

Parton distributions

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For about 50 years now we know that the nucleon is composed of point-like objects, quarks and gluons (partons, in general). However, even if the fundamental theory for the calculation of the quark and gluon distributions is known, we do not know how to compute these objects from first principles. Parton distributions are usually defined as light-cone correlations in the nucleon. Until recently, however, it was not possible to calculate the distributions in lattice QCD because, unlike spatial correlations, one cannot simulate light-cone correlations in an Euclidian lattice. In 2013, Ji proposed a way to circumvent this restriction, through the use of quark quasi-distributions which are defined as purely spatial correlations. Although they are not the physical distributions, the quark quasi-distributions are related to the quark distributions through a perturbative calculation. We thus present here our results for the x dependence of the unpolarized, helicity and transversity non singlet quark distributions of the nucleon using Ji's proposal and the methods of lattice gauge theory with twisted mass fermions.