

Sprachverarbeitung: Übung

SoSe 24

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For this exercise, you need to both submit manual calculations as well as Python code. Please submit two files in Ilias, one a PDF with your calculations and one a file containing your Python code (either Jupyter Notebook or Python script). You can also combine both files into a zip-archive and submit only the archive. You can either solve the calculations by hand on a sheet of paper, scan it and submit as a PDF file or use the capabilities to write mathematical equations of tools like MS Word / LibreOffice / LaTeX, etc. to write down your calculations digitally.

Exercise 1.

Given is a Neural Network with one hidden layer and the following weights (see also Figure 1):

$$W_1 = \begin{bmatrix} 0.8 & -0.7 & 0.4 & -0.3 \\ 0.3 & 0.1 & -0.3 & 0.1 \\ -0.2 & -0.3 & 0.5 & 0.9 \end{bmatrix} W_2 = [0.3 \quad 0.6 \quad 0.2] \quad (1)$$

Given are two input vectors x_1 and x_2 :

$$x_1 = [-0.5 \quad 0.8 \quad 1 \quad 0.2] \quad x_2 = [0.5 \quad 0 \quad 1 \quad -1] \quad (2)$$

Calculate the output of the neural network y for both input vectors by calculating the dot product of each input vector with the weights of each neuron of the hidden layer (W_1) and afterwards the dot product of the hidden layer values with the weights of W_2 . Use the sigmoid function for both the activation function of the hidden layer and the function of the output layer.

Exercise 2.

Implement a neural network with Keras and Tensorflow in Python using the `Sequential()` object. You can decide on the number of hidden layers, the number of neurons in each layer, the activation functions and the number of epochs yourself. Use the data of apartment sales given on https://lehre.idh.uni-koeln.de/site/assets/files/5151/apartments_sales.csv and split it into 75% training and 25% test sets. Use the

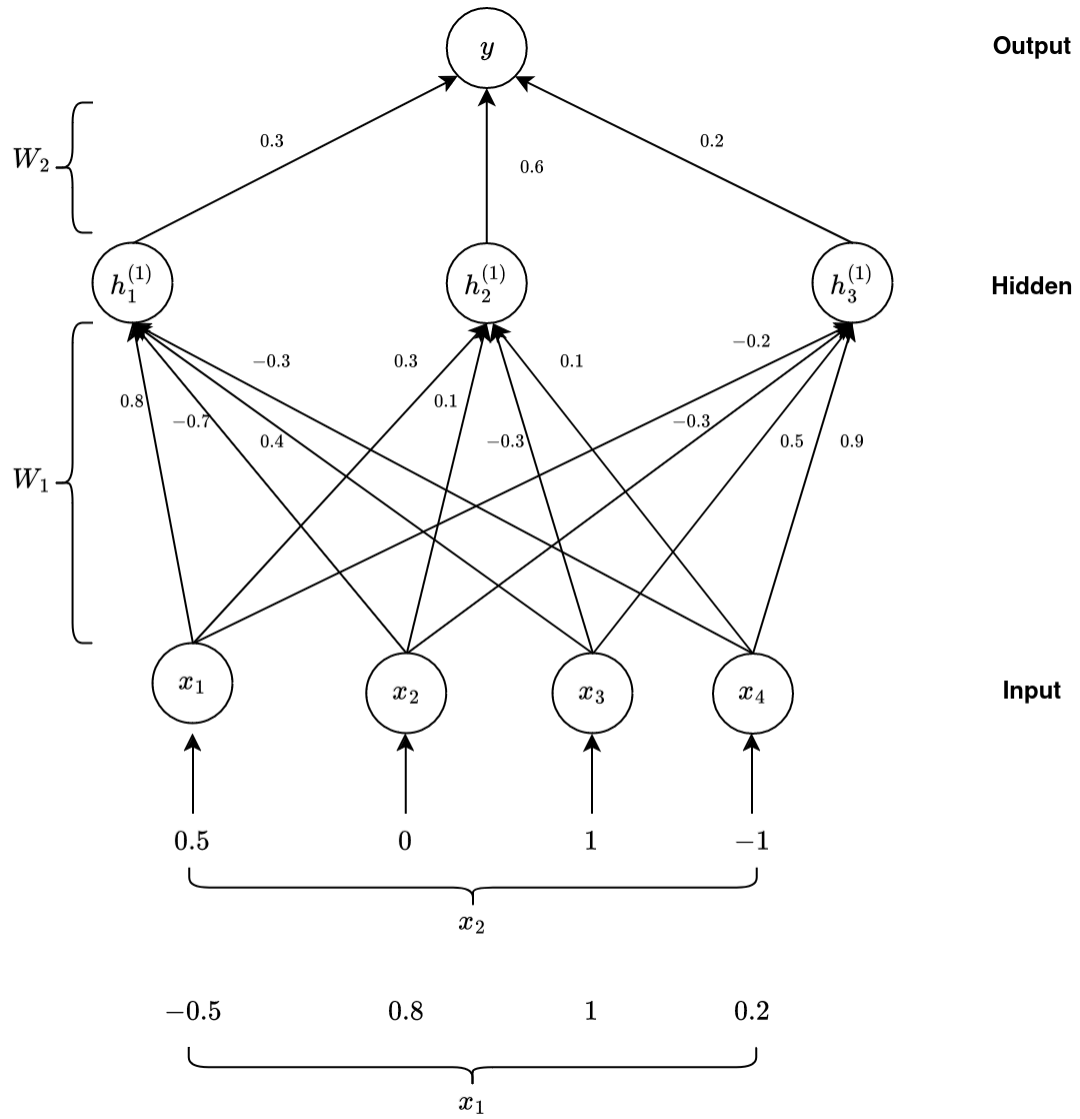


Figure 1: Neural Network

features “distance_to_city_center”, “rooms” and “size” to predict if the apartment has already been sold or not (column “sold”) Train your neural network on the train set and print the accuracy score for the test set.