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Title: Machine-learning of topological defects and deconfinement transition on the lattice

Abstract: We discuss the advantages of machine learning techniques in recognizing the dynamics of topological objects and building order parameters associated with phase transitions in lattice quantum field theories. We consider the compact U(1) gauge theory in three spacetime dimensions as the simplest example of a theory that exhibits confinement and mass gap phenomena generated by monopoles. We train a neural network with a Monte-Carlo generated set of monopole configurations, treated as three-dimensional holograms, to distinguish between confinement and deconfinement phases in a supervised learning approach. We show that a well-trained neural network may distinguish between confining and nonconfining monopole configurations ``from a single glimpse" with reasonable accuracy. As a second example, we discuss the ability of a neural network to (re)build a gauge-invariant deconfinement order parameter in the finite-temperature lattice Yang-Mills theory. Some comments on current-state applications of machine learning techniques to lattice gauge theories will also be given.