# 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)

1

= 2 (𝑤 − 4)2

## Derivative

𝑑𝐶(𝑤) = (𝑤 − 4)

𝑑𝑤

Gradient Decent Formula

𝑤k+1

= 𝑤k

− 𝜂 𝑑𝐶(𝑤k)

𝑑𝑤

𝜂 = 0.5

Initialize Parameter

𝑤0 = −2

Fill out the table here is the first two elements.

# First iteration k=1

## Gradient Decent Formula

𝑤1

= 𝑤0

+ 𝜂 𝑑𝐶(𝑤0)

𝑑𝑤

= −2 − 0.5(−2 − 4)

= −2 − 0.5(−6)

= −2 + 3

= 1

## Cost

( ) 1 2

𝐶 1 = 2 (1 − 4)

= 1 (−3)2=4.5

2

# Second iteration k=2

## Gradient Decent Formula

𝑤2

= 𝑤1

+ 𝜂 𝑑𝐶(𝑤1)

𝑑𝑤

= 1 − 0.5(1 − 4)

= 1 − 0.5(−3)

= 1 + 1.5

= 2.5

## Cost

𝐶(1)

1

= 2 (2.5 − 4)2

= 1 (1.5)2=1.125

2

Fill in the rest of the table

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| k | 1 | 2 | 3 | 4 | 5 |
| 𝐶(𝑤k) | 4.5 | 1.125 | 0.281 | 0.070 | 0.018 |
| 𝑤k | 1.0 | 2.5 | 3.25 | 3.625 | 3.813 |