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)	0-60 MPH Time (seconds)	Price (in USD)
0	Porsche	911	2022	3	379	331	4	101,200
1	Lamborghini	Huracan	2021	5.2	630	443	2.8	274,390
2	Ferrari	488 GTB	2022	3.9	661	561	3	333,750
3	Audi	R8	2022	5.2	562	406	3.2	142,700
4	McLaren	720S	2021	4	710	568	2.7	298,000
…	…	…	…	…	…	…	…	…
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		

```
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 == '-':
```

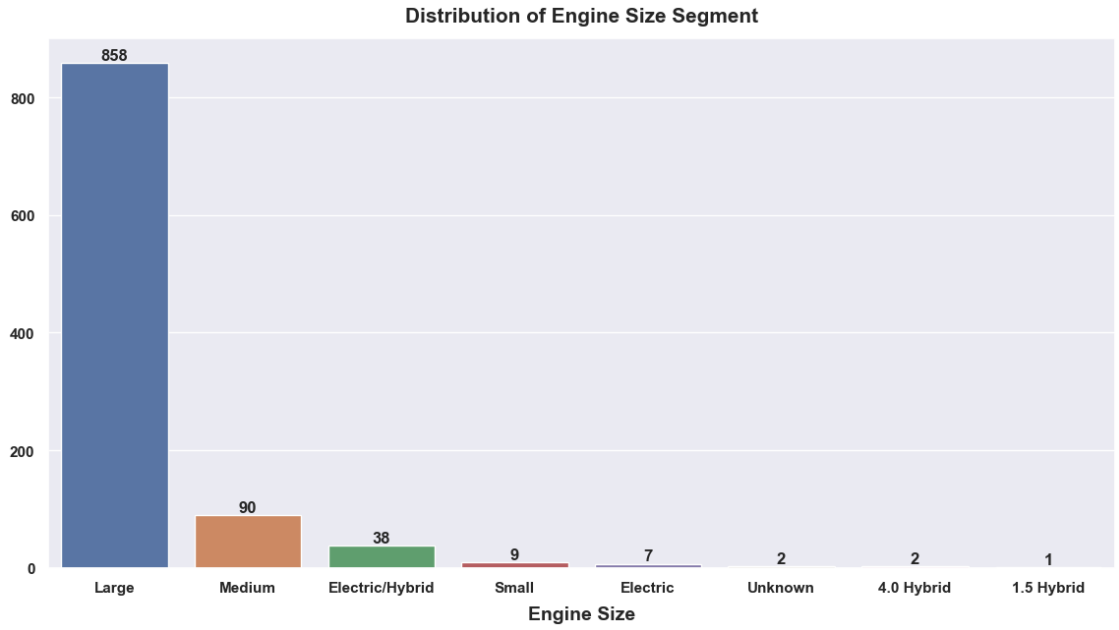
```
        return 'Unknown'
    elif float(engine_size) < 2:
        return 'Small'
    elif float(engine_size) < 3:
        return 'Medium'
    else:
        return'Large'

# 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)	0-60 MPH Time (seconds)	Price (in USD)
0	Porsche	2022	Large	379	331	4.0	101200
1	Lamborghini	2021	Large	630	443	2.8	274390
2	Ferrari	2022	Large	661	561	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)
```

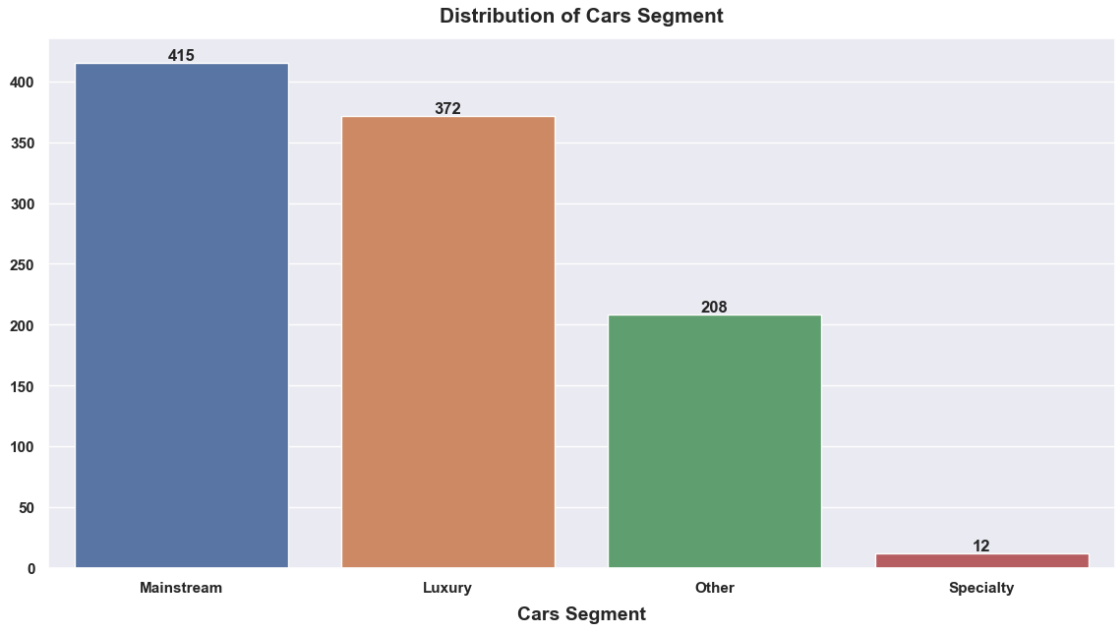
[22]:
```
# Define a function to segment the values
def segment_car_make(car_make):
    if car_make  in ['Porsche', 'Lamborghini', 'Ferrari','McLaren','Aston␣
 ↪Martin','Bugatti','Koenigsegg']:
        return 'Luxury'
    elif car_make in ['Audi','BMW','Mercedes-Benz', 'Chevrolet', 'Ford',␣
 ↪'Nissan','Dodge', '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]:
```
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)
```

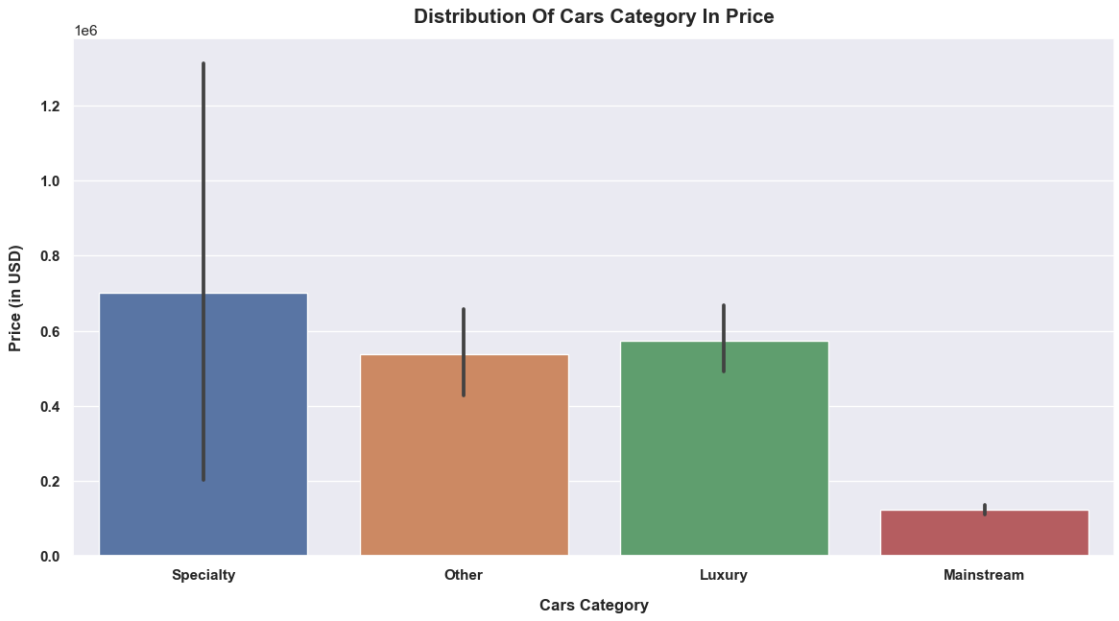
[24]:
```
      Car Make  Year Engine Size (L)  Horsepower  Torque (lb-ft)  \
0       Luxury  2022           Large         379             331
1       Luxury  2021           Large         630             443
2       Luxury  2022           Large         661             561
3   Mainstream  2022       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

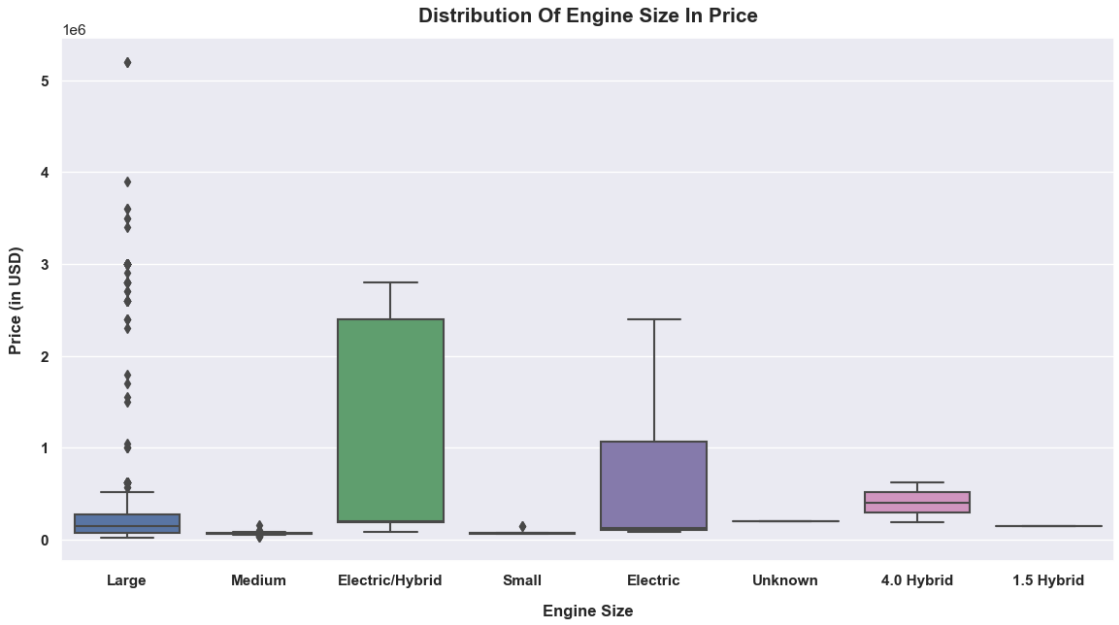
[25]:
```
plt.figure(figsize=(14,7))
sns.barplot(data=df,x=df["Car Make"],y=df["Price (in USD)"], order=df["Car␣
 ↪Make"].value_counts(ascending=True).index)
plt.title("Distribution Of Cars Category In␣
 ↪Price",fontsize=15,weight="bold",pad=12)
plt.xticks(weight="bold")
plt.yticks(weight="bold")
```

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

[ ]: