

Neural Networks

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Neural Network (also called 'artificial neural networks or simulated neural networks) is an algorithm that try to mimic the brain.

It have been widely used in 80s and early 90s, its popularity diminisced in late 90s, but recently is again widely popular and used in many applications.

suitable areas of application

ANNs are often used to classify and cluster data at a high velocity. i.e. speech recognition or image recognition.

The most famous example is Google's search algorithm .

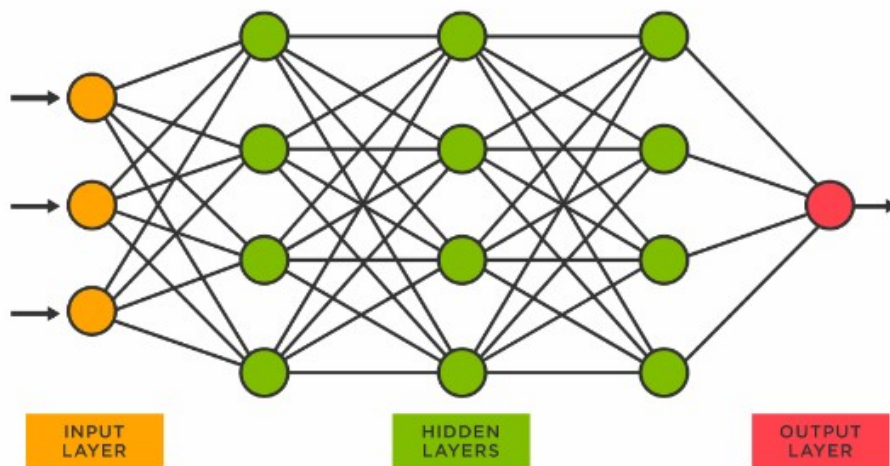
How does (ANNs) works

Essentially they are composed by node layers containing an input layer, one or more hidden layers, and an output layer.

each node simulate an artificial neuron, it has a weight and a threshold and it is connected to the nodes of the next layer.

If the output of any specific node is higher than the threshold value, than it send data to the next node.

We can think of each individual node as its own linear regression model, composed of input data, weights, a threshold and an output.



All inputs are then multiplied by their respective weights and then summed. Then, the output is passed through an activation function, which determines the output.

$$g(w_1x_1 + w_2x_2 + \dots + w_ix_i + threshold)$$

if

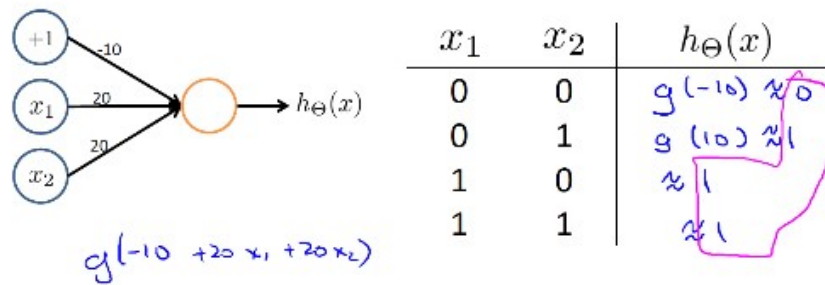
$$\sum_i w_ix_i > threshold$$

, then the node is activated and the information pass.

For example:

Code

Example: OR function



Strengths

- Use large datasets
- Non-linear and flexible
- Fast

Weaknesses

- they can learn from training data, so they require a huge amount of data
- they can become too complex
- high computational requirements