**Neural Network:**

Neural networks take a different strategy to problem solving than that of conventional computers. conventional computer utilize an algorithmic methodology i.e. the computer use a set of command in order to solve a problem. We need to provide set of instruction with steps that the computer needs to follow are known the computer cannot solve the problem**. That restricts the problem solving capability of conventional computers to problems that we already understand and know how to solve. But computers would be so much more useful if they could do things that we don't exactly know how to do.**

Neural network is a classiﬁer modeled after how the human brain works, which is very diﬀerent from how one usually writes computer code. A human brain contains an enormous amount of nerve cells, neurons. Each of these cells are connected to many other similar cells, creating a very complex network of signal transmission. Each cell collects inputs from all other neural cells it is connected to, and if it reaches a certain threshold, it signals to all the cells it is connected to. Neural network cannot be programmed to perform a specific task. In neural network example information must be selected carefully otherwise useful time is wasted or even worse the network might be functioning incorrectly. It is not easy to recognize if it faulty system or not , unless an error occurs.

The building block of a neural net is the neuron. An artificial neuron works similarly the natural one does. In artificial neuron network accept many inputs having multiple weights and has one output which depends on the inputs. As per biological point of view neuron can either 'fire' or not 'fire'(When a neuron fires, it outputs a pulse signal of a few hundred Hz). In an artificial neuron 'firing' is normally represented by a logical one and nor 'firing' by a logical zero.

*"****Definition:****Neural computing is the study of networks of adaptable nodes which, through a process of learning from task examples, store experiential knowledge and make it available for use."   
Aleksander, I. and Morton, H.*

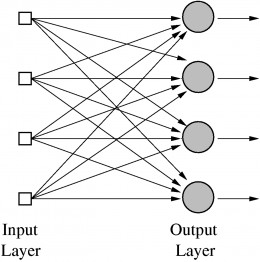
**Modal of Neurons:**

|  |  |
| --- | --- |
| **C:\Users\Ravi\Desktop\Neuron1.jpg** | **C:\Users\Ravi\Desktop\neuronmodel.jpg** |

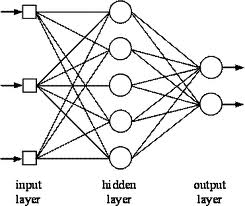
In the human brain, a typical neuron received signals from others through a host of fine structures called *dendrites***.** The neuron transfer signals of electrical activity through a long**,** this is process calls as an *axon*,which divide into thousands of branches**.** At the end of each branch,this form called a *synapse*transfer the recreation from the axon into electrical effects that inhibit or excite activity in the linked neurons.

**Neural Network Architecture:**

* Single layer feed forward network.
  + Learning in feed-forward networks use for supervised learning, in which pairs of input and output values are supply into the network for many loop, so that the network trained the interconnection between the input and output.
* Multilayer Feed Forward Network
  + **Back propagation** is a method used in artificial neural networks to calculate a gradient that is needed in the calculation of the weights to be used in the network
  + Self Organizing Map(Unsupervised Learning)



**Single Layer feed forward network**

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**Multilayer feed forward network**

Input layer-It contains those units (Artificial neurons) which get contribution from the outside world on which system will learn, perceive about or generally process.

Output layer — It contains units that react to the data about how it’s learned any task.

Hidden layer**—**These layers are in between input and output layers**.** The main objective of hidden layer is to transfer the input into something that output unit can use and analysing.

Neural networks are fully connected when every node in hidden layer is fully connected to the every node in its previous layer(input) and to the next layer (output) layer.

Neural network are for the most part utilized in pattern recognition because of their capability to generalise and to respond to unexpected inputs/patterns**.** During training, neurons are leant to analysis different specific patterns and whether to fire or not when that pattern is received**.** If a pattern is accepted during the implement time that is not related with an output**,** the neuron chooses the output that corresponds to the pattern from the set of patterns that it has been taught of, that is least different from the input. It is called generalisation**.**For example:   
A 4-input neuron is trained to execute when the input is 1111 and not to execute when the input is 0000**.** After the generalisation rule created the neuron will also execute when the input is 0111, 1011, 1101, 1110 or 1111 but will not execute when the input is 0000, 0001, 0010, 0100 or 1000**.** For other inputs (like 0011) will generate a random result since they are equally distant from 0000 and 1111   
Most complex pattern recognition can be reached by using a network of neurons hence the name neural networks.The systems regularly utilized for pattern recognition are called feed forward because they have no feedback. They simply relation with inputs and outputs.Now day Neural networks successfully implemented in speech, language, and image recognition**.** Of course, pattern recognition has been successfully implemented using conventional computers programming , but creating the software is take long time and the system will generally have a slower output.

Pattern recreation is much more harder tasks and something that on conventional computers is very difficult to do.For pattern recreation feed-forward networks are not enough.Feedback is require to create a dynamic system that will generate the specific pattern.The output of each node is connected to the input of the adjacent nodes.This is called auto-associative networks.

Neural networks and conventional algorithmic computers are not in match but complement each other**. There are tasks are more suited to an algorithmic approach like arithmetic operations and tasks that are more suited to neural networks. Even more, a large number of tasks, require systems that use a combination of the two approaches (normally a conventional computer is used to supervise the neural network) in order to perform at maximum efficiency.**

***Neural networks do not perform miracles. But if used sensibly they can produce some amazing results.***

**References:**  
1. An introduction to neural computing. Aleksander, I. and Morton, H. 2nd edition   
2. Developments in autonomous vehicle navigation. Stefan Neuber, Jos Nijhuis, Lambert Spaanenburg. Institut fur Mikroelektronik Stuttgart, Allmandring 30A, 7000 Stuttgart-80

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