

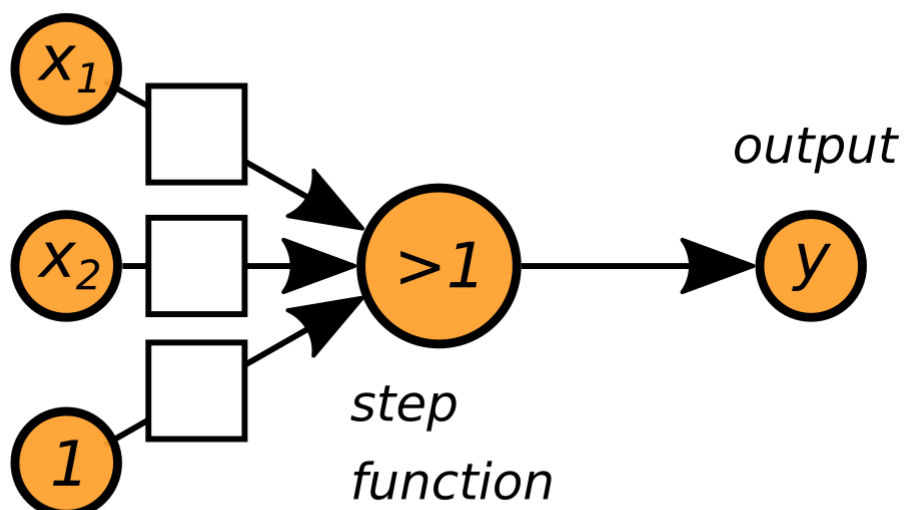
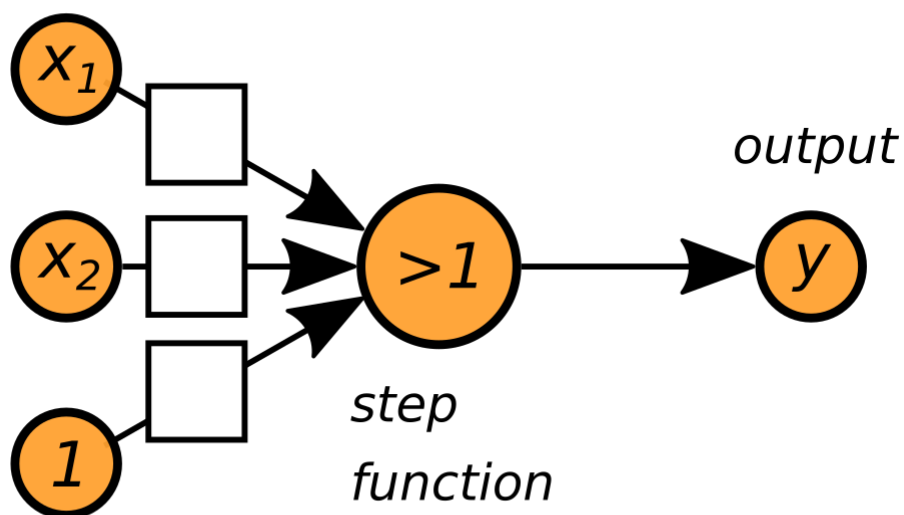
Artificial Neural Networks

In this exercise, we will build a pen-and-paper neural network for two datasets:

Logical AND		
x1	x2	output
0	0	0
0	1	0
1	0	0
1	1	1

Logical OR		
x1	x2	output
0	0	0
0	1	1
1	0	1
1	1	1

Your task is to set the weights in the two networks (for AND and OR) in such a way that it gives the correct result for all four data points. As an activation function we use the **step function**: it returns 1 if the weighted sum of the inputs is larger than 1.

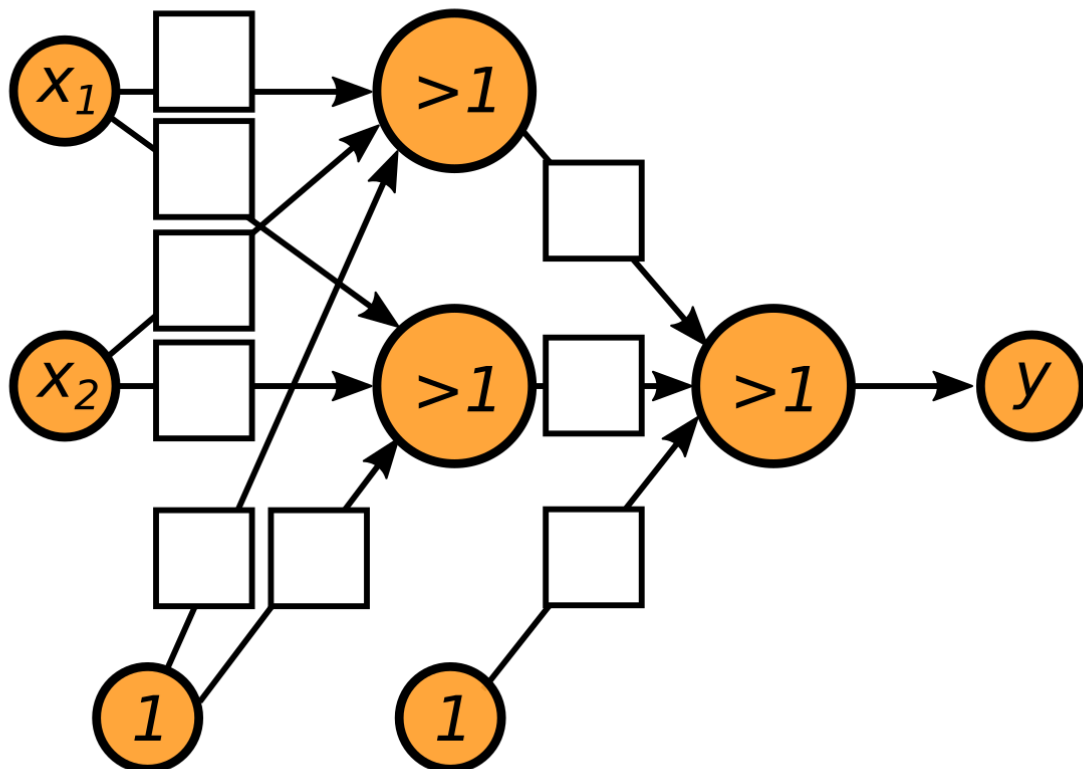


Feed-Forward-Network

Now let's try something more complicated: The XOR function, a nonlinear function.

Logical XOR		
x1	x2	output
0	0	0
0	1	1
1	0	1
1	1	0

To model this dataset we need a neural network with two layers. You will need to set the weights for all three neurons.



Hint: The XOR function can be expressed as:

$$\text{XOR}(x_1, x_2) = \text{OR}(\text{AND}(x_1, -x_2), \text{AND}(-x_1, x_2))$$