Siddhardhan

Building Logistic Regression model from Scratch in Python

Logistic Regression

About Logistic Regression:

1. Supervised Learning Model
2. Classification model
3. Best for Binary Classification Problem
4. Uses Sigmoid function
5. Binary Cross Entropy Loss Function (or) Log Loss

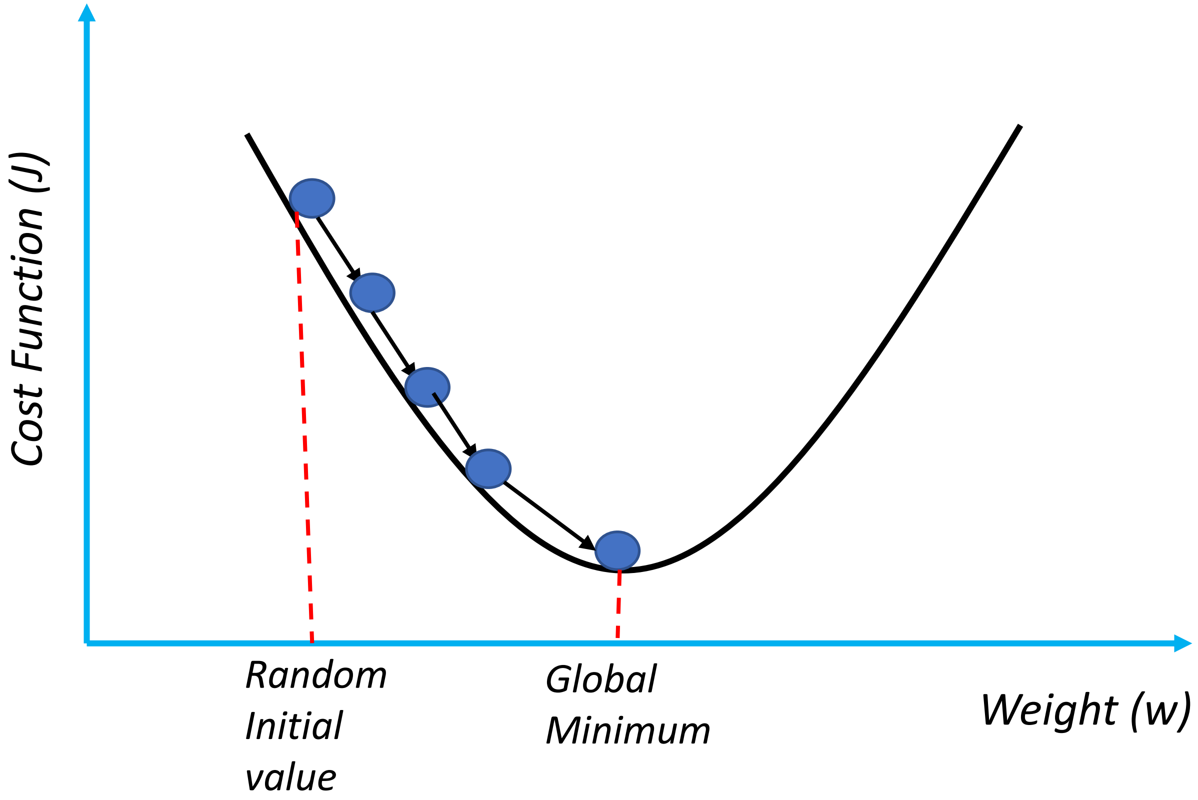
$$\hat{Y} = \frac{1}{1 + e^{-Z}}$$

Sigmoid Function

$$Z = w.X + b$$

$$J(w, b) = \frac{1}{m}\Sigma(L(y^{(i)}, \hat{y}^{(i)})) = -\frac{1}{m}\Sigma(y^{(i)} \log \hat{y}^{(i)} + (1 - y^{(i)}) \log(1 - \hat{y}^{(i)}))$$

Gradient Descent



Gradient Descent

Gradient Descent is an optimization algorithm used for minimizing the cost function in various machine learning algorithms. It is used for updating the parameters of the learning model.

$$w_2 = w_1 - L*dw$$

$$b_2 = b_1 - L*db$$

w --> weight
b --> bias
L --> Learning Rate

dw --> Partial Derivative of cost function with respect to w

db --> Partial Derivative of cost function with respect to b

$$dw = \frac{1}{m} * (\hat{Y} - Y).X$$

$$db = \frac{1}{m} * (\hat{Y} - Y)$$

Logistic Regression

Logistic Regression model:

- Sigmoid Function

$$\hat{Y} = \frac{1}{1 + e^{-Z}}$$

$$Z = w.X + b$$

- Updating weights through Gradient Descent

$$w_2 = w_1 - L*dw$$

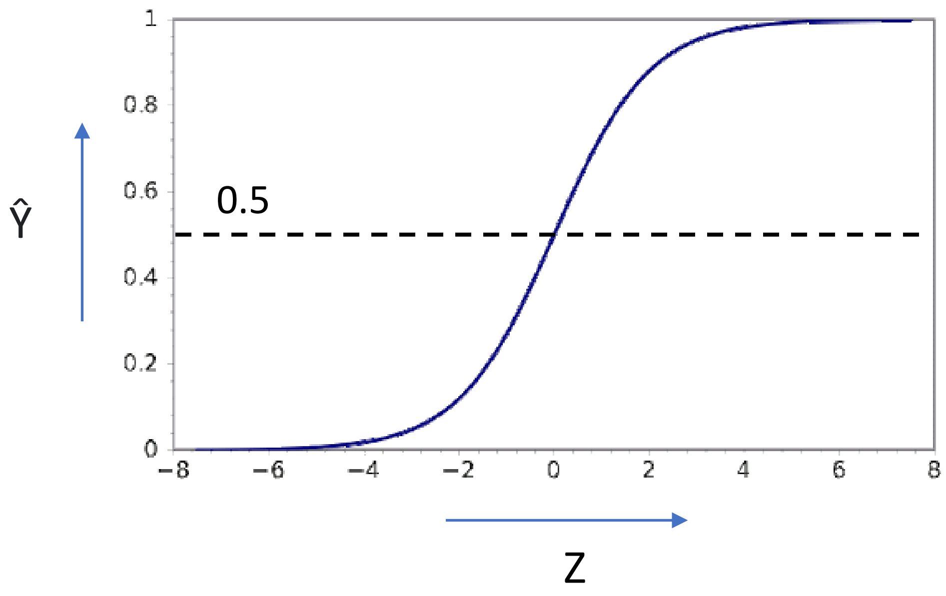
$$b_2 = b_1 - L*db$$

- Derivatives

$$dw = \frac{1}{m} * (\hat{Y} - Y).X$$

$$db = \frac{1}{m} * (\hat{Y} - Y)$$

Logistic Regression



$$\hat{Y} = \frac{1}{1 + e^{-Z}}$$

Sigmoid Function

$$Z = w.X + b$$

$\hat{Y}$ - Probability that (y = 1)

$\hat{Y}$ = P(Y=1 | X)

X - input features

w – weights
(number of weights is equal to the number of input features in a dataset)

b - bias

Multiplying 2 Matrices

Rule : The number of columns in the First matrix should be equal to the number of rows in the Second Matrix

The resultant matrix will have the same number of rows as the first matrix & the same number of columns as the Second Matrix

$$\begin{bmatrix} 2 & 3 \\ 10 & 5 \end{bmatrix} \text{ x } \begin{bmatrix} 10 & 5 \\ 20 & 4 \end{bmatrix}$$

$2 \text{ x } \boxed{2 \qquad 2} \text{ x } 2$

Can be multiplied.
Resultant matrix will have the shape 2 x 2

$$\begin{bmatrix} 2 & 1 \\ 4 & 2 \\ 6 & 3 \end{bmatrix} \text{ x } \begin{bmatrix} 5 & 2 \\ 3 & 6 \\ 2 & 5 \end{bmatrix}$$

$3 \text{ x } \boxed{2 \qquad 3} \text{ x } 2$

Cannot be multiplied.