# **Exercise 15:** Quantifying a Network's Quality

Summer Term 2024

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In this exercise you should design an error function with which you can measure neural network's mapping quality. This is an essential step towards *learning*.

**Review:** Please, review the rather "indirect" way of the fitness evaluation in the "Real-World Applications" exercise.

**To Do:** For the following problems, you should design an appropriate fitness function $E(w_{ij})$, also called error function in the context of neural networks. Please, do the tasks twice, once for units with discrete output values, e.g., threshold units, and once for units with continuous output values.

**Tasks:** Please consider a neural network with

1. one output unit and one pattern to map

   $E(w_{ij}) =$

   $E(w_{ij}) =$

2. $o$ output units and one pattern to map

   $E(w_{ij}) =$

   $E(w_{ij}) =$

3. one output unit and $n$ patterns to map

   $E(w_{ij}) =$

   $E(w_{ij}) =$

4. $o$ output units and $n$ patterns to map.

   $E(w_{ij}) =$

   $E(w_{ij}) =$

**Question:**

1. Are your solution the only ones or would you have other options?
2. How would you automate the construction of threshold networks as you have done by hand in the previous exercise?

Have fun, Theo and Ralf.