Learning Rules

(1) Hebb Network.

↳ when an axon of cell A is near enough to excite cell B, & repeatedly or permanently takes place in firing it, some growth process or metabolic change takes place in one or both the cells such that A's efficiency as one of the cells firing B, increases.

↳ weight rises proportional to the product of i/p & learning signal.

↳ learning signal = neuron's o/p.

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

$$\Delta w_i = x_i y$$

↳ more suited for bipolar data to distinguish b/w on & off & when i/p & ~~training~~ target in off.

↳ $b_{new} = b_{old} + \Delta b$

$$\Delta b = y.$$

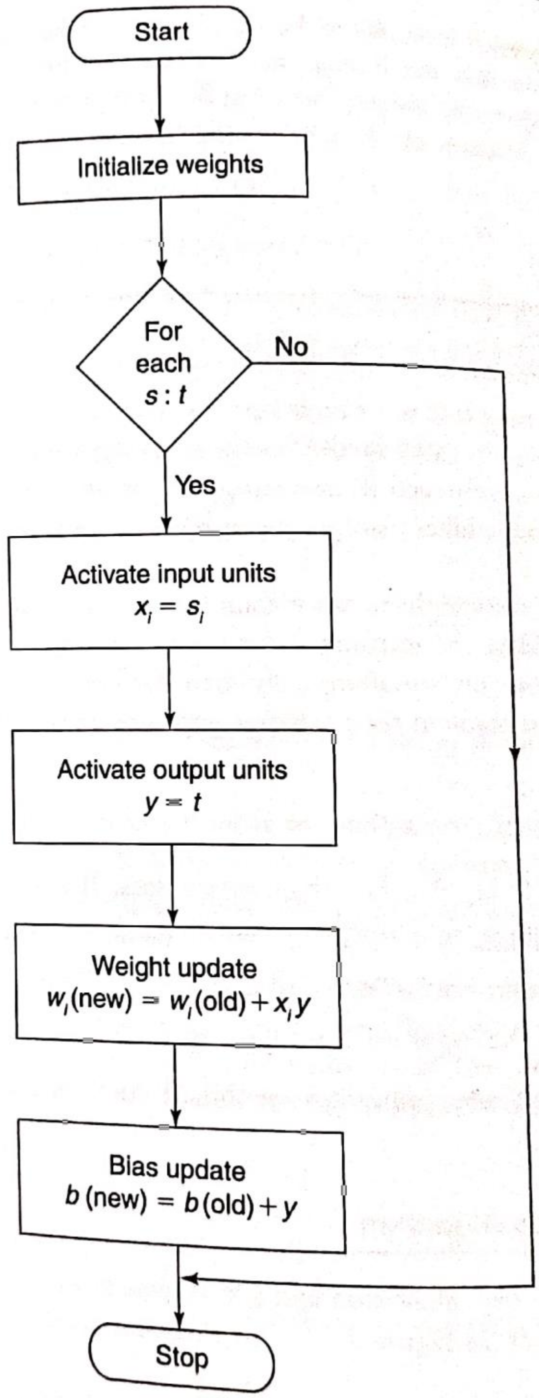

Start
Initialize weights
For each $s:t$
No
Yes
Activate input units
$x_i = s_i$
Activate output units
$y = t$
Weight update
$w_i(\text{new}) = w_i(\text{old}) + x_i y$
Bias update
$b(\text{new}) = b(\text{old}) + y$
Stop

Figure 2-2…

Hebb net for AND Gate.

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

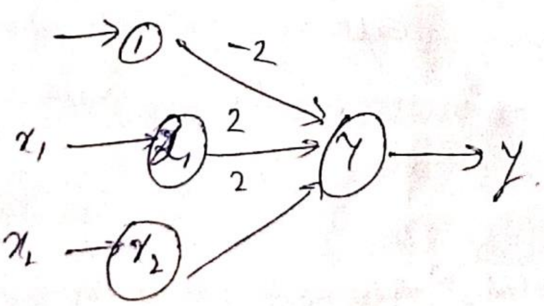
Initially:
$w_1 = w_2 = b = 0.$

1. $[x_1 \ x_2 \ b] = [1, 1, 1]$
$y = 1.$
$w_1 \text{ new} = 0 + 1 = 1$
$w_2 \text{ new} = 0 + 1 = 1$
$b \text{ new} = 1$

2. $[1 \ -1 \ 1]$
$y = -1$
$w_1 \text{ new} = 1 + (-1) = 0$
$w_2 \text{ new} = 1 + (+1) = 2$
$b_{new} = 1 + (-1) = 0$

3. $[-1 \ 1 \ 1]$ $y = -1$
$w_1 \text{ new} = 0 + 1 = 1$
$w_2 \text{ new} = 2 + (-1) = 1$
$b_{new} = 0 + (-1) = -1$

4. $[-1 \ -1 \ 1]$ $y = -1$
$w_1 \text{ new} = 1 + (+1) = 2$
$w_2 \text{ new} = 1 + (1) = 2$
$b_{new} = -1 + (-1) = -2.$



Design Hebb net for patterns L & U where
5 i/p = +1 for (+) & -1 for (·). 'L' (1) & 'U' (-1) class.

+	·	·		+	·	+
+	·	·		+	·	+
+	+	+		+	+	+