Corolla  2018              50000
Petrol
1    cars.csv       2    Honda    Civic  2019              40000
Petrol
2    cars.csv       3     Ford  Mustang  2017              20000
Petrol
3    cars.csv       4   Maruti    Swift  2020              30000
Diesel
4    cars.csv       5  Hyundai   Sonata  2016              60000
Diesel

  Transmission Owner_Type  Mileage  Engine  Power    Price
0       Manual      First       15    1498    108   800000
1    Automatic     Second       17    1597    140  1000000
2    Automatic      First       10    4951    395  2500000
3       Manual      Third       23    1248     74   600000
4    Automatic     Second       18    1999    194   850000
```

```
df.drop('Source.Name',axis = 1 , inplace = True)
```

```
df.head()
```

```
   Car_ID    Brand     Model  Year  Kilometers_Driven Fuel_Type 
Transmission  \
0       1   Toyota  Corolla  2018              50000    Petrol 
Manual
1       2    Honda    Civic  2019              40000    Petrol 
Automatic
2       3     Ford  Mustang  2017              20000    Petrol 
Automatic
3       4   Maruti    Swift  2020              30000    Diesel 
Manual
4       5  Hyundai   Sonata  2016              60000    Diesel 
Automatic

  Owner_Type  Mileage  Engine  Power    Price
0      First       15    1498    108   800000
1     Second       17    1597    140  1000000
2      First       10    4951    395  2500000
3      Third       23    1248     74   600000
4     Second       18    1999    194   850000
```

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 100 entries, 0 to 99
Data columns (total 12 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   Car_ID             100 non-null    int64 
 1   Brand              100 non-null    object
 2   Model              100 non-null    object
 3   Year               100 non-null    int64 
 4   Kilometers_Driven  100 non-null    int64 
 5   Fuel_Type          100 non-null    object
 6   Transmission       100 non-null    object
 7   Owner_Type         100 non-null    object
 8   Mileage            100 non-null    int64 
 9   Engine             100 non-null    int64 
 10  Power              100 non-null    int64 
 11  Price              100 non-null    int64 
dtypes: int64(7), object(5)
memory usage: 9.5+ KB
```

check null values

```
df.isnull().sum()
```

```
Car_ID               0
Brand                0
Model                0
Year                 0
Kilometers_Driven    0
Fuel_Type            0
Transmission         0
Owner_Type           0
Mileage              0
Engine               0
Power                0
Price                0
dtype: int64

df.describe()

           Car_ID        Year  Kilometers_Driven     Mileage
Engine  \
count  100.000000   100.00000         100.000000  100.000000
100.000000
mean    50.500000  2018.39000       28150.000000   17.210000
1855.230000
std     29.011492     1.17116        9121.375716    3.309902
631.311475
min      1.000000  2016.00000       10000.000000   10.000000
999.000000
25%     25.750000  2017.75000       22000.000000   15.000000
1462.000000
50%     50.500000  2018.00000       27000.000000   17.000000
1774.000000
75%     75.250000  2019.00000       32000.000000   19.000000
2143.000000
max    100.000000  2021.00000       60000.000000   25.000000
4951.000000

            Power         Price
count  100.000000  1.000000e+02
mean   158.130000  1.574000e+06
std     76.968137  1.000265e+06
min     68.000000  4.500000e+05
25%    103.000000  7.000000e+05
50%    148.000000  1.300000e+06
75%    187.000000  2.500000e+06
max    396.000000  4.000000e+06
```

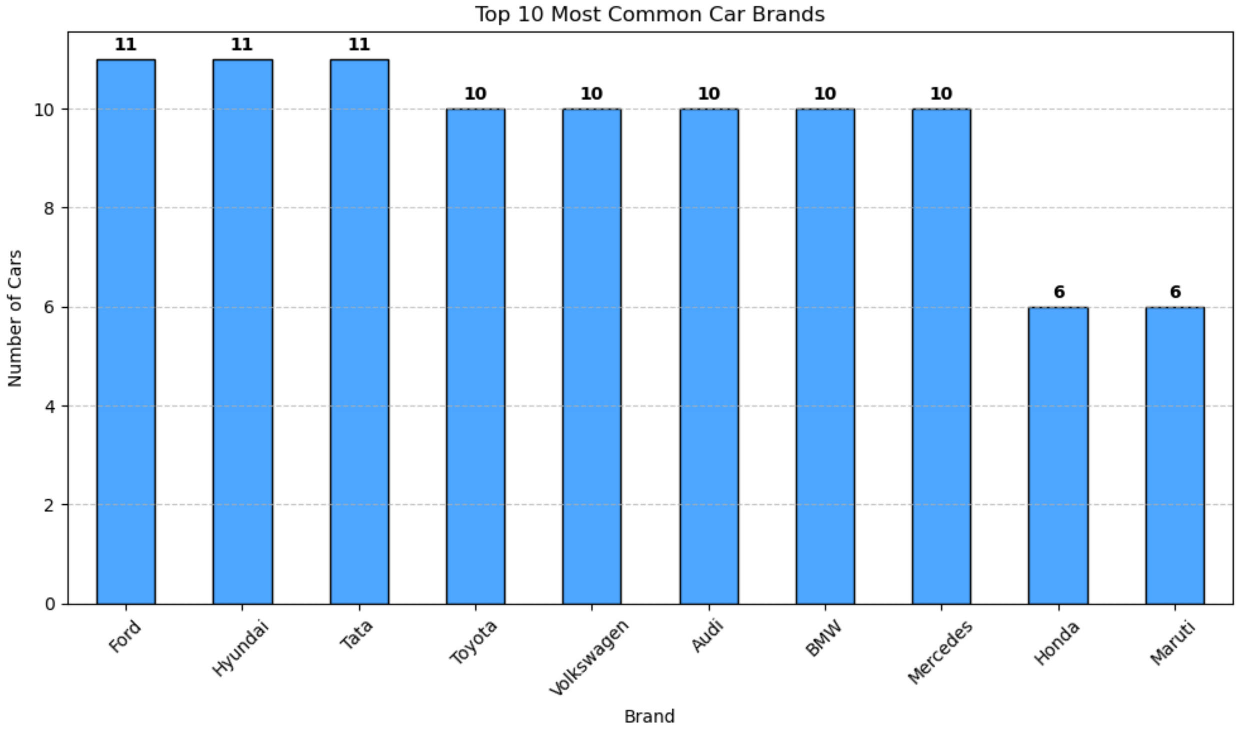
Create new column

```
df["full_name"] = df["Brand"] + " " + df["Model"]
```

```
df.head()

   Car_ID    Brand    Model  Year  Kilometers_Driven Fuel_Type
Transmission  \
0       1   Toyota  Corolla  2018              50000    Petrol
Manual
1       2    Honda    Civic  2019              40000    Petrol
Automatic
2       3     Ford  Mustang  2017              20000    Petrol
Automatic
3       4   Maruti    Swift  2020              30000    Diesel
Manual
4       5  Hyundai   Sonata  2016              60000    Diesel
Automatic

  Owner_Type  Mileage  Engine  Power    Price       full_name
0      First       15    1498    108   800000  Toyota Corolla
1     Second       17    1597    140  1000000     Honda Civic
2      First       10    4951    395  2500000    Ford Mustang
3      Third       23    1248     74   600000    Maruti Swift
4     Second       18    1999    194   850000  Hyundai Sonata
```

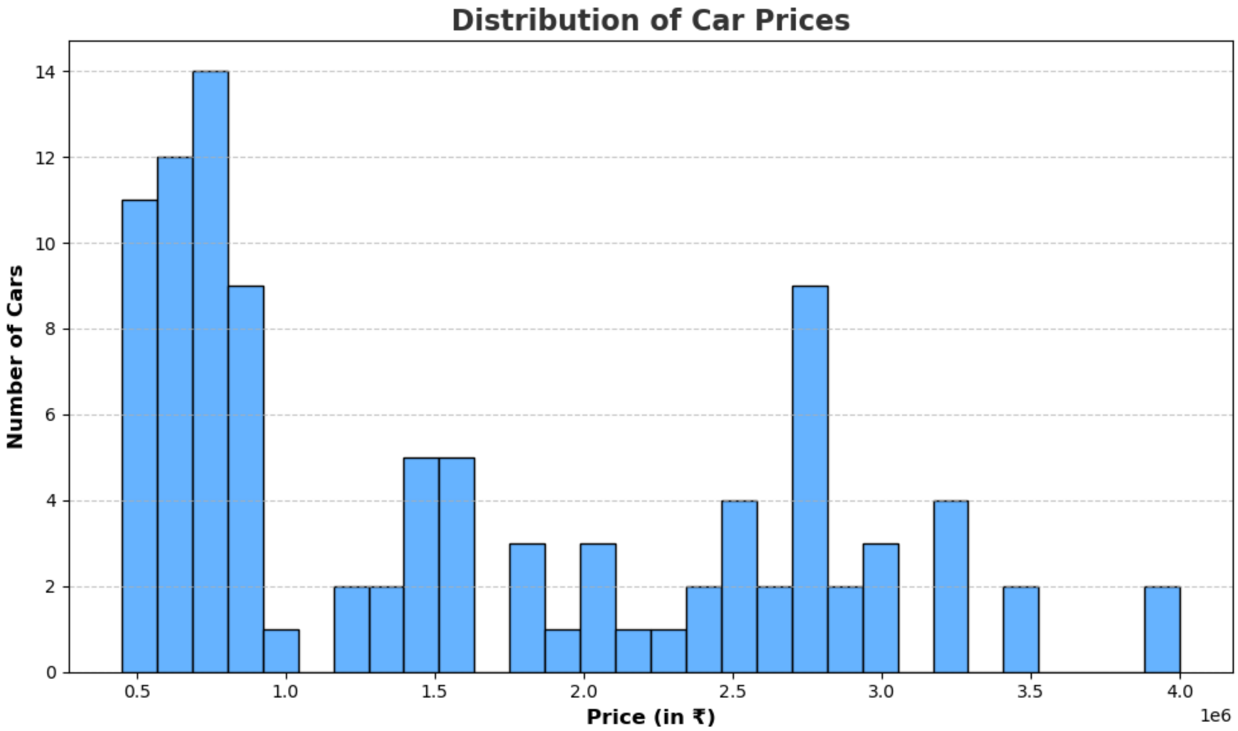
Top 10 Most Common Car Brands

```
brand_counts = df['Brand'].value_counts().head(10)
plt.figure(figsize=(10,6))
brand_counts.plot(kind='bar', color='#4da6ff', edgecolor='black')
plt.title('Top 10 Most Common Car Brands')
plt.xlabel('Brand')
plt.ylabel('Number of Cars')
plt.xticks(rotation=45)

for i, val in enumerate(brand_counts.values):
    plt.text(i, val + 0.1, str(val), ha='center', va='bottom',
fontsize=10, fontweight='bold', color='black')


plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```



Distribution of Car Prices

```
plt.figure(figsize=(10, 6))
plt.hist(df['Price'].dropna(), bins=30, color='#66b3ff',
edgecolor='black')


plt.title('Distribution of Car Prices', fontsize=16,
fontweight='bold', color='#333')
plt.xlabel('Price (in ₹)', fontsize=12, fontweight='bold')
plt.ylabel('Number of Cars', fontsize=12, fontweight='bold')


plt.grid(axis='y', linestyle='--', alpha=0.7)
plt.tight_layout()
plt.show()
```

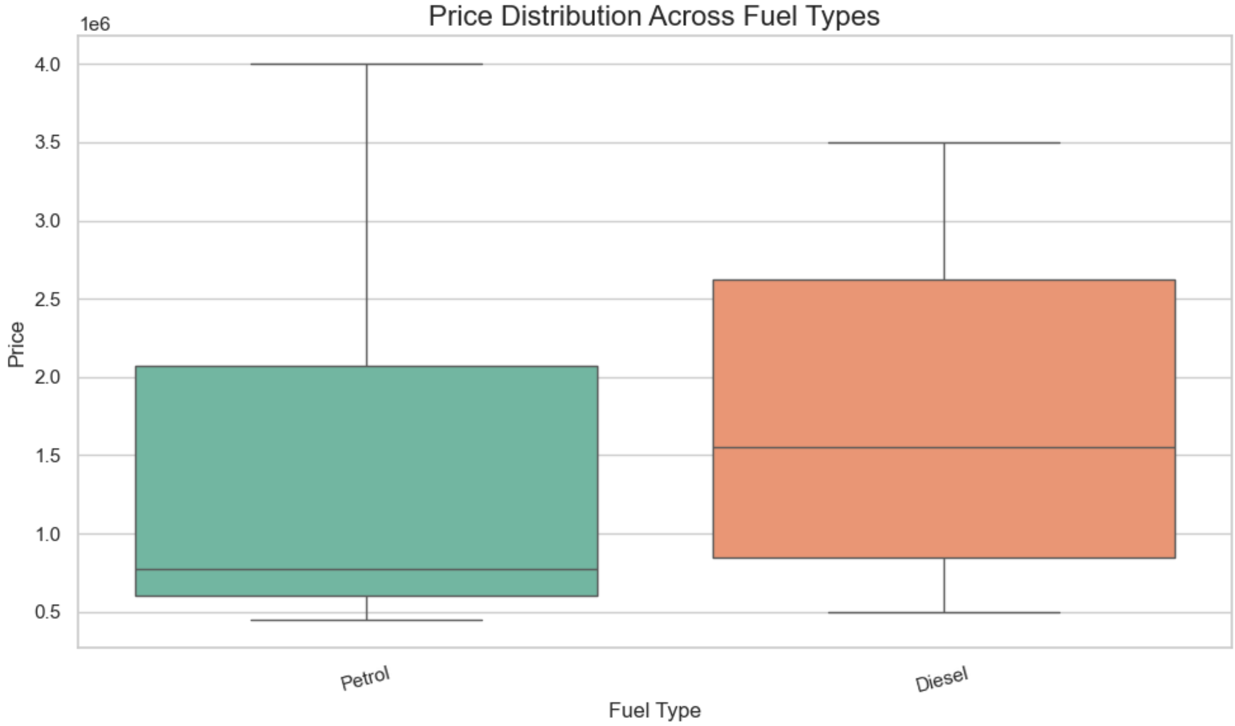


Price Distribution Across Fuel Type

```
df = df.dropna(subset=['Price', 'Fuel_Type'])


sns.set(style="whitegrid")


plt.figure(figsize=(10, 6))
sns.boxplot(x='Fuel_Type', y='Price', data=df, palette='Set2')


plt.title('Price Distribution Across Fuel Types', fontsize=16)
plt.xlabel('Fuel Type', fontsize=12)
plt.ylabel('Price', fontsize=12)
plt.xticks(rotation=15)
plt.tight_layout()
plt.show()
```

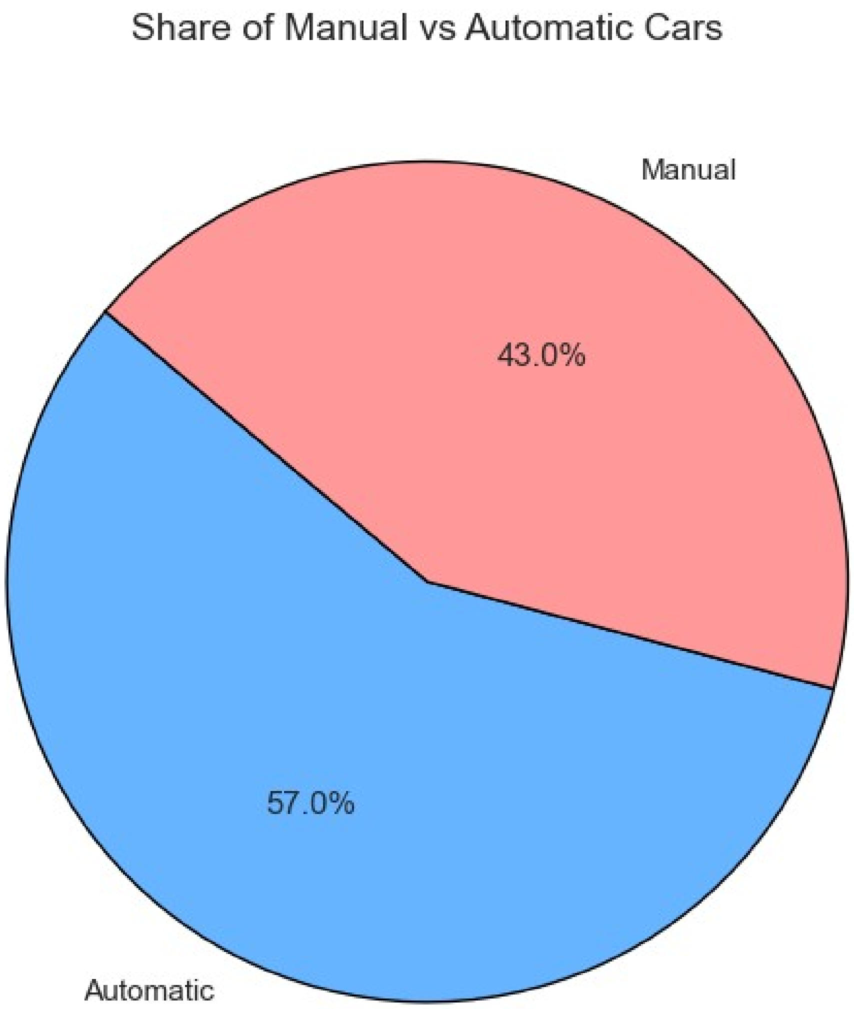
```
C:\Users\akhil\AppData\Local\Temp\ipykernel_11104\283430776.py:8:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `x` variable to `hue` and set
`legend=False` for the same effect.
```

```
sns.boxplot(x='Fuel_Type', y='Price', data=df, palette='Set2')
```



Share of manual vs automatic cars

```
df = df.dropna(subset=['Transmission'])


transmission_counts = df['Transmission'].value_counts()


colors = ['#66b3ff', '#ff9999']
plt.figure(figsize=(6, 6))
plt.pie(transmission_counts,
        labels=transmission_counts.index,
        autopct='%1.1f%%',
        startangle=140,
        colors=colors,
        wedgeprops={'edgecolor': 'black'})


plt.title('Share of Manual vs Automatic Cars', fontsize=14)
plt.tight_layout()
plt.show()
```



```
df.columns.values
```

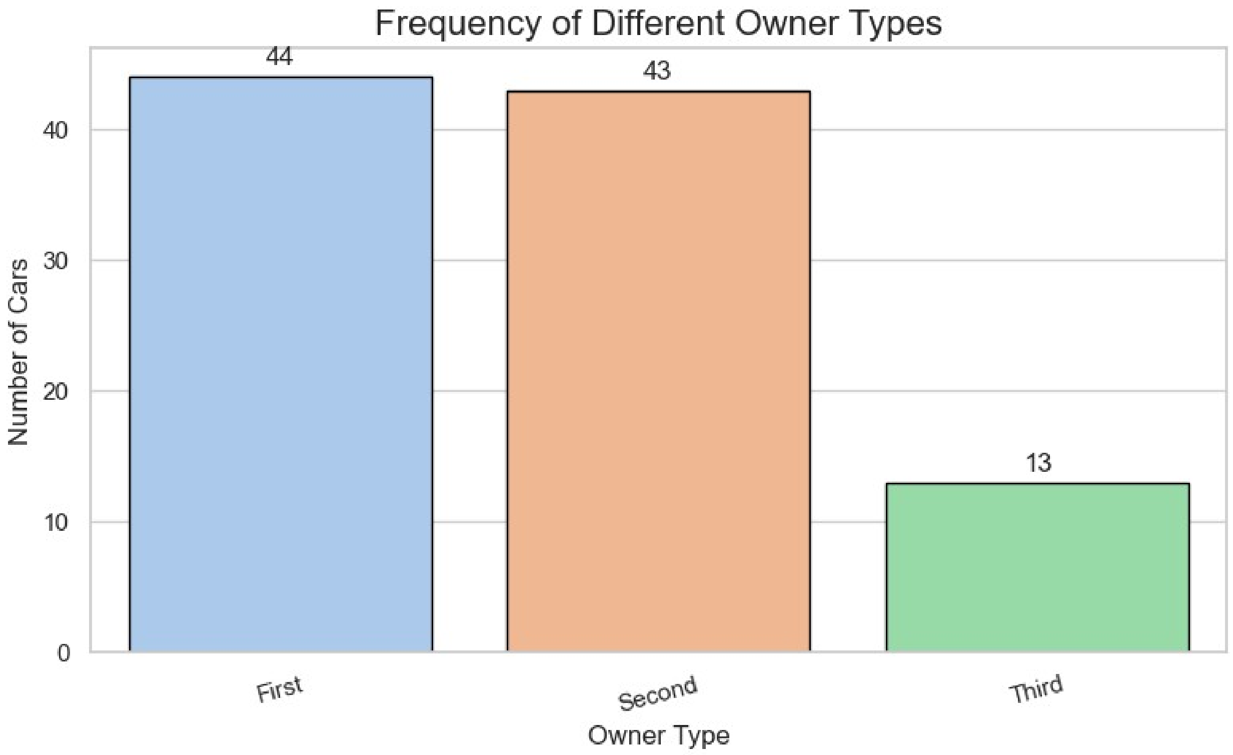
```
array(['Car_ID', 'Brand', 'Model', 'Year', 'Kilometers_Driven',
       'Fuel_Type', 'Transmission', 'Owner_Type', 'Mileage', 'Engine',
       'Power', 'Price', 'full_name'], dtype=object)
```

Frequency of different owner types

```
df = df.dropna(subset=['Owner_Type'])


sns.set(style="whitegrid")
```

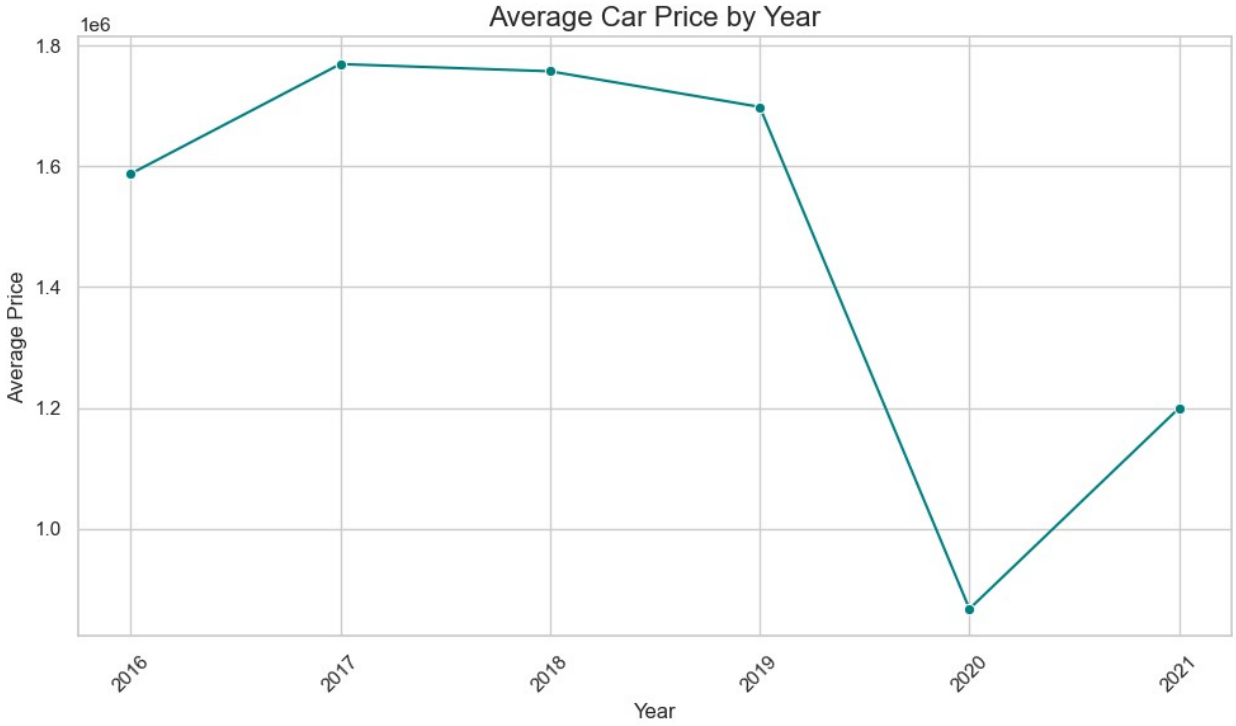
```python
plt.figure(figsize=(8, 5))
ax = sns.countplot(data=df, x='Owner_Type', palette='pastel',
edgecolor='black')

for container in ax.containers:
    ax.bar_label(container, padding=3)


plt.title('Frequency of Different Owner Types', fontsize=16)
plt.xlabel('Owner Type', fontsize=12)
plt.ylabel('Number of Cars', fontsize=12)
plt.xticks(rotation=15)
plt.tight_layout()
plt.show()
```

```
C:\Users\akhil\AppData\Local\Temp\ipykernel_11104\1808975656.py:8:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `x` variable to `hue` and set
`legend=False` for the same effect.

  ax = sns.countplot(data=df, x='Owner_Type', palette='pastel',
edgecolor='black')
```



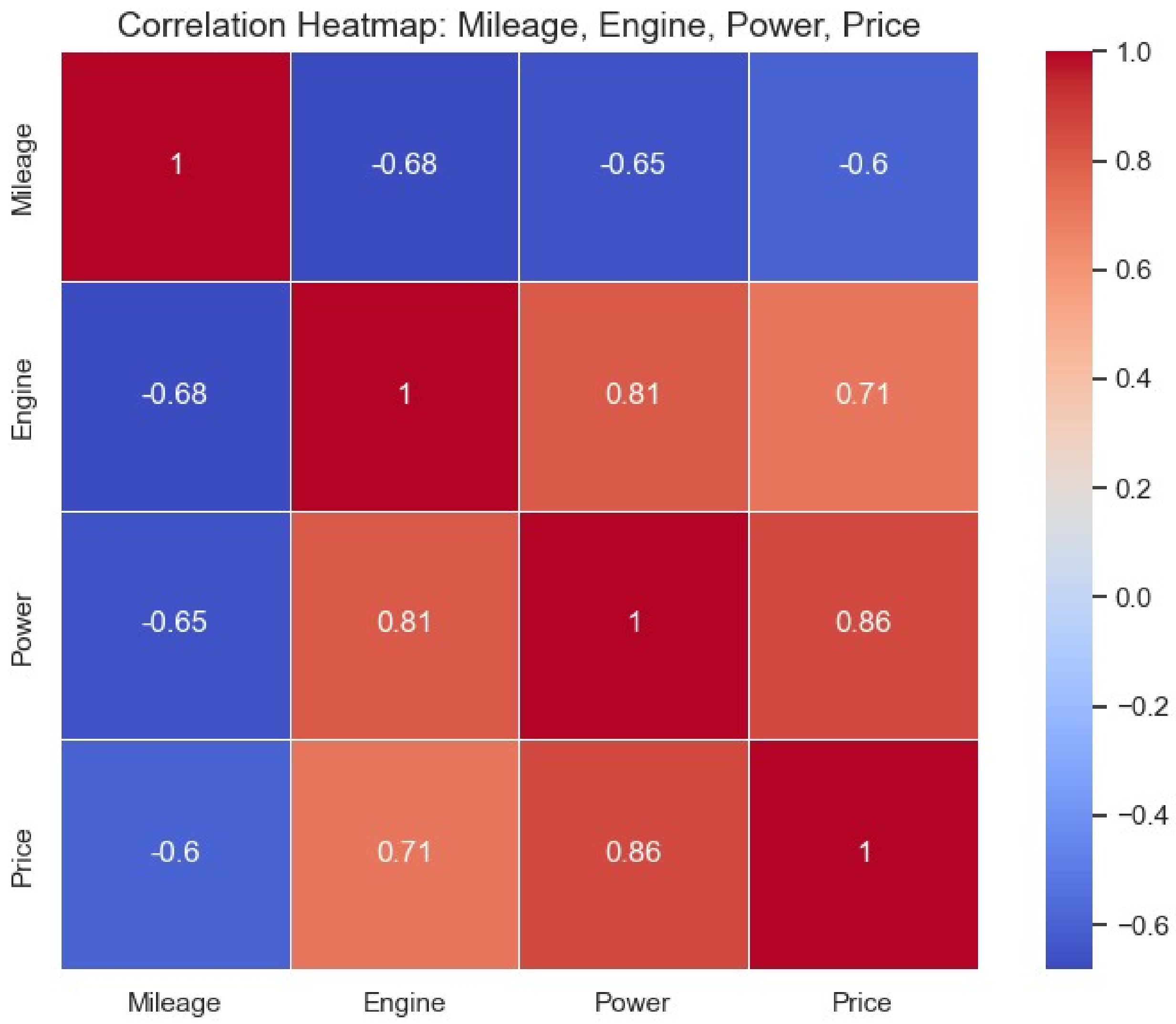
Average car price by year

```
df = df.dropna(subset=['Year', 'Price'])


avg_price_by_year = df.groupby('Year')['Price'].mean().reset_index()


avg_price_by_year = avg_price_by_year.sort_values('Year')


sns.set(style="whitegrid")


plt.figure(figsize=(10, 6))
sns.lineplot(data=avg_price_by_year, x='Year', y='Price', marker='o',
color='teal')


plt.title('Average Car Price by Year', fontsize=16)
plt.xlabel('Year', fontsize=12)
plt.ylabel('Average Price', fontsize=12)
plt.xticks(rotation=45)
plt.grid(True)
plt.tight_layout()
plt.show()
```



Correlation between Mileage,Engine,Power,Price

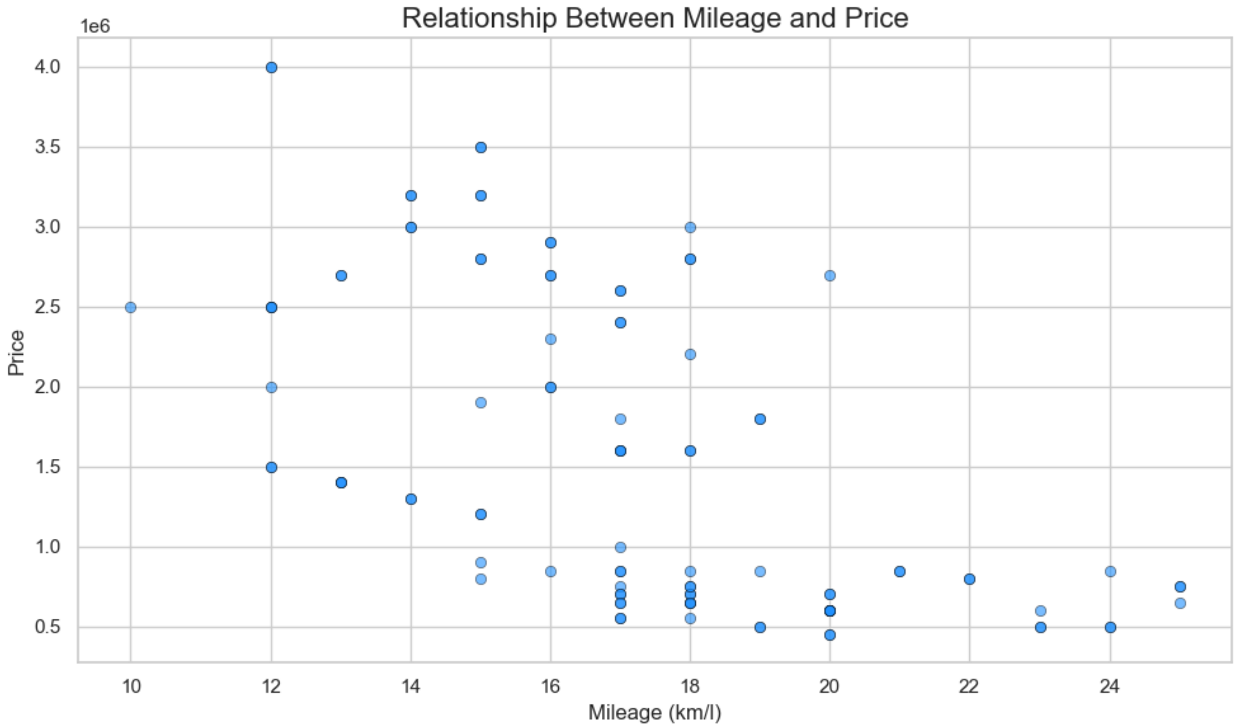
```
cols = ['Mileage', 'Engine', 'Power', 'Price']
df_corr = df[cols].dropna()


for col in cols:
    df_corr[col] = pd.to_numeric(df_corr[col], errors='coerce')


corr_matrix = df_corr.corr()


sns.set(style="white")


plt.figure(figsize=(8, 6))
sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', linewidths=0.5,
square=True)


plt.title('Correlation Heatmap: Mileage, Engine, Power, Price',
fontsize=14)
plt.tight_layout()
plt.show()
```



Relationship between Mileage and Price

```
df['Mileage'] = pd.to_numeric(df['Mileage'], errors='coerce')
df['Price'] = pd.to_numeric(df['Price'], errors='coerce')

# Drop rows with non-convertible values
df = df.dropna(subset=['Mileage', 'Price'])

# Set plot style
sns.set(style="whitegrid")

# Create scatter plot
plt.figure(figsize=(10, 6))
sns.scatterplot(data=df, x='Mileage', y='Price', color='dodgerblue',
edgecolor='black', alpha=0.6)
```

```
# Add title and labels
plt.title('Relationship Between Mileage and Price', fontsize=16)
plt.xlabel('Mileage (km/l)', fontsize=12)
plt.ylabel('Price', fontsize=12)
plt.grid(True)
plt.tight_layout()
plt.show()
```



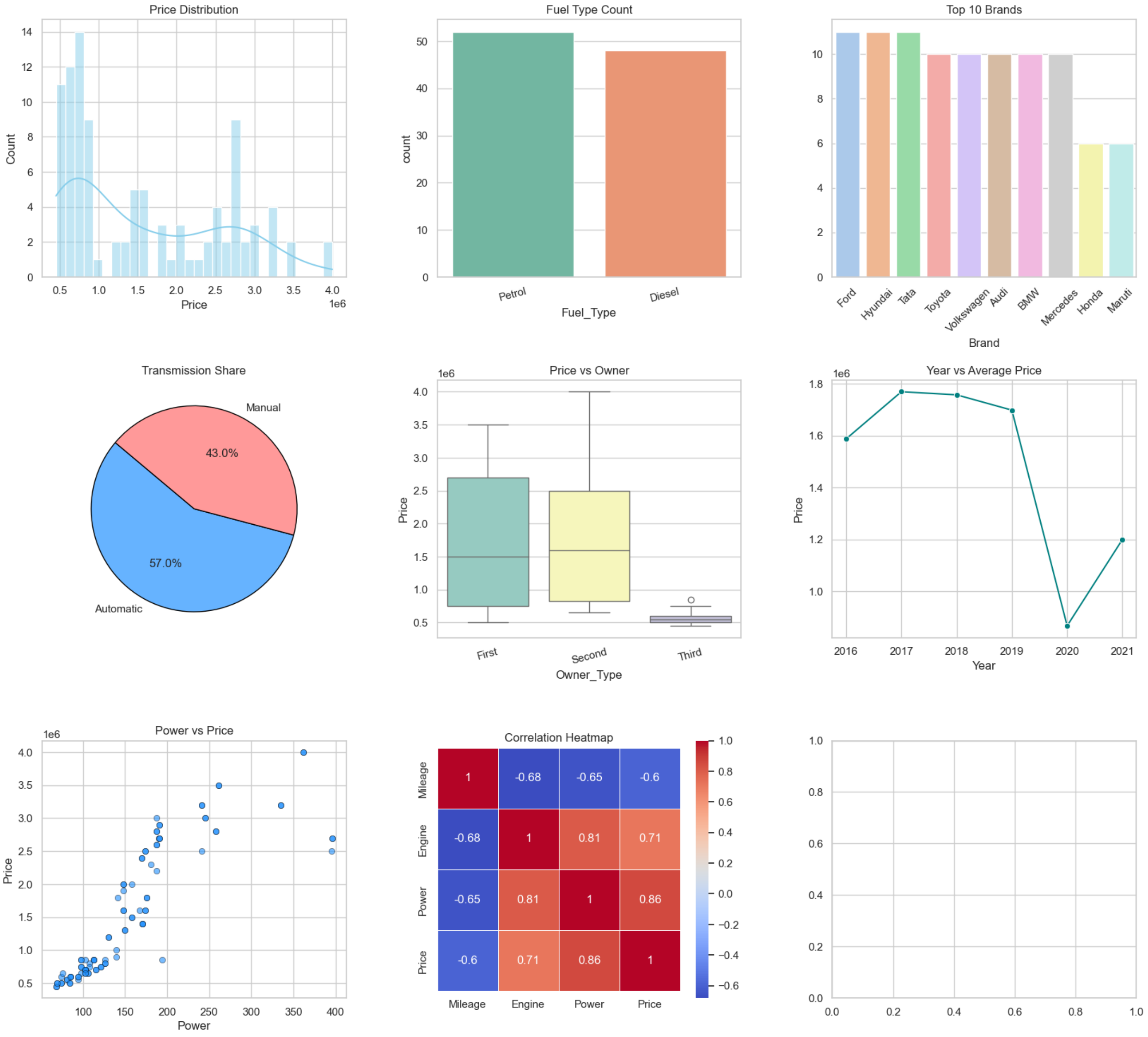
Sub Plots

```
df = df.dropna(subset=['Price', 'Fuel_Type', 'Brand', 'Transmission',
'Owner_Type', 'Year', 'Power'])


avg_price_by_year = df.groupby('Year')
['Price'].mean().reset_index().sort_values('Year')


corr_matrix = df[['Mileage', 'Engine', 'Power',
'Price']].dropna().corr()


sns.set(style="whitegrid")
fig, axes = plt.subplots(3, 3, figsize=(20, 18))
plt.subplots_adjust(hspace=0.4, wspace=0.3)
```

```
sns.histplot(df['Price'], bins=30, kde=True, color='skyblue',
ax=axes[0, 0])
axes[0, 0].set_title('Price Distribution')


sns.countplot(x='Fuel_Type', data=df, palette='Set2', ax=axes[0, 1])
axes[0, 1].set_title('Fuel Type Count')
axes[0, 1].tick_params(axis='x', rotation=15)


top_brands = df['Brand'].value_counts().nlargest(10)
sns.barplot(x=top_brands.index, y=top_brands.values, palette='pastel',
ax=axes[0, 2])
axes[0, 2].set_title('Top 10 Brands')
axes[0, 2].tick_params(axis='x', rotation=45)


trans = df['Transmission'].value_counts()
axes[1, 0].pie(trans, labels=trans.index, autopct='%1.1f%%',
startangle=140, colors=['#66b3ff', '#ff9999'],
wedgeprops={'edgecolor': 'black'})
axes[1, 0].set_title('Transmission Share')


sns.boxplot(x='Owner_Type', y='Price', data=df, palette='Set3',
ax=axes[1, 1])
axes[1, 1].set_title('Price vs Owner')
axes[1, 1].tick_params(axis='x', rotation=15)


sns.lineplot(data=avg_price_by_year, x='Year', y='Price', marker='o',
color='teal', ax=axes[1, 2])
axes[1, 2].set_title('Year vs Average Price')


sns.scatterplot(data=df, x='Power', y='Price', color='dodgerblue',
alpha=0.6, edgecolor='black', ax=axes[2, 0])
axes[2, 0].set_title('Power vs Price')


sns.heatmap(corr_matrix, annot=True, cmap='coolwarm', linewidths=0.5,
square=True, ax=axes[2, 1])
axes[2, 1].set_title('Correlation Heatmap')
```

```
C:\Users\akhil\AppData\Local\Temp\ipykernel_11104\2036007220.py:19:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `x` variable to `hue` and set
```

```
`legend=False` for the same effect.

  sns.countplot(x='Fuel_Type', data=df, palette='Set2', ax=axes[0, 1])
C:\Users\akhil\AppData\Local\Temp\ipykernel_11104\2036007220.py:25:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `x` variable to `hue` and set
`legend=False` for the same effect.

  sns.barplot(x=top_brands.index, y=top_brands.values,
palette='pastel', ax=axes[0, 2])
C:\Users\akhil\AppData\Local\Temp\ipykernel_11104\2036007220.py:35:
FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be
removed in v0.14.0. Assign the `x` variable to `hue` and set
`legend=False` for the same effect.

  sns.boxplot(x='Owner_Type', y='Price', data=df, palette='Set3',
ax=axes[1, 1])

Text(0.5, 1.0, 'Correlation Heatmap')
```


Price Distribution
Count
Price
1e6
Fuel Type Count
count
Petrol
Diesel
Fuel_Type
Top 10 Brands
Ford
Hyundai
Tata
Toyota
Volkswagen
Audi
BMW
Mercedes
Honda
Maruti
Brand
Transmission Share
Manual
43.0%
57.0%
Automatic
Price vs Owner
1e6
Price
First
Second
Third
Owner_Type
Year vs Average Price
1e6
Price
2016
2017
2018
2019
2020
2021
Year
Power vs Price
1e6
Price
Power
Correlation Heatmap
Mileage
Engine
Power
Price
1
-0.68
-0.65
-0.6
-0.68
1
0.81
0.71
-0.65
0.81
1
0.86
-0.6
0.71
0.86
1