11. Z(2) Lattice Gauge Theory.

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 (3+1)-d Z(2) lattice gauge theory. The partition function is

$$Z = \sum_{\{U\}} \mathrm{e}^{-\beta \sum_P U_P}$$

with the plaquette defined in terms of link variables $U(x, \hat{m}u) = \pm 1$. Sum over distinct plaquettes only. Use periodic boundary conditions and the heat bath algorithm. Track errors and think about thermalization and autocorrelation.

(i) Plot the average plaquette vs. sweep for $\beta = 0.6$ and $\beta = 1.0$.

(ii) Plot the average plaquette for $\beta = 0 \rightarrow 1.2$. An interesting way to do this is to slowly heat the system by stepping in β after a certain number of sweeps (and *not* rethermalizing). Try cooling the system as well and place both curves on the same plot. Discuss your results.

(ii) Plot the average Polyakov loop over the same range of β.