

Terminologies of ANN

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Weight

- Each neuron is connected to other neurons by means of directed communication links, each with associate weight.
- The weight represent information being used by the net to solve a problem.
- The weights contain information about the input signal.
- The weight can be represented in terms of matrix.
- The weight matrix can also be called as *connection matrix*.

Bias

- Acts exactly as a weight on a connection from a unit whose activation function is always 1.
- Included in the network has its impact in calculating the net input.
- Included by adding a component $x_0=1$ so the input vector x becomes

$$x=(1, x_1, x_2, \dots, x_n)$$

- Plays major role in determining the output of the network.
- 2 types of bias
 - +ve bias (helps in increasing the net i/p of the network)
 - -ve bias (helps in decreasing the net i/p of the network)

Bias

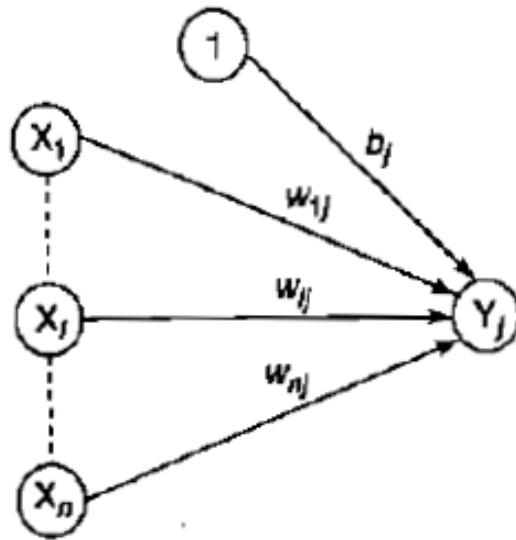


Figure 2-16 Simple net with bias.

Consider the straight line equation:

$$y = mx + c$$

Where m is weight, x is the input, c is the bias and y is the output.

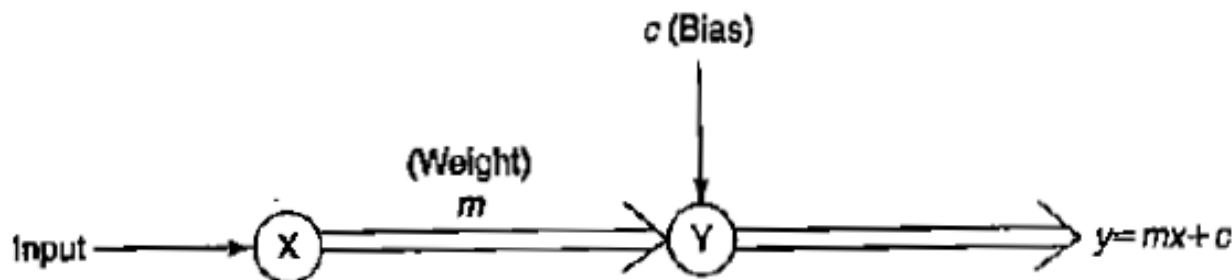


Figure 2-17 Block diagram for straight line.

Threshold

- Threshold ' θ ' is a factor which is used in calculating the activations of the given net.
- A comparison is made between the calculated net-input & threshold to obtain the network o/p.
- For each and every application, there is a threshold limit.

(e.g.) DC motor

- If its maximum speed is 1500rpm then $\theta = 1500$.

Threshold

- If the motor is run on a speed higher than its set threshold, it may damage motor coils.
- In NN, based on the threshold value, the activation functions are defined and the output is calculated.
- The activation function (binary step) using threshold can be defined as

$$\begin{aligned} f(x_{in}) &= 1 && \text{if } x_{in} \geq \theta \\ f(x_{in}) &= 0 && \text{otherwise} \end{aligned}$$

where θ is the fixed threshold value

Learning rate

- It is denoted by “ α ”.
- It is used to control the amount of weight adjustment at each step of training.
- The learning rate, ranging from 0 to 1, determines the rate of learning at each time step.

Momentum Factor

- Convergence is made faster if the momentum factor is added to the weight updating process.
- This is generally done in back propagation networks.

Vigilance Parameter

- Denoted as “ ρ ”
- Generally used in adaptive resonance theory (ART) network.
- Used to control the degree of similarity required for patterns to the same cluster.
- The choice this value may vary from 0.7 to 1 to perform useful work in controlling the number of clusters.