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The NNLO unpolarized isovector quark PDF of the nucleon at the physical point from lattice QCD

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We present recent work on the calculation of the unpolarized isovector quark parton distribution function (PDF) of the nucleon at the physical point from lattice QCD utilizing a next-to-next-to-leading order (NNLO) matching. The main observables for these calculations are equal-time spatially-separated matrix elements of a boosted nucleon. There are two main strategies one can employ to obtain information on the PDF from these matrix elements. The first is based on the reduced Ioffe-time pseudo-distribution, which employs an OPE that is valid at short distances. Using this approach, we match to the light-cone Ioffe-time distribution via a deep neural network to solve the inverse problem that arises from this strategy. The second approach is based on Large-Momentum Effective Theory, which allows for a matching in Bjorken-x space. We apply this method with the recently developed hybrid renormalization scheme to produce an x-dependent PDF.

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