



SNS COLLEGE OF TECHNOLOGY

(AN AUTONOMOUS INSTITUTION)

Approved by AICTE & Affiliated to Anna University
Accredited by NBA & Accredited by NAAC with 'A+' Grade,
Recognized by UGC saravanampatti (post), Coimbatore-641035.



Department of Biomedical Engineering

**Course Name: 19ECT303 & Artificial Intelligence and machine
learning**

III Year : V Semester

Unit IV-NEURONS & NEURAL NETWORKS

Topic : Neural Networks and Perceptron

19ECT303/Artificial Intelligence and Machine learning/Unit 4/Mr.
Karthik G. L. /AP/BME



What is Neural Networks?

- A Neural Network is a computing system that is based on the biological neural network that makes up the human brain.
- Neural networks are not based on any specific computer program written for it, but it can progressively learn and improve its performance over time.



- A neural network is made up of a collection of units or nodes called neurons.
- These neurons are associated with methods for an association called a synapse.
- Using the synapse, a neuron can transmit signals or information to another neuron nearby.
- The receiving neuron can receive the signal, process it, and signal the next one. The process continues until an output signal is produced.



Application of Neural Networks



- Computer Vision
- Pattern Recognition/Matching
- Natural Language Processing

Vision Title 2

Vision Title 3

19ECT303/Artificial Intelligence and Machine learning/Unit 4/
Mr. Kathik G.L./AP/BME



Neural Network implementation

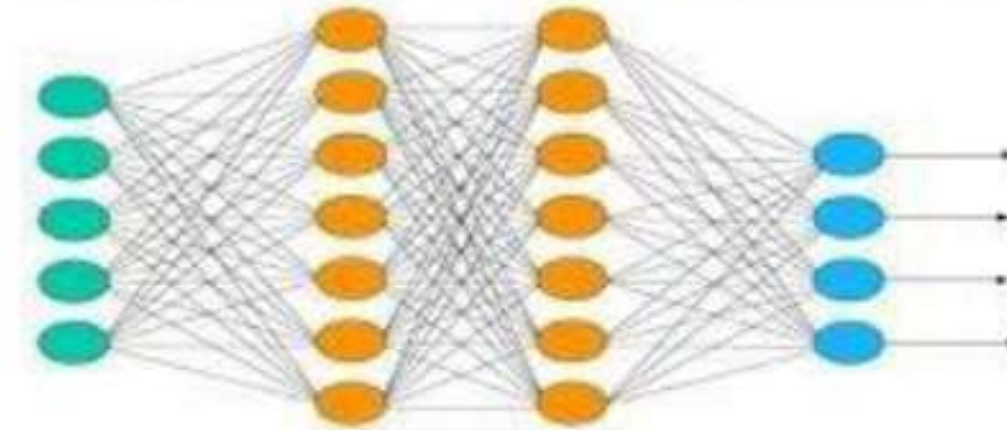


- Nodes represents Neurons
- Output of each Neuron is a non linear function
- The non linear function takes sum of all inputs of Neurons
- Neuron and Synapses have weights
- This weight controls the strength of the signal the neuron sends out across the synapse to the next neuron.
- Neurons are normally arranged in layers.



What are Hidden layers?

Basics of Neural Networks



Vision Title 3

The layers between input and output layers are called hidden layers. There can be many layers until we get an output. Neurons are normally arranged in layers. Different layers may perform different kinds of transformation on its input, or it can adjust as per output result. Signals move through different layers including hidden layers to the outputs.

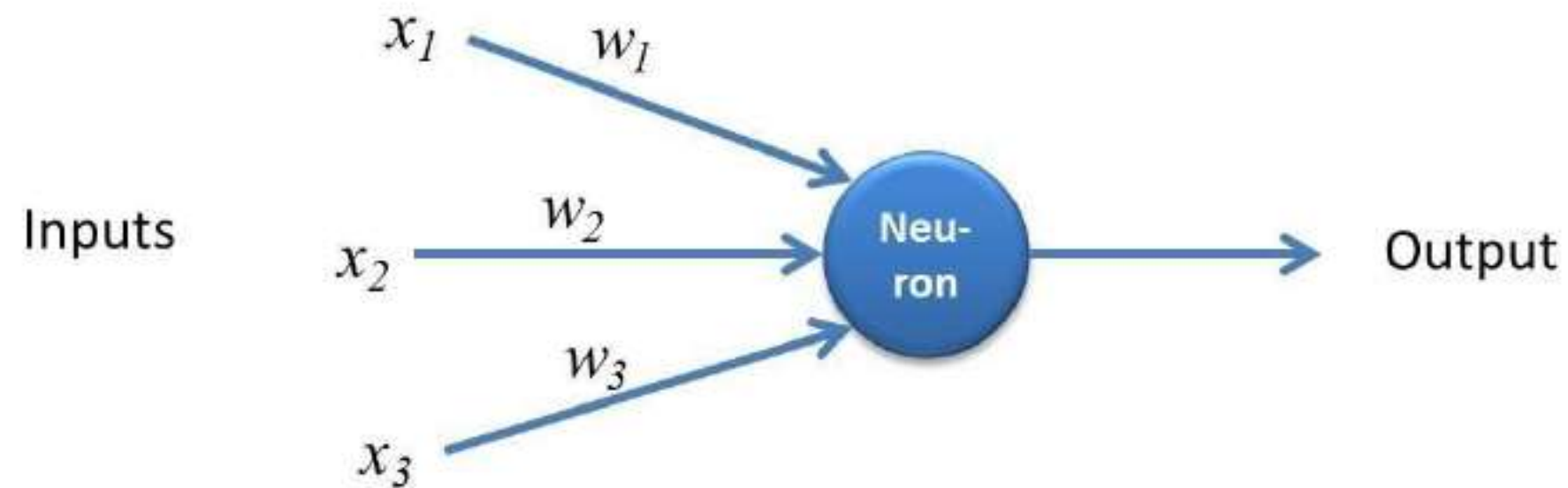


Simple model of Neural Network – The Perceptron

The perceptron learning algorithm is the simplest model of a neuron that illustrates how a neural network works. The perceptron is a machine learning algorithm developed in 1957 by Frank Rosenblatt and first implemented in IBM 704.

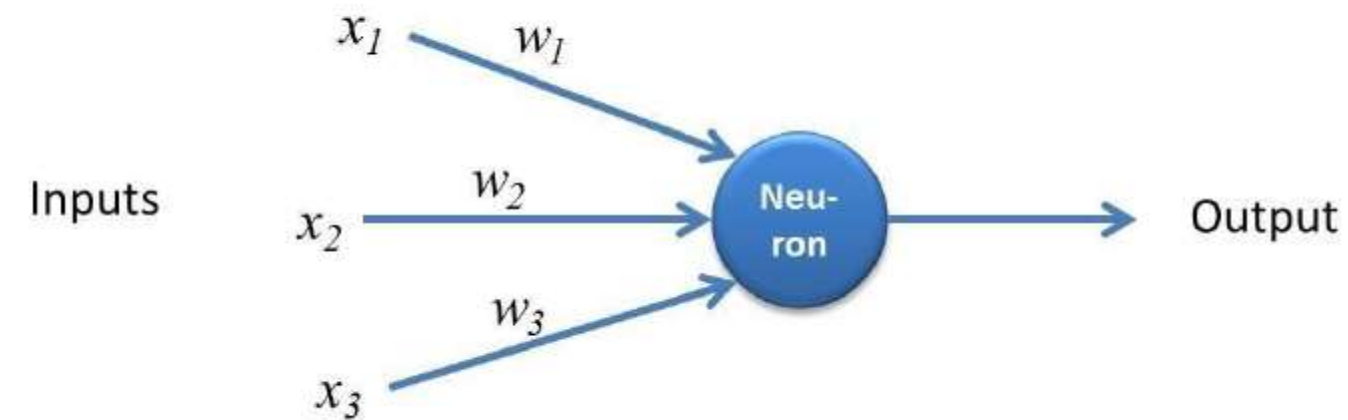
Vision Tit 2

Vision Title 3





How it works?



Vision Title 3

$$\mathbf{Output} = w_1x_1 + w_2x_2 + w_3x_3$$

$$\mathit{output} = \begin{cases} 0 & \text{if } \sum_j w_j x_j < \mathit{threshold} \\ 1 & \text{if } \sum_j w_j x_j > \mathit{threshold} \end{cases}$$

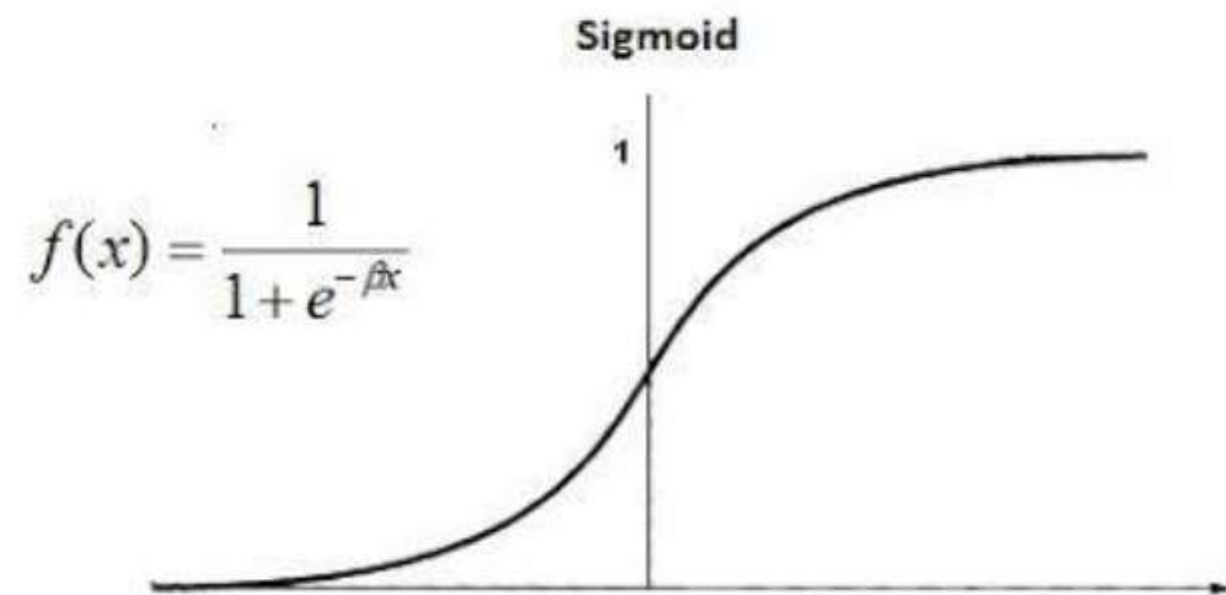


Introducing Bias and Sigmoid function

Let's not consider a general example, this time we have not just 3 inputs but n inputs. Just as you know, the formula now becomes:

$$\text{Output} = w_1x_1 + w_2x_2 + w_3x_3 + \dots + w_nx_n$$

Vision Title 3



So if we use the symbol σ , we would have:

$$\sigma (w_1x_1 + w_2x_2 + w_3x_3 + \dots + w_nx_n)$$



Linear Discriminant Analysis (LDA)

Now, suppose, we want the neuron to activate when the value of this output is greater than some threshold, that is, below this threshold, the neuron does not activate, above the threshold, it activates. At that point we call this limit, inclination and remember it for the capacity.

We would then have

$$\sigma (w_1x_1 + w_2x_2 + w_3x_3 + \dots + w_nx_n + bias)$$

The bias is a measure of how high the weighted sum needs to be before the neuron activates.

Only activate when weighted sum > bias.



From the previous discussion, mention about
Primary components of a Perceptron Learning
Algorithm



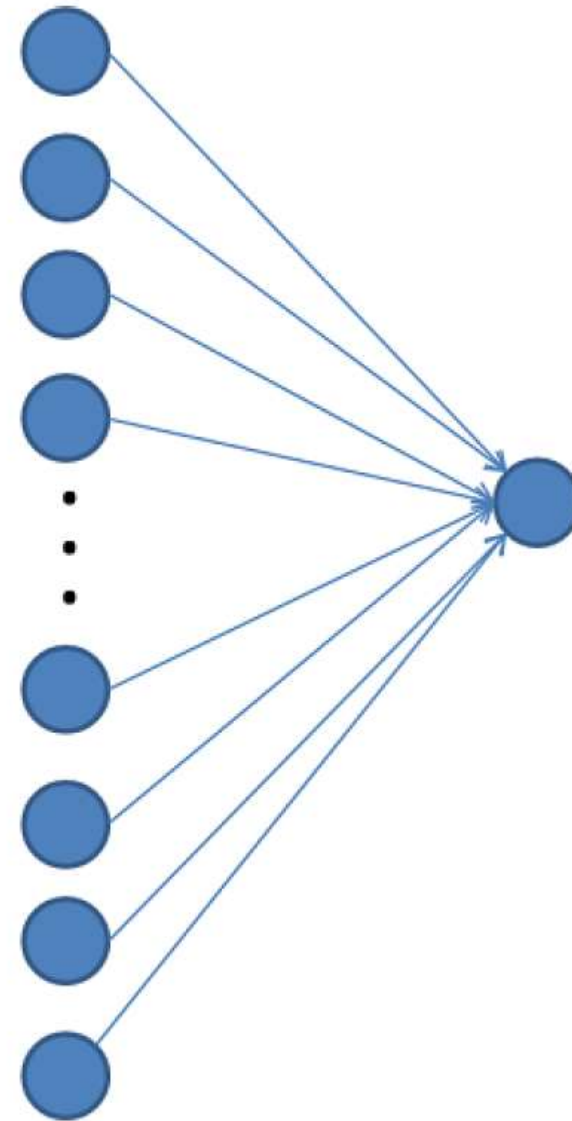
Bayes theorem in LDA



- The LDA model uses Bayes' Theorem to estimate probabilities. They make predictions upon the probability that a new input dataset belongs to each class.
- The class which has the highest probability is considered as the output class and then the LDA makes a prediction.



How many layer perceptron is the below structure?

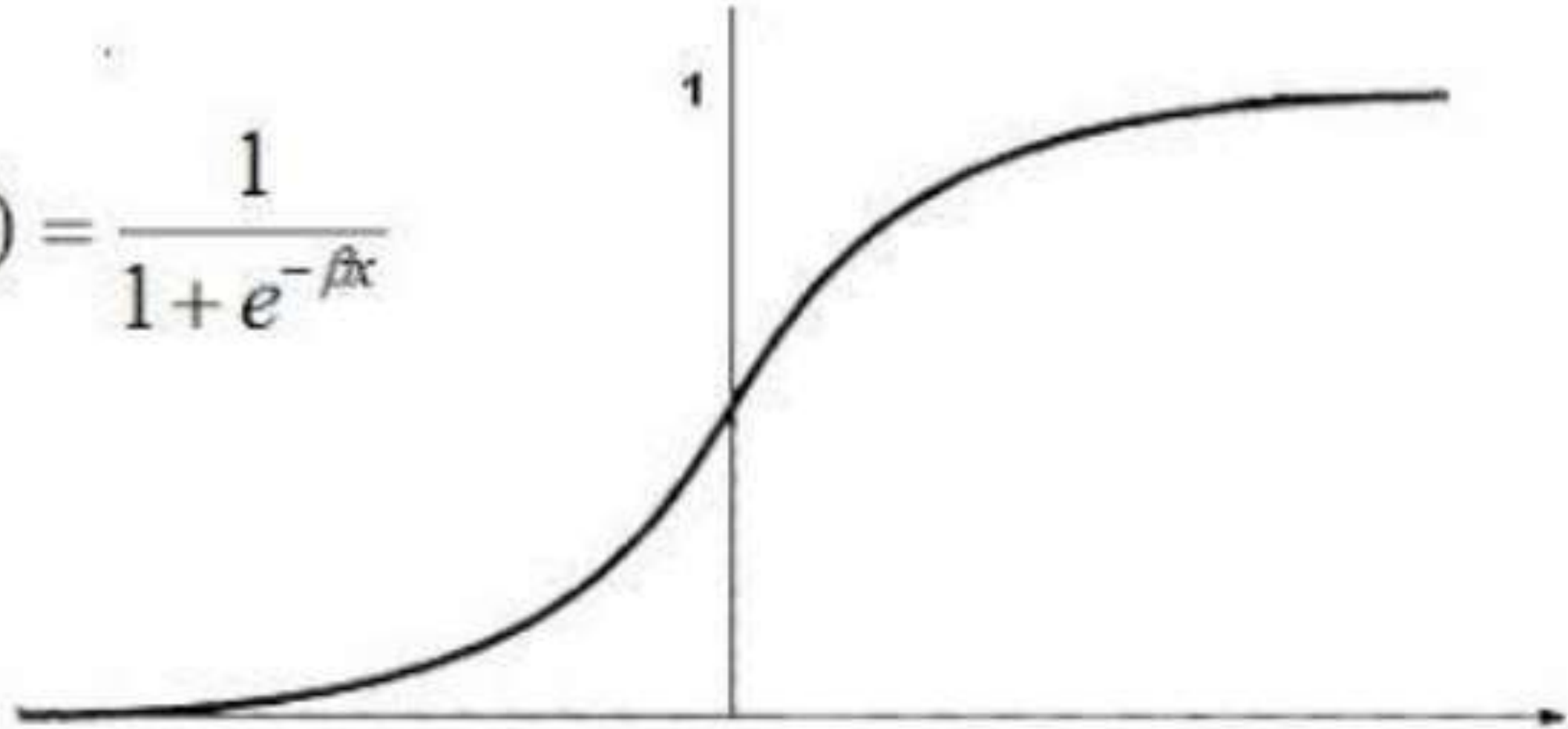


Vision Title 3



Name the below function.

$$f(x) = \frac{1}{1 + e^{-\beta x}}$$



Title 3



Quiz



Neuron is equivalent to

- a) Node
- b) Weight
- c) Bias
- d) Activation function

Vision Tit 2

Vision Title 3



THANK YOU !!!
HAPPINESS ISN'T OUTSIDE,
ITS WITHIN