

Assignment-2

- 18K41A0530

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: itr = 1

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

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

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

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

 $= -0.2$

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

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

step-6: itr = itr + 1
 $= 1 + 1 = 2$

step-7: if (itr > epochs)
 goto step-5
else
 goto step-3

Step-3: $\frac{\partial f}{\partial x} = 2x = 2(-0.8) = -1.6$

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

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

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

$$\begin{aligned}\text{Step-5: } x &= x + \Delta x \\ &= -0.8 + 0.16 \\ &= -0.64 \\ y &= y + \Delta y \\ &= 0.8 - 0.16 \\ &= 0.64\end{aligned}$$

$$\begin{aligned}\text{Step-6: } \text{itr} &= \text{itr} + 1 \\ &= 2 + 1 = 3\end{aligned}$$

$$\begin{aligned}\text{Step-7: } &\text{if } (\text{itr} > \text{epochs}) \\ &\quad 3 > 2 \\ &\quad \text{goto step-8} \\ &\text{else} \\ &\quad \text{goto step-3}\end{aligned}$$

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