Contribution ID: **34** Type: **not specified**

Theoretical uncertainties on the evolution of alpha_s, PDFs, and TMDs

Monday 31 October 2022 18:00 (15 minutes)

The QCD strong coupling (alpha_s) and the parton distribution functions, both collinear (PDFs) and transverse-momentum dependent (TMDs), are fundamental ingredients for phenomenology at high-energy facilities such as the Large Hadron Collider (LHC).
It is therefore of crucial importance to estimate any theoretical uncertainties associated to them.

Both alpha_s and PDFs/TMDs obey their own renormalisation-group equations (RGEs) whose solution determines their scale evolution.
Although the kernels that govern these RGEs have been computed to very high perturbative precision, they are not exactly known.

In this contribution, we present a procedure that allows us to assess the uncertainty on the evolution of these quantities due to our imperfect knowledge of their respective evolution kernels.
Inspired by transverse-momentum and threshold resummation, we introduce additional scales, that we dubbed resummation scales, that can be varied to estimate the uncertainty on their evolution at any scale.

As a test case, we consider inclusive deep-inelastic-scattering structure functions in a region relevant for the extraction of PDFs.
We study the effect of varying these resummation scales and compare it to the usual renormalisation and factorisation scale variations.

We also present a preliminary study of the theoretical uncertainties associated to the trasverse-momentum spectrum of Drell-Yan production and the LHC focusing on the low trasverse-momentum region.

Primary authors: HAUTMANN, Francesco (Universiteit Antwerpen, Trinity College Oxford); BERTONE, Valerio (NIKHEF); Dr BOZZI, Giuseppe (INFN e Università di Cagliari)

Presenter: BERTONE, Valerio (NIKHEF)

Session Classification: PDF uncertainties, PDF theory