# ARTIFICIAL NEURAL NETWORK

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# DEFINITION

Artificial neural network is a computing system made up of a number of simple, highly interconnected processing elements, which process information by their dynamic state response to external inputs.

It is composed of a large number of highly interconnected processing elements (neurones) working in unison to solve specific problems.

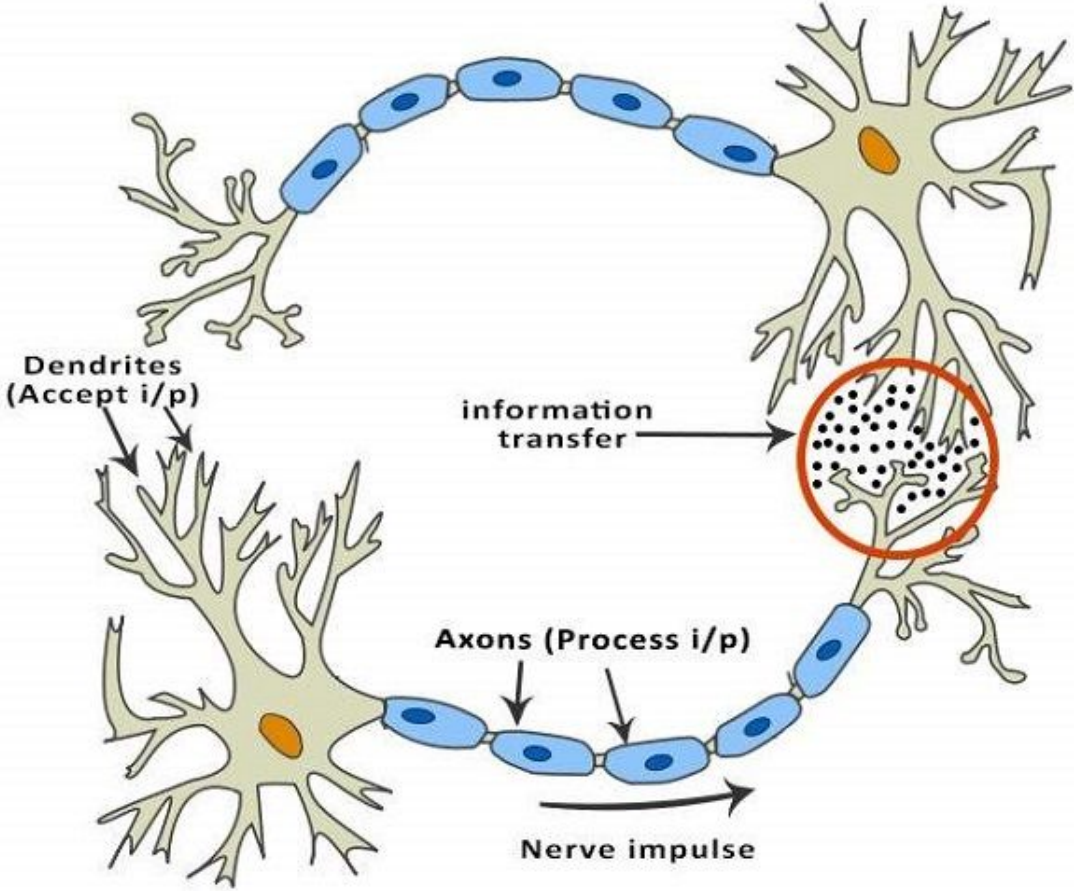
Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse. This expert can then be used to provide projections given new situations of interest and answer "what if" questions.

# Advantages

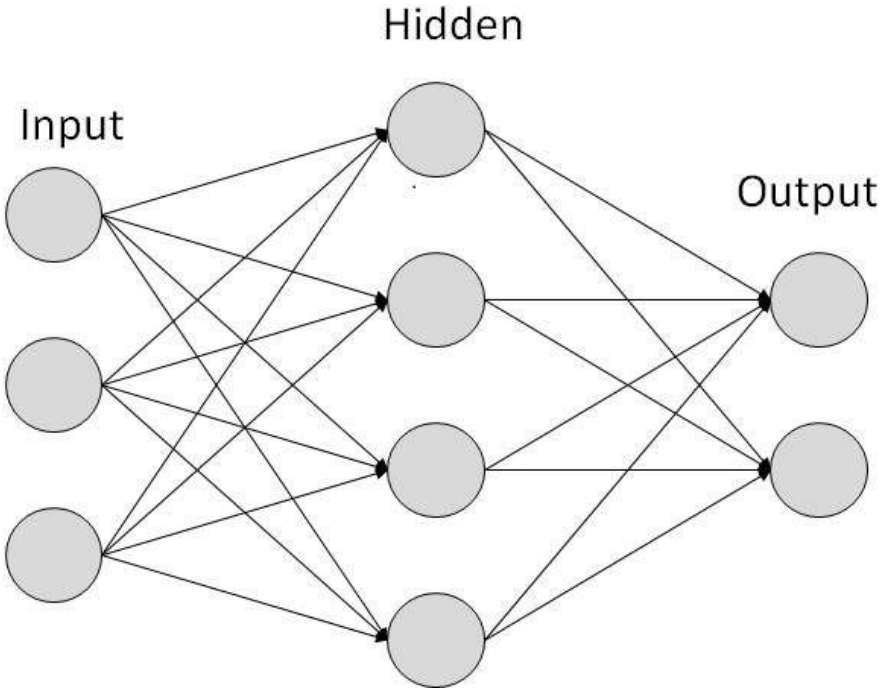
1. Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.
2. Self-Organisation: An ANN can create its own organisation or representation of the information it receives during learning time.
3. Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.
4. Fault Tolerance via Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

# Difference between human brain and artificial neural network(ANN)

| HUMAN BRAIN | ANN |
| --- | --- |
| The human brain is composed of 86 billion nerve cells called **neurons**. | ANNs are composed of multiple **nodes**, which imitate biological **neurons** of human brain. |
| Neurons are connected to other thousand cells by **Axons**. | The neurons are connected by links and they interact with each other. |
| Stimuli from external environment or inputs from sensory organs are accepted by dendrites. | The nodes can take input data and perform simple operations on the data. |
| These inputs create electric impulses, which quickly travel through the neural network. A neuron can then send the message to other neuron to handle the issue or does not send it forward. | The result of these operations is passed to other neurons. The output at each node is called its **activation** or **node value**. |




**BASIC STRUCTURE OF NEURONS IN A HUMAN BRAIN**




## BASIC STRUCTURE OF ANN

In the topology diagrams shown, each arrow represents a connection between two neurons and indicates the pathway for the flow of information. Each connection has a weight, an integer number that controls the signal between the two neurons.

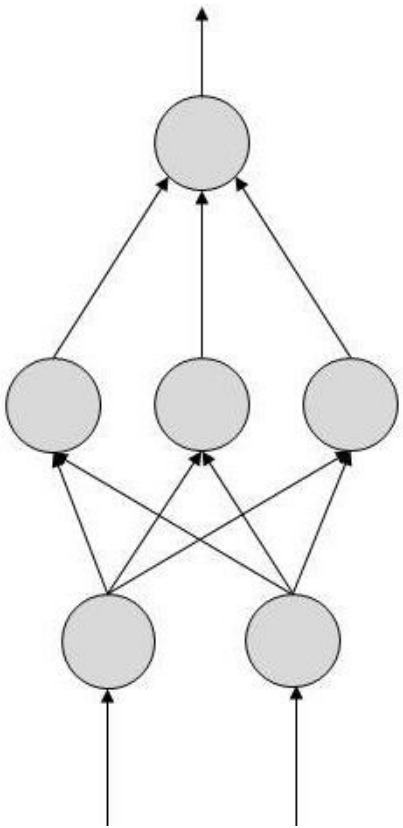
If the network generates a "good or desired" output, there is no need to adjust the weights. However, if the network generates a "poor or undesired" output or an error, then the system alters the weights in order to improve subsequent results.

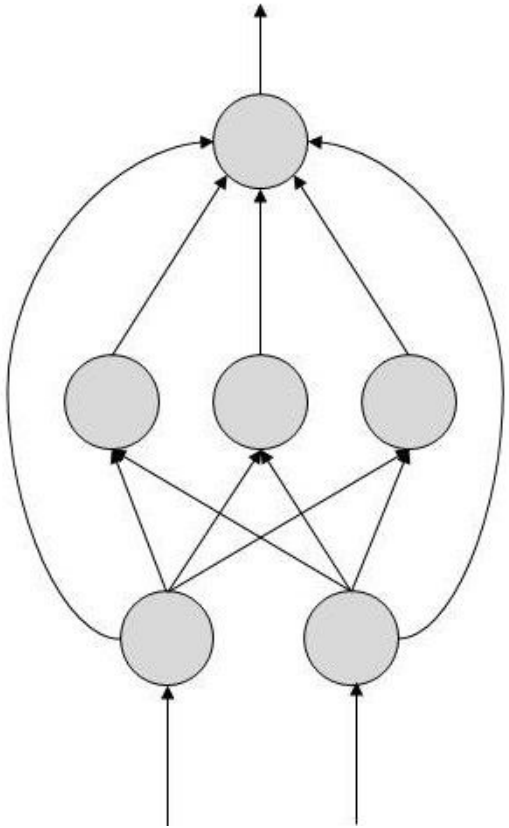
# TYPES OF NEURAL NETWORKS

- FEEDFORWARD ANN
- FEEDBACK ANN

**FeedForward ANN**

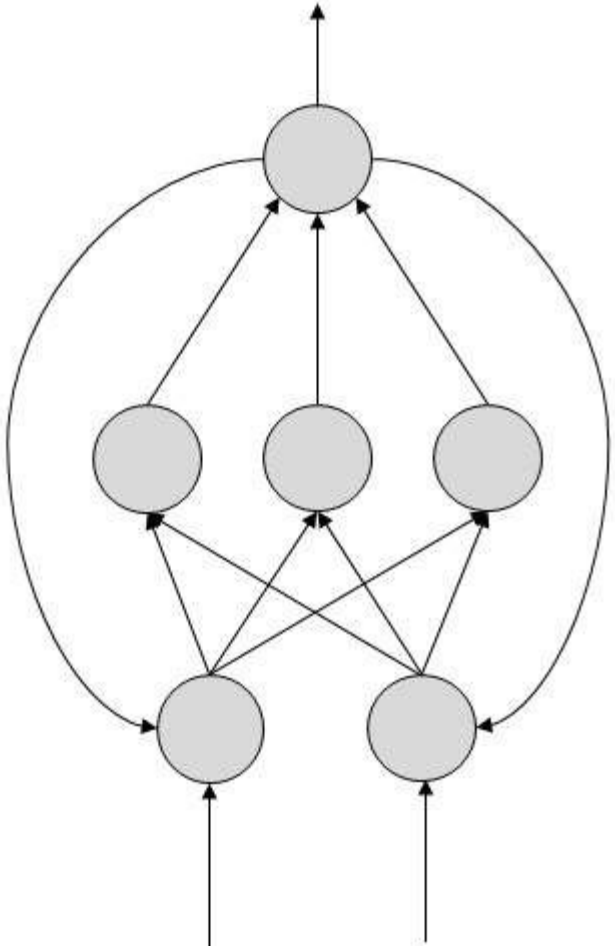
The information flow is unidirectional. A unit sends information to other unit from which it does not receive any information. There are no feedback loops. They are used in pattern generation/recognition/classification. They have fixed inputs and outputs.





**FeedBack ANN**

Here, feedback loops are allowed. They are used in content addressable memories.



# USES OF ANN:

- Computer Vision
- Speech Recognition
- Machine Translation
- Social network filtering
- Playing board and video games
- Medical diagnosis

# THANK YOU