Question - 6

Date	time	load
01/04/2018	0.00	5551.82
01/04/18	1.00	4983.17

load is predicted based on previous hour load and load at sametime but one day before.

x_i	y_i
5551.82	4931.26
4983.17	4775.53

step-1 :- Read dataset, set $\eta = 0.1$, epochs = 1, $m = 1$, $c = -1$,

$$E^2 g_{m,0} = E^2 g_{c,0} = 0, \quad E^2_{c,0} = E^2_{m,0} = 0, \quad \Delta m_0 = \Delta c_0 = 0$$

step-2 : set iteration = 1

Step-3 : set sample i=1

step-4 :- cal g_m and g_c

$$g_m = -(y_i^q - m x_i^q - c) x_i^q$$

$$= -(4931.26 - 5551.82 + 1)(5551.82)$$

$$g_m = 3439685.599$$

Eg $g_c = -(y_i^q - mx_i^q - c)$

$= -(4931.26 - 5551.82 + 1)$

$g_c = 619.56$

$$E^2_{g_m,t} = \gamma E^2_{g_m,t-1} + (1-\gamma)(g_m)^2$$

$= 0.9 \times 0 + (1-0.9)(3439685.599)^2$

$= 1.18 \times 10^{12}$

$$E^2_{g_c,t} = \gamma E^2_{g_c,t-1} + (1-\gamma)(g_c)^2$$

$= 0.9 \times 0 + (1-0.9)(619.56)^2$

$= 38385.45$

step-5

calculate exponential decaying avg. Step length

$$E^2_{m,1} = \gamma E^2_{m,t-1} + (1-\gamma)[\Delta m_{t-1}]^2$$

$= 0.9 \times 0 + (1-0.9) \times 0$

$= 0$

$E^2_{c,1} = 0.9 \times 0 + (1-0.9) \times 0 = 0$

Step-6 :-

update m & c

$$m = m - \frac{\sqrt{E^2_{m,t} + \varepsilon}}{\sqrt{E^2_{g_m,t} + \varepsilon}} \times g_m$$

$$m = 1 - \frac{\sqrt{0 + 10^{-8}}}{\sqrt{1.18 \times 10^{12} + 10^{-8}}} * 3439685.599$$

$$= 0.99$$

$$c = c - \frac{\sqrt{E^2_{c,t} + \varepsilon}}{\sqrt{E^2_{g_c,t} + \varepsilon}} * g_c$$

$$= -1 - \frac{\sqrt{0 + 10^{-8}}}{\sqrt{38385.45 + 10^{-8}}} * 619.56$$

$$= -1.0003$$

Step-6 set sample $i = i+1 = 2$, if 2 not $> n_s$ goto step 4

Step 4 cal g_m & g_c

$$g_m = \frac{\partial E}{\partial m} = -(y_i^a - m x_i^a - c)x_i^a$$

$$= -(4775.53 - (0.99)(4983.17) - 1(-1.0003))(4983.17)$$

$$= 781400.92$$

$$E^2_{g_m,t} = 0.9 * (1.18 \times 10^{12}) + (1 - 0.9)(781400.92)^2$$

$$= 1.123 \times 10^{12}$$

$$g_c = -(4775.53 - (0.99)(4983.17) - (-1.0003))$$

$$= 136.808$$

$$E^2_{g_c,t} = \gamma E^2_{g_c,t-1} + (1-\gamma)(g_c)^2$$

$$= 0.9 \times 38385.45 + (1-0.9)(156.808)^2$$

$$= 37005.77$$

Step-5 :-

$$E^2_{m,t} = \gamma E^2_{m,t-1} + (1-\gamma)[\Delta m_{t-1}]^2$$

$$= 0.9 \times 0 + (1-0.9)(0.99)^2$$

$$= 0.098$$

$$E^2_{c,1} = \gamma E^2_{c,t-1} + (1-\gamma)[\Delta c_{t-1}]^2$$

$$= 0.9 \times 0 + (1-0.9)(-1.0003)^2$$

$$= 0.10006$$

Step-6 :- update m & c

$$m = 0.99 - \frac{\sqrt{0.098 + 10^{-8}}}{\sqrt{1.123 \times 10^{12} + 10^{-8}}} \times (781400.92)$$

$$m = 0.989$$

$$c = -1.0003 - \frac{\sqrt{0.10006 + 10^{-8}}}{\sqrt{37005.77 + 10^{-8}}} \times 156.808$$

$$c = -1.258$$

Step-7 sample $i = i+1 = 3$ if 3 not $>= n_s$ goto next step

Step-8 iteration $t = t+1 = 2 > epochs$