Exact renormalization group flow with neural-network parametrized effective action

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We develop a novel method to evaluate the functional renormalization group (fRG) equations numerically. The method is based on extensive use of artificial neural networks as function approximators. We implement a Hessian-free retraining scheme which is particularly suited to address problems in which the expected output from the function approximator is continuous, which is the case for a renormalization group (RG) flow. We apply our method to the case of a ϕ^4 theory and solve the local potential approximated (LPA) equations. We find that our neural-network based solver for the functional RG equation gives good results and represents a novel approach towards solving the full fRG equation.