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QCD Static force from the lattice with gradient flow

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Non-perturbative static force measurements on the lattice can be used to extract the QCD scale Λ_{QCD} by comparison to perturbative results. We measure the static force on the lattice directly. The corresponding observable consists of a Wilson loop with a discretized E -field insertion in one of the temporal Wilson lines. This causes discretization effects, which have to be considered in an additional Z_E factor. We use gradient flow to improve the signal to noise ratio, to renormalize the E -field insertion, and to perform proper continuum limits. Our final numerical results can be compared to perturbative equations, and observations regarding the renormalization property of gradient flow for observables with field strength components insertions, which are needed for NREFTs, can be obtained.

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