Basic Concept of Neurons

1. Introduction

In the context of a neural network, a neuron is the most fundamental unit of processing. It's also called a perceptron. A neural network is based on the way a human brain works. So, we can say that it simulates the way the biological neurons signal to one another.

In this tutorial, we'll study the neuron from both the biological context and the artificial neural network context.

2. Neural Network Terminology

Typically, from the biological perspective, we find neurons as part of the central nervous system and the human brain.

Apart from the living world, in the realm of Computer Science's Artificial Neural Networks, a neuron is a collection of a set of inputs, a set of weights, and an activation function. It translates these inputs into a single output. Another layer of neurons picks this output as its input and this goes on and on. In essence, we can say that each neuron is a mathematical function that closely simulates the functioning of a biological neuron.

The following figure shows a typical neural network:

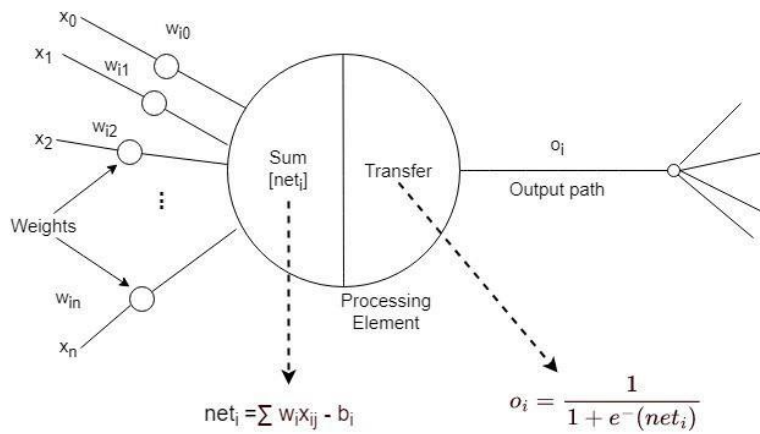**19CST302&Neural Networks and Deep Learning**
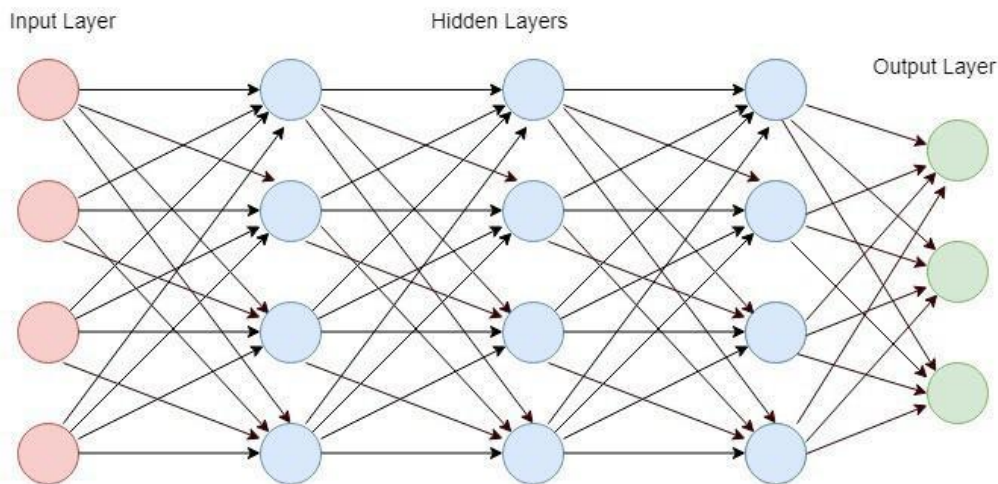
3. Understanding Neurons

With this background, we now move on to study both the biological neuron and artificial neuron in greater depth.

3.2. Neuron in an Artificial Neural Network

After going through the biological neuron, let's move to the artificial neuron.

An artificial neuron or neural node is a mathematical model. In most cases, it computes the weighted average of its input and then applies a bias to it. Post that, it passes this resultant term through an activation function. This activation function is a nonlinear function such as the sigmoid function that accepts a linear input and gives a nonlinear output.

The following figure shows a typical artificial neuron:

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$$net_i = \sum w_i x_{ij} - b_i$$

$$o_i = \frac{1}{1 + e^{-(net_i)}}$$

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