17

lecture 3 المحاضرة الثالثة

Quiz1

$w_1 = b = 0.2$, $\alpha = 1$

x_1	x_2	t
1	1	-1
1	-1	1
-1	1	1
-1	-1	1

First input $y_{in} = \sum x_i w_i + b$

$x_1 w_1 + x_2 w_2 + b$

$y_{in} = 0.2 \times 1 + 1 \times 0.2 + 0.2 = 0.6$

$w_1(new) = w_1(old) + \alpha (t - y_{in}) x_1$

$0.2 + 0.2(-1 - 0.6) \times 1 = -0.12$

$w_2(new) = 0.2 + 0.2(-1 - 0.6) \times 1 = -0.12$

$b(new) = b(old) + \alpha (t - y_{in})$

$= 0.2 + 0.2 (-1 - 0.6) = -0.12$

$E_1 = (t - y_{in})^2 = (-1 + 0.6)^2 = 2.56$

second input $w_1 = w_2 = b = -0.12$

$y_{in} = -0.12 + 0.12 \times 1 + 0.12 = -0.12$

$w_1(new) = -0.12 + 0.2 (1 + 0.12) \times 1 = 0.109$

$w_2(new) = -0.12 + 0.2 (1 + 0.12) \times -1 = -0.399$

$b = -0.12 + 0.2 (1 + 0.12) = 0.349$

$E_2 = (1 + 0.12)^2 = 1.2599$

third input

$y_{in} = -0.109 - 0.399 + 0.349 = -0.109$

$w_1(new) = 0.109 + 0.2 (1 + 0.109) \times 1 = 0.1168$

$w_2(new) = -0.399 + 0.2 (1 + 0.109) \times 1 = -0.1232$

$b = 0.349 + 0.2 (1 + 0.109) = 0.5648$

$E_3 = (1 + 0.109)^2 = 1.218816$

Fourth input

$y_{in} = 0.1168 + 0.1232 + 0.5618 = \underline{0.8018}$

$w_1(new) = -0.1163 + 0.2(1 - 0.8093)x_1 = \boxed{-0.15584}$

$w_2(new) = -0.1232 + 0.2(1 - 0.8093)x_1 = \boxed{-0.10127}$

$b = 0.5618 + 0.2(1 - 0.8018)$

$= 0.60389$

$E_4 = (1 - 0.8018)^2 = \boxed{0.0381030}$

EPOCH 1

x_1	x_2	y_{in}	y	Δw_1	Δw_2	Δb	w_1	w_2	b	error
1	1	0.6	1	-0.32	-0.32	-0.32	-0.12	-0.12	-0.12	2.56
1	-1	-0.12	1	0.224	-0.224	0.14	-0.104	-0.344	0.34	1.2544
-1	1	-0.104	1	-0.208	0.2288	-0.112	-0.1168	-0.1232	0.5618	1.216816
-1	-1	0.8018	1	0	-0.0384	-0.0384	0.03909	-0.15584	-0.16224	0.6038	0.0381030

19

$E_T = \sum (t - y_{in})^2 = 2.56 + 1.2599 + 1.218816 + 0.0381639$

$= 5.07$

Epoch 2

x_1	x_2	y	y_{in}	Δw_1	Δw_2	Δb	w_1	w_2	bias
1	1	-1	0.2868	-0.2576	-0.25176	-0.2587	-0.412	-0.414	0.346
1	-1	1	0.35312	0.12938	-0.12938	0.1293	-0.2836	+0.5483	0.476
-1	1	1	0.21686	0.1578	0.1578	0.1578	-0.1414	-0.391	0.6377
-1	-1	1	1.9663	0.0433	0.0433	-0.0433	-0.3981	-0.2477	0.5106

error
0.51
0.9185
0.1227
0.2174

$E_T = \sum (t - y_{in})^2 = 0.51 + 0.1185 + 0.6277 +$

$0.2174 = 1.0766$

Quiz ②

$w_1 = w_2 = 0$ $\quad b = 0$

$w_i(new) = w_i(old) + \Delta w$

x_1	x_2	b	y
1	1	1	1
1	0	1	-1
0	1	1	-1
0	0	1	-1

(1,1) $w_1(new) = 0 + 1 = 1$

$w_2(new) = 0 + 1 = 1$

$b(new) = 0 + 1 = 1$

(1,0)

$w_1 = 1 - 1 = 0$ $\quad b = 1 - 1 = 0$

$w_2 = 1 + 0 = 1$

(0,1)

$w_1 = 0 + 0 = 0$ $\quad b = 0 - 1 = -1$

$w_2 = 1 - 1 = 0$

Decision Boundary $b = 0$

(2)

$w_1 = w_2 = 0$, $b = 0$

x_1	x_2	b	y
1	1	1	1
1	-1	1	-1
-1	1	1	-1
-1	-1	1	-1

(1,1)

$w_1 = 0 + 1 = 1$, $b = 0 + 1 = 1$

$w_2 = 0 + 1 = 1$

(1,-1)

$w_1 = 1 - 1 = 0$ $\quad b = 1 - 1 = 0$

$w_2 = 1 + 1 = 2$

(-1,1)

$w_1 = 0 + 1 = 1$, $b = 0 - 1 = -1$

$w_2 = 2 - 1 = 1$

Decision Boundary $x_1 + x_2 - 1 = 0$