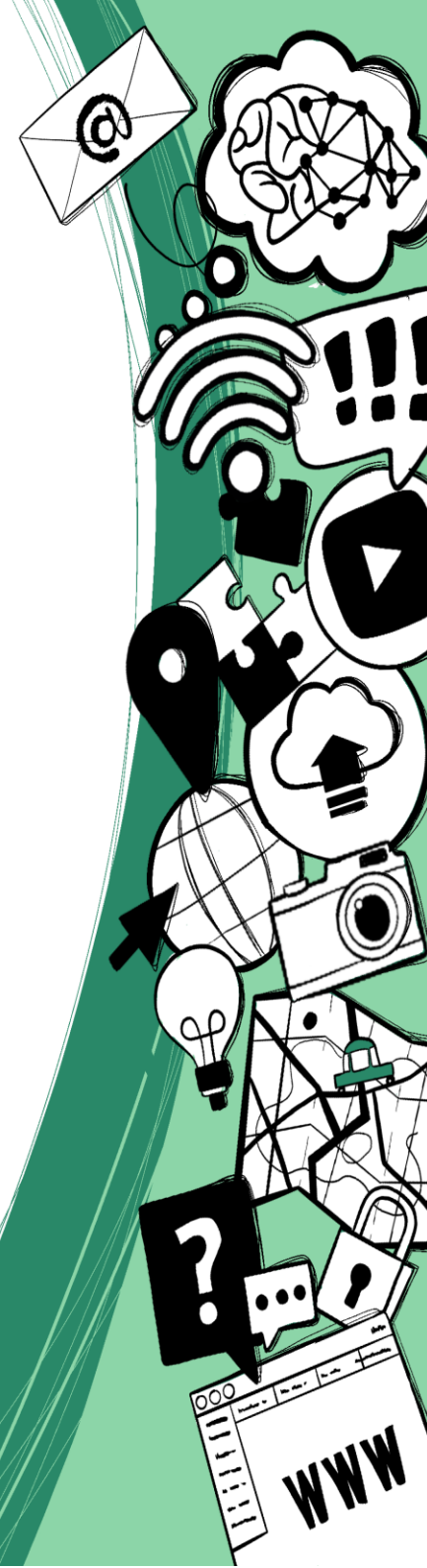


Neuronal Networks III

practical Example

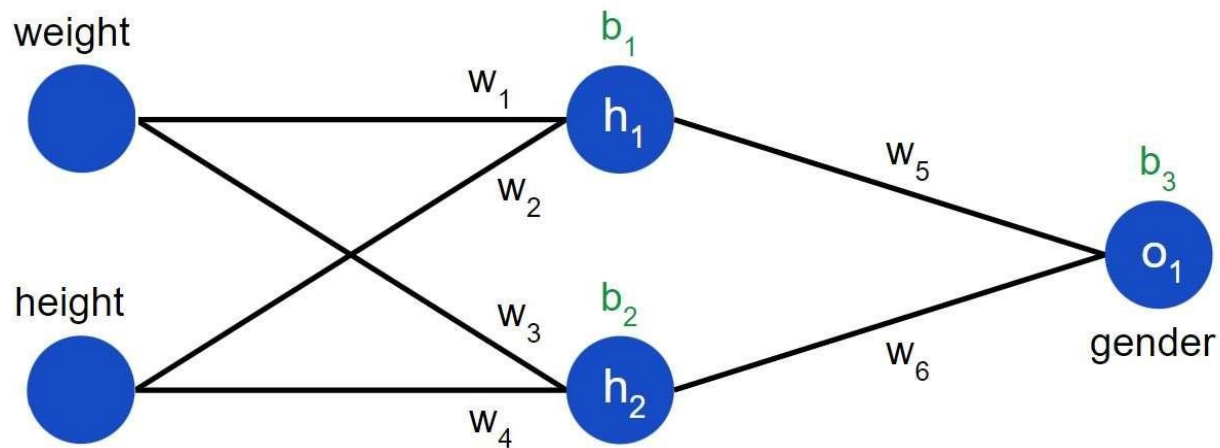




We want to deepen what we have learned so far and do the calculations for a neural network manually.

For this we use a very simple network and at the same time show the application of a non-graphic task.





This network consists of only 5 neurons.

- 2 input neuron
- 2 neurons in a hidden layer
- 1 output neuron

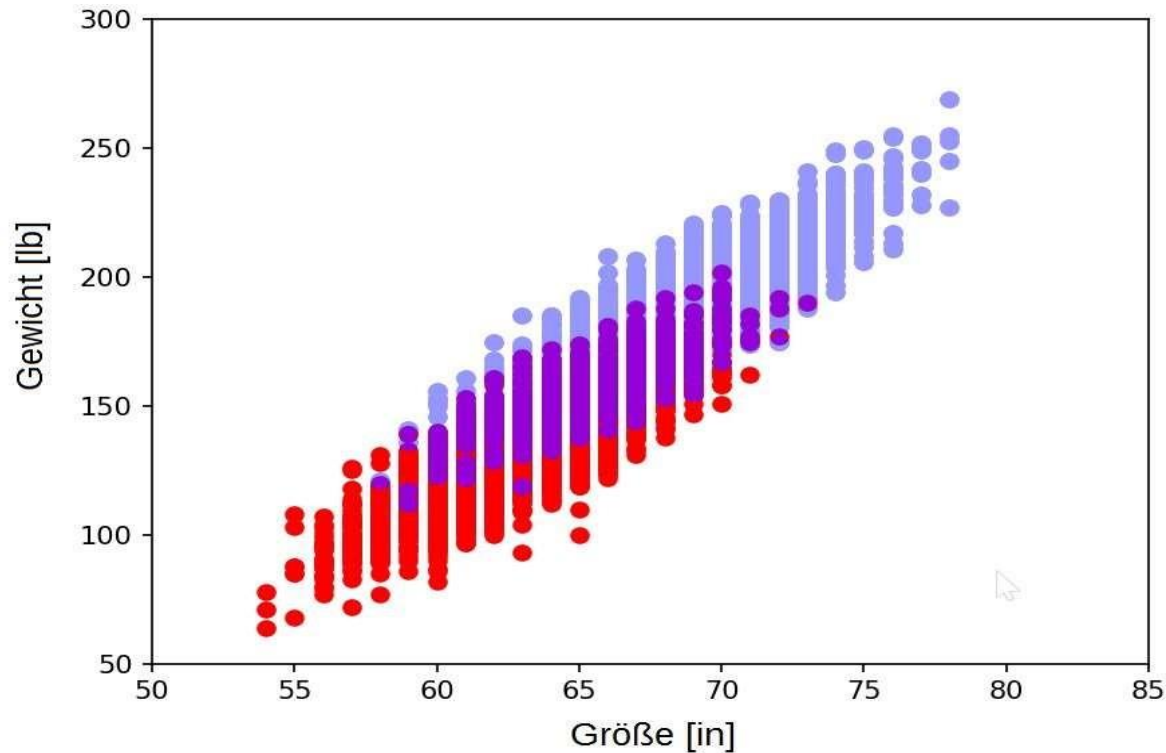
The network should read a person's

- weight [kg] and
- height [cm]

into the two input neurons.



The output neuron should give the likelihood that the corresponding person is female.
Is that even possible?

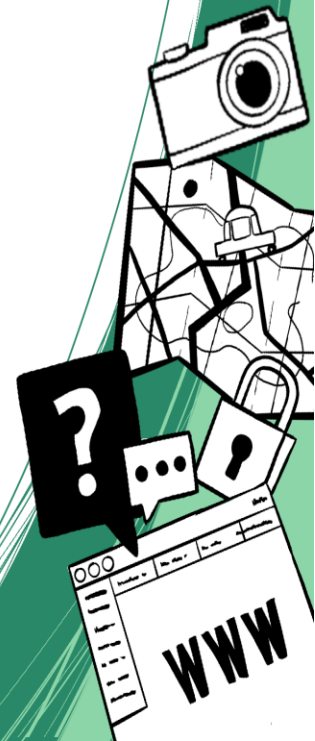


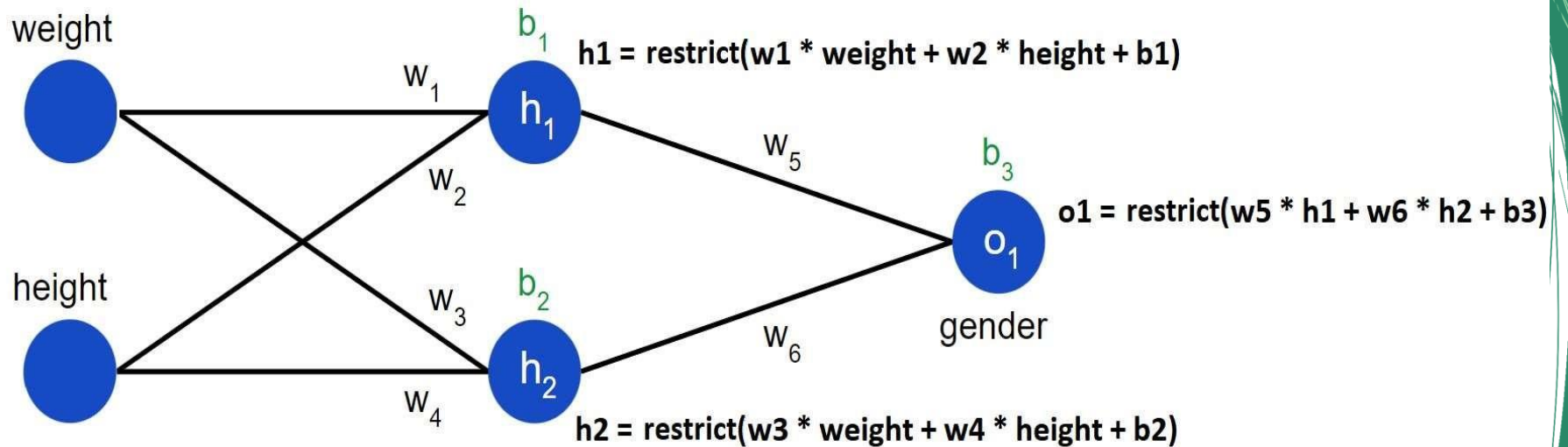
Yes, at least partially. The graph above shows the distribution of weight a height from a list of 500 random people.



We do see an overlap area in which no good predictions will be possible, principle, if it is only a question of probabilities, a certain prediction can be made. The network should indicate in the output layer whether a woman or a man is suspected.

- Values close to 1 should indicate a woman
- Values close to 0 man
- Values around 0.5 are intended to show an indeterminate result





- h_1 and h_2 are the activations of the 2 inner (hidden) neurons
- o_1 is the output value
- w_1 - w_6 are the weights
- b_1 - b_3 are the biases

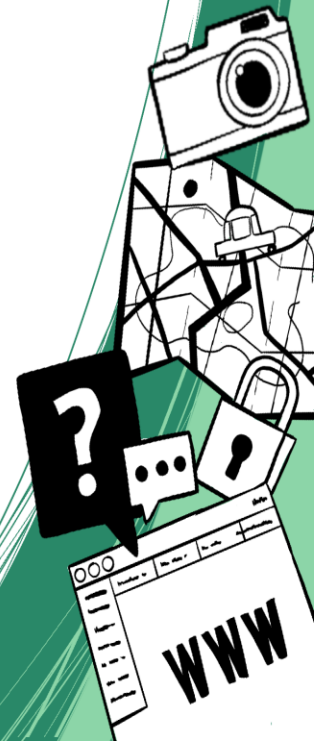
h_1 , h_2 and o_1 are calculated as shown above.





We use the "restrict()" function so that the values in the nodes are always in the interval $[-1, 1]$.

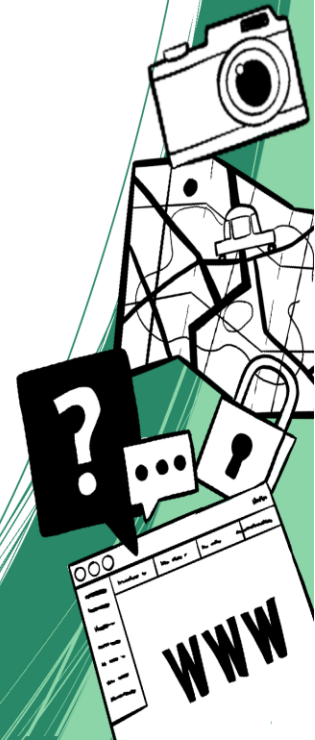
Otherwise the activations could increase too much. Values that are already between 0 and 1 are hardly changed or not changed at all, values that are too large or too small are compressed so that they fall within the desired limits.





Advanced content, training of the network: training.pptx

In the simulator (see index.html in the folder simulator) you can try out the response of the network yourself for different inputs.



Links

Machine Learning for Beginners, an Introduction to Neural Networks: <https://towardsdatascience.com/machine-learning-forbeginners-an-introduction-to-neural-networksd49f22d238f9>

Like above on the author's page:
<https://victorzhou.com/blog/intro-to-neu-networks/>

Source of weight data:
<https://www.kaggle.com/>

VC

Python program of this network: [simple_nn.py](#)
Another version with "leaky ReLU" instead of sigmoid:
[simple_nn_leaky_relu.py](#)

