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Using equivariant neural networks as maps of gauge field configurations

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Lattice gauge equivariant convolutional neural networks (L-CNNs) are neural networks consisting of layers that respect gauge symmetry. They can be used to predict physical observables [1], but also to modify gauge field configurations. The approach proposed here is to treat a gradient flow equation as a neural ordinary differential equation parametrized by L-CNNs. Training these types of networks with standard backpropagation usually requires to store the intermediate states of the flow time evolution, which can easily lead to memory saturation issues. A solution to this problem is offered by the adjoint sensitivity method. We present our derivation and test our approach on toy models.

[1] M. Favoni, A. Ipp, D. I. Müller, D. Schuh, Phys.Rev.Lett. 128 (2022), 032003, [arXiv:2012.12901]

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