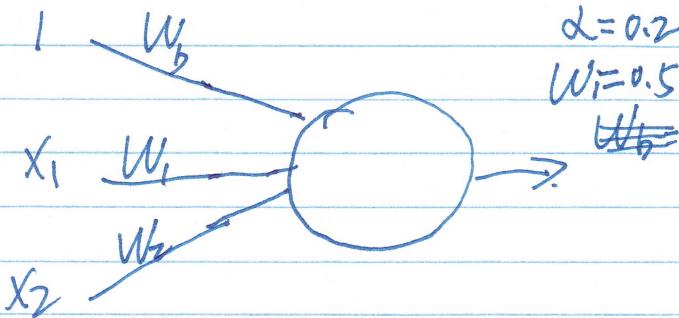


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HW4

1.(a)



$$\alpha = 0.2$$

$$W_i = 0.5$$

~~$$W_b = 0.5$$~~

$$\Delta W_i = \alpha X_i (T - 0)$$

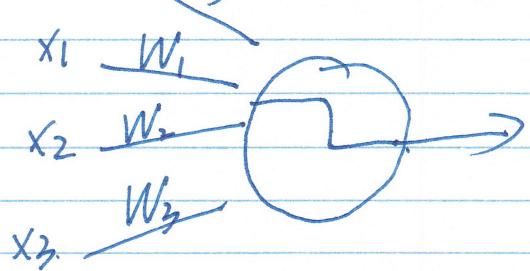
$$W_2 = -1 \quad W_b = 0.5$$

				T	0	ΔW_1	ΔW_2
2	2	1	$1 - 2 + 0.5 = -0.5$	1	0	0.4	0.4
0	0	0	$0 - 0 + 0.5 = 0.5$	0	1	0	0
-1	3	1	$-0.5 - 3 + 0.5 = -3$	1	0	-0.2	0.6
1	1	1	$0.5 - 1 + 0.5 = 0$	1	0	0.2	0.2
1	-2	0	$0.5 + 2 + 0.5 = 3$	0	1	-0.2	0.4

(b)

x_1	x_2	x_3	y
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

(c) $-1.5 - W_b$ $x_1 = x_2 = x_3 = 1$



$$2. i_1 = 0.2 \times 0.3 - 0.5 \times 0.2 + 0.2 \times 0.1 - 1 \times 0.4 = -0.42.$$

$$(1) i_2 = 0.1 \times 0.3 + 0.3 \times 0.2 + 0.1 \times 0.3 + 1 \times 0.7 = 0.82.$$

$$i_3 = -0.1 \times 0.3 + 0.2 \times 0.2 + 0.4 \times 0.1 + 1 \times 0.1 = 0.15.$$

$$K_1 = -0.3 \times (-0.42) + 0.2 \times 0.82 + 0.2 \times 0.15 + 0.3 = 0.62.$$

$$K_2 = 0.4 \times (-0.42) + 0.5 \times 0.82 + 0.7 \times 0.15 - 0.3 = 0.047.$$

$$(b) \begin{array}{ccccc} x_1 & x_2 & x_3 & y_1 & y_2 \\ 1 & 0 & 1 & 0 & 1 \end{array}$$

$$\begin{cases} i_1 = 0.2 + 0.2 - 0.4 = 0 \\ i_2 = -0.5 + 0.3 + 0.7 = 0.5 \\ i_3 = -0.1 + 0.4 + 0.1 = 0.4 \end{cases} \quad \begin{aligned} K_1 &= 0.2 \times 0.5 + 0.2 \times 0.4 + 0.3 = 0.48 \\ K_2 &= 0.5 \times 0.5 + 0.7 \times 0.4 - 0.3 = 0.23. \end{aligned}$$

$$x_1 = 1 \quad x_2 = 0 \quad x_3 = 1 \quad T = \begin{cases} 0 \\ 1 \end{cases} \quad D = \begin{cases} 0.48 \\ 0.23 \end{cases}$$

Instance 1: $\Delta W_{jk} = \alpha \text{aig}(T_k - O_k) g'(lm_k)$
 $W_{j1} = 0.2 \times 0 \times \dots = 0$

$$0.2 \times 0 \times 0.77 \times 0.23 \times 0.77 = 0$$

$$W_{j2} = 0.2 \times 0.5 \times (-0.48) \times 0.52 = -0.012.$$

$$0.2 \times 0.5 \times 0.77 \times 0.23 \times 0.77 = 0.0136$$

$$W_{j3} = 0.2 \times 0.4 \times (-0.48) \times 0.48 \times 0.52 = 0.009.$$

$$0.2 \times 0.4 \times 0.77 \times 0.23 \times 0.77 = 0.0109.$$

$$\Delta W_{ij} = \alpha \text{aig}'(um_j) \sum_k (T_k - O_k) g'(lm_k)$$

$$i_1 j_1 = -0.3 \times (-0.48) \times 0.52 + 0.4 \times 0.77 \times 0.23 \times 0.77 = 0.0905$$

$$i_2 j_2 = 0.188 \times (-0.48) \times 0.48 \times 0.52 + 0.5136 \times 0.77 \times 0.23 \times 0.77 = 0.0506$$

$$i_3 j_3 = 0.191 \times (-0.48) \times 0.48 \times 0.52 + 0.7109 \times 0.77 \times 0.23 \times 0.77 = 0.0791.$$

$$\Delta W = i_1 j_1 = 0.2 \times 1 \times 0 \times 0.0905 = 0 \quad i_2 j_2 = 0.2 \times 0 \times 0 \times 0.0905 = 0.$$

$$i_1 j_2 = 0.2 \times 1 \times 0.5 \times 0.5 \times 0.0506 = 0.00253 \quad i_2 j_2 = 0.2 \times 0 \times 0.5 \times 0.5 \times 0.0506 = 0$$

~~$$i_1 j_3 = 0.2 \times 1 \times 0.4 \times 0.6 \times 0.0791 = 0.00356 \quad i_2 j_3 = 0.2 \times 0 \times 0.4 \times 0.6 \times 0.0791 = 0$$~~

$$i_2 j_3 = 0.2 \times 1 \times 0 \times 0.0905 = 0$$

$$i_3 j_2 = 0.2 \times 1 \times 0.5 \times 0.5 \times 0.0506 = 0.00253$$

~~$$i_3 j_3 = 0.2 \times 1 \times 0.4 \times 0.6 \times 0.0905 = 0.00356$$~~

$$\text{Updated } W_i = \alpha 2, 0.1025, -0.0864$$

$$W_{i2} = -0.5, 0.3, 0.2$$

$$W_{i3} = 0.2, 0.3025, 0.4030$$

$$W_{j1} = -0.3, 0.4, 0.191, 0.7119$$

$$W_{j2} = 0.188, 0.5136, 0.7119$$

$$\begin{array}{ccccccccc}
 \text{Instance 2} = & X_1 & X_2 & X_3 & Y_1 & Y_2 & T & & 0 \\
 & 0.5 & 1 & 0 & 1 & 0 & 1 & 0 & 0.7857 \quad 0.0989 \\
 j_1 = & 0.2 \times 0.5 - 0.5 - 0.4 = -0.8 & & & & K_1 = -0.4 \times (-0.8) + 1.0512 \times 0.188 + 0.25178 \\
 j_2 = & 0.10253 \times 0.5 + 0.3 + 0.7 = 1.05126 & & & & x_1 \cdot 1.91 + 0.3 = 0.7857 \\
 j_3 = & -0.09644 \times 0.5 + 0.2 + 0.1 = 0.25178 & & & & K_2 = 0.4 \times (-0.8) + 1.0512 \times 0.5126 + 0.25178 \\
 & & & & & x_0 \cdot 7109 - 0.3 = 0.0989 \\
 \Delta W_{j_1} = & 0.2 \times 0.5 \times 0.214 \times 0.786 \times 0.214 = 0.0036 & & & & \\
 & 0.2 \times 0.5 \times (-0.901) \times 0.099 \times 0.901 = -0.008 & & & & \\
 \end{array}$$

$$\begin{aligned}
 \Delta W_{j_2} &= 0.2 \times 1 \times 0.214 \times 0.786 \times 0.219 = 0.0072 \\
 &0.2 \times 1 \times (-0.901) \times 0.099 \times 0.901 = -0.016
 \end{aligned}$$

$$\begin{aligned}
 \Delta W_{j_3} &= 0.2 \times 0 \times 0.214 \times 0.786 \times 0.219 = 0 \\
 &0.2 \times 0 \times (-0.901) \times 0.099 \times 0.401 = 0
 \end{aligned}$$

$$\begin{aligned}
 j_1 &= -0.2964 \times 0.214 \times 0.786 \times 0.214 + 0.392 \times (-0.901) \times 0.99 \times 0.901 = -0.0422 \\
 j_2 &= 0.1952 \times 0.214 \times 0.786 \times 0.214 + 0.4976 \times (-0.901) \times 0.099 \times 0.901 = 0.03296 \\
 j_3 &= 0.191 \times 0.214 \times 0.786 \times 0.214 + 0.7109 \times (-0.901) \times 0.099 \times 0.901 = -0.05026
 \end{aligned}$$

$$\begin{aligned}
 i_1 j_1 &= 0.2 \times 0.3 \times (-0.8) \times 1.8 \times (-0.0422) = 0.061 \\
 i_1 j_2 &= 0.2 \times 0.5 \times 1.05126 \times (-0.05126) \times 0.03296 = -0.0002 \\
 i_1 j_3 &= 0.2 \times 0.5 \times 0.25178 \times 0.7482 \times (-0.05026) = 0.001 \\
 i_2 j_1 &= 0.2 \times 1 \times (-0.8) \times 1.8 \times (-0.0422) = 0.0122 \\
 i_2 j_2 &= 0.2 \times 1 \times 1.50126 \times (-0.05126) \times 0.03296 = -0.0004 \\
 i_2 j_3 &= 0.2 \times 1 \times 0.25178 \times 0.7482 \times (-0.05026) = -0.002 \\
 i_3 j_1 &= 0.2 \times 0 \times 0.8 \times 1.8 \times (-0.0422) = 0 \\
 i_3 j_2 &= 0.2 \times 0 \times 1.0512 \times (-0.0512) \times 0.03296 = 0 \\
 i_3 j_3 &= 0.2 \times 0 \times 0.2517 \times 0.7482 \times (-0.05026) = 0
 \end{aligned}$$

$$\begin{aligned}
 \text{Updated } W_i &= W_{i_1} = 0.2061, 0.1024, -0.097, \quad W_{j_1} = -0.2964, 0.392 \\
 W_{i_2} &= -0.488, 0.2996, 0.198, \quad W_{j_2} = 0.1952, 0.4976 \\
 W_{i_3} &= 0.2, 0.30253, 0.40356, \quad W_{j_3} = 0.191, 0.7109
 \end{aligned}$$