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Theoretical, parametrization, and sampling uncertainties in parton distributions: a view from CT

I summarize recent studies of various types of uncertainties in the global analysis of parton distribution functions (PDFs) by the CTEQ-TEA group. Sampling of the multivariate PDF parameter space introduces an important source of uncertainty that has implications for critical collider applications such as W boson mass measurement and Higgs physics. Parametrization and sampling uncertainties can be at least as prominent as (N)NNLO theoretical uncertainties in both the Hessian and Neural Network PDF frameworks. To test if the sampling of the PDF uncertainty of an experimental observable is truly representative of all acceptable solutions, we introduce a technique ("a hopscotch scan") based on a combination of parameter scans and stochastic sampling. With this technique, we demonstrate that CT, MSHT, and NNPDF fits arrive at different estimates of PDF uncertainties when fitting similar experimental data, and we elucidate a source of this difference.

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