Assignment III.

Bootstrap and Jackknife

due: December 6, 2017
problem 1  PHYS 139/239

(A) Create the visible data set with 100 data, like on the left plot, from the Gamma distribution \( \text{Gamma}(4,1) \). Your sampling will look different. Also create the histogram of the invisible Gamma distribution on the right side plot. Your distribution will look different. Calculate the mean and the variance of the data and compare with the analytic values.

Visible side (sample):

Hidden side (population):

These happen to be drawn from a Gamma distribution.
(B) Compare the mean and the error of the ratio $x^2/x^4$ you obtained accurately with large sampling on the “invisible” right side of the sampling and compare with jackknife sampling of the visible 100 data.

Visible side (sample):

Hidden side (population):

These happen to be drawn from a Gamma distribution.
Calculate the mean and the error of the ratio $x^2/x^4$ accurately with large sampling on the “invisible” right side of the sampling and compare with bootstrap sampling of the visible 100 data.
problem 3  PHYS 239

Jackknife and bootstrap analysis with the superposition of two normal distributions for the ratio $x^2/x^4$:

$$F(x) = 0.3 \cdot N(\mu=1,\sigma=2) + 0.7 \cdot N(\mu=4,\sigma=1).$$

Your distribution is expected to be similar to the plot.
We measure in an experiment at 23 values of $x_i$ the outcome $y_i$ from normal distributions where the results are listed in the data.txt file:
Calculate from the jackknife and bootstrap procedures of your data the mean value of $b_3 b_5$ and calculate the jackknife and bootstrap errors.

$$f(x) = b_1 \exp(-b_2 x) + b_3 \exp\left(-\frac{1}{2} \frac{(x - b_4)^2}{b_5^2}\right)$$