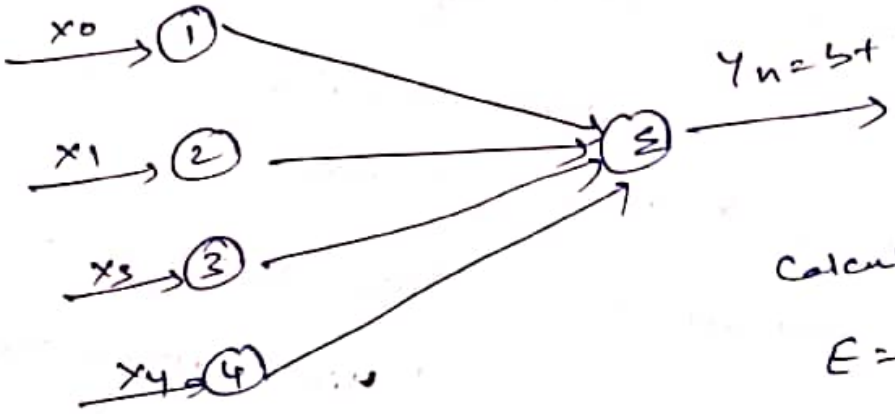
ADALINE

→ A network with a single linear unit is called Adaline (Adaptive Linear Neural).

• I/p – o/p relationship is linear.

The units with linear activation function are called linear units.

• Adaline uses bipolar activation function for its input and output layer.



Calculate error

$$E = \Sigma (t - y_{in})^2$$

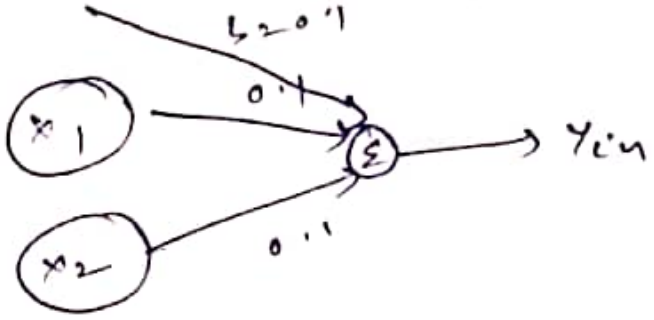
$$w_i(new) = w_i(old) + \alpha (t - o) x_i$$

$$b(new) = b(old) + \alpha (t - o).$$

e perceptron utilizes a binary step function for
ification, making it suitable for binary tasks.

LINE employs a continuous linear activation
ain, enabling it to produce continuous valued
put.

Design of OR GATE



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

Initially the weights and bias are assumed to be small, say 0.1 and the learning rate set to 0.1

Also, here the least square errors set to 2.

The weights are updated until the squared error is greater than least squared error.

The weights are set to $w_1 = w_2 = b = 0.1$ and the learning rate = 0.1.

$y_{in} = b + x_1 w_1 + x_2 w_2$

$= 0.1 + 1 \times 0.1 + 1 \times 0.1 = 0.3$.

Now Compute $(t - y_{in}) = (1 - 0.3) = 0.7$

Update the weights

$w_i(new) = w_i(old) + \Delta w_i \quad \Delta w_i = \alpha(t - o) x_i$

$w_1 = 0.1 + 0.1(0.7)1 = 0.17$

$w_2 = 0.1 + 0.1(0.7)1 = 0.17$

$b = 0.1 + 0.1 \times 0.7 = 0.17$.

$E = (t - y_{in})^2 = (0.7)^2$

$= 0.49$.

$y_{in} = 0.17 + 0.17 \times 1 + 0.17 \times -1$

$= 0.17$ ✓

$w_2 = 0.17 + 0.1(0.83)$

$t - y_{in} = (1 - 0.17) = 0.83$

$w_1 = 0.17 + 0.1(0.83)1 = 0.253$

$w_2 = 0.17 + 0.1(0.83)(-1) = 0.087$

$b = 0.17 + 1 \times 0.8 = 0.253$

$E = (t - y_{in})^2$

$= (1 - 0.17) = (0.83)^2$

$= 0.69$

Third input (-1, 1).

$y_{in} = 0.253 + 0.253(-1) + 0.067 \times 1$

$= 0.253 - 0.253 + 0.067 = 0.067.$

$(t-o) = 1 - 0.067 = 0.913$

$w_1 = 0.253 + 0.1(0.913)(-1) = 0.1617$

$w_2 = 0.067 + 0.1(0.913)(1) = 0.1763$

$b = 0.253 + 0.1(0.913) = 0.3443.$

$E = (t - y_{in})^2 = (0.913)^2 = 0.83$

Fourth I/P (-1, -1).

$y_{in} = 0.3443 + (-1)(0.1617) + (-1)(0.1763)$

$= 0.0043.$

$(t-o) = (-1 - 0.0043) = -1.0043$

$w_1 = 0.1617 + 0.1(-1.0043)(-1) = 0.2619$

$w_2 = 0.1763 + 0.1(-1.0043)(-1) = 0.2787$

$b = 0.3443 + 0.1(-1.0043) = 0.2439.$

$E = (t - y_{in})^2 = (-1 - 0.043)^2 = 1.01$

Total error after epoch 1

$= 0.49 + 0.69 + 0.83 + 1.01 = 3.02$

But expected error was 2, so again we have to [illegible] process