Abstract Submitted
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Triangular Quantum Loop Topography for Machine Learning YI ZHANG, EUN-AH KIM, Cornell Univ — Despite rapidly growing interest in harnessing machine learning in the study of quantum many-body systems there has been little success in training neural networks to identify topological phases. The key challenge is in efficiently extracting essential information from the many-body Hamiltonian or wave function and turning the information into an image that can be fed into a neural network. When targeting topological phases, this task becomes particularly challenging as topological phases are defined in terms of non-local properties. Here we introduce triangular quantum loop (TQL) topography: a procedure of constructing a multi-dimensional image from the "sample" Hamiltonian or wave function using two-point functions that form triangles. Feeding the TQL topography to a fully-connected neural network with a single hidden layer, we demonstrate that the architecture can be effectively trained to distinguish Chern insulator and fractional Chern insulator from trivial insulators with high fidelity. Given the versatility of the TQL topography procedure that can handle different lattice geometries, disorder, interaction and even degeneracy our work paves the route towards powerful applications of machine learning in the study of topological quantum matters. Reference: arXiv:1611.01518.

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