

- **Linear regression** is a method used to model the relationship between a dependent variable and one or more independent variables.
- It assumes that there is a linear relationship between the variables and tries to find the line of best fit that minimizes the sum of squared errors.

In [23]: `results.summary()`

Out[23]: OLS Regression Results

Dep. Variable:	medv	R-squared:	0.544
Model:	OLS	Adj. R-squared:	0.543
Method:	Least Squares	F-statistic:	601.6
Date:	Tue, 28 Jan 2020	Prob (F-statistic):	5.08e-88
Time:	22:35:45	Log-Likelihood:	-1641.5
No. Observations:	506	AIC:	3287.
Df Residuals:	504	BIC:	3295.
Df Model:	1		
Covariance Type:	nonrobust		

# Simple Linear Regression

- Simple linear regression involves modeling the relationship between a dependent variable  $y$  and a single independent variable  $x$ .
- The line of best fit can be represented by the equation  $y = b_0 + b_1 * x$ , where  $b_0$  is the y-intercept and  $b_1$  is the slope of the line.

between a dependent variable  $y$  and multiple independent variables  $x_1, x_2, \dots, x_n$ .

- The line of best fit can be represented by the equation  $y = b_0 + b_1x_1 + b_2x_2 + \dots + b_nx_n$ .

*Maclaurin*  
**Ex:** Calculate the Taylor polynomial (up to and including quadratic terms) about  $(a, b) = (0, 0)$  for

$$f(x, y) = \frac{1}{1 - x - y} = \frac{1}{1 - (x+y)}.$$

We know  $\frac{1}{1-u} = 1 + u + u^2 + \dots$  (for  $|u| < 1$ )

Let,  $\frac{1}{1-(x+y)} = 1 + (x+y) + (x+y)^2 + \dots$

# in Python

- We can use the `LinearRegression` class from the `scikit-learn` library to perform linear regression in Python.
- Here is an example of how to fit a simple linear regression model:

```
from sklearn.linear_model import LinearRegression

# define the data
X = [[0], [1], [2]]
y = [0, 1, 2]

# create and fit the model
model = LinearRegression()
model.fit(X, y)
```

- We can use visualization libraries such as matplotlib or seaborn to create scatter plots and visualize the line of best fit.
- Here is an example of how to create a scatter plot with a fitted line:

```
import matplotlib.pyplot as plt

# define the data
X = [0, 1, 2]
y = [0, 1, 2]

# plot the data
plt.scatter(X, y)

# plot the fitted line
plt.plot(X, y)
```