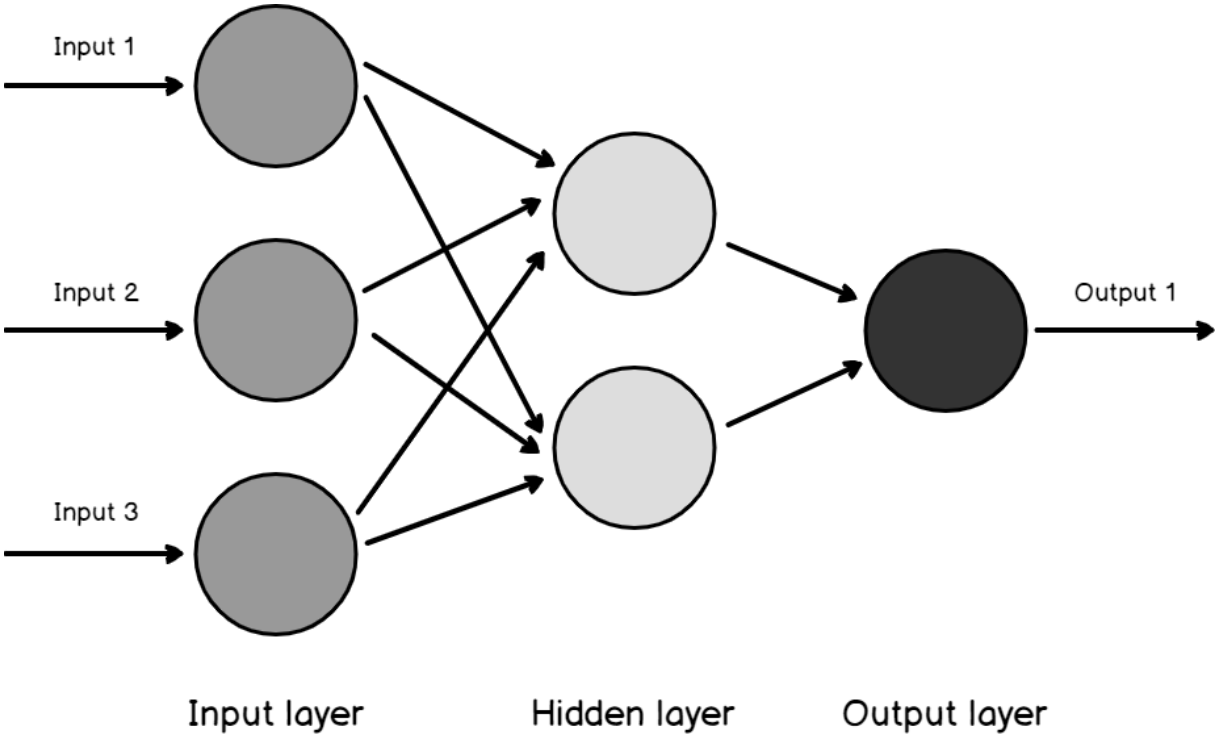
The basics of neural networks

Artificial neural networks are inspired by the neural networks in the human/animal brain.
Simple architecture:



Input layer with 3 nodes.
Hidden layer with 2nodes.
Output layer with 1 node.

The arrows indicate the direction of the information flow.
The points in the input layer are passive, these points do not change the input information.
The points in the input layer are assigned a single value and duplicate these values to their multiple output.
The points in the hidden and output layer are active, these points do change the information.

The points in the input layer therefore contain the data that must be evaluated, for example the stock prices over a certain period of time.
The data from the input points is duplicated to **all** points in the hidden layer, this is called a full interconnection.

The data that enters the hidden layer is first multiplied by a certain weight. These weights are values that are recorded in a program.
After that, all values are added together to one value and before this value leaves the hidden layer, it first goes through a nonlinear mathematical function called a sigmoid. This is an S-shaped curve that limits the value between 0 and 1.

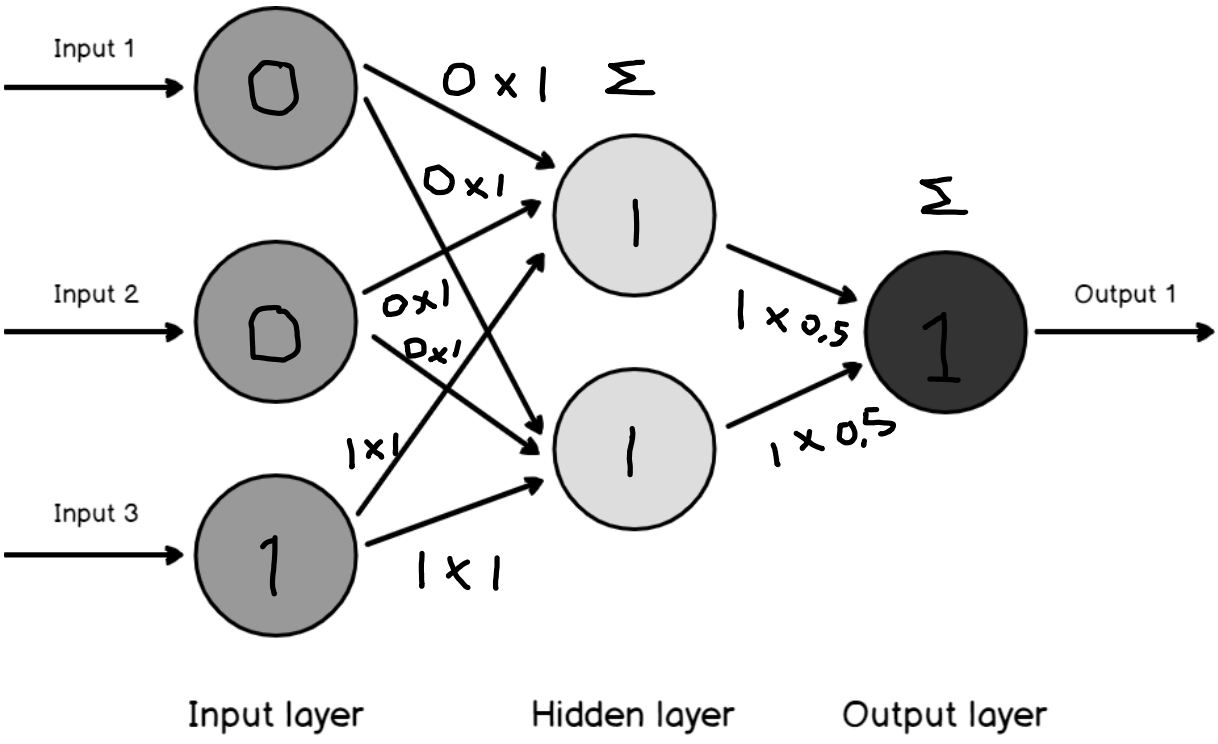
The data points of the hidden layer are again duplicated to all points in the output layer.

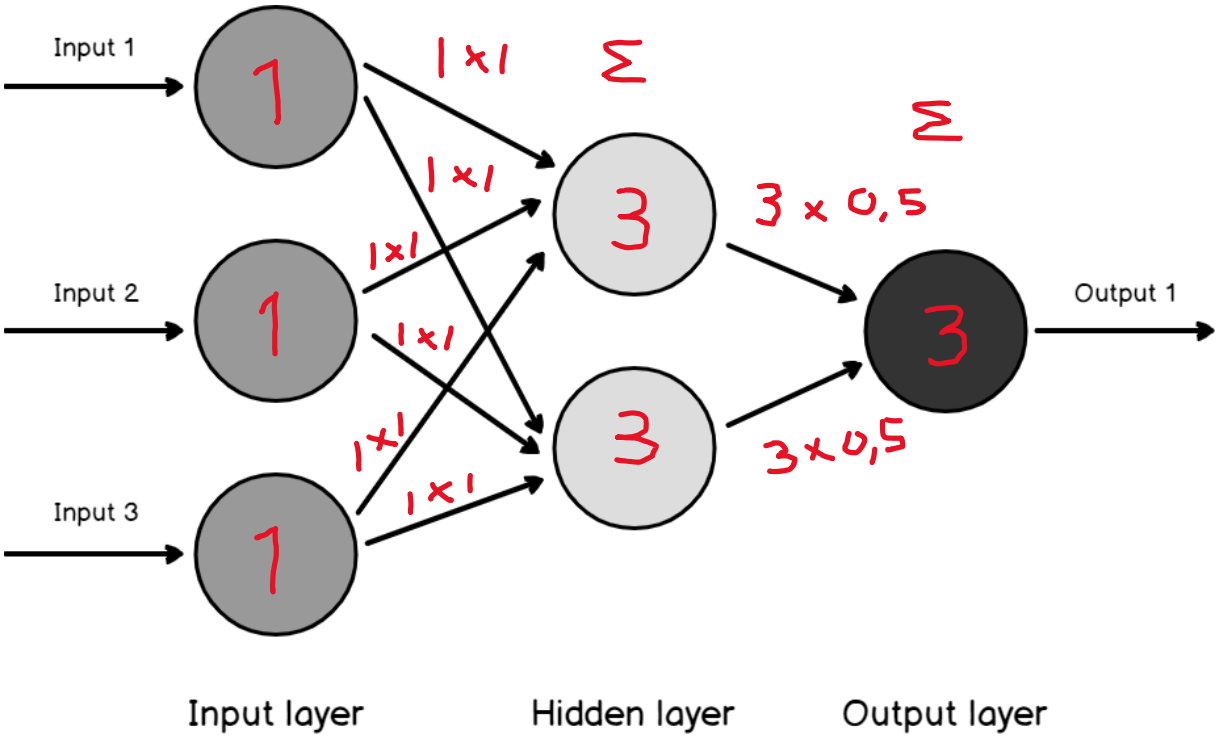
Example (without sigmoid):
Suppose that the input in an input node can be a 1 (true) or a 0 (not true) then there are 2^3 = 8 possible inputs.
001 / 010 / 100 / 011 / 101 / 110 / 000 / 111

Suppose the output should show how many 1's there are in the input so there are 4 different outputs (0, 1, 2, 3) possible.

The question then is what values should we assign to the different layers?

In this simple example, without calculation, we can see for ourselves that we can multiply the information from the input layer by a weight of 1 and multiply the information from the hidden layer by a weight of 0.5 (there are other weights possible).





No rules, no algorithms, no procedures but the relationship between the input and output is determined only by the chosen weights.