Computational Astrophysics

Auto-Correlation

This lab session is based on recovery of signal from a noisy data using auto-correlation. Collect the observed data (data_cor) with time resolution 0.05 sec. Write a small code to execute an auto-correlation of the data and perform the following tasks:

1. Plot the observe data and convince yourself that it is a noisy data.

2. Plot auto-correlation results for total time duration of 5 sec and 10 sec on the same figure with the data. Is there any qualitative differences between two results?

3. Perform the auto-correlation of the observed data using FFT: $[p \odot p] = \mathcal{F}^{-1}|P(\omega)|^2$
Confirm that your results from (2) validates the result from (3).

The formula for auto-correlation of a time time dependent signal p(t) is given as:

$$p \odot p \approx \frac{1}{T}\int_0^T p^*(\tau)p(\tau + t)\, d\tau,$$

where T is the duration of the correlation.