18K41A0528

Assignment-11

Manual Calculation for two iterations with first two Samples (NAG optimiter).

Sample	x	y
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

$$V_t = \gamma V_{t-1} - \eta \frac{\partial F(x+\gamma V_{t-1})}{\partial x}$$

$$x = x + V_t$$

Step-1: $\eta = 0.1$, $m = 0$, $c = 0$, $v_m = 0$, $v_c = 0$, $\gamma = 0.9$, epochs = 2

Step-2: itr = 1

Step-3: sample = 1

Step-4: $y = mx + c = 0 \times 0.2 + 0 = 0$

Step-5: $E = 1/2(y_i - y)^2 = \frac{1}{2}(3.4 - 0)^2 = \frac{1}{2}(3.4 \times 3.4) = 5.78$

Step-6: $\frac{dE}{dm} = -(y_i - (m + \gamma v_m)x_i - (-\gamma v_c)x_i$

$= -(3.4 - (0 + 0.9 \times 0)0.2 - 0 - 0.9 * 0)0.2$

$= -(3.4)0.2 = -0.68$

$\frac{dE}{dc} = -(y_i - (m + \gamma v_m)x_i + c - \gamma v_c)$

$= -(3.4 - (0 + 0.9 * 0)0.2 - 0 - 0.9 * 0)$

$= -(3.4) = -3.4$

Step-7: $V_m = \gamma * V_m - \eta \frac{dE}{dm} = 0.9 * 0 - (0.1)(-0.60) = 0.068$

$V_c = \gamma V_c - \eta \frac{\partial E}{\partial c} = 0.9 * 0 - 0.1 * -3.4 = 0.34$

Step-8: $m = m + V_m = 0 + 0.068 = 0.068$

$c = c + V_c = 0 + 0.34 = 0.34$

Step-9: Sample = 2

Step-10: if (2 > 2)

step 11

else

step 4

Step-4: $y = 0.068 \times 0.4 + 0.34 = 0.3672$

Step-5: $E = \frac{1}{2}(y_i - y)^2 = \frac{1}{2}(3.8 - 0.36)^2 = 5.91$

Step-6: $\frac{\partial E}{\partial m} = -(3.8 - (0.068 + 0.9 * 0.068)0.4 - 0.34 - 0.9 * 0.34)0.4$

$= -1.24$

$\frac{\partial E}{\partial c} = -[3.8 - (0.068 + 0.9 * 0.068)0.4 - 0.34 - 0.9 * 0.34]$

$= -3.10$

Step-7: $V_m = \gamma V_m - \eta \frac{\partial E}{\partial m}$

$= 0.9 * 0.068 - (0.1)(-1.24)$

$V_m = 0.185$

$V_c = \gamma V_c - \eta \frac{\partial E}{\partial c}$

$= 0.9 * 0.34 - 0.1 * (-3.10)$

$V_c = 0.616$

Step-8: $m = m + v_m = 0.068 + 0.185 = 0.253$

$C = C + V_c = 0.34 + 0.616 = 0.956$

$m = 0.25, c = 0.95$

Step-9: sample = 3

Step-10: if (sample > 2)

step 11

else

step-4

Step-11: ito = 2.

Step-12: if (ito > 2)

Step 13

else

step 3

Step-3: sample = 1

step-4: $y = (0.25)(0.2) + 0.95 = 1$

step-5: $E = \frac{1}{2}(3.4 - 1)^2 = 2.88$

step-6: $\frac{dE}{dm} = -(3.4 - (0.25 + 0.9 * 0.18)0.2 - 0.95 - 0.9 * 0.6)$

0.2

$= -0.36$

$\frac{dE}{dc} = -(3.4 - 0.085 - 0.95 - 0.54)$

$= -1.82$

step-7: $V_m = 8V_m - \eta \frac{dE}{dm}$

$= 0.9 * 0.18 - 0.1 * (0.36)$

$V_m = 0.19$

$V_c = 8V_c - \eta \frac{dE}{dc}$

$= 0.9 * 0.61 - 0.1 * (-1.82)$

$V_c = 0.73$

Step-8: $m = m + V_m = 0.25 + 0.19 = 0.44$

$c = c + V_c = 0.95 + 0.73 = 1.68$

Step-9: Sample = 2

Step-10: if (2 > 2)

Step 11

else

step-4

Step-4: $y = mx_i + c$

$y = (0.44)(0.4) + 1.68$

$y = 1.85$

Step-5: $1/2 (3.8 - 1.8)^2 = 2$

Step-6: $\frac{\partial E}{\partial m} = -(3.8 - (0.44 + 0.9 * 0.19) 0.4 - 1.68 - 0.9 * 0.73) 0.4$

$= -0.49$

$\frac{\partial E}{\partial c} = -(3.8 - (0.44 + 0.9 * 0.19) 0.4 - 1.68 - 0.9 * 0.73)$

$= -(3.8 - 0.24 - 1.68 - 0.65)$

$= -1.23$

Step-7: $V_m = \delta V_m - \eta \frac{\partial E}{\partial m}$

$= 0.9 * 0.19 - 0.1 * (-0.49)$

$V_m = 0.22$

$V_c = \delta V_c - \eta \frac{\partial E}{\partial c}$

$= 0.9 * 0.73 - 0.1 * (-1.23)$

$V_c = 0.78$

Step-8: $m = m + v_m = 0.44 + 0.22 = 0.66$

$c = c + v_m = 1.68 + 0.78 = 2.46$

Step-9: sample = 3

Step-10: if (3 > 2)

step 11

Step-11: itr = 3

Step-12: if (3 > 2)

step-13

Step-13: $m = 0.66, c = 2.46$

Step-14: $MSE = \frac{1}{ns} \sum_{i=1}^{ns} (y_i^9 - y_i)^2$

$MSE = \frac{1}{2} \sum_{i=1}^{2} (y_i^9 - y_i)^2$

$= \frac{1}{2} [(3.4 - 2.59)^2 + (3.8 - 2.72)]^2$

$MSE = 0.911$