

Advanced Statistics for Data Analysis

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General tools/techniques for particle and astroparticle physics

- General introduction. Bayesian and frequentist approaches.
- Hypothesis tests, with introduction to Machine Learning principles.
- Least Squares method (application to Kalman filter, vertex fit, constrained fit).
- Likelihood fit (application to profile likelihood and S-plot).
- Confidence Intervals (standard CL, Feldman Cousins, CL_{s+b}).
- Special techniques: Unfolding.

Tools/techniques for gravitational waves and astrophysics

- Random processes. Fourier, discrete fourier. Convolution theorem. Plancherel Theorem.
- Time domain: cross correlation, convolution.
- Frequency domain: power spectral density $\rightarrow$ noise characteristic (white, coloured...). Cross power spectral density.
- Coherence (Pearson's). Data whitening & matched filtering.