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A Lattice Calculation of Parton Distributions

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Although Parton Distribution Functions are the fundamental objects describing the inner structure of hadrons, there exists so far no computation of them from first principles. The most promising candidate for such calculation, lattice QCD, performed successful computations for the masses, charges and form factors but not of the distributions themselves. The reason for this is that quark distributions are given by light-cone correlations and simulations of them are difficult to be done on an Euclidian lattice. However, a recent proposal allows the light-cone distributions to be extracted from purely spatial correlations, being thus accessible by lattice methods. We present here the latest results of our effort to perform an ab-initio lattice calculation of the nonsinglet combinations for $u(x)-d(x)$, $\Delta u(x) - \Delta d(x)$, and $\delta u(x) - \delta d(x)$, on a $32^3 \times 64$ lattice. We also discuss the challenges of the present calculations, possible extensions and the status of the renormalization program for these objects.

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