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Using analytic models to describe effective PDFs

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Abstract

Parton distribution functions (PDFs) play a crucial role in collider phenomenology. They are non-perturbative quantities extracted from fits to available data, although their scale dependence is dictated by the DGLAP evolution equations. In this article, we discuss strategies that exploited Machine-Learning (ML) techniques to efficiently calculate PDFs, by-passing the scale evolution. We obtain analytical approximations to the PDFs as a function of x and Q^2, incorporating up to next-to-leading order (NLO) QCD effects. To test our methodology, we reproduced the HERAPDF2.0 set and implemented our analytical expressions in benchmark codes, finding a reduction of the computational cost while keeping the precision of the simulations well under control.

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