Markings and Notes

This documents explains how many marks you get for each exercise and if required why. If you have questions about these feel free to ask during the tutorial or via mail to s6marode@uni-bonn.de

Exercise 2.1

It is often better to use a random initialization (called hot start) as it takes less time to equilibrate. But your initialization method is also valid.

Exercise 2.1.1: Modification to 2D

Correct.

Points (2/2)

Exercise 2.1.2: Metropolis Accept/Reject

Correct.

Points (6/6)

Exercise 2.1.3: Update Procedure

A sweep is defined such that you touch every single site of the lattice. So just running over Λ iterations of random sites does not suffice the exercise. (-2P)

Regardless, in general it is a valid update strategy.

Points (0/2)

=> Points (8/10)

Exercise 2.2

Correct.

Points (1/1)

Exercise 2.3

Correct.

Points (1/1)

Exercise 2.4

Correct. A few words on what happens at the phase transition would have been nice.

Points (1/1)

Exercise 2.5

You have all the functions for getting an `plt.errorbar` plot, why are you not plotting the error of the magnetization? Otherwise, correct.

Points (2/2)

Exercise 2.6

Again no errorbars.

You should do this for multiple system sizes Λ. (-1P)

Otherwise, this is correct.

Points (1/2)

Exercise 2.7

Again no errorbars.

You should do this for multiple system sizes Λ. (-1P)

Unfortunately, I am missing a few words about the physical significance of this plot. (-1P) The important points here are that as one increase N the discontinuity becomes sharper (actually a real discontinuity). The absolute magnetization can be used as an order parameter to estimate the critical coupling.

The magnetization without the absolute value should be identical zero by symmetry of the system.

$$\mathcal{H}_{J,h=0}(s) = \mathcal{H}_{J,h=0}(-s)$$

However, when you do a simulation you will have a hard time seeing this behaviour because the algorithm will be trapped in one of the cases. To overcome this, multiple starting conditions and multiple random number states would be required and averaged, which in turn needs some more sophisticated data analysis. (-0.5P)

Points (0.5/3)

Exercise 2.8 (Extra)

Points Extra (0/4)

Summary

Overall you did a good job!

Points (14.5/20+4) (72.5%)