

Advanced Statistics for Data Analysis

(F. Badaracco, F. Di Bello, F. Parodi)

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 --> noise characteristic (white, coloured...). Cross power spectral density.

Coherence (Pearson's). Data whitening & matched filtering