# ASSIGNMENT-3

-18K41A0502

Let us consider a sample dataset have one input ($x_i^a$) and one output ($y_i^a$), and number of samples 4. Develop a simple linear regression model using stochastic gradient descent optimizer.

| Sample(i) | $x_i^a$ | $y_i^a$ |
|---|---|---|
| 1 | 0.2 | 3.4 |
| 2 | 0.4 | 3.8 |
| 3 | 0.6 | 4.2 |
| 4 | 0.8 | 4.6 |

- Do manual calculations for two iterations with first two samples.
- Write the python code to build simple linear regression model using SGD optimizer (consider all 4 samples).

S-1: x, y, m=1, c=-1, $\eta$=0.1, epoches=2, ns=2

S-2: itr=1

S-3: Sample=1

S-4: $\frac{dE}{dm} = -(3.4-(1))((0.2)-(-1))0.2$

$= -0.84$

& $\frac{dE}{dc} = -(3.4(1))(0.2+1) = -4.2$

S-5: $\Delta m = -(0.1)(-0.84) = 0.084$

$\Delta c = -(0.1)(-4.2) = 0.42$

S-8: if (sample > ns)

3 > 2

goto S-9

else

goto S-4

S-9: Ptr += 1

1 + 1 = 2

S-10: If (itr > epoches)

2 > 2

goto S-11

else

goto S-3

S-3: sample = 1

S-4: $\frac{\partial E}{\partial M} = -(3.4 - (1.2)(0.2) + 0.18)\,0.2$

$= -(3.34)\,0.2$

$= -0.668$

S $\frac{\partial E}{\partial C} = -(3.4 - (1.2)(0.2) + 0.18)$

$= -3.34$

S-5: $\Delta m = -(0.1)(-0.668)$

$= 0.0668$

S-6: $m = m + \Delta m = 1.24 + 0.066 \approx 1.3$

$c = C + \Delta c = 0.18 + 0.33 = 0.15$

S-7: sample += 1

1 + 1 = 2

S-8: if (sample > ns)

2 > 2

goto s-9

else

goto s-4

S-4: $\frac{\partial E}{\partial M} = -(3.8 - (1.3)(0.4) - 0.15)0.4$

$= -1.25$

$\frac{\partial E}{\partial C} = -(3.8 - (1.3)(0.4) - 0.15)$

$= -3.13$

S-5: $\Delta m = -(0.1)(-1.25) = 0.12$

$\Delta c = -(0.1)(-3.13) = 0.31$

S-6: $m = m + \Delta m = 1.3 + 0.12 = 1.42$

$c = c + \Delta c - 0.15 + 0.31 = 0.46$

S-7: sample = sample + 1

2 + 1 = 3

S-8: if (sample > ns)

3 > 2

goto s-9

else

goto s-4

s-9: itr = itr + 1

= 2 + 1 = 3

S-10: If (ybr > epoches)

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goto S-11

else

goto S-3

S-11: print m&c

m = 1.42, e = 0.46