

Exercise 13: Linear Network Units

Summer Term 2024

Networks that contain only linear units, is another variant of the very many existing network models. After the exercise, you will see why this network model has only educational purposes.

Review: Questions:

1. What are network layers?
2. What does the transfer function do?
3. How is the transfer function in backpropagation multi-layer perceptrons defined?
4. What is the general definition of a network unit?

To Do: Estimate the functionality of linear networks analytically. In this network model, the transfer function is defined as $f(\text{net}_i) = \text{net}_i$.

Tasks: Please, do the following tasks:

1. Define a linear network with two input units, no hidden layer, and one output unit. What is the mathematical function of this network?
2. What is changing, if you consider two output neurons?
3. Now, please add a hidden layer with two neurons. What is the resulting behavior (functionality) of the resulting network? Please, provide a mathematical description. Hint: it is sufficient to consider only one output unit.
4. What is changing, if you add further hidden layers with one or more hidden units?
5. What is the utility of linear network models?

Have fun, Theo and Ralf.