In the name of God

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COMPUTATIONAL PHYSICS

Exercise Set 2

(Date Due: 1393/07/10)

1. Error analysis and propagation: Using the input file, write a bash file with proper program file to do following tasks:

A : Read input data file which contains more than 10^6 one-column data. and spilt it to 100 input files.
B : Making directories and send each previous data set to corresponding directory.
C : Compute mean, variance and mean standard deviation of each data sets. And write them in a file which contains the label of data, mean, standard deviation and mean standard deviation. Finally plot them.
D : Compute $C(i,j) = \frac{1}{N^2}\sum_l \sum_k (x_l^{(i)} - \langle x\rangle^{(i)})(x_k^{(j)} - \langle x\rangle^{(j)})$. Make a matrix and plot it as a density plot.
E : Compute $p_i(x)$ as a function of x for each sets.
F : Compute $\sigma_m(p(x))$. Plot $p(x)$ versus x and show its error-bar for 5 sets of data.
G : Compute $C_i(\tau) = \langle x(t+\tau)x(t)\rangle$ for series and plot it for 5 sets of data.
H : Compute $p(x(i), x(j))$ and compare it with each one-point probability density function by determining $\Delta(\tau) = |p(x(t+\tau), x(t)) - p(x(t+\tau))p(x(t))|$. For 5 arbitrary sets plot $\Delta(\tau)$ as a function of τ. Explain your results.

2. Fitting formula: Using file which is called *fitinput.txt* and consider $y_{theory} = ax^H$ compute a, H and their errors.

Good luck, Movahed