

Machine Learning 2

Exercise Sheet 4

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Exercise 7: Neural Networks (10 Points)

Given is a neural network with **one** hidden layer. The network takes as input a 2-dimensional vector $x = (x_1, x_2)$ and outputs a single value \hat{y} . The number of neurons in the hidden layer is set to be two.

- a) Make a sketch of the whole network architecture. Do not forget the biases in the input and the hidden layer. To make your life a little bit easier, use different variables for the network parameters in different layers. Write down the formulas for the inputs z_1, z_2 in the hidden layer and the formula for the final prediction \hat{y} !
- b) Compute the partial derivatives of all network parameters including the bias parameters for \hat{y} being a regression value.
- c) Compute the partial derivatives of all network parameters including the bias parameters for \hat{y} being a binary value. *Hint:* This is the same as above, only in the output layer a logistic of the sum is used instead of only the sum.