Assignment: Gradient Descent Example

In this assignment, you will implement the gradient descent algorithm to optimize a simple cost function, by filling out a table of values. You will start with a random value for the parameter. You will determine the value of the cost function, and you will update the parameters using gradient descent.

Cost function

$$C(w) = \frac{1}{2}(w - 4)^2$$

Derivative

$$\frac{dC(w)}{dw} = (w - 4)$$

Gradient Decent Formula

$$w_{k+1} = w_k - \eta \frac{dC(w_k)}{dw}$$

$$\eta = 0.5$$

Initialize Parameter

$$w_0 = -2$$

Fill out the table here is the first two elements.

First iteration k=1

Gradient Decent Formula

$$w_1 = w_0 + \eta \frac{dC(w_0)}{dw}$$

$$= -2 - 0.5(-2 - 4)$$
$$= -2 - 0.5(-6)$$

$= -2 + 3$

$= 1$

$$C(1) = \frac{1}{2}(1-4)^2$$

$= \frac{1}{2}(-3)^2 = 4.5$

Second iteration k=2

Gradient Decent Formula

$$w_2 = w_1 + \eta\frac{dC(w_1)}{dw}$$

$= 1 - 0.5(1-4)$

$= 1 - 0.5(-3)$

$= 1 + 1.5$

$= 2.5$

Cost

$$C(1) = \frac{1}{2}(2.5-4)^2$$

$= \frac{1}{2}(1.5)^2 = 1.125$

Fill in the rest of the table

k	1	2	3	4	5
$C(w_k)$	4.5	1.125	0.281	0.070	0.018
w_k	1.0	2.5	3.25	3.625	3.813