

In the name of God

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OPTIMIZATION METHODS IN PHYSICS

Exercise Set 10

(Due Date: 1400/10/30)

1. Hamiltonian Monte Carlo method for data modeling: Using file which is called *fitinput.txt* and consider $y_{theory} = ax^H$ compute a , H and their errors using HMC method. Compare your results computed by MCMC method.

2. Write a MCMC program to compute $\langle E \rangle$, $\langle |M| \rangle$, C_V and χ as a function of temperature for a 2d Ising model with

$$\mathcal{H} = -J \sum_{\langle ij \rangle} S_i S_j$$

suppose you have 400 atoms and $k_B = J = 1$ and for $T \in [1 - 4]$ with $\Delta T = 0.1$.

3. For above , consider an external magnetic field as $B_{ext} = +1$, now compute $\langle E \rangle$, $\langle |M| \rangle$, C_V and χ as a function of temperature,

Good luck, Movahed
