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Stochastic RG and Gradient Flow in Scalar Field Theory

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A renormalization group transformation defined as a simple stochastic process is proposed, and its relation to functional RG is described. The transformation leads to a new instantiation of Monte Carlo Renormalization Group that is amenable to lattice simulation by performing a Langevin equation integration on top of the ensemble of bare fields generated by traditional MCMC methods. The emergence of gradient flow (GF) as a means of computing the quantities in the effective theory determined by the stochastic RG transformation will be outlined. Lastly, preliminary results in the test case of scalar fields in three dimensions is presented.

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