

In the name of God

Department of Physics  
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SELECTED TOPICS COURSE

Exercise Set 5

1. Data modeling: to achieve a proper data modeling approach, list various essential tasks to do.
2. Chi-square: What are necessary and sufficient conditions to enable us to write the  $\chi^2$  as follows:

$$\chi^2 \equiv \sum_{i=1} \frac{[y(x_i) - Y(x_i, \Theta)]^2}{\sigma_i^2}$$

3. Fitting formula: Using file which is called *dataexp2.txt* and consider  $y_{theory} = ax^H$  compute  $a$ ,  $H$  and their errors using MCMC method.
4. Hamiltonian Monte Carlo method for data modeling: Using file which is called *dataexp2.txt* and consider  $y_{theory} = ax^H$  compute  $a$ ,  $H$  and their errors using HMC method.
5. Microcanonical Hamiltonian Monte Carlo method for data modeling for  $q = 2$ : Using file which is called *dataexp2.txt* and consider  $y_{theory} = ax^H$  compute  $a$ ,  $H$  and their errors using Microcanonical HMC method. Compare your results with that obtained by HMC.

Good luck, Movahed

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