Computational Statistical Physics

Exercise sheet 02

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Exercise 1.   Ising model: Finite size scaling analysis

Goal: In numerical simulations we are only able to tackle relatively small system sizes whereas real physical systems are usually much larger. Finite size scaling analysis *is a technique which allows us to get good approximations for the thermodynamic limit.*

Task 1: Use your program of the first exercise sheet to perform simulations of the 3D Ising system for different system sizes to determine the critical exponents γ and ν .

Hint: Use the finite size scaling relation of the magnetic susceptibility and the fact that the critical temperature is given by $T_c \approx 4.51$.

You might find the following points useful:

- You can get a first estimate for the ratio γ/ν by plotting $\chi_{\max}$ as a function of the system size.

- Vary γ/ν and $1/\nu$ until you get the best possible data collapse. Judge the quality of the data collapse "by eye".

Task 2 (OPTIONAL): Repeat the same process for the specific heat.