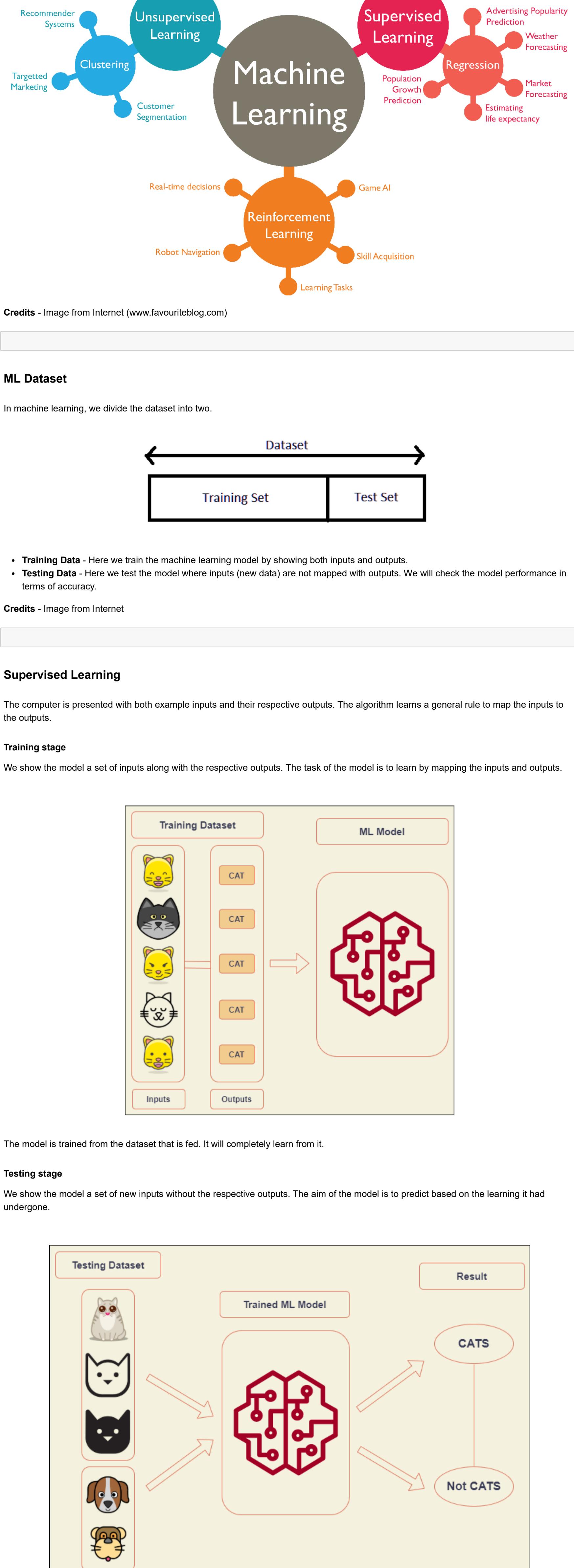


## Machine Learning



Credits - Image from Internet ([www.favouriteblog.com](http://www.favouriteblog.com))

In [ ]:

### ML Dataset

In machine learning, we divide the dataset into two.



- **Training Data** - Here we train the machine learning model by showing both inputs and outputs.
- **Testing Data** - Here we test the model where inputs (new data) are not mapped with outputs. We will check the model performance in terms of accuracy.

Credits - Image from Internet

In [ ]:

### Supervised Learning

The computer is presented with both example inputs and their respective outputs. The algorithm learns a general rule to map the inputs to the outputs.

#### Training stage

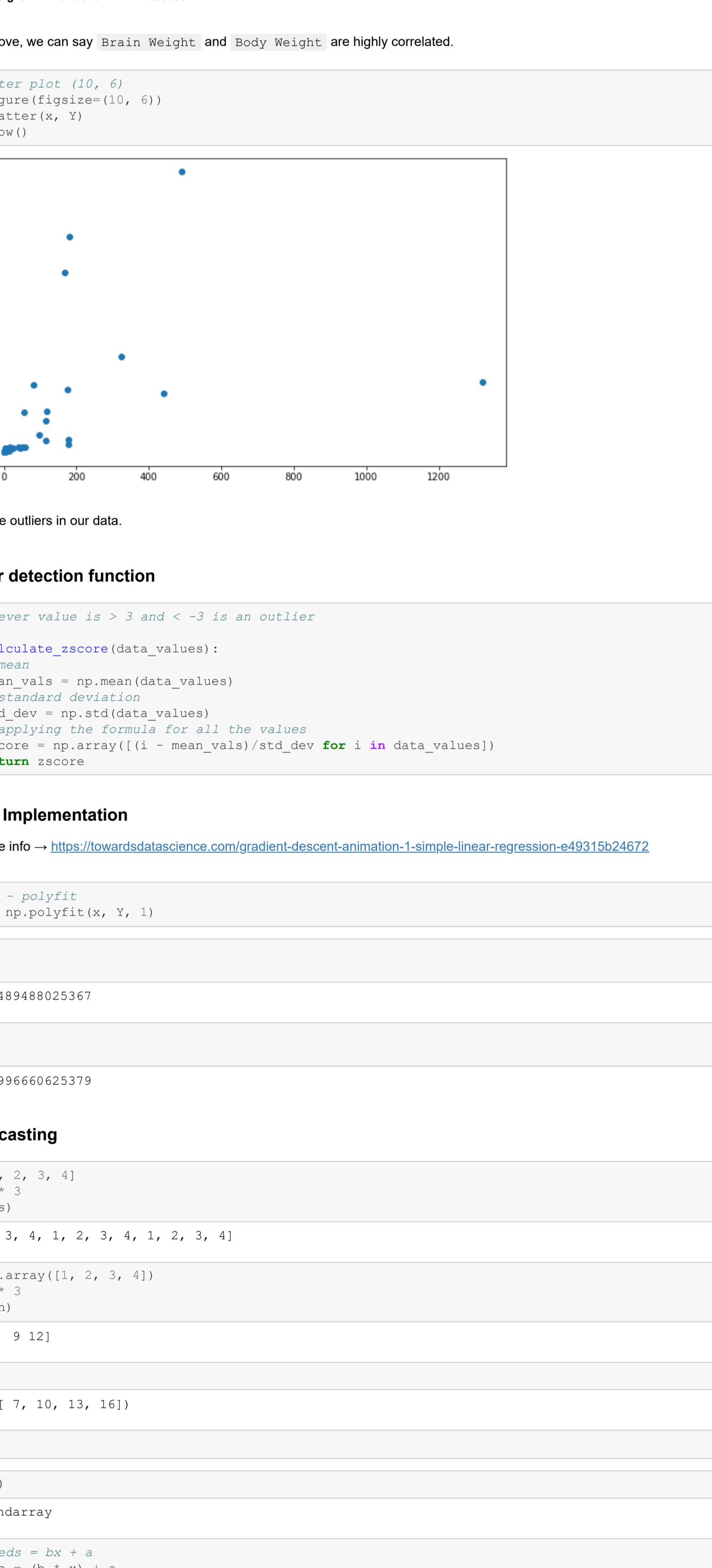
We show the model a set of inputs along with the respective outputs. The task of the model is to learn by mapping the inputs and outputs.



The model is trained from the dataset that is fed. It will completely learn from it.

#### Testing stage

We show the model a set of new inputs without the respective outputs. The aim of the model is to predict based on the learning it had undergone.



The model predicts the category based on the previous training or learning.

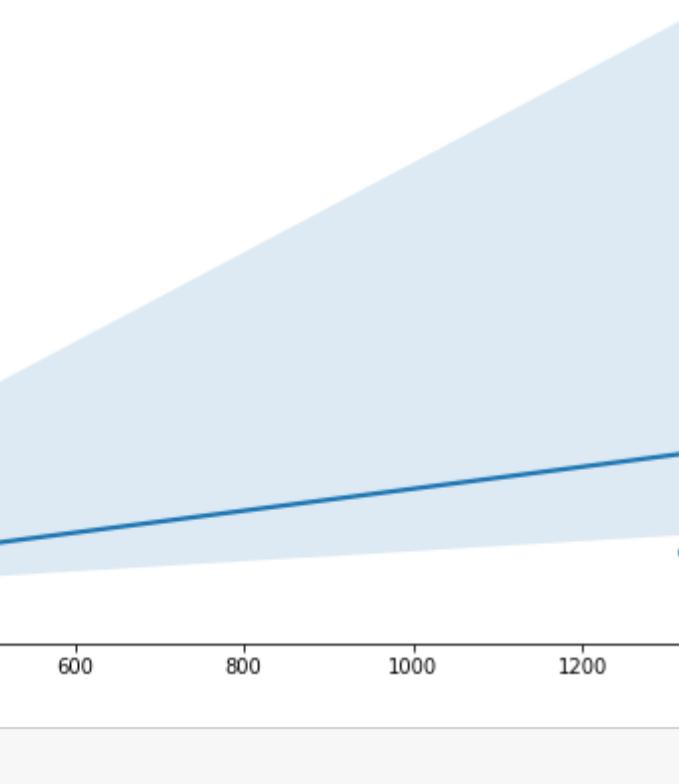
### Images by Author

#### Note

- Algorithms learn from data.
  - They find -
    - relationships
    - develop understanding
    - make decisions
    - evaluate their confidence from the training data they are given.
  - The better the training data is, the better the model performs.

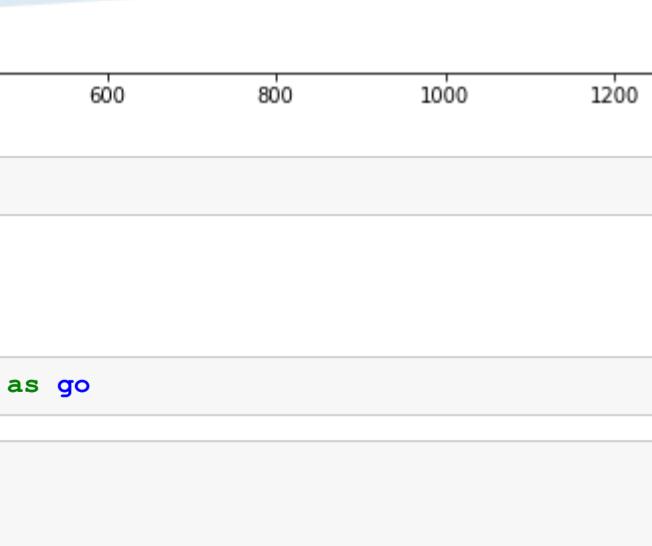
### Exception case for the above example

1. Suppose I have trained my model to identify/separate duck and rabbit images from the large dataset.

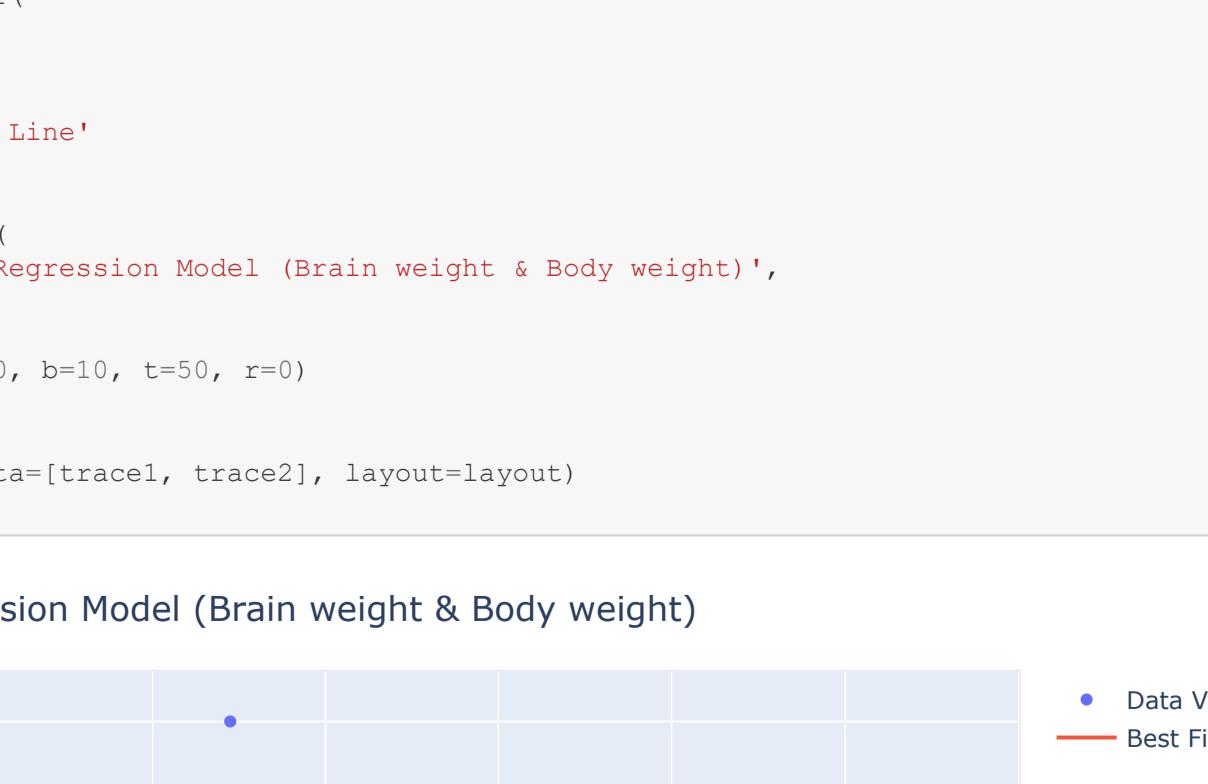


1. Now, I need to test my model with the new data.

- New image



- Is it duck or rabbit?



2. What can you say about this?

Credits - Images from Internet

In [ ]:

### Regression

- Regression is a process of predicting the dependant variable based on the independent variable.

Dependant variable is always considered as  $Y$ .

Independent variable is always considered as  $X$ .

For doing regression analysis, there needs to be a strong relationship between  $x$  and  $Y$ .

**Example** - Predicting the expenses of an employee based on his/her income.

- Here,
  - expenses are dependant variable  $\rightarrow Y$
  - income is independent variable  $\rightarrow X$

**How can we predict  $Y$  from  $X$ ?**

To predict  $Y$  from  $X$ , we follow a mathematical model -

$$Y = bX + a$$

- Here,
  - $b \rightarrow$  Co-efficient parameter
  - $a \rightarrow$  Bias parameter

- Other terms
  - $\hat{Y}$  ( $\hat{Y}$  hat)  $\rightarrow$  Predicted  $Y$  value
  - $Y \rightarrow$  Actual value

#### What is Error?

- The distance between  $\hat{Y}$  and  $Y$  is called Error.

- Our aim while building the Regression model is to minimize the Error.



Credits - Image from Internet

In [ ]:

### Broadcasting

- $f$  = [1, 2, 3, 4]

- $s = f * 3$

- $g = g + s$

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Dependant variable is depends on mutiple Independant variables.

**Model -**

$$Y = b_1x_1 + b_2x_2 + b_3x_3 + \dots + b_nx_n + a$$

- $x_1, x_2, x_3, \dots, x_n$  are independant variables.
- $b_1, b_2, b_3, \dots, b_n$  are coefficient variables.
- $a$  is bias variable.

The main aim of any machine learning model is to minimize the error.