CAR PRICE PREDICTION WITH MACHINE LEARNING

importing libraries

In [1]:

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

pd.options.display.max_rows=500
pd.options.display.max_columns=30
```

In [2]:

```
# reading csv file
df=pd.read_csv("C:\\Users\\ayith\\OneDrive\\Documents\\data sets\\CarPrice_Assignment.cs
```

In [3]:

```
df.head()
```

Out[3]:

	car_ID	symboling	CarName	fueltype	aspiration	doornumber	carbody	drivewheel
0	1	3	alfa-romero giulia	gas	std	two	convertible	rwd
1	2	3	alfa-romero stelvio	gas	std	two	convertible	rwd
2	3	1	alfa-romero Quadrifoglio	gas	std	two	hatchback	rwd
3	4	2	audi 100 ls	gas	std	four	sedan	fwd
4	5	2	audi 100ls	gas	std	four	sedan	4wd

In [4]:

```
df.shape
```

Out[4]:

```
(205, 26)
```

In [5]:

```
df.info()   # checking file info
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 205 entries, 0 to 204
Data columns (total 26 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   car_ID            205 non-null    int64  
 1   symboling         205 non-null    int64  
 2   CarName           205 non-null    object 
 3   fueltype          205 non-null    object 
 4   aspiration        205 non-null    object 
 5   doornumber        205 non-null    object 
 6   carbody           205 non-null    object 
 7   drivewheel        205 non-null    object 
 8   enginelocation    205 non-null    object 
 9   wheelbase         205 non-null    float64
 10  carlength         205 non-null    float64
 11  carwidth          205 non-null    float64
 12  carheight         205 non-null    float64
 13  curbweight        205 non-null    int64  
 14  enginetype        205 non-null    object 
 15  cylindernumber    205 non-null    object 
 16  enginesize        205 non-null    int64  
 17  fuelsystem        205 non-null    object 
 18  boreratio         205 non-null    float64
 19  stroke            205 non-null    float64
 20  compressionratio  205 non-null    float64
 21  horsepower        205 non-null    int64  
 22  peakrpm           205 non-null    int64  
 23  citympg           205 non-null    int64  
 24  highwaympg        205 non-null    int64  
 25  price             205 non-null    float64
dtypes: float64(8), int64(8), object(10)
memory usage: 41.8+ KB
```

In [6]:

```
# checking null values

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

Out[6]:

```
car_ID              0
symboling           0
CarName             0
fueltype            0
aspiration          0
doornumber          0
carbody             0
drivewheel          0
enginelocation      0
wheelbase           0
carlength           0
carwidth            0
carheight           0
curbweight          0
enginetype          0
cylindernumber      0
enginesize          0
fuelsystem          0
boreratio           0
stroke              0
compressionratio    0
horsepower          0
peakrpm             0
citympg             0
highwaympg          0
price               0
dtype: int64
```

In [7]:

```
df.columns
```

Out[7]:

```
Index(['car_ID', 'symboling', 'CarName', 'fueltype', 'aspiration',
       'doornumber', 'carbody', 'drivewheel', 'enginelocation', 'wheelbas
e',
       'carlength', 'carwidth', 'carheight', 'curbweight', 'enginetype',
       'cylindernumber', 'enginesize', 'fuelsystem', 'boreratio', 'strok
e',
       'compressionratio', 'horsepower', 'peakrpm', 'citympg', 'highwaymp
g',
       'price'],
      dtype='object')
```

spliting the numerical & categiercal columns

In [8]:

```
num_col=df.select_dtypes(exclude='object')
```

In [9]:

```
num_col.columns
```

Out[9]:

```
Index(['car_ID', 'symboling', 'wheelbase', 'carlength', 'carwidth',
       'carheight', 'curbweight', 'enginesize', 'boreratio', 'stroke',
       'compressionratio', 'horsepower', 'peakrpm', 'citympg', 'highwaymp
g',
       'price'],
      dtype='object')
```

In [10]:

```
num_col
```

Out[10]:

	car_ID	symboling	wheelbase	carlength	carwidth	carheight	curbweight	enginesize	boreratio	stro
0	1	3	88.6	168.8	64.1	48.8	2548	130	3.47	2.6
1	2	3	88.6	168.8	64.1	48.8	2548	130	3.47	2.6
2	3	1	94.5	171.2	65.5	52.4	2823	152	2.68	3.4
3	4	2	99.8	176.6	66.2	54.3	2337	109	3.19	3.4
4	5	2	99.4	176.6	66.4	54.3	2824	136	3.19	3.4
5	6	2	99.8	177.3	66.3	53.1	2507	136	3.19	3.4
6	7	1	105.8	192.7	71.4	55.7	2844	136	3.19	3.4
7	8	1	105.8	192.7	71.4	55.7	2954	136	3.19	3.4
8	9	1	105.8	192.7	71.4	55.9	3086	131	3.13	3.4
9	10	0	99.5	178.2	67.9	52.0	3053	131	3.13	3.4

In [11]:

```
# changeing the column name
df.rename(columns={"CarName":"companyname"},inplace=True)
```

In [12]:

```
cat_col=df.select_dtypes(include='object')
```

In [13]:

```
cat_col.columns
```

Out[13]:

```
Index(['companyname', 'fueltype', 'aspiration', 'doornumber', 'carbody',
       'drivewheel', 'enginelocation', 'enginetype', 'cylindernumber',
       'fuelsystem'],
      dtype='object')
```

In [14]:

```
df
```

Out[14]:

	car_ID	symboling	companyname	fueltype	aspiration	doornumber	carbody	drivewheel	enginelo
0	1	3	alfa-romero giulia	gas	std	two	convertible	rwd	
1	2	3	alfa-romero stelvio	gas	std	two	convertible	rwd	
2	3	1	alfa-romero Quadrifoglio	gas	std	two	hatchback	rwd	
3	4	2	audi 100 ls	gas	std	four	sedan	fwd	
4	5	2	audi 100ls	gas	std	four	sedan	4wd	
5	6	2	audi fox	gas	std	two	sedan	fwd	
6	7	1	audi 100ls	gas	std	four	sedan	fwd	
7	8	1	audi 5000	gas	std	four	wagon	fwd	

In [15]:

```
cat_col.columns
```

Out[15]:

```
Index(['companyname', 'fueltype', 'aspiration', 'doornumber', 'carbody',
       'drivewheel', 'enginelocation', 'enginetype', 'cylindernumber',
       'fuelsystem'],
      dtype='object')
```

replaceing the company names of cars

In [16]:

```
df.companyname = df.companyname.str.lower()

def replace_name(a,b):
    df.companyname.replace(a,b,inplace=True)

replace_name([ 'nissan rogue',
       'nissan latio', 'nissan titan', 'nissan leaf', 'nissan juke',
       'nissan note', 'nissan clipper', 'nissan nv200', 'nissan dayz',
       'nissan fuga', 'nissan otti', 'nissan teana', 'nissan kicks','nissan versa', 'nis
replace_name(['alfa-romero giulia', 'alfa-romero stelvio',
       'alfa-romero quadrifoglio'],'alfa-romero')
replace_name(['audi 100 ls', 'audi 100ls', 'audi fox',
       'audi 5000', 'audi 4000', 'audi 5000s (diesel)'],'audi')
replace_name([ 'bmw 320i', 'bmw x1', 'bmw x3', 'bmw z4',
       'bmw x4', 'bmw x5'],'BMW')
replace_name(['chevrolet impala',
       'chevrolet monte carlo', 'chevrolet vega 2300'],'chevrolet')
replace_name(['dodge rampage',
       'dodge challenger se', 'dodge d200', 'dodge monaco (sw)',
       'dodge colt hardtop', 'dodge colt (sw)', 'dodge coronet custom',
       'dodge dart custom', 'dodge coronet custom (sw)'],'Dodge')
replace_name(['honda civic',
       'honda civic cvcc', 'honda accord cvcc', 'honda accord lx',
       'honda civic 1500 gl', 'honda accord', 'honda civic 1300',
       'honda prelude', 'honda civic (auto)'],'Honda')
replace_name(['isuzu mu-x', 'isuzu d-max ', 'isuzu d-max v-cross'],'isuzu')
replace_name(['jaguar xj', 'jaguar xf', 'jaguar xk', 'maxda rx3'],'jaguar')
replace_name(['maxda glc deluxe', 'mazda rx2 coupe',
       'mazda rx-4', 'mazda glc deluxe', 'mazda 626', 'mazda glc',
       'mazda rx-7 gs', 'mazda glc 4', 'mazda glc custom l',
       'mazda glc custom'],'mazda')
replace_name(['buick electra 225 custom',
       'buick century luxus (sw)', 'buick century', 'buick skyhawk',
       'buick opel isuzu deluxe', 'buick skylark',
       'buick century special', 'buick regal sport coupe (turbo)'],'buick')
replace_name(['mitsubishi mirage', 'mitsubishi lancer', 'mitsubishi outlander',
       'mitsubishi g4', 'mitsubishi mirage g4', 'mitsubishi montero',
       'mitsubishi pajero'],'mitsubishi')
replace_name(['peugeot 504', 'peugeot 304',
       'peugeot 504 (sw)', 'peugeot 604sl', 'peugeot 505s turbo diesel'],'peugeot')
replace_name(['plymouth fury iii',
       'plymouth cricket', 'plymouth satellite custom (sw)',
       'plymouth fury gran sedan', 'plymouth valiant', 'plymouth duster'],'plymouth')
replace_name(['porsche macan',
       'porcshce panamera', 'porsche cayenne', 'porsche boxter'],'porcshce')
replace_name(['renault 12tl', 'renault 5 gtl'],'renault')
replace_name(['saab 99e', 'saab 99le', 'saab 99gle'],'saab')
replace_name(['subaru', 'subaru dl', 'subaru brz',
       'subaru baja', 'subaru r1', 'subaru r2', 'subaru trezia',
       'subaru tribeca'],'subaru')
replace_name(['toyota corona mark ii',
       'toyota corona', 'toyota corolla 1200', 'toyota corona hardtop',
       'toyota corolla 1600 (sw)', 'toyota carina', 'toyota mark ii',
       'toyota corolla', 'toyota corolla liftback',
       'toyota celica gt liftback', 'toyota corolla tercel',
       'toyota corona liftback', 'toyota starlet', 'toyota tercel',
       'toyota cressida', 'toyota celica gt', 'toyouta tercel'],'toyota')
replace_name(['vokswagen rabbit',
       'volkswagen 1131 deluxe sedan', 'volkswagen model 111',
```

```
       'volkswagen type 3', 'volkswagen 411 (sw)',
       'volkswagen super beetle', 'volkswagen dasher', 'vw dasher',
       'vw rabbit', 'volkswagen rabbit', 'volkswagen rabbit custom'],'volkswagen')
replace_name([ 'volvo 145e (sw)', 'volvo 144ea', 'volvo 244dl', 'volvo 245',
       'volvo 264gl', 'volvo diesel', 'volvo 246'],'volvo')
df.companyname.unique()
```

Out[16]:

```
array(['alfa-romero', 'audi', 'BMW', 'chevrolet', 'Dodge', 'Honda',
       'isuzu', 'jaguar', 'mazda', 'buick', 'mercury cougar',
       'mitsubishi', 'Nissan', 'peugeot', 'plymouth', 'porcshce',
       'renault', 'saab', 'subaru', 'toyota', 'volkswagen', 'volvo'],
      dtype=object)
```

finding the unique values of each column

In [17]:

```
df['fueltype'].unique()
```

Out[17]:

```
array(['gas', 'diesel'], dtype=object)
```

In [18]:

```
df['aspiration'].unique()
```

Out[18]:

```
array(['std', 'turbo'], dtype=object)
```

In [19]:

```
cat_col.columns
```

Out[19]:

```
Index(['companyname', 'fueltype', 'aspiration', 'doornumber', 'carbody',
       'drivewheel', 'enginelocation', 'enginetype', 'cylindernumber',
       'fuelsystem'],
      dtype='object')
```

In [20]:

```
df['doornumber'].unique()
```

Out[20]:

```
array(['two', 'four'], dtype=object)
```

In [21]:

```
df2=pd.unique(df[[ 'fueltype', 'aspiration', 'doornumber', 'carbody',
       'drivewheel', 'enginelocation', 'enginetype', 'cylindernumber',
       'fuelsystem']].values.ravel('k'))
```

In [22]:

```
df2
```

Out[22]:

```
array(['gas', 'diesel', 'std', 'turbo', 'two', 'four', 'convertible',
       'hatchback', 'sedan', 'wagon', 'hardtop', 'rwd', 'fwd', '4wd',
       'front', 'rear', 'dohc', 'ohcv', 'ohc', 'l', 'rotor', 'ohcf',
       'dohcv', 'six', 'five', 'three', 'twelve', 'eight', 'mpfi', '2bbl',
       'mfi', '1bbl', 'spfi', '4bbl', 'idi', 'spdi'], dtype=object)
```

In [23]:

```
num_col.columns
```

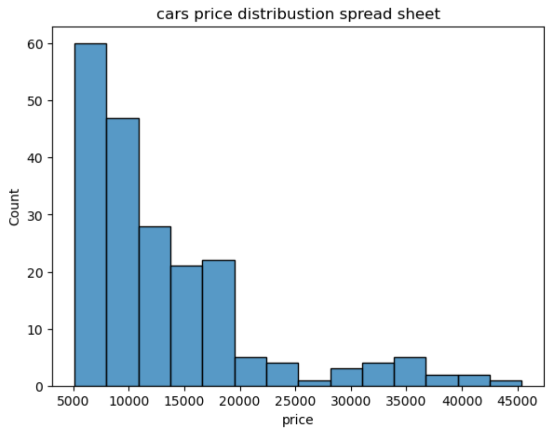
Out[23]:

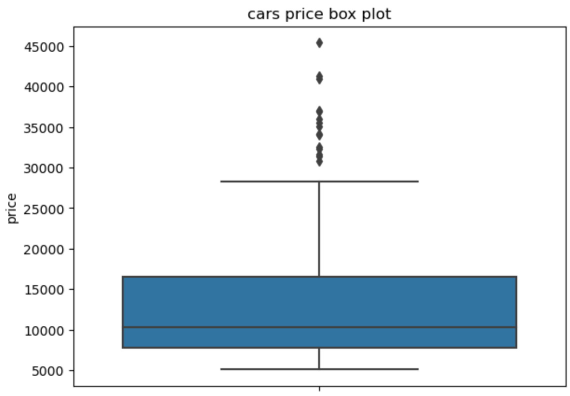
```
Index(['car_ID', 'symboling', 'wheelbase', 'carlength', 'carwidth',
       'carheight', 'curbweight', 'enginesize', 'boreratio', 'stroke',
       'compressionratio', 'horsepower', 'peakrpm', 'citympg', 'highwaymp
g',
       'price'],
      dtype='object')
```

checking the car prices

In [24]:

```
plt.figure(figsize=(15,5))

plt.subplot(1,2,1)
plt.title('cars price distribustion spread sheet')
sns.histplot(df.price)

plt.subplot(1,2,2)
plt.title('cars price box plot')
sns.boxplot(y=df.price)

plt.show()
```





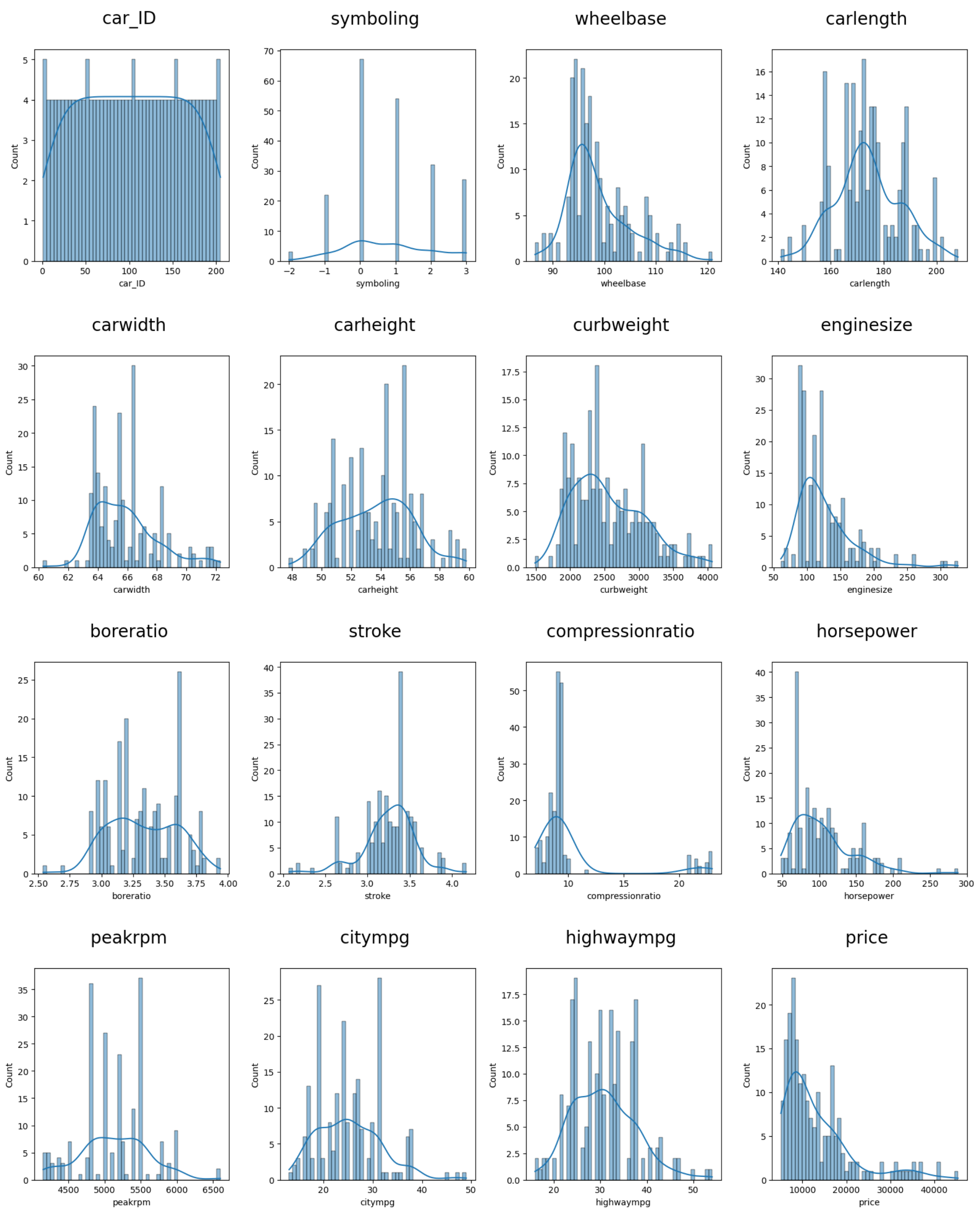
In [25]:

```
print(df.price.describe(percentiles=[0.25,0.5,0.85,0.75,0.9,1]))
```

```
count      205.000000
mean     13276.710571
std       7988.852332
min       5118.000000
25%       7788.000000
50%      10295.000000
75%      16503.000000
85%      18500.000000
90%      22563.000000
100%     45400.000000
max      45400.000000
Name: price, dtype: float64
```

In [26]:

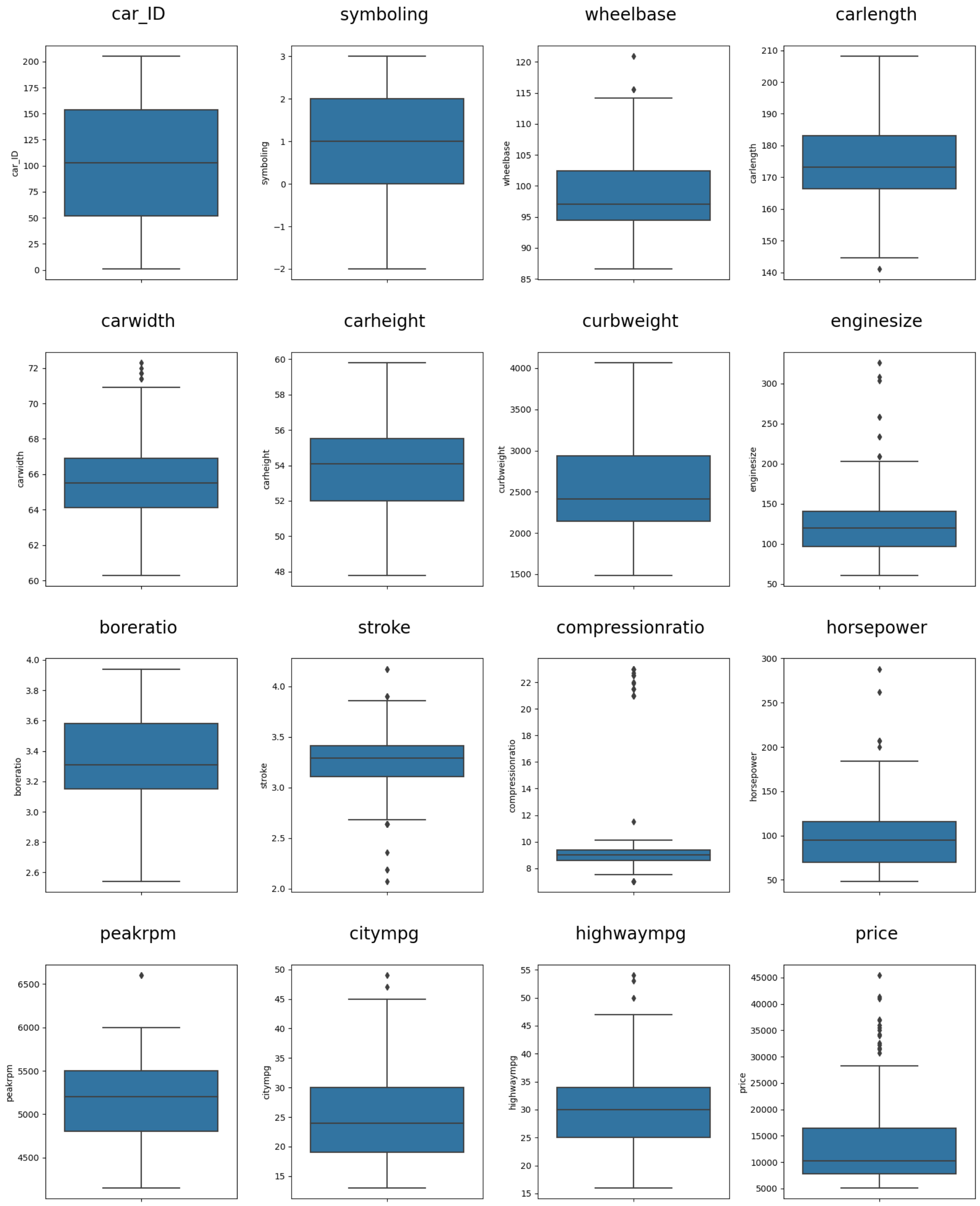
```
cols = num_col.columns

plt.figure(figsize = (16, 20))
plotnumber = 1

for i in range(len(cols)):
    if plotnumber <= 16:
        ax = plt.subplot(4, 4, plotnumber)
        sns.histplot(x = cols[i], data = df, ax = ax, palette='rocket', kde = True, bins
        plt.title(f"\n{cols[i]} \n", fontsize = 20)

    plotnumber += 1

plt.tight_layout()
plt.show()
```



checking the outliers of columns

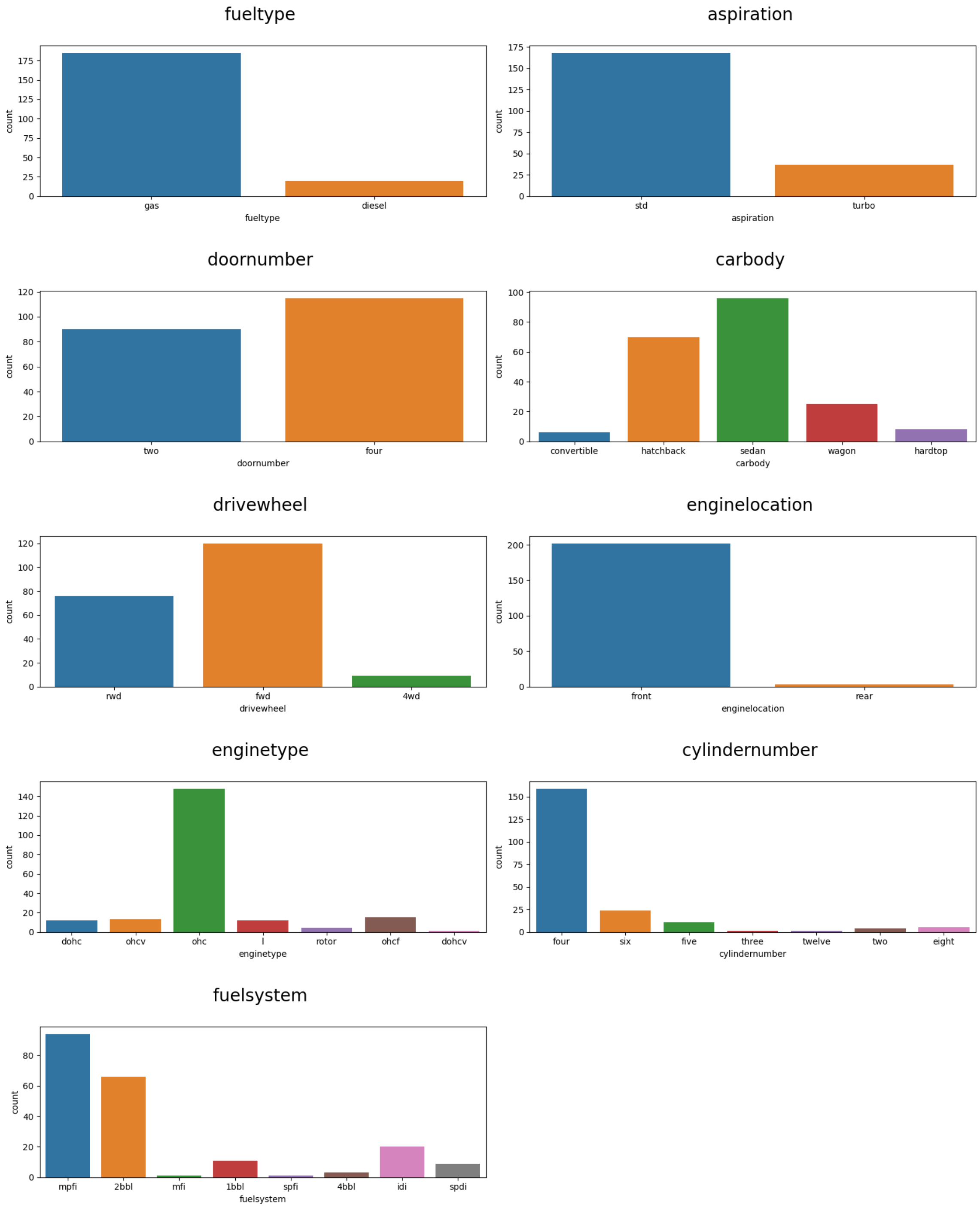
In [27]:

```
cols = num_col.columns

plt.figure(figsize = (16, 20))
plotnumber = 1

for i in range(len(cols)):
    if plotnumber <= 16:
        ax = plt.subplot(4, 4, plotnumber)
        sns.boxplot(y = cols[i], data = df, ax = ax)
        plt.title(f"\n{cols[i]} \n", fontsize = 20)

    plotnumber += 1

plt.tight_layout()
plt.show()
```


car_ID
symboling
wheelbase
carlength
carwidth
carheight
curbweight
enginesize
boreratio
stroke
compressionratio
horsepower
peakrpm
citympg
highwaympg
price

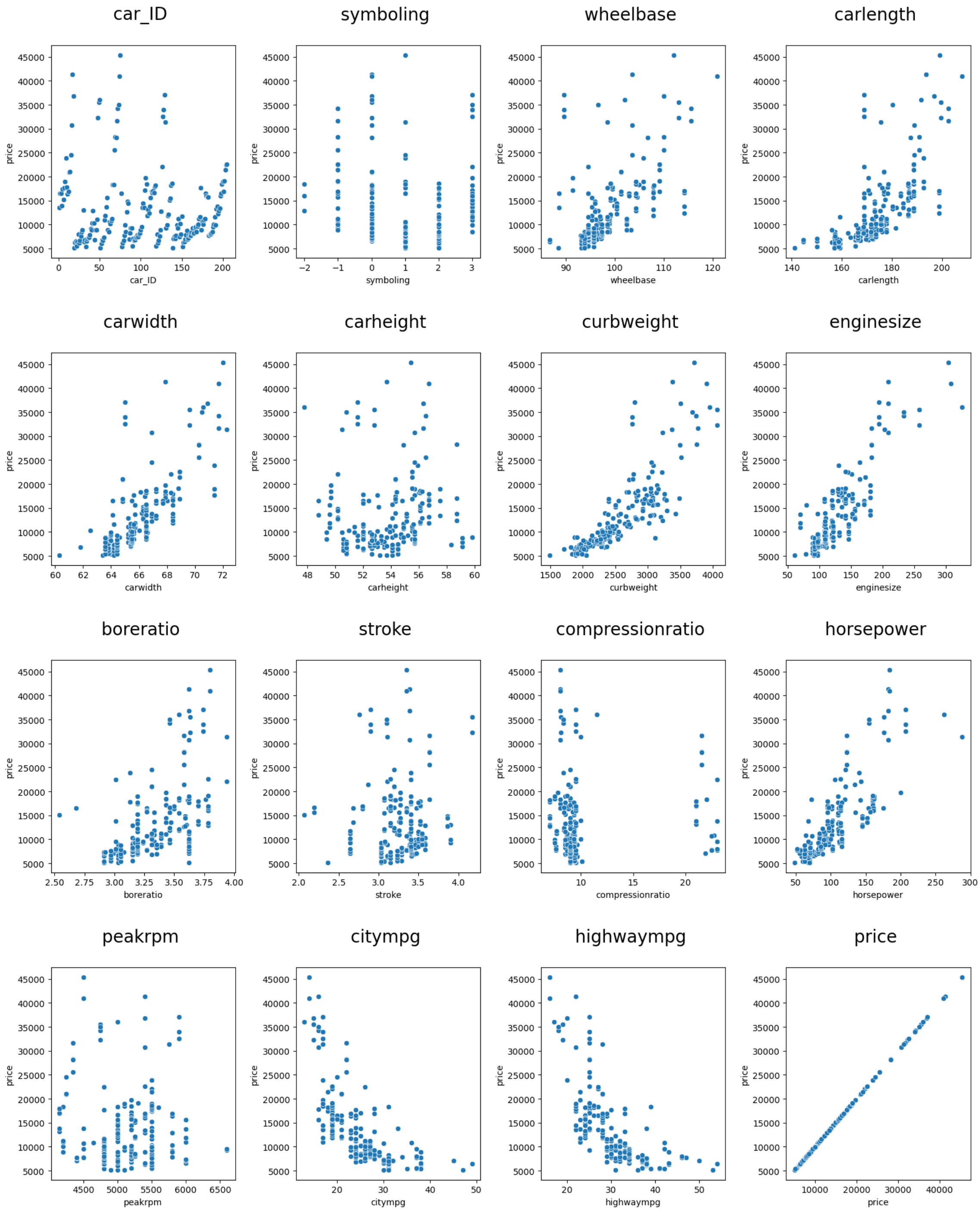
In [28]:

```
cols = cat_col.columns

plt.figure(figsize = (16, 20))
plotnumber = 1

for i in range(1, len(cols)):
    if plotnumber <= 10:
        ax = plt.subplot(5, 2, plotnumber)
        sns.countplot(x = cols[i], data = df, ax = ax)
        plt.title(f"\n{cols[i]} \n", fontsize = 20)

    plotnumber += 1

plt.tight_layout()
plt.show()
```



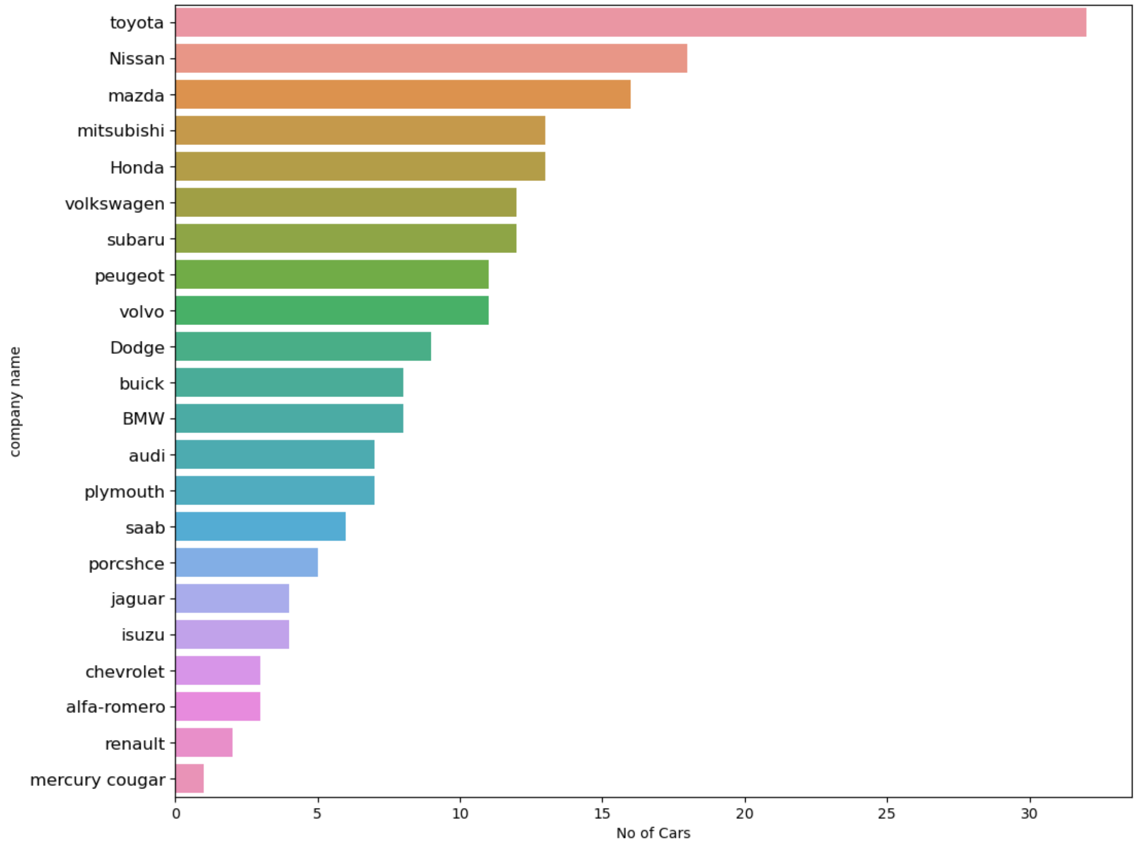
In [29]:

```
#Bivariate and Multivariate Analysis
cols = num_col.columns

plt.figure(figsize = (16, 20))
plotnumber = 1

# plotting the countplot of each categorical column.

for i in range(len(cols)):
    if plotnumber <= 16:
        ax = plt.subplot(4, 4, plotnumber)
        sns.scatterplot(x = cols[i], y = df['price'], data = df, ax = ax, palette='rocke
        plt.title(f"\n{cols[i]} \n", fontsize = 20)

    plotnumber += 1

plt.tight_layout()
plt.show()
```


car_ID
symboling
wheelbase
carlength
carwidth
carheight
curbweight
enginesize
boreratio
stroke
compressionratio
horsepower
peakrpm
citympg
highwaympg
price

In [30]:

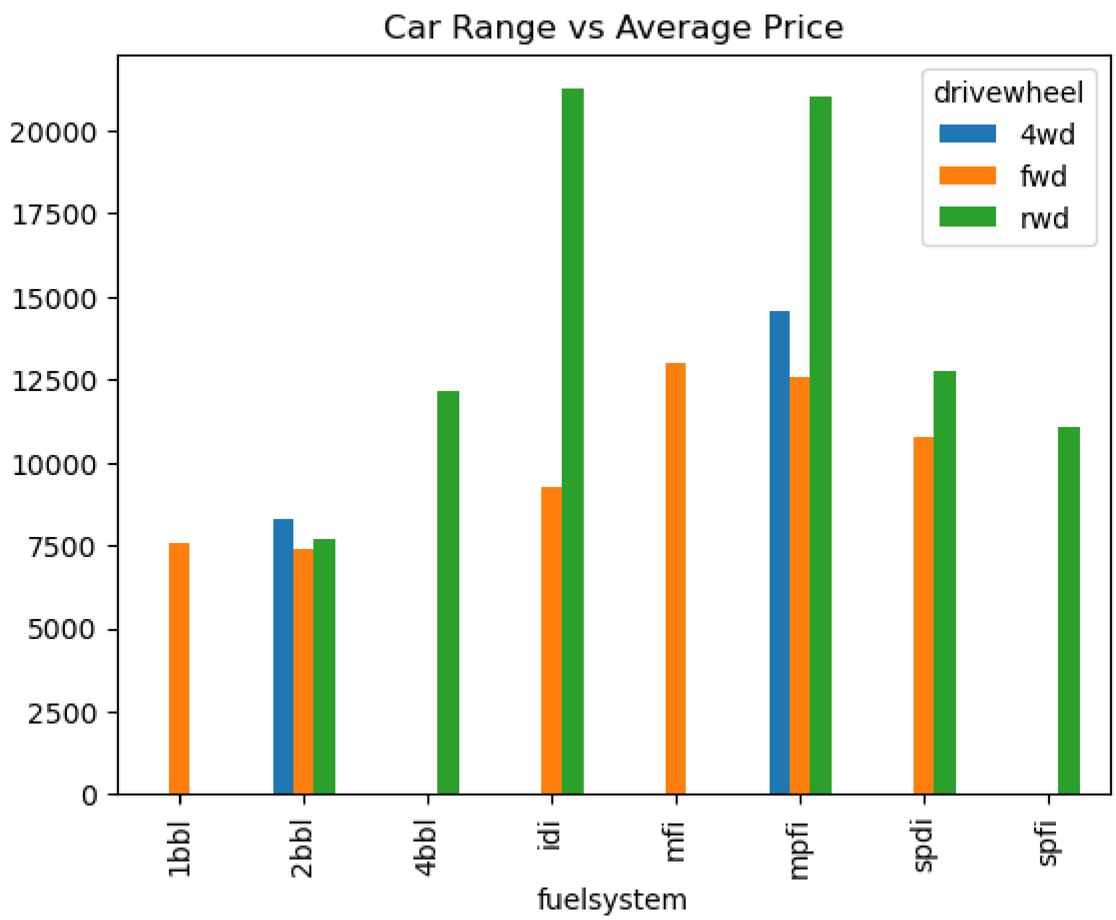
```
df1 = pd.DataFrame(df['companyname'].value_counts().reset_index())
df1.columns = ['company name', 'No of Cars']

plt.figure(figsize = (12, 10))
sns.barplot(x = 'No of Cars', y = 'company name', data = df1)
plt.yticks(size = 12)
plt.show()
```



In [31]:

```
plt.figure(figsize=(25, 6))

df1 = pd.DataFrame(df.groupby(['fuelsystem','drivewheel'])['price'].mean().unstack(fill_
df1.plot.bar()
plt.title('Car Range vs Average Price')
plt.show()
```

```
<Figure size 2500x600 with 0 Axes>
```



In [32]:

```
# Defining the map function
def dummies(x,df):
    temp = pd.get_dummies(df[x], drop_first = True)
    df = pd.concat([df, temp], axis = 1)
    df.drop([x], axis = 1, inplace = True)
    return df
# Applying the function to the cars_lr

cars_lr = dummies('fueltype',df)
cars_lr = dummies('aspiration',df)
cars_lr = dummies('carbody',df)
cars_lr = dummies('drivewheel',df)
cars_lr = dummies('enginetype',df)
cars_lr = dummies('cylindernumber',df)
```

In [33]:

```
df['cylindernumber'].value_counts()
```

Out[33]:

```
four      159
six        24
five       11
eight       5
two         4
three       1
twelve      1
Name: cylindernumber, dtype: int64
```

In [34]:

```
# creating features and label variable

X = df.drop(columns = 'price', axis = 1)
y = df['price']
```

In [35]:

```
X = pd.get_dummies(X, drop_first = True)
X
```

Out[35]:

	car_ID	symboling	wheelbase	carlength	carwidth	carheight	curbweight	enginesize	boreratio	strc
0	1	3	88.6	168.8	64.1	48.8	2548	130	3.47	2.6
1	2	3	88.6	168.8	64.1	48.8	2548	130	3.47	2.6
2	3	1	94.5	171.2	65.5	52.4	2823	152	2.68	3.4
3	4	2	99.8	176.6	66.2	54.3	2337	109	3.19	3.4
4	5	2	99.4	176.6	66.4	54.3	2824	136	3.19	3.4
5	6	2	99.8	177.3	66.3	53.1	2507	136	3.19	3.4
6	7	1	105.8	192.7	71.4	55.7	2844	136	3.19	3.4
7	8	1	105.8	192.7	71.4	55.7	2954	136	3.19	3.4
8	9	1	105.8	192.7	71.4	55.9	3086	131	3.13	3.4
9	10	0	99.5	178.2	67.9	52.0	3053	131	3.13	3.4

In [36]:

```
# checking for multicollinearity using `VIF` and `correlation matrix`

from statsmodels.stats.outliers_influence import variance_inflation_factor

vif = pd.DataFrame()

vif['VIF'] = [variance_inflation_factor(X, i) for i in range(X.shape[1])]
vif['Features'] = X.columns

vif
```

```
C:\Users\ayith\anaconda3\lib\site-packages\statsmodels\stats\outliers_infl
uence.py:195: RuntimeWarning: divide by zero encountered in double_scalars
  vif = 1. / (1. - r_squared_i)
```

Out[36]:

	VIF	Features
0	5.361348e+02	car_ID
1	6.794082e+00	symboling
2	1.906423e+01	wheelbase
3	2.389053e+01	carlength
4	1.621246e+01	carwidth
5	7.377879e+00	carheight
6	4.564945e+01	curbweight
7	6.652621e+01	enginesize
8	1.465711e+01	boreratio
9	6.150801e+00	stroke
10	2.507274e+02	compressionratio
11	5.475149e+01	horsepower
12	6.574496e+00	peakrpm
13	5.440969e+01	citympg
14	4.602128e+01	highwaympg
15	1.114962e+01	companyname_Dodge
16	2.738459e+01	companyname_Honda
17	1.166208e+02	companyname_Nissan
18	5.425691e+00	companyname_alfa-romero
19	1.013191e+01	companyname_audi
20	2.886631e+01	companyname_buick
21	4.488424e+00	companyname_chevrolet
22	9.477336e+00	companyname_isuzu
23	9.461843e+00	companyname_jaguar
24	4.188605e+01	companyname_mazda
25	3.987083e+00	companyname_mercury cougar
26	6.889266e+01	companyname_mitsubishi
27	inf	companyname_peugeot
28	7.834242e+01	companyname_plymouth
29	5.404968e+01	companyname_porcshce
30	2.520523e+01	companyname_renault
31	7.503304e+01	companyname_saab
32	inf	companyname_subaru
33	5.163982e+02	companyname_toyota
34	2.879255e+02	companyname_volkswagen
35	2.654728e+02	companyname_volvo
36	1.461142e+04	fueltype_gas

	VIF	Features
37	6.557001e+00	aspiration_turbo
38	3.871617e+00	doornumber_two
39	3.638616e+00	carbody_hardtop
40	1.961038e+01	carbody_hatchback
41	2.511357e+01	carbody_sedan
42	1.231669e+01	carbody_wagon
43	1.277756e+01	drivewheel_fwd
44	1.987256e+01	drivewheel_rwd
45	inf	enginelocation_rear
46	7.016475e+00	enginetype_dohcv
47	inf	enginetype_l
48	1.690185e+01	enginetype_ohc
49	inf	enginetype_ohcf
50	4.897694e+00	enginetype_ohcv
51	inf	enginetype_rotor
52	2.622677e+01	cylindernumber_five
53	1.328438e+02	cylindernumber_four
54	4.740406e+01	cylindernumber_six
55	inf	cylindernumber_three
56	7.266285e+00	cylindernumber_twelve
57	inf	cylindernumber_two
58	3.236884e+01	fuelsystem_2bbl
59	6.265078e+00	fuelsystem_4bbl
60	1.931060e+03	fuelsystem_idi
61	2.307026e+00	fuelsystem_mfi
62	4.112491e+01	fuelsystem_mpfi
63	9.476591e+00	fuelsystem_spdi
64	2.371209e+00	fuelsystem_spfi

In [37]:

```
from sklearn.model_selection import train_test_split
```

In [38]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size = 0.30, random_state
```

In [39]:

```
from sklearn.preprocessing import MinMaxScaler

scaler = MinMaxScaler()
num_vars = ['wheelbase', 'curbweight', 'enginesize', 'boreratio', 'horsepower','carlengt
df[num_vars] = scaler.fit_transform(df[num_vars])
```

In [40]:

```
X_train.shape,X_test.shape,y_train.shape, y_test.shape
```

Out[40]:

```
((143, 65), (62, 65), (143,), (62,))
```

In [41]:

```
from sklearn.preprocessing import StandardScaler

sc = StandardScaler()
X_train = sc.fit_transform(X_train)
X_test = sc.transform(X_test)
```

In [42]:

```
from sklearn.preprocessing import StandardScaler
```

In [43]:

```
sc_X=StandardScaler()
```

In [44]:

```
xtrain = sc_X.fit_transform(X_train)
```

In [45]:

```
xtest = sc_X.fit_transform(X_test)
```

In [46]:

```
from sklearn import linear_model
from sklearn import svm
classifiers = [
    svm.SVR(),
    linear_model.SGDRegressor(),
    linear_model.BayesianRidge(),
    linear_model.LassoLars(),
    linear_model.ARDRegression(),
    linear_model.PassiveAggressiveRegressor(),
    linear_model.TheilSenRegressor(),
    linear_model.LinearRegression()]
for item in classifiers:
    print(item)
    clf = item
    clf.fit(X_train,y_train)
    print(clf.predict(X_test),'\n')
```

```
SVR()
[10238.12276056 10260.3675765  10257.04914872 10252.80697331
 10247.83027535 10252.30709027 10237.82093074 10243.0421458
 10258.87572884 10240.32069379 10257.81419195 10258.75219862
 10258.6491851  10253.64122035 10249.8864627  10250.9352058
 10249.9143013  10258.50721112 10242.54048827 10236.34548367
 10248.54212947 10260.89091875 10246.94492443 10251.23455215
 10258.86710926 10243.49461286 10238.29193753 10260.86964611
 10237.79535727 10237.58744636 10246.75804201 10250.25092673
 10256.01630166 10248.40297226 10237.80680512 10263.97459931
 10246.48594743 10257.0731738  10240.2871778  10260.3483104
 10249.80709623 10258.21869406 10263.09304853 10254.77274982
 10250.90913386 10241.34731372 10241.21319864 10252.86536054
 10251.60289828 10247.18733764 10259.57521899 10246.21887302
 10242.03955144 10243.15839881 10258.07314152 10260.04456723
 10249.65723971 10263.28100703 10247.79513392 10240.57649894
 10243.30930862 10256.50528322]

SGDRegressor()
```

In [47]:

```
y_predict=clf.predict(X_test)
```

In [48]:

```
y_predict
```

Out[48]:

```
array([  6491.33013063,  16517.51546265,  13871.62658698, -22335.91047974,
         9077.71912522,  11379.62856787,   5731.4533077 ,   3982.10940929,
        16536.45671656,   8359.76633075,  20690.87402857,  37434.70962928,
        12553.12739777,  15853.2478588 ,   7038.81595548,  10202.65327457,
        30497.19303664,  18312.51556015,   8268.44285146,   7272.42813068,
         8876.58359759,  16347.56964018,  31439.16549892,  11709.18691969,
        18048.9782788 ,   6930.87381963,   6640.27375018,  17148.64257305,
         7154.93586799,   5025.87584299,   8285.06170759,  11913.41113717,
        37695.8583478 ,   9492.18059157,   6675.38007648,  30010.03932916,
        14316.34723004,  14879.58722212,   4658.13156823,  37650.96440879,
         5887.11755297,  15437.36409643,  33112.28396095,  28122.03077554,
        11036.38055303,   8787.60583286,   7201.73549831,  13042.90944121,
        10805.01826805,  10067.7306153 ,  20606.77026338,   8077.16199632,
         7588.41881322,  10031.69451295,  29743.06854061,  17956.15323513,
         9505.15189693,  18140.31476368,  10017.21479342,   6561.21526583,
         3925.36278597,  14602.13315934])
```

In [49]:

```
from sklearn.linear_model import LinearRegression

lr = LinearRegression()
lr.fit(X_train, y_train)
```

Out[49]:

```
LinearRegression()
```

In [50]:

```
lr.score(X_train, y_train)
```

Out[50]:

```
0.9783548097431701
```

In [59]:

```
lr.score(X_test, y_predict)
```

Out[59]:

```
1.0
```

In [52]:

```
from sklearn.linear_model import Lasso, LassoCV
```

In [53]:

```
lassocv = LassoCV(alphas = None, cv = 10, max_iter = 10000, normalize = True)
lassocv.fit(X_train, y_train)
```

```
C:\Users\ayith\anaconda3\lib\site-packages\sklearn\linear_model\_base.py:1
41: FutureWarning: 'normalize' was deprecated in version 1.0 and will be r
emoved in 1.2.
If you wish to scale the data, use Pipeline with a StandardScaler in a pre
processing stage. To reproduce the previous behavior:

from sklearn.pipeline import make_pipeline

model = make_pipeline(StandardScaler(with_mean=False), Lasso())

If you wish to pass a sample_weight parameter, you need to pass it as a fi
t parameter to each step of the pipeline as follows:

kwargs = {s[0] + '__sample_weight': sample_weight for s in model.steps}
model.fit(X, y, **kwargs)

Set parameter alpha to: original_alpha * np.sqrt(n_samples).
  warnings.warn(
```

Out[53]:

```
LassoCV(cv=10, max_iter=10000, normalize=True)
```

In [54]:

```
lasso = Lasso(alpha = lassocv.alpha_)
lasso.fit(X_train, y_train)
```

```
C:\Users\ayith\anaconda3\lib\site-packages\sklearn\linear_model\_coordinat
e_descent.py:647: ConvergenceWarning: Objective did not converge. You migh
t want to increase the number of iterations, check the scale of the featur
es or consider increasing regularisation. Duality gap: 6.261e+07, toleranc
e: 8.925e+05
  model = cd_fast.enet_coordinate_descent(
```

Out[54]:

```
Lasso(alpha=0.5743416905388534)
```

In [55]:

```
lasso.score(X_train, y_train)
```

Out[55]:

```
0.9774145188740271
```

In [56]:

```
lasso.score(X_test, y_test)
```

Out[56]:

```
0.7185672985278083
```

In [61]:

```
#y_test=y_test.flatten()
predict = clf.predict(X_test)
compar = pd.DataFrame({'actual':y_test, 'predicted': predict})
compar = compar.reset_index(drop = True)
compar[:10]
```

Out[61]:

	actual	predicted
0	6795.0	6491.330131
1	15750.0	16517.515463
2	15250.0	13871.626587
3	5151.0	-22335.910480
4	9995.0	9077.719125
5	11199.0	11379.628568
6	5389.0	5731.453308
7	7898.0	3982.109409
8	17199.0	16536.456717
9	6529.0	8359.766331

In [ ]:

```

```