

9. Finite Temperature 2-d Ising Model

Present your solutions to the following problems using latex, if you have figures make sure they are publication quality, include your code in the solutions. Print your pdf files and bring them to class.

1. Solve the 2-d Ising model at finite temperature using the heat bath algorithm. Set units so that $H = -\sum_{\langle ij \rangle} \sigma_i^z \sigma_j^z$. Use periodic boundary conditions, estimate the errors in your results, and carefully assess thermalization and autocorrelation.

(i) Plot the magnetization vs. sweep for $kT = 2.0$ and $kT = 2.5$. Try different initial conditions (like all spins up and random spins). Place the curves on one plot. Comment on what you see.

(ii) Measure the magnetization vs kT and obtain an accurate estimate of the Curie temperature.

(iii) Measure the spin-spin correlation function for $kT = 2.0$, $kT = 2.5$, and $kT = kT_c$. Try to fit the functions.