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Neural Networks & Deep Learning.

1) find global minimum point and value for function

$$f(x) = x^4 + 3x^2 + 10$$

2) Manual calculations for 2 iterations:

Given $f(x) = x^4 + 3x^2 + 10$

Step-1 : Initialise variables

$x = 1$

$n = 0.1$

epoches $= 2$

Step-2: first order derivative of $f(x)$ at $x=1$

$$\left(\frac{\partial f}{\partial x}\right)_{x=1} = (4x^3 + 6x),$$

$$= 4(1) + 6(1)$$

$$= 10$$

Step-3: Calculate change in x

$$\Delta x = -n \frac{\partial f}{\partial x}$$

$$= -(0.1)(10)$$

$$\Delta x = -1$$

Step-4: Update variable x

$$x = x + \Delta x$$

$$= 1 + (-1)$$

$$x = 0$$

Step-5: Increment iterations

$$itr = itr + 1$$

Step-6: if (iterations > epoches) then go to step-7

else, go to step-2

here, $itr = 2$, epoches $= 2$

$$2 > 2 \qquad (false)$$

Hence go to step-2

Step-2: Calculate 1st order derivative of $f(x)$

at $x = 0$

$$\left(\frac{\partial f}{\partial x}\right)_{x=0} = (4x^3 + 6x)_0$$

$$= 0$$

Step-3: Calculate change in x

$$\Delta x = -n \frac{\partial f}{\partial x}$$

$$= -(0.1) 0$$

$$\Delta x = 0$$

Step-4: Update variable x

$$x = x + \Delta x$$

$$= 0 + 4(0) = 0$$

Step-5: Increment iterations

$$it = itr + 1$$

Step-6: if (itr > epoches) goto step 7

else, go to step-2

here $itr = 3$, epoches $= 2$

$$3 > 2 \qquad - true$$

Hence go to step-7.

2

step-7: Print variable x

$\Rightarrow x = 0$

at $x = 0$

we find min. value of $f''f(x)$

$f(0) = 10$

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