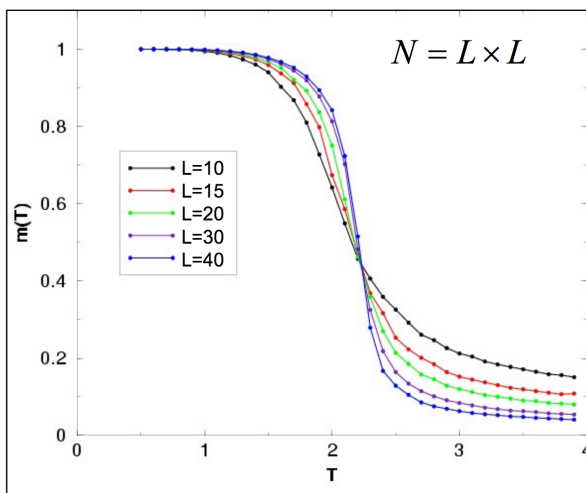
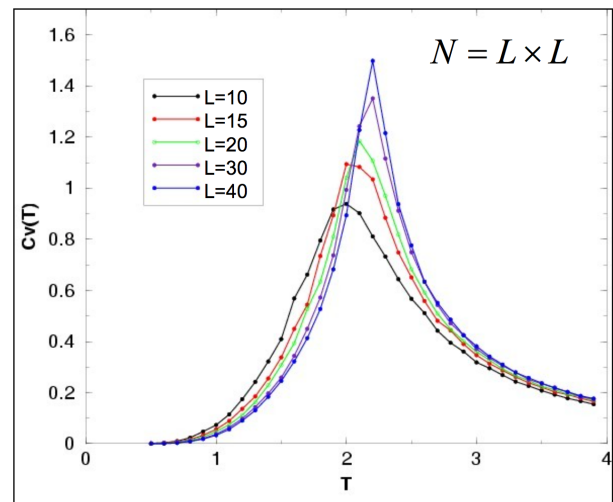


Assignment #3: Monte Carlo Simulation, Estimating Pi (sampling examples), Ising model simulation



The order parameter $m(T)$ as a function of T for different system sizes



Specific heat $C_v(T)$ as a function of T for various system sizes

Understanding Sampling, Ising Model for magnetization

Simulation Methods course

Fall 2019

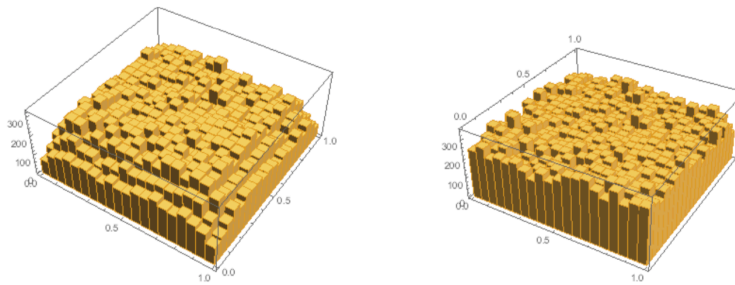
Writing the Simulation

On the webpage I give you a code for the sampling and the Ising model. You can use these codes to generate the histograms for the distribution of points for the pi estimation problem.

Pi estimation problem

- estimate Pi using the direct sampling method show results for different N points in the sample (I go up to 100,000,000)
- estimate Pi using the Markov chain sampling method with BAD REJECTION
- estimate Pi using the Markov chain sampling method with GOOD REJECTION

Show me the histogram of the sample points for the latter 2 cases



(something like this)

Ising model simulation

I give you a code for the Ising model simulation that runs at a fixed temperature.

If you want to rewrite the whole simulation, you should write the simulation in C/ C++ or something low level (a language that compiles) so that you can control it better (what happens with the cpu and memory usage). High level languages are not used in simulation because of the performance is more important than the ease of coding. Do not use Java or some high level language, or Matlab to write the simulation itself. You can use these tools or whichever tool you like to plot the results of the simulation. I give you a plot tool that uses OpenGL.

What you need to present:

- you ran the code for the Ising model and you obtained the curves we showed for M , E , χ (magnetic susceptibility) and c_v (specific heat). Run for a set of temperature points (at least 15-20 points around T_c) and 3 different system sizes (100x100 is what I set up you can run for smaller 50x50 and larger 150x150 for example)
- I want to see the curves you obtain for the Ising model + maybe some videos at low T , close to T_c and high T
- I will ask the code to see if you understood it