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Recent Breakthrough in Lattice QCD for Hadron Structure

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I present a first direct lattice-QCD calculation of the Bjorken-x dependence of hadron structure functions. The method is based on the observation that while in the rest frame of the proton, the parton distributions correspond to light-cone correlations, in the infinite-momentum frame, the same distributions correspond to time-independent space correlations. An effective field theory approach taking the infinite-momentum limit can be established, yielding matching conditions to relate finite-momentum lattice-QCD data to the light-cone distribution. This improves on the traditional lattice approach which relies on an operator product expansion to access limited information about the lowest moments of the distributions. In this talk, I present a pioneering study of the nucleon quark density, helicity and transversity distributions, and pion distribution amplitude.