Assignment-3

18K41A0278

Stochastic Gradient Descent

X	Y
0.2	3.4
0.4	3.8
0.6	4.2
0.8	4.6

Step1: $[X, Y]$, epochs = 2, $\eta = 0.1$, $m = 1$, $C = -1$

Step2: iteration = 1 $\quad [\because e_{max} = \frac{1}{2}[y_i - mx_i - C) \times 2]$

Step3: sample = 1

Step4: error $E = \frac{1}{2}[3.4 - (1 \times 0.2) + 1)]^2$

$= 0.5[3.4 + 0.8]^2 \Rightarrow \underline{8.82}$

$\frac{\partial f}{\partial m} = -(y_i - mx_i - C)x_i \Rightarrow -(3.4 - (1)(0.2) - (-1))\ 0.2$

$\Rightarrow -(3.4 - 0.2 + 1)(0.2) \Rightarrow \underline{0.84}$

$\frac{\partial f}{\partial c} = -(y_i - mx_i - C) = -(3.4 - (1)(0.2) - (-1))$

$= -(3.4 - 0.2 + 1) \Rightarrow \underline{-4.2}$

Step5: $\Delta m = -\eta \frac{\partial f}{\partial m} = -(0.1)(0.84) \Rightarrow \underline{0.084}$

$\Delta n = -\eta \frac{\partial f}{\partial c} = -(0.1)(-4.2) \Rightarrow \underline{0.42}$

Step6: $m = m + \Delta m = 1 + 0.084 = \underline{1.084}$

$C = C + \Delta C = -1 + 0.42 \Rightarrow \underline{-0.58}$

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Step 7: sample = sample + 1
= 1 + 1 ⇒ 2

Step 8: if (sample > no. of samples)
go to step 9
else go to step 4
Here 2 < 4

$y = (1.084)(0.4) - 0.58$
$= -0.1464$

From step 4
$E = (0.5)(3.8 + 0.1464)2 \Rightarrow 7.79$

Step 9:
$\frac{\partial f}{\partial m} = -(y_i - mx_i - c)x_p$

$= (3.8 - (1.084)(0.4) + 0.58)\,0.4$

$= (3.8 + 0.464)\,0.4 \Rightarrow -1.88$

$\frac{\partial f}{\partial c} = -(y_i - mx_i - c) = -3.94$

Step 10: $\Delta m = -\eta \frac{\partial f}{\partial m} = -(0.1)(-1.58) \Rightarrow 0.158$

$\Rightarrow \Delta n = -\eta \frac{\partial f}{\partial c} = -(0.1)(-3.94)$
$= 0.394$

Step 11:
$m = m + Dm = 1.084 + 0.158 = 1.242$
$C = C + DC = -0.58 + 0.394 = 0.186$

Step 12: sample = sample + 1 ⇒ 2 + 1 ⇒ 3
sample = 3 > no. of samples
go to next step.