7. Multiple Regression

- Multiple linear regression is the most common form of linear regression analysis.
- As a predictive analysis, the multiple linear regression is used to explain the relationship between one continuous dependent variable and two or more independent variables.
- The independent variables can be continuous or categorical (dummy coded as appropriate).

Problem Statement: We can predict the CO2 emission of a car based on the size of the engine, but with multiple regression we can throw in more variables, like the weight of the car, to make the prediction more accurate.

Import the libraries

In [ ]:

```python
import pandas
import numpy as np
```

In [ ]:

```python
df = pandas.read_csv("cars.csv")
```

Then make a list of the independent values and call this variable X.

Put the dependent values in a variable called y.

In [ ]:

```python
X = df[['Weight', 'Volume']]
y = df['CO2']
```

It is common to name the list of independent values with a upper case X, and the list of dependent values with a lower case y.

In [ ]:

```python
from sklearn import linear_model
regr = linear_model.LinearRegression()
regr.fit(X, y)
```

Out[ ]:

```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

we have a regression object that are ready to predict CO2 values based on a car's weight and volume:

In [ ]:

```python
#predict the CO2 emission of a car where the weight is 2300kg, and the volume is 1300cm
3:
predictedCO2 = regr.predict([[2300, 1300]])
```

In [ ]:

```python
print(predictedCO2)
```

[107.2087328]

We have predicted that a car with 1.3 liter engine, and a weight of 2300 kg, will release approximately 107 grams of CO2 for every kilometer it drives.

In [ ]:

```python
print(regr.coef_)
```

[0.00755095 0.00780526]

Conclusion :

The result array represents the coefficient values of weight and volume.

Weight: 0.00755095 Volume: 0.00780526

These values tell us that if the weight increase by 1kg, the CO2 emission increases by 0.00755095g.

And if the engine size (Volume) increases by 1 cm3, the CO2 emission increases by 0.00780526 g.

We have already predicted that if a car with a 1300cm3 engine weighs 2300kg, the CO2 emission will be approximately 107g.

In [ ]: