CSE

Neural Networks & Deep Learning

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Find global minimum point & value for function

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

Sol:- Given, $f(x) = x^4 + 3x^2 + 10$

Step 1:- Initialize, $x = 1$
$\eta = 0.1$
epoches = 2

Step 2:- calculate gradient (slope) derivative of function at $x = 1$

$$\frac{df}{dx}\Big|_x \Rightarrow 4x^3 + 6x\Big|_{x=1}$$

$$\Rightarrow 4(1) + 6(1)$$
$$= 10$$

Step 3:- calculate Δx.

$$\Delta x = -\eta \frac{df}{dx}$$
$$= -(0.1)(10)$$
$$= -1$$

Step 4:- update value of x

$$x = x + \Delta x$$
$$= 1 + (-1)$$
$$= 0$$

Step 5:- increment iteration variable.

$$i = i + 1 \Rightarrow 1 + 1 = 2$$
$$i = 2$$

Step 6:- if (i > epoches)
step 7

else
step 2

Here i=2, epoches=2
∴ go to step 2

step 2:- calculate gradient / slope / derivative of function at x=0

$$\frac{\partial f}{\partial x}\Big|_{x=0} \Rightarrow 4x^3+6x\Big|_0$$

$$=0$$

step 3:- calculate Δx

$$\Delta x = -\eta \frac{\partial f}{\partial x}$$
$$= -(0.1)(0)$$
$$=0$$

step 4:- change / update x.

$$x = x+\Delta x$$
$$= 0+0$$
$$x=0$$

step 5:- increment i

$$i = i+1$$
$$= 2+1 = 3$$

step 6:- if (i > epoches)
step 7
else
step 2

Here i=3, epoches=2
∴ step 7.

step 7:- $f(x) = x^4+3x^2+10$

at $x=0 \Rightarrow (0)^4+3(0)^2+10$

$$=10$$

∴ global minimum point is at $f(0)=10$