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Nonperturbative Collins-Soper Kernel from Lattice QCD

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The transverse momentum dependent parton distribution functions (TMDPDFs) measure the transverse momentum of partons in a fast moving hadron, and is an important observable for the Electron-Ion Collider. The energy evolution of TMDPDFs is given by the Collins-Soper (CS) anomalous dimension, or the CS kernel, which is essential to the fitting of TMDPDFs from global cross section data at different energies. At small transverse momentum, the CS kernel is nonperturbative and can only be determined from global fitting or first principle calculations. In this talk, I present an exploratory calculation of the CS kernel from lattice QCD using the large-momentum effective theory, which is a systematic approach to extract light-cone parton physics. Our preliminary results show that it is promising to achieve precision calculation with currently available computing resources, which has the potential to be used in the global fitting of TMDPDFs in the future.

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