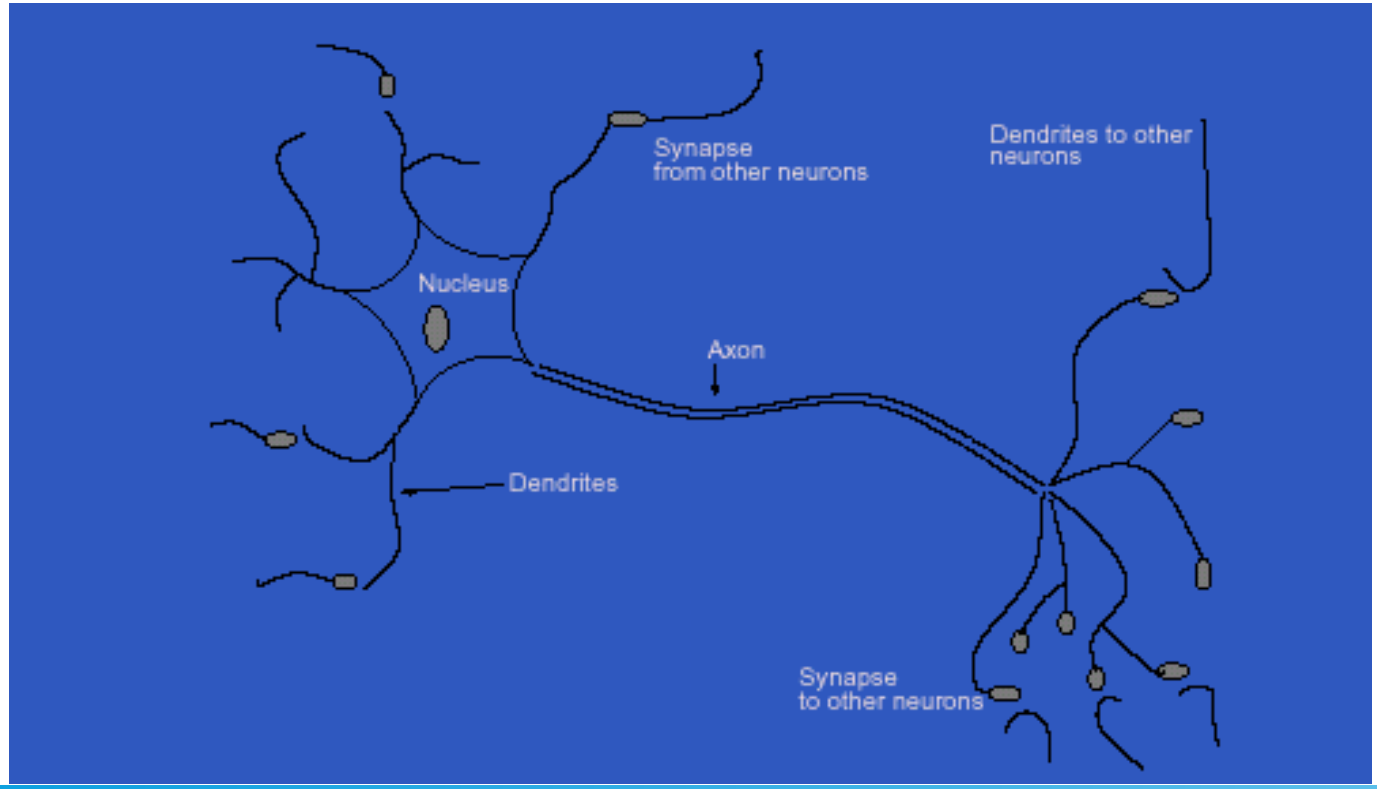
Artificial Neural Network

The idea of ANNs..?

- NNs learn relationship between cause and effect or organize large volumes of data into orderly and informative patterns.
- Neural network: information processing paradigm inspired by biological nervous systems, such as our brain
- Structure: large number of highly interconnected processing elements (neurons) working together Like people, they learn from experience (by example)

- ANN acquires a large collection of units that are interconnected in some pattern to allow communication between the units. These units, also referred to as nodes or neurons, are simple processors which operate in parallel.
- Every neuron is connected with other neuron through a connection link. Each connection link is associated with a weight that has information about the input signal.

Inspiration from Neurobiology



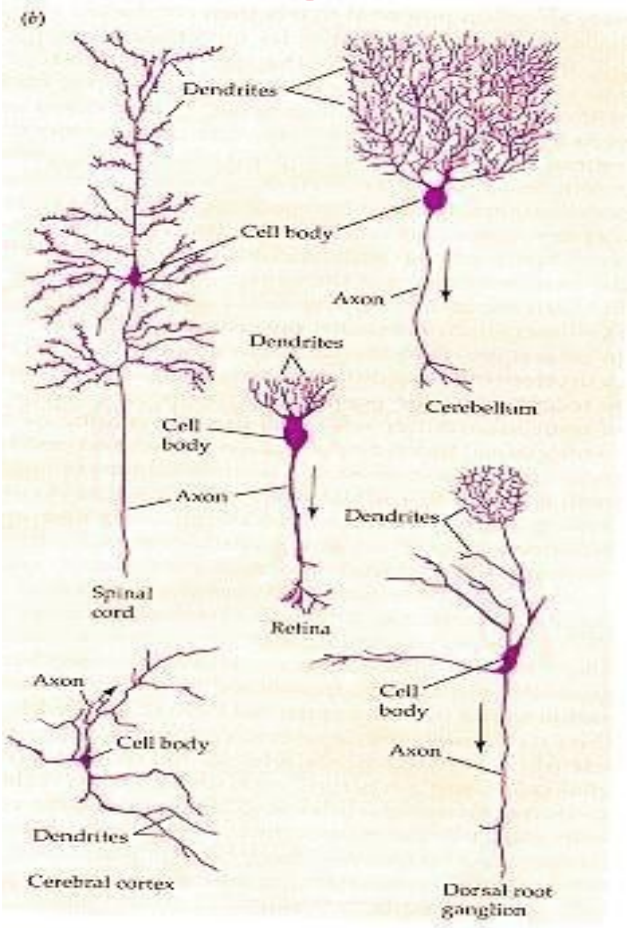
Biological neuron

- Biological neuron has three types of main components; dendrites, soma (or cell body) and axon.
- Dendrites receives signals from other neurons.
- The soma, sums the incoming signals. When sufficient input is received, the cell fires; that is it transmit a signal over its axon to other cells.

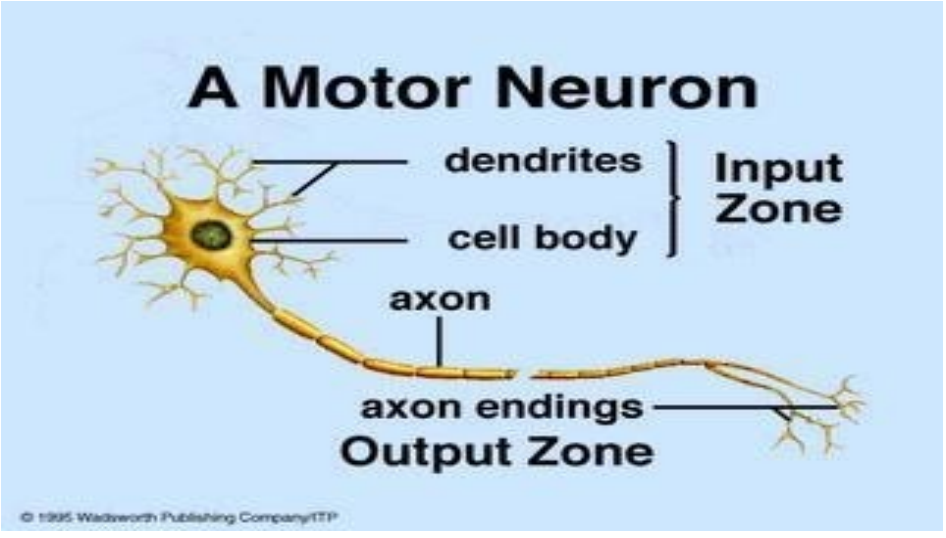
Working of a Biological Neuron

- Dendrites − They are tree-like branches, responsible for receiving the information from other neurons it is connected to. In other sense, we can say that they are like the ears of neuron.
- Soma − It is the cell body of the neuron and is responsible for processing of information, they have received from dendrites.
- Axon − It is just like a cable through which neurons send the information.
- Synapses − It is the connection between the axon and other neuron dendrites.

Biological Neural Networks



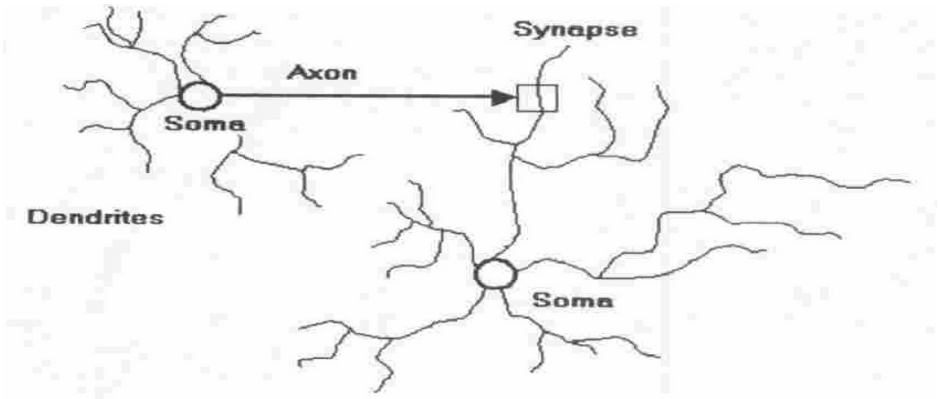
Biological neuron



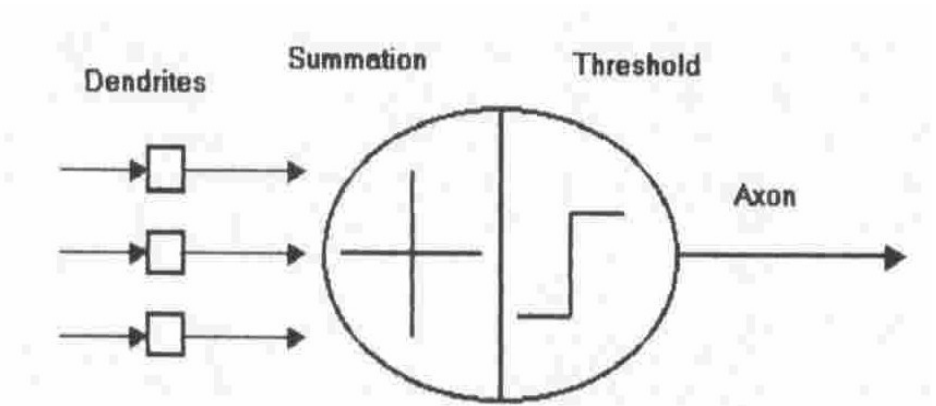
Biological neuron

Biological Neural Network	Artificial Neural Network ANN
Soma	Node
Dendrites	Input
Synapse	Weights or Interconnections
Axon	Output

Artificial Neuron



Four basic components of a human biological neuron



The components of a basic artificial neuron

ANN is an information processing system that has certain performance characteristics in common with biological nets.

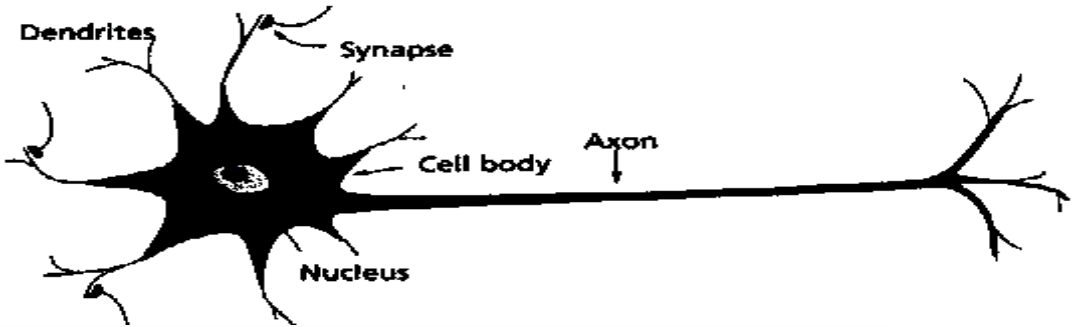
Several key features of the processing elements of ANN are suggested by the properties of biological neurons:

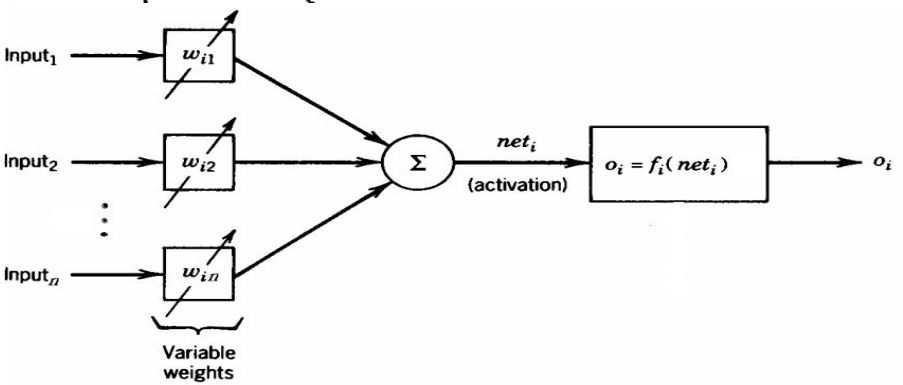
1. The processing element receives many signals.
2. Signals may be modified by a weight at the receiving synapse.
3. The processing element sums the weighted inputs.
4. Under appropriate circumstances (sufficient input), the neuron transmits a single output.
5. The output from a particular neuron may go to many other neurons

Artificial Neurons

- From experience: examples / training data
- Strength of connection between the neurons is stored as a weight- value of the specific connection.
- Learning the solution to a problem = changing the connection weights

A physical neuron





An artificial neuron

Model Of A Neuron

Input units (dendrite)

Connection weights (synapse)

Summing function

computation (soma)

(axon)

A neural net consists of a large number of simple processing elements called neurons, units, cells or nodes.

Each neuron is connected to other neurons by means of directed communication links, each with associated weight.

The weight represent information being used by the net to solve a problem.

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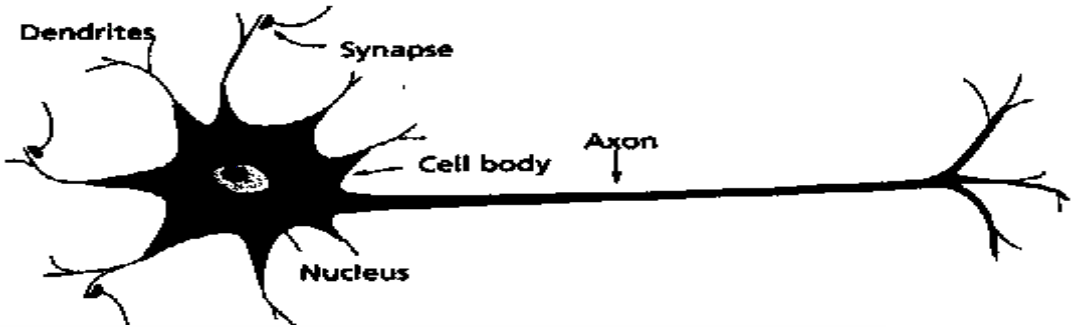
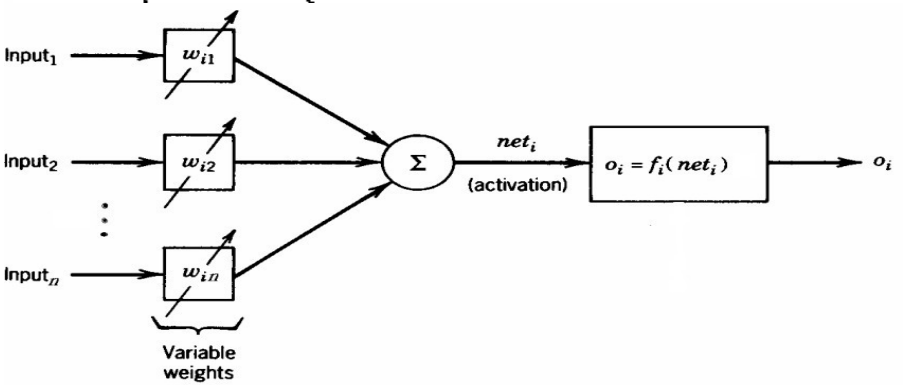
A physical neuron





An artificial neuron