19KU41A04F0

Assignment-6

manual calculation

① Read data [x, y]

$y = m_1 x^2 + m_2 x + c$

x	y
7.6	157
7.1	174

② Data preprocessor using normalization

x	y
0.428	0.537
0.190	0.612

③ initialization, $m1 = 1$, $m2 = 1$, $c = -1$

max iteration = 1000, eta = 0.1, epochs = 1

④ set iter = 1

⑤ set sample(i) = 1

⑥ $\frac{df}{dm_1} = -1 (y - m1 * x * x - m2 * x - c) * x * x$

$= -(0.537 - 1 * (0.4)(0.4) - 1 * (0.4) + 1) * (0.4)(0.4)$

$= -0.1552$

$$\frac{df}{dm_2} = -1(y - m_1 * x * x - m_2 * x - c) * x$$

$$-1(0.537 - 1 * (0.4)(0.4) - 1 * (0.4) * (0.4)$$

$$= 0.388$$

$$\frac{dE}{dc} = -1 * (y - m_1 * x * x - m_2 * x - c)$$

$$= -0.97$$

(7) $\Delta m_1 = -\eta \frac{df}{dm_1} = -0.1(-0.157) = 0.01$

$\Delta m_2 = -\eta \frac{dE}{dm_2} = -0.1(-0.388) = 0.038$

$\Delta c = -\eta \frac{df}{dc} = -0.1(-0.97) = 0.097$

(8) $m_1 = m_1 + \Delta m_1 = 1 + 0.0157 = 1.0157$

$m_2 = m_2 + \Delta m_2 = 1 + 0.038 = 1.038$

$c = c + \Delta c = -1 + 0.097 = -0.903$

(9) sample (i) = i + 1

$i = 1 + 1 = 2$

(10) if (sample (i) $\leq$ 5)

if ($2 \leq 2$) T $\rightarrow$ steps

(11) $\frac{dE}{dm_1} = -(0.612 - 1.0157 * 0.190 * 0.190 -$

$1.038 * 0.190 + 0.903) * (0.19)$

$= -0.04624$

$$\frac{dE}{dm_2} = -[0.612 - 1.015 * 0.190 * 0.190 - 1.031 * 0.190 + 0.903) * (0.19)$$

$$= -0.24341$$

$$\frac{dE}{dm_c} = -(0.612 - 1.015 * 0.190 * 0.190 - 1.03 * 0.190 + 0.903)$$

$$= -1.281$$

(7) $\Delta m_1 = -\eta \frac{dE}{dm_1} = -0.1(-0.0462) = 4.62 \times 10^{-3}$

$\Delta m_2 = -\eta \frac{dE}{dm_2} = -0.1(-0.243) = 0.0243$

$\Delta c = -\eta \frac{dE}{dc} = -0.1(-1.281) = 0.1281$

(8) $m_1 = m_1 + \Delta m_1 = 1.0155 + 4.62 \times 10^{-3} = 1.020$

$m_2 = m_2 + \Delta m_2 = 1.031 + 0.024 = 1.054$

$c = c_3 + \Delta c = -0.901 + 0.1281 = -0.775$

(9) sample (i) = i + 1

i = 2 + 1 = 3

(10) if (sample(i) $\leq$ ns)

if (3 $\leq$ 2) ↛ Next step

(11) iter = iter + 1 = 1 + 1 = 2

(12) if (iter $\leq$ epochs)

if $(2 \leq 1)$ → F → Next step

(13) STOP

print m and c

m = 1.020, 1.054

C = −0.775