Material for Week 8

Physics 4488/6562: Statistical Mechanics

https://sethna.lassp.cornell.edu/Teaching/562/

Exercises due Mon. Mar 20

Last correction at December 22, 2022, 2:09 pm

On Wednesday, you will be running simulations during class. They should run on laptops, tablets, or smart phones.

Monday
In-class question: 7.24 *Is sound a quasiparticle?*
Wednesday
Read: Chapter 8, Sec. (8.1) (The Ising model)
Pre-class question: 8.16 *Ising hard disks*
In-class question: 8.1 *The Ising model*
In-class question: 8.17 *Ising parallel updates*
Friday
Read: Chapter 8, Sec. 8.2 (Markov Chains)
Pre-class question: 8.3 *Coin flips and Markov*
In-class question: 8.5 *Detailed balance*
Monday
Read: Chapter 8, Sec. 8.3 (What is a Phase? Perturbation theory)
Pre-class question: 8.18 *Ising low temperature expansion*

Exercises for everyone

8.20 *Unicycle.*

Select one (4488) or two (6562)

7.16 *White dwarfs, neutron stars, and black holes.* (Astrophysics, Quantum) Cold stars don't collapse because they are made of fermions – until they get too massive

7.26 *Entanglement of two spins.* (Quantum, Computation) Entanglement with an unobservable state increases entropy.

8.2 *Ising fluctuations and susceptibilities.* (Computation) Using Bierbaum's "ising.js" simulation to test predictions for the relation between fluctuations and susceptibilities in the Ising model.

8.4 *Red and green bacteria.* (Mathematics, Biology) Try analyzing the extinction rate, this time with Markov chains.

7.27 *Heisenberg entanglement.* Computing entanglement and testing the eigenstate thermalization hypothesis. Hints at https://sethna.lassp.cornell.edu/StatMech/EOPCHintsAndMaterials.html