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Application of Bayesian inference with usage of Markov Chain Monte Carlo to a many-parameter fit of ep-collider HERA data to extract the proton structure functions.

Thursday 24 May 2012 13:30 (4h 45m)

A many-parameter fit to extract the the proton structure functions from the Neutral Current deep-inelastic scattering cross sections, measured from the data collected at HERA ep-collider with the ZEUS detector, will be presented. The structure functions F_2 and F_L are extracted as a function of Bjorken-x in bins of virtuality $Q2$. The fit is performed with the Bayesian Analysis Toolkit (BAT) which allows the investigation of complex statistical problems encountered in Bayesian inference. It is realised with the use of Markov Chain Monte Carlo and gives access to the full posterior probability distribution, which enables straightforward parameter estimation and uncertainty propagation.

78 parameters are fit in total, 54 central F_2 and F_L values, 3 normalisations, and 21 systematic uncertainties included as nuisance parameters. The resulting posterior distributions showed correlations between parameters. The experience gained from this analysis will be discussed.

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