Assignment-3

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Simple Linear regression model using stochastic Gradient Descent Optimizer.

Sample(i)	x_i^a	y_i^a	
1	0.2	3.4	} 2 samples.
2	0.4	3.8	
3	0.6	4.2	
4	0.8	4.6	

Step-1: $m=1, C=-1, \eta=0.01$, epochs = 2, itr = 0, ns = 2

Step-2: itr = itr+1 = 1

Step 3: Sample = 1

Step 4: $E = \frac{1}{2(1)}(y_i - mx_i - C)^2$

$\frac{\partial E}{\partial m} = -(y_i - mx_i - C)x_i$

$= -(4.2)(0.2) = -0.84$

$\frac{\partial E}{\partial C} = -(y_i - mx_i - C)$

$= -(3.4 - 0.2 + 1)$

$= -4.2$

Step5: $\Delta m = -\eta \frac{\partial E}{\partial m}$

$= -(0.01)(-0.84)$

$\Delta m = 0.0084$

$\Delta C = -\eta \frac{\partial E}{\partial C}$

$= -(0.01)(-4.2)$

$\Delta C = 0.042$

Step-6: $m = m + \Delta m$

$= 1 + 0.084$

$= 1.0084$

$C = C + \Delta C$

$= -1 + 0.042$

$= -0.958$

Step-7: Sample = Sample+1 = 1+1 = 2

Step-8: if (sample > ns)

2 > 2(x)

go to step-4

Step-4: $\frac{dE}{dm} = -(y_i - mx_i - c)x_i$

$= -(4.4)(0.4) = -1.76$

$\frac{dE}{dc} = -(y_i - mx_i - c)$

$= -(3.8 - (0.4) + 1)$

$= -4.4$

Step-5: $\Delta m = -\eta \frac{dE}{dm}$

$= -0.01(-1.76)$

$\Delta m = 0.0176$

$\Delta c = -\eta \frac{dE}{dc}$

$= -(0.01)(-4.4)$

$\Delta c = 0.044$

Step-6: $m = m + \Delta m$

$= 1.084 + 0.0176$

$m = 1.026$

$c = c + \Delta c$

$= -0.958 + 0.044$

$c = -0.914$

Step-7: Sample = Sample + 1

$= 2 + 1 = 3$

Step-8: if (Sample > ns)

3 > 2 (v)

go to next step

Step-9: itr = itr + 1 = 1 + 1 = 2

Step-10: if (itr > epochs)

2 > 2 (x)

go to step-2

Step-2: itr = itr + 1 = 2 + 1 = 3

Step-3: Sample = 1

Step-4 $\frac{dE}{dm} = -(y_i - mx_i - c)x_i$

$= -(3.4 - (1.026)(0.2) + 0.914)(0.2)$

$\frac{dE}{dm} = +(0.818 - 1)$

$\frac{\partial E}{\partial c} = -(y_i - mx_i - c) = -4.0936$

Step-5: $\Delta m = -\eta \frac{\partial E}{\partial m}$

$= -(0.01)(-0.8187)$

$\Delta m = 0.008187$

$\Delta c = -\eta \frac{\partial E}{\partial c}$

$= -0.01(-4.0936)$

$\Delta c = 0.0409$

Step-6: $m = m + \Delta m$

$= 1.1016 + 0.00818$

$m = 1.10978$

$c = c + \Delta c$

$= -0.914 + 0.0409$

$c = -0.8730$

Step-7: Sample = Sample + 1 = 1 + 1 = 2

Step-8: if (Sample < ns)

2 > 2 (x)

go to step-3

Step-3: Sample - 2

Step-4: $\frac{\partial E}{\partial m} = -(y_i - mx_i - c)x_i$

$= -1.6916$

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

$= -4.229$

Step-5: $\Delta m = -\eta \frac{\partial E}{\partial m}$

$= (0.01)(-1.69)$

$= 0.0169$

$\Delta c = -\eta \frac{\partial E}{\partial c}$

$= -(0.01)(-4.229)$

$= 0.0422$

Step-6: $m = m + \Delta m$

$= 1.10978 + 0.0169$

$m = 1.1266$

$c = c + \Delta c$

$= -0.8730 + 0.0422$

$c = -0.8308$

Step-7: Sample = sample+1 = 2+1 = 3

Step-8: if (sample > ns)

3 > 2 (v)

go to next step

Step-9: ito = 2+1 = 3

Step-10: if (ito > epoch)

3 > 2 (v)

go to next step

Step-11: Print m = 1.126, c = -0.830.