

Computational Physics II

Homework 3

Submission: November 18 (Monday), 2019

Correlation function for Ising model (10 points)

- Write a program to calculate the correlation function for a few configurations (Take $L = 128$ and quench it to $0.6T_c$) that you have obtained for the 2D non-conserved order parameter Ising model simulation in HW1. Use the following formula to calculate the correlation function:

$$C(r, t) = \langle \psi(\vec{0}, t) \psi(\vec{r}, t) \rangle - \langle \psi(\vec{0}, t) \rangle \langle \psi(\vec{r}, t) \rangle \quad (1)$$

where ψ is a space and time dependent order parameter and $r = |\vec{r}|$. $\langle .. \rangle$ denotes spatial averaging.

- Plot $C(r, t)$ vs r for those 5 times to show that its decay becomes slower as the system approaches towards ferromagnetic phase. (*maximum value of r is $L/2$.*)
- Extract the domain lengths from the decay of the correlation function (say $C(\ell, t) = 0.5$) for a few different times and plot them as a function of t in a double-log plot. Plot a line for the expected t^α growth.