

## ASSIGNMENT - 2

Find the global minimum point and value for the function  $f(x, y) = x^2 + y^2 + 10$ .

Manual Calculations:

Step 1: Initialising required parameters  
 $x = 1, y = -1, \eta = 0.1, \text{itr} = 1, \text{epochs} = 2$

Step 2:  $\frac{\partial f}{\partial x} = 2x = 2(1) = 2$

$$\frac{\partial f}{\partial y} = 2y = 2(-1) = -2$$

Step 3:  $\Delta x = -\eta \frac{\partial f}{\partial x} = (-0.1)(2) = -0.2$

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

Step 4:  $x = x + \Delta x = 1 - 0.2 = 0.8$

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

Step 5:  $\text{itr} = \text{itr} + 1 = 1 + 1 = 2$

Step 6: If  $(\text{itr} > \text{epochs})$

$$2 > 2$$

False  $\rightarrow$  goto step 2.

Step 2:  $\frac{\partial f}{\partial x} = 2x = 2(0.8) = 1.6$

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

step 3:  $\Delta x = -\eta \frac{\partial f}{\partial x} = (-0.1)(1.6) = -0.16$

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

step 4:  $x = x + \Delta x = 0.8 - 0.16 = 0.64$

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

step 5:  $itr = itr + 1 = 2 + 1 = 3$

step 6: if  $(itr > epochs)$

$3 > 2$

true  $\rightarrow$  goto next step

step 7:  $f(x, y) = (0.16)^2 + (-0.16)^2 + 10$   
 $= 10.0512$