In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeRegressor
```

In [3]:
```
df = pd.read_csv("C:/Users/Jahnavi/Downloads/Car/CarPrice.csv")
df
```

Out[3]:

	car_ID	symboling	CarName	fueltype	aspiration	doornumber	carbody	drivewheel	enginelocation	wheelbase	...	enginesize	fuelsystem	boreratio	stroke	compressionratio	horsepower	peakrpm	citympg	highwaympg	price
0	1	3	alfa-romero giulia	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	13495
1	2	3	alfa-romero stelvio	gas	std	two	convertible	rwd	front	88.6	...	130	mpfi	3.47	2.68	9.0	111	5000	21	27	16500
2	3	1	alfa-romero Quadrifoglio	gas	std	two	hatchback	rwd	front	94.5	...	152	mpfi	2.68	3.47	9.0	154	5000	19	26	16500
3	4	2	audi 100 ls	gas	std	four	sedan	fwd	front	99.8	...	109	mpfi	3.19	3.40	10.0	102	5500	24	30	13950
4	5	2	audi 100ls	gas	std	four	sedan	4wd	front	99.4	...	136	mpfi	3.19	3.40	8.0	115	5500	18	22	17450
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
200	201	-1	volvo 145e (sw)	gas	std	four	sedan	rwd	front	109.1	...	141	mpfi	3.78	3.15	9.5	114	5400	23	28	16845
201	202	-1	volvo 144ea	gas	turbo	four	sedan	rwd	front	109.1	...	141	mpfi	3.78	3.15	8.7	160	5300	19	25	19045
202	203	-1	volvo 244dl	gas	std	four	sedan	rwd	front	109.1	...	173	mpfi	3.58	2.87	8.8	134	5500	18	23	21485
203	204	-1	volvo 246	diesel	turbo	four	sedan	rwd	front	109.1	...	145	idi	3.01	3.40	23.0	106	4800	26	27	22470
204	205	-1	volvo 264gl	gas	turbo	four	sedan	rwd	front	109.1	...	141	mpfi	3.78	3.15	9.5	114	5400	19	25	22625

205 rows × 26 columns

In [4]:
```
df.isnull().sum()
```

Out[4]:
```
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 [6]:
```
df.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 [8]:
```
df.describe()
```

Out[8]:

	car_ID	symboling	wheelbase	carlength	carwidth	carheight	curbweight	enginesize	boreratio	stroke	compressionratio	horsepower	peakrpm	citympg	highwaympg	price
count	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000	205.000000
mean	103.000000	0.834146	98.756585	174.049268	65.907805	53.724878	2555.565854	126.907317	3.329756	3.255415	10.142537	104.117073	5125.121951	25.219512	30.751220	13276.710571
std	59.322565	1.245307	6.021776	12.337289	2.145204	2.443522	520.680204	41.642693	0.270844	0.313597	3.972040	39.544167	476.985643	6.542142	6.886443	7886.852332
min	1.000000	-2.000000	86.600000	141.100000	60.300000	47.800000	1488.000000	61.000000	2.540000	2.070000	7.000000	48.000000	4150.000000	13.000000	16.000000	5118.000000
25%	52.000000	0.000000	94.500000	166.300000	64.100000	52.000000	2145.000000	97.000000	3.150000	3.110000	8.600000	70.000000	4800.000000	19.000000	25.000000	7788.000000
50%	103.000000	1.000000	97.000000	173.200000	65.500000	54.100000	2414.000000	120.000000	3.310000	3.290000	9.000000	95.000000	5200.000000	24.000000	30.000000	10295.000000
75%	154.000000	2.000000	102.400000	183.100000	66.900000	55.500000	2935.000000	141.000000	3.580000	3.410000	9.400000	116.000000	5500.000000	30.000000	34.000000	16503.000000
max	205.000000	3.000000	120.900000	208.100000	72.300000	59.800000	4066.000000	326.000000	3.940000	4.170000	23.000000	288.000000	6600.000000	49.000000	54.000000	45400.000000

In [10]:
```
df.CarName.unique()
```

Out[10]:
```
array(['alfa-romero giulia', 'alfa-romero stelvio',
       'alfa-romero Quadrifoglio', 'audi 100 ls', 'audi 100ls',
       'audi fox', 'audi 5000', 'audi 4000', 'audi 5000s (diesel)',
       'bmw 320i', 'bmw x1', 'bmw x3', 'bmw z4', 'bmw x4', 'bmw x5',
       'chevrolet impala', 'chevrolet monte carlo', 'chevrolet vega 2300',
       '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)', '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)', 'isuzu MU-X', 'isuzu D-Max ',
       'isuzu D-Max V-Cross', 'jaguar xj', 'jaguar xf', 'jaguar xk',
       'maxda rx3', 'maxda glc deluxe', 'maxda rx2 coupe', 'maxda rx-4',
       'maxda glc deluxe', 'mazda 626', 'mazda glc', 'mazda rx-7 gs',
       'mazda glc 4', 'mazda glc custom l', 'mazda glc custom',
       'buick electra 225 custom', 'buick century luxus (sw)',
       'buick century', 'buick skylark', 'buick opel isuzu deluxe',
       'buick skylark', 'buick century special',
       'buick regal sport coupe (turbo)', 'mercury cougar',
       'mitsubishi mirage', 'mitsubishi lancer', 'mitsubishi outlander',
       'mitsubishi g4', 'mitsubishi mirage g4', 'mitsubishi montero',
       'mitsubishi pajero', 'Nissan versa', 'nissan gt-r', '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',
       'peugeot 504', 'peugeot 304', 'peugeot 504 (sw)', 'peugeot 604sl',
       'peugeot 505s turbo diesel', 'plymouth fury iii',
       'plymouth cricket', 'plymouth satellite custom (sw)',
       'plymouth fury gran sedan', 'plymouth valiant', 'plymouth duster',
       'porsche macan', 'porcshce panamera', 'porsche cayenne',
       'porsche boxter', 'renault 12tl', 'renault 5 gtl', 'saab 99e',
       'saab 99le', 'saab 99gle', 'subaru', 'subaru dl', 'subaru brz',
       'subaru baja', 'subaru r1', 'subaru r2', 'subaru trezia',
       'subaru tribeca', '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',
       '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',
       'volvo 145e (sw)', 'volvo 144ea', 'volvo 244dl', 'volvo 245',
       'volvo 264gl', 'volvo diesel', 'volvo 246'], dtype=object)
```

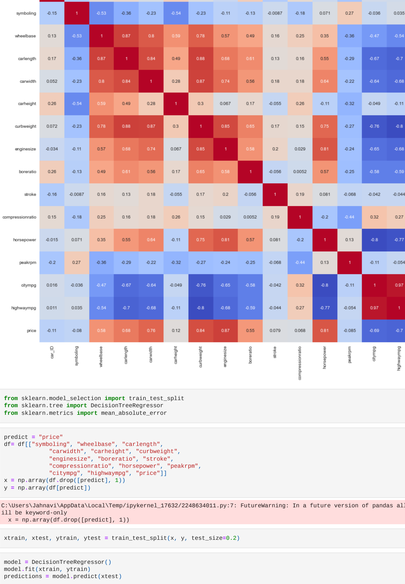
In [11]:
```
df.corr()
```

Out[11]:

	car_ID	symboling	wheelbase	carlength	carwidth	carheight	curbweight	enginesize	boreratio	stroke	compressionratio	horsepower	peakrpm	citympg	highwaympg	price
car_ID	1.000000	-0.151621	0.129729	0.170636	0.052387	0.255960	0.071962	-0.033930	0.260064	-0.160824	0.150276	-0.015006	-0.203789	0.015940	0.011255	-0.109093
symboling	-0.151621	1.000000	-0.531954	-0.357612	-0.232919	-0.541038	-0.227691	-0.105790	-0.130051	-0.008735	-0.178515	0.070873	0.273606	-0.035823	0.034606	-0.079978
wheelbase	0.129729	-0.531954	1.000000	0.874587	0.795144	0.589435	0.776386	0.569329	0.488750	0.160959	0.249786	0.353294	-0.360469	-0.470414	-0.544082	0.577816
carlength	0.170636	-0.357612	0.874587	1.000000	0.841118	0.491029	0.877728	0.683360	0.606454	0.129533	0.158414	0.552623	-0.287242	-0.670909	-0.704662	0.682920
carwidth	0.052387	-0.232919	0.795144	0.841118	1.000000	0.279210	0.867032	0.735433	0.559150	0.182942	0.181129	0.640732	-0.220012	-0.642704	-0.677218	0.759325
carheight	0.255960	-0.541038	0.589435	0.491029	0.279210	1.000000	0.295572	0.067149	0.171071	-0.055307	0.261214	-0.108802	-0.320411	-0.048640	-0.107358	0.119336
curbweight	0.071962	-0.227691	0.776386	0.877728	0.867032	0.295572	1.000000	0.850594	0.648480	0.168790	0.151362	0.750739	-0.266243	-0.757414	-0.797405	0.835305
enginesize	0.033930	-0.105790	0.569329	0.683360	0.735433	0.067149	0.850594	1.000000	0.583774	0.203129	0.028971	0.809769	-0.244660	-0.653658	-0.677470	0.874145
boreratio	0.260064	-0.130051	0.488750	0.606454	0.559150	0.171071	0.648480	0.583774	1.000000	-0.055909	0.005197	0.573677	-0.254976	-0.584532	-0.587012	0.553173
stroke	-0.160824	-0.008735	0.160959	0.129533	0.182942	-0.055307	0.168790	0.203129	-0.055909	1.000000	0.186110	0.080940	-0.067964	-0.042145	-0.043931	0.079443
compressionratio	0.150276	-0.178515	0.249786	0.158414	0.181129	0.261214	0.151362	0.028971	0.005197	0.186110	1.000000	-0.204326	-0.435741	0.324701	0.265201	0.067984
horsepower	-0.015006	0.070873	0.353294	0.552623	0.640732	-0.108802	0.750739	0.809769	0.573677	0.080940	-0.204326	1.000000	0.131073	-0.801456	-0.770544	0.808139
peakrpm	-0.203789	0.273606	-0.360469	-0.287242	-0.220012	-0.320411	-0.266243	-0.244660	-0.254976	-0.067964	-0.435741	0.131073	1.000000	-0.113544	-0.054275	-0.085267
citympg	0.015940	-0.035823	-0.470414	-0.670909	-0.642704	-0.048640	-0.757414	-0.653658	-0.584532	-0.042145	0.324701	-0.801456	-0.113544	1.000000	0.971337	-0.685751
highwaympg	0.011255	0.034606	-0.544082	-0.704662	-0.677218	-0.107358	-0.797465	-0.677470	-0.587012	-0.043931	0.265201	-0.770544	-0.054275	0.971337	1.000000	-0.697599
price	-0.109093	-0.079978	0.577816	0.682920	0.759325	0.119336	0.835305	0.874145	0.553173	0.079443	0.067984	0.808139	-0.085267	-0.685751	-0.697599	1.000000

In [13]:
```
sns.set_style("whitegrid")
plt.figure(figsize=(15, 10))
sns.distplot(df.price)
plt.show()
```

```
C:\Users\Jahnavi\anaconda3\lib\site-packages\seaborn\distributions.py:2619: FutureWarning: `distplot` is a deprecated function and will be removed in a future version. Please adapt your code to use either `displot` (a figure-level function with similar flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```



In [15]:
```
plt.figure(figsize=(20, 15))
corrrelations = df.corr()
sns.heatmap(corrrelations, cmap="coolwarm", annot=True)
plt.show()
```

In [20]:
```
from sklearn.model_selection import train_test_split
from sklearn.tree import DecisionTreeRegressor
from sklearn.metrics import mean_absolute_error
```

In [21]:
```
predict = "price"
df= df[["symboling", "wheelbase", "carlength",
            "carwidth", "carheight", "curbweight",
            "enginesize", "boreratio", "stroke",
            "compressionratio", "horsepower", "peakrpm",
            "citympg", "highwaympg", "price"]]
x = np.array(df.drop([predict], 1))
y = np.array(df[predict])
```

```
C:\Users\Jahnavi\AppData\Local\Temp/ipykernel_17632/2248634011.py:7: FutureWarning: In a future version of pandas all arguments of DataFrame.drop except for the argument 'labels' will be keyword-only
  x = np.array(df.drop([predict], 1))
```

In [22]:
```
xtrain, xtest, ytrain, ytest = train_test_split(x, y, test_size=0.2)
```

In [23]:
```
model = DecisionTreeRegressor()
model.fit(xtrain, ytrain)
predictions = model.predict(xtest)
```

In [24]:
```
model.score(xtest, predictions)
```

Out[24]:
```
1.0
```

In [ ]: