Major concepts in Leonard Susskind's Statistical Mechanics

Lecture 1   2   3   4   5   6   7   8   9   10

Boltzmann-Gibbs Distribution
(distribution of energy levels)

Exact/ Inexact, curl

Basic Probability

Total heat to change state is path dependent

Boltzmann Constant

Derivation of Boltzmann dist From total probability and energy.

Entropy (**S**) & Information

Hamiltonian: System energy description e.g. kinetic + potential

Temperature **T**

Partition Function **z** (sum of counts at all energy levels)

"-1st Law": Conservation of Information (Liouville's Thm.)

Boltzmann Distribution Of Harmonic Oscillator

Energy as derivative of partition function

Phase space

Quantum Mechanical Harmonic Oscillator

0th Law: Thermal equilibrium "transitive"

Entropy in terms of average energy and partition function

Entropy: - property of system - what you know about system

1st law: Energy is conserv

Ideal Gas Partition Function

Chaotic system can fill phase space = maximum entropy

2nd Law: Entropy increases

Pressure of Ideal Gas

Poincare recurrence & Reversibility

Temperature, Equilibrium

Helmholz Free Energy

Ising Model

Adiabatic: "slowly", No heat added, Reversible, Stable energy levels

Stirling's Approximation Of Factorial

Phase Transition

Theorem relating Change in energy, entropy, volume

Lagrange Multipliers

Liquid-Gas Transition In Ising Model

Fluctuations (Variance)

How to find z, partition function:
- find Hamiltonian (energy equation)
- integrate over dp, dx of E
        - (position. momentum)
- plug in to $z = \int e^{-\beta E_i}$

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