ETH
Eidgenössische Technische Hochschule Zürich
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Optimization & Physics
Exercise 2

HS 07
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The goal of this exercise is to become familiar with the Cologne spin-glass server and to verify the results of your simulation.

Problem 2.1 The Cologne spin-glass server

In this exercise we want to use the Cologne spin-glass server, which was presented to you in the last lecture. Generate a file of Gaussian distributed bonds (most suitable done by a script), which can be used for the Edwards-Anderson-Ising spin glass. Make sure to use the required file format:
type: gauss
size: 3
name: example instance
1 2 -0.24456
2 3 1.345245
3 1 0.233455
...

Problem 2.2 Simulated annealing

We will now extend the Edwards-Anderson-Ising spin glass code of the last exercise by incorporating the simulated annealing method. Instead of simulating the model at a specific temperature, the system approaches the ground state via a cooling protocol. In the lecture three cooling protocols were shown.

$$\begin{aligned} T(t) &= a/(b+\log(t)) && \text{logarithmic} \\ T(t) &= a - bt && \text{linear } 0.1 \leq b \leq 0.2 \\ T(t) &= a\exp(-bt) && \text{exponential } 0.8 \leq b \leq 0.99 \end{aligned} \tag{1}$$

Choose either the linear or the exponential cooling protocol and start from different initial spin configuration. Compare your results with the data provided by the Cologne spin-glass server. Do you obtain the same groundstate spin configuration? In addition, you can run your simulation a 1000 times and measure how often you reach the groundstate.