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Parton Distribution Functions from pseudo-distributions

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We present a detailed study of the nucleon unpolarized parton distribution function (PDF) using the approach of parton pseudo-distribution functions. We use this method to extract PDFs from the lattice results obtained using simulations with the
light quark mass fixed to its physical value. Then, the physical Ioffe time distributions are obtained from the nucleon matrix elements extracted from lattice simulations through a matching procedure. We reconstruct the PDF using different approaches. Using a direct Fourier transform of Ioffe-time data poses an inverse problem, due to the ill-defined inverse equation. We use two advanced reconstruction techniques to tackle this problem: the Backus-Gilbert method and fitting data to a suitable function as implied by global fitting in phenomenology. We fit the real and imaginary parts of Ioffe-time data to the cosine and sine Fourier transform of $x^a(1-x)^b$ type function, respectively. We find good agreement with PDFs from global fits and it is further improved by quantifying several systematic effects.

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