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A non-perturbative renormalization scheme with the gradient flow

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The range of energy scales normally accessible by large-volume lattice computations is typically fairly limited ($1/asimeq1-4$ GeV) and potentially insufficient to reproduce high-energy perturbative results.
In order to match lattice results with more phenomenologically amenable schemes, such as the $\bar{M}S$ scheme, we must evolve the non-perturbative results to higher energies where matching with perturbation theory is possible.
We thereupon present a method to determine both the renormalization constants and anomalous dimensions for local operators by studying ratios and double ratios of correlation functions both in continuum perturbation theory and on the lattice. In particular, we employ the Yang-Mills
(Wilson) gradient flow to parametrize the renormalization scale.
This has two major benefits. On the lattice, the introduction of the flow time fixes the energy scale, which permits a continuum limit free from power divergences in the lattice spacing due to operator mixing.
Further, while the gradient flow slightly complicates perturbation theory, it has been shown that all gauge fields in the bulk are intrinsically renormalized.
Focusing on massless fermion bilinears, we study correlation functions at positive flow time at leading and next-to-leading order in perturbation theory with $\bar{M}S$ subtraction. Through renormalization group equations, it is possible to match these correlators to lattice data at the hadronic scale,
with the goal of identifying an energy regime within which both agree.

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