sports-car-price

June 6, 2023

1 Import Libraries

```
[1]: import pandas as pd
     import numpy as np
     import matplotlib.pyplot as plt
     import seaborn as sns
     sns.set_theme(color_codes=True)

     import warnings
     warnings.filterwarnings("ignore")
```

2 Import Dataset

```
[2]: df = pd.read_csv("Sport car price.csv")
     df
```

```
[2]:          Car Make Car Model  Year Engine Size (L) Horsepower Torque (lb-ft)  \
     0         Porsche       911  2022               3        379            331
     1     Lamborghini   Huracan  2021             5.2        630            443
     2         Ferrari   488 GTB  2022             3.9        661            561
     3            Audi        R8  2022             5.2        562            406
     4         McLaren      720S  2021               4        710            568
     …             …         …    …               …          …              …
     1002   Koenigsegg     Jesko  2022               5       1280           1106
     1003        Lotus     Evija  2021  Electric Motor       1972           1254
     1004      McLaren     Senna  2021               4        789            590
     1005       Pagani    Huayra  2021               6        764            738
     1006        Rimac    Nevera  2021  Electric Motor       1888           1696

          0-60 MPH Time (seconds) Price (in USD)
     0                          4        101,200
     1                        2.8        274,390
     2                          3        333,750
     3                        3.2        142,700
     4                        2.7        298,000
     …                        …              …
```

```
1002                       2.5      3,000,000
1003                         2      2,000,000
1004                       2.7      1,000,000
1005                         3      2,600,000
1006                      1.85      2,400,000

[1007 rows x 8 columns]
```

3 Data Understanding

[3]:
```
df.head(3)
```

[3]:
```
      Car Make Car Model  Year Engine Size (L) Horsepower Torque (lb-ft)  \
0      Porsche       911  2022               3        379            331
1  Lamborghini   Huracan  2021             5.2        630            443
2      Ferrari   488 GTB  2022             3.9        661            561

  0-60 MPH Time (seconds) Price (in USD)
0                       4        101,200
1                     2.8        274,390
2                       3        333,750
```

[4]:
```
df.shape
```

[4]:
```
(1007, 8)
```

[5]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1007 entries, 0 to 1006
Data columns (total 8 columns):
 #   Column                   Non-Null Count  Dtype
---  ------                   --------------  -----
 0   Car Make                 1007 non-null   object
 1   Car Model                1007 non-null   object
 2   Year                     1007 non-null   int64
 3   Engine Size (L)          997 non-null    object
 4   Horsepower               1007 non-null   object
 5   Torque (lb-ft)           1004 non-null   object
 6   0-60 MPH Time (seconds)  1007 non-null   object
 7   Price (in USD)           1007 non-null   object
dtypes: int64(1), object(7)
memory usage: 63.1+ KB
```

[6]:
```
# Removing comma from price column
df["Price (in USD)"] = df["Price (in USD)"].str.replace(",","")
```

```
# Converting price column to integer
df["Price (in USD)"] = df["Price (in USD)"].apply(int)
```

[7]:
```
# Changing data into float
df["0-60 MPH Time (seconds)"] = df["0-60 MPH Time (seconds)"].str.
 ↪replace("<","")
df["0-60 MPH Time (seconds)"] = df["0-60 MPH Time (seconds)"].apply(float)
```

[8]:
```
# Converting data into integer
df["Torque (lb-ft)"] = df["Torque (lb-ft)"].str.replace(",","").str.
 ↪replace("+","")
df["Torque (lb-ft)"] = df["Torque (lb-ft)"].str.replace("-","0")
df["Torque (lb-ft)"] = df["Torque (lb-ft)"].fillna("0")
df["Torque (lb-ft)"] = df["Torque (lb-ft)"].apply(int)
```

[9]:
```
# Converting data into integer
df["Horsepower"] = df["Horsepower"].str.replace("+","").str.replace(",","")
df["Horsepower"] = df["Horsepower"].apply(int)
```

4 Segment Engine Size

[10]:
```
df["Engine Size (L)"].unique()
```

[10]:
```
array(['3', '5.2', '3.9', '4', '4.4', '6.2', '3.8', '8', '5', '3.5',
       '4.7', '2', '2.9', '6', 'Electric', '6.5', '3.7', 'Electric Motor',
       '2.5', '1.5 + Electric', '6.8', '8.4', nan, '6.6', '7', '1.7',
       '3.3', '-', '6.7', '1.8', 'Electric (tri-motor)', '5.5',
       'Electric (93 kWh)', 'Electric (100 kWh)', 'Hybrid (4.0)', '4.6',
       '3.6', '1.5', 'Hybrid', '5.7', '2.0 (Electric)', '4.0 (Hybrid)',
       '0', '6.4', '6.3', '2.3'], dtype=object)
```

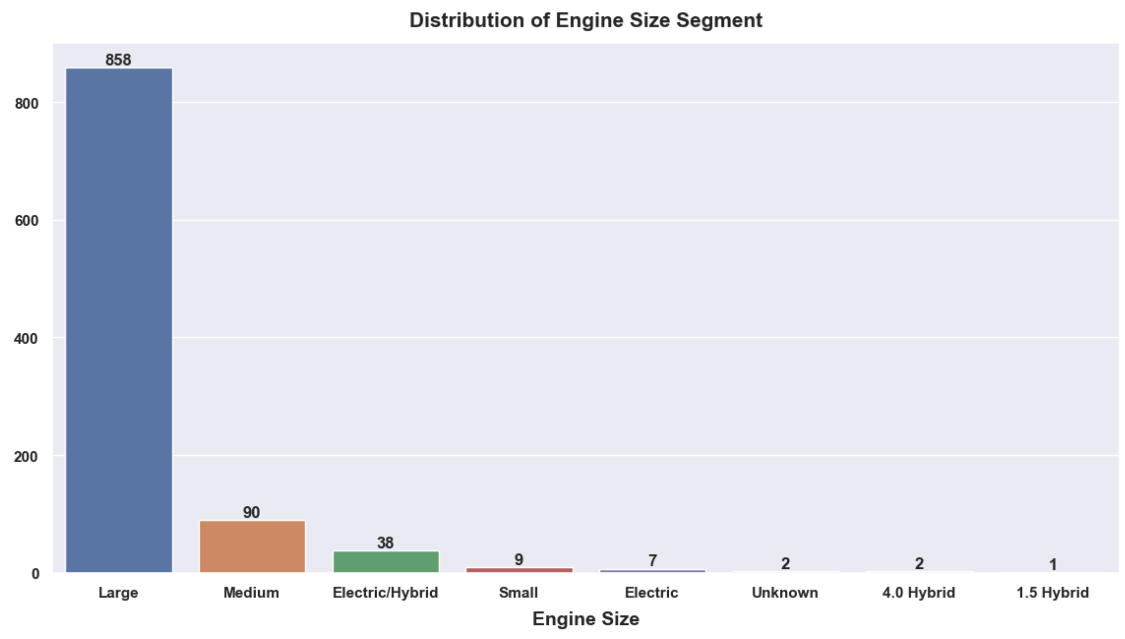
[11]:
```
# Define a function to segment the values
def segment_engine_size(engine_size):
    if engine_size in ['Electric','Hybrid']:
        return 'Electric/Hybrid'
    elif engine_size in ['Electric (93 kWh)', 'Electric (100 kWh)','Electric␣
 ↪(tri-motor)','Electric Motor','2.0 (Electric)']:
        return 'Electric'
    elif engine_size == '1.5 + Electric':
        return '1.5 Hybrid'
    elif engine_size in ['Hybrid (4.0)','4.0 (Hybrid)']:
        return '4.0 Hybrid'
    elif engine_size == '0':
        return 'Unknown'
    elif engine_size == '-':
        return 'Unknown'
    elif float(engine_size) < 2:
        return 'Small'
    elif float(engine_size) < 3:
        return 'Medium'
    else:
        return'Large'

# Applying the function to the engine size column
df["Engine Size (L)"] = df["Engine Size (L)"].apply(segment_engine_size)
df["Engine Size (L)"].unique()
```

[11]:
```
array(['Large', 'Medium', 'Electric/Hybrid', 'Electric', '1.5 Hybrid',
       'Small', 'Unknown', '4.0 Hybrid'], dtype=object)
```

5 Distribution of Engine Size Segment

[12]:
```
plt.figure(figsize=(14,7))
ax = sns.countplot(data=df,x=df["Engine Size (L)"],order=df["Engine Size (L)"].
 ↪value_counts().index)
plt.title("Distribution of Engine Size␣
 ↪Segment",pad=12,fontsize=15,weight="bold")
plt.xticks(weight="bold")
plt.yticks(weight="bold")
plt.xlabel("Engine Size",weight="bold",fontsize= 14,labelpad=8)
plt.ylabel("")
for i in ax.containers:
    i.datavalues
    ax.bar_label(i,weight="bold")
plt.show()
```



[13]:
```
# Find data types after changing data types
df.dtypes
```

[13]:
```
Car Make                     object
Car Model                    object
Year                          int64
Engine Size (L)              object
Horsepower                    int64
Torque (lb-ft)                int64
0-60 MPH Time (seconds)     float64
Price (in USD)                int64
dtype: object
```

6 Summary

[14]:
```
df.describe()
```

[14]:
```
              Year   Horsepower  Torque (lb-ft)  0-60 MPH Time (seconds)  \
count  1007.000000  1007.000000     1007.000000              1007.000000
mean   2021.201589   657.984111      557.347567                 3.513406
std       2.019802   593.017842      441.906994                 0.777639
min    1965.000000   181.000000        0.000000                 1.800000
25%    2021.000000   454.000000      406.000000                 2.900000
50%    2021.000000   591.000000      509.000000                 3.500000
75%    2022.000000   708.500000      604.000000                 4.000000
```

```
max    2023.000000  10000.000000    10000.000000                 6.500000

       Price (in USD)
count    1.007000e+03
mean     3.820359e+05
std      7.383227e+05
min      2.500000e+04
25%      7.180000e+04
50%      1.400000e+05
75%      2.500000e+05
max      5.200000e+06
```

[15]:
```
df.describe(include=object)
```

[15]:
```
       Car Make Car Model Engine Size (L)
count      1007      1007            1007
unique       38       176               8
top     Porsche        GT           Large
freq         88        55             858
```

7 Find Duplicate Values

[16]:
```
df.loc[df.duplicated().sum()]
```

[16]:
```
Car Make                      Chevrolet
Car Model                   Camaro ZL1
Year                              2022
Engine Size (L)                  Large
Horsepower                         650
Torque (lb-ft)                     650
0-60 MPH Time (seconds)            3.5
Price (in USD)                   69000
Name: 293, dtype: object
```

8 Find Null values

[17]:
```
df.isna().sum()
```

[17]:
```
Car Make                   0
Car Model                  0
Year                       0
Engine Size (L)            0
Horsepower                 0
Torque (lb-ft)             0
0-60 MPH Time (seconds)    0
```

```
Price (in USD)            0
dtype: int64
```

9 Removing irrelevant columns

[18]:
```
df["Car Model"].value_counts()
```

[18]:
```
GT                   55
Camaro ZL1           30
Evora GT             27
Continental GT       24
LC 500               24
                     ..
Fenyr SuperSport      1
Panamera Turbo        1
Atom                  1
AMG C 63 S            1
Mustang               1
Name: Car Model, Length: 176, dtype: int64
```

[19]:
```
df.drop(columns= "Car Model",inplace=True)
```

[20]:
```
df.head(3)
```

[20]:
```
      Car Make  Year Engine Size (L)  Horsepower  Torque (lb-ft)  \
0      Porsche  2022           Large         379             331
1  Lamborghini  2021           Large         630             443
2      Ferrari  2022           Large         661             561

   0-60 MPH Time (seconds)  Price (in USD)
0                      4.0          101200
1                      2.8          274390
2                      3.0          333750
```

10 Segment Car Make

[21]:
```
df["Car Make"].unique()
```

[21]:
```
array(['Porsche', 'Lamborghini', 'Ferrari', 'Audi', 'McLaren', 'BMW',
       'Mercedes-Benz', 'Chevrolet', 'Ford', 'Nissan', 'Aston Martin',
       'Bugatti', 'Dodge', 'Jaguar', 'Koenigsegg', 'Lexus', 'Lotus',
       'Maserati', 'Alfa Romeo', 'Ariel', 'Bentley', 'Mercedes-AMG',
       'Pagani', 'Polestar', 'Rimac', 'Acura', 'Mazda', 'Rolls-Royce',
       'Tesla', 'Toyota', 'W Motors', 'Shelby', 'TVR', 'Subaru',
       'Pininfarina', 'Kia', 'Alpine', 'Ultima'], dtype=object)
```

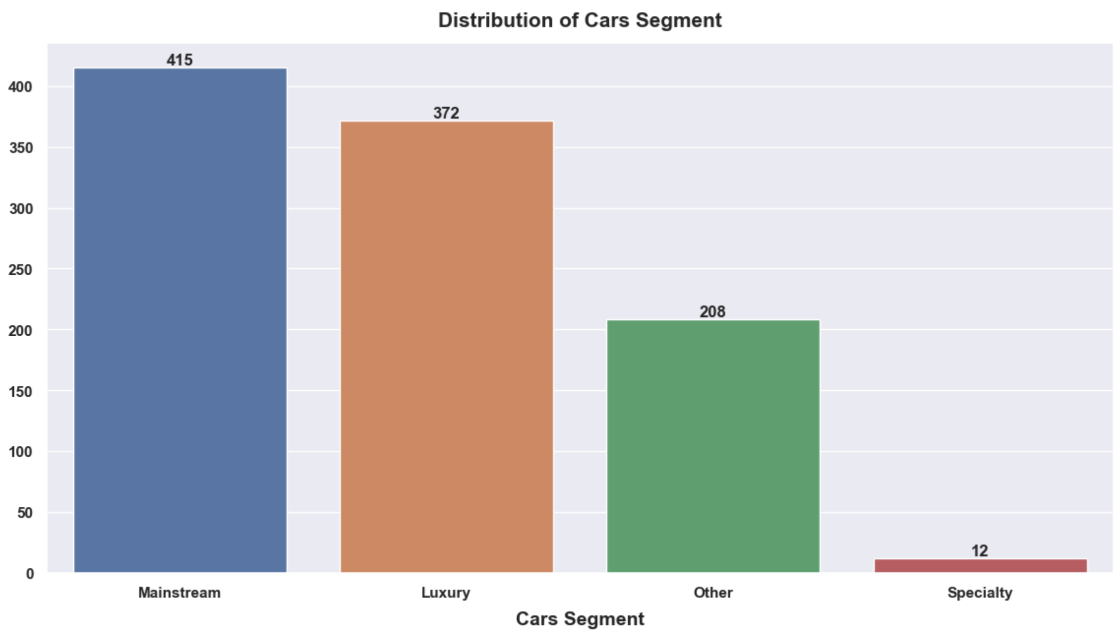
[22]:
```python
# Define a function to segment the values
def segment_car_make(car_make):
    if car_make  in ['Porsche', 'Lamborghini', 'Ferrari','McLaren','Aston␣
 ↪Martin','Bugatti','Koenigsegg']:
        return 'Luxury'
    elif car_make in ['Audi','BMW','Mercedes-Benz', 'Chevrolet', 'Ford',␣
 ↪'Nissan','Dodge', 'Jaguar','Mercedes-AMG']:
        return 'Mainstream'
    elif car_make in ['Ariel','W Motors', 'Shelby', 'TVR', 'Subaru','Alpine',␣
 ↪'Ultima']:
        return 'Specialty'
    else:
        return 'Other'

# Applying the function to the car make column
df["Car Make"] = df["Car Make"].apply(segment_car_make)
df["Car Make"].unique()
```

[22]:
```
array(['Luxury', 'Mainstream', 'Other', 'Specialty'], dtype=object)
```

11 Distribution of Cars Segment

[23]:
```python
plt.figure(figsize=(14,7))
ax = sns.countplot(data=df,x=df["Car Make"],order=df["Car Make"].value_counts().
 ↪index)
plt.title("Distribution of Cars Segment",pad=12,fontsize=15,weight="bold")
plt.xticks(weight="bold")
plt.yticks(weight="bold")
plt.xlabel("Cars Segment",weight="bold",fontsize= 14,labelpad=8)
plt.ylabel("")
for i in ax.containers:
    i.datavalues
    ax.bar_label(i,weight="bold")
plt.show()
```



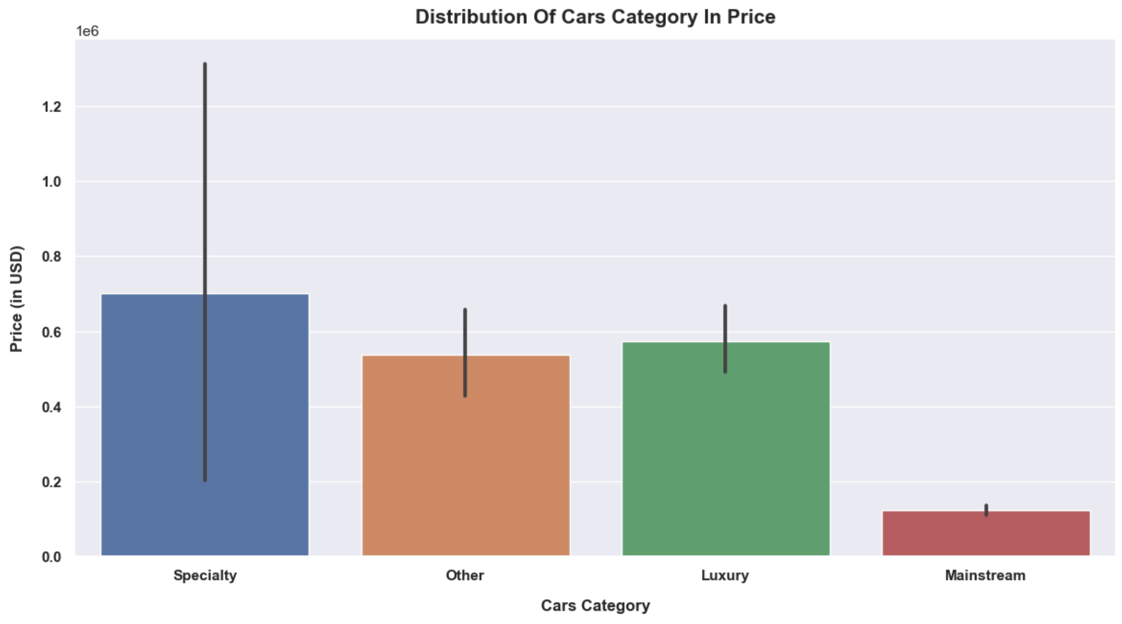
[24]:
```
df.head(5)
```

[24]:
```
     Car Make  Year Engine Size (L)  Horsepower  Torque (lb-ft)  \
0      Luxury  2022           Large         379             331
1      Luxury  2021           Large         630             443
2      Luxury  2022           Large         661             561
3  Mainstream  2022           Large         562             406
4      Luxury  2021           Large         710             568

   0-60 MPH Time (seconds)  Price (in USD)
0                      4.0          101200
1                      2.8          274390
2                      3.0          333750
3                      3.2          142700
4                      2.7          298000
```

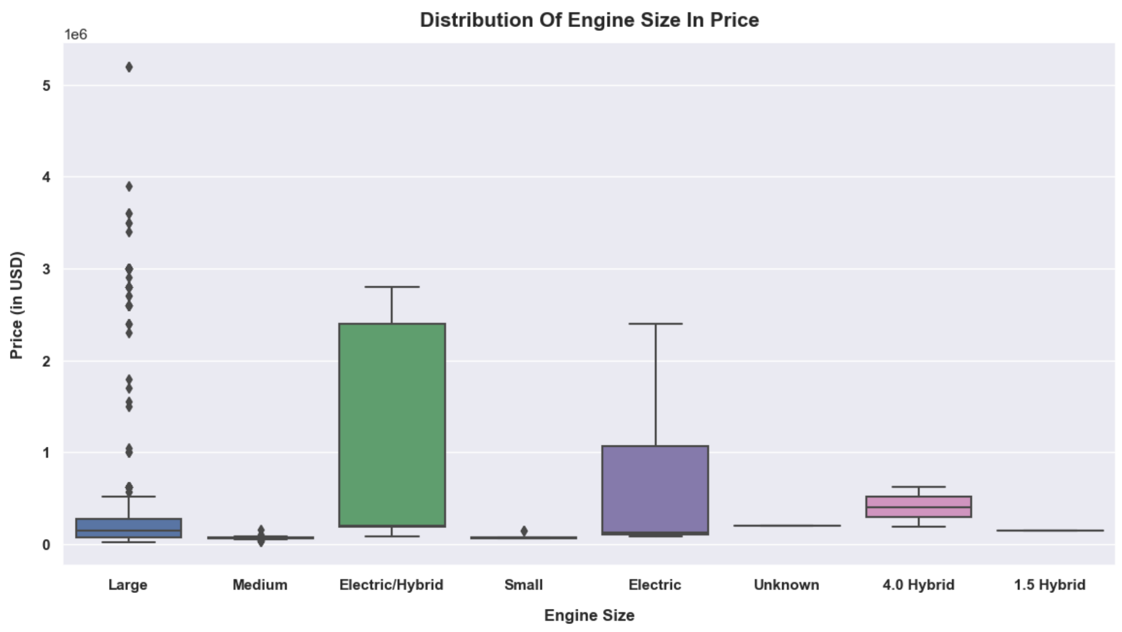
12 Distribution Of Cars Category In Price

[25]:
```
plt.figure(figsize=(14,7))
sns.barplot(data=df,x=df["Car Make"],y=df["Price (in USD)"], order=df["Car␣
↪Make"].value_counts(ascending=True).index)
plt.title("Distribution Of Cars Category In␣
↪Price",fontsize=15,weight="bold",pad=12)
plt.xticks(weight="bold")
plt.yticks(weight="bold")
plt.xlabel("Cars Category",weight="bold",fontsize=12,labelpad=12)
plt.ylabel("Price (in USD)",weight="bold",fontsize=12,labelpad=12)
plt.show()
```



13 Distribution Of Engine Size In Price

[26]:
```
plt.figure(figsize=(14,7))
sns.boxplot(data=df,x=df["Engine Size (L)"],y=df["Price (in␣
↪USD)"],order=df["Engine Size (L)"].value_counts().index)
plt.title("Distribution Of Engine Size In␣
↪Price",fontsize=15,weight="bold",pad=12)
plt.xticks(weight="bold")
plt.yticks(weight="bold")
plt.xlabel("Engine Size",weight="bold",fontsize=12,labelpad=12)
plt.ylabel("Price (in USD)",weight="bold",fontsize=12,labelpad=12)
plt.show()
```


Distribution Of Engine Size In Price
1e6
Price (in USD)
0
1
2
3
4
5
Large
Medium
Electric/Hybrid
Small
Electric
Unknown
4.0 Hybrid
1.5 Hybrid
Engine Size

```
[ ]:
```