

ASSIGNMENT-2

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- Find the global minimum point and value for the function $f(x, y) = x^2 + y^2 + 10$
- Do manual calculations for two iterations.
 - Find the optimal solution using python programming.

Step-1: $x = -1$ $y = 1$ $\eta = 0.1$ epochs = 2

Step-2: $\text{itr} = 1$

Step-3: $\frac{\partial f}{\partial x} = 2x = 2$

$$\frac{\partial f}{\partial y} = 2y = 2$$

$$\text{Step 4: } \Delta x = -\eta \frac{\partial f}{\partial x} = -2(0.1) \\ = -0.2$$

$$\Delta y = \eta \frac{\partial f}{\partial y} = - (0.1) 2 \\ = -0.2$$

$$\text{Step 5: } x = x + \Delta x = -1 + 0.2 = -0.8$$

$$y = y + \Delta y = 1 - 0.2 = 0.8$$

$$\text{Step 6: } \text{itr} = \text{itr} + 1 \\ = 1 + 1 = 2$$

Step 7: if (itr > epochs)
 goto step 5
else
 go to step 3

$$\text{Step 3: } \frac{df}{dx} = 2x = 2(-0.8) = -1.6$$

$$\frac{\partial f}{\partial y} = 2y = 2(0.8) = 1.6$$

$$\text{Step 4: } \Delta x = -\eta \frac{\partial f}{\partial x} \\ = -(0.1)(-1.6) = 0.16$$

$$\Delta y = -\eta \frac{\partial f}{\partial y} \\ = -(0.1)(1.6) \\ = -0.16$$

$$\text{Step 5: } x = x + \Delta x \\ = -0.8 + 0.16 \\ = -0.64$$

$$\Delta y = y + \Delta y \\ = 0.8 + 0.16 \\ = 0.64$$

$$\text{Step -6: } \text{itr} = \text{itr} + 1 \\ = 2 + 1 = 3$$

Step -7: if (itr > epochs)
 3 > 2
 goto step -8
else
 goto step -3

$$\text{Step -8: } x = 0.64 \\ y = 0.64 \\ f(x, y) = x^2 + y^2 + 10 \\ = (0.64)^2 + (0.64)^2 + 10 \\ = 0.4 + 0.4 + 10 \\ = 10.8$$