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Learning phase transitions by confusion EVERT VAN NIEUWENBURG, YE-HUA LIU, SEBASTIAN HUBER, ETH Zurich — Classifying phases of matter is a central problem in physics. For quantum mechanical systems, this task can be daunting owing to the exponentially large Hilbert space. Thanks to the available computing power and access to ever larger data sets, classification problems are now routinely solved using machine learning techniques. Here, we propose to use a neural network based approach to find transitions depending on the performance of the neural network after training it with deliberately incorrectly labelled data. We demonstrate the success of this method on the topological phase transition in the Kitaev chain, the thermal phase transition in the classical Ising model, and the many-body-localization transition in a disordered quantum spin chain. Our method does not depend on order parameters, knowledge of the topological content of the phases, or any other specifics of the transition at hand. It therefore paves the way to a generic tool to identify unexplored transitions.

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