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**Symmetry Discovery using Machine Learning** KRISH DESAI, University of California, Berkeley, BENJAMIN NACHMAN, Lawrence Berkeley National Laboratory, JESSE THALER, Massachusetts Institute of Technology — The discovery of symmetries in physical laws is of both pure and applied interest to various areas of physics. Besides being meaningful in and of itself, symmetry identification in a data set magnifies the statistical power of the data set by reducing its effective dimension. We propose a customised loss function for a modified generative adversarial network (GAN) to allow the neural net to discover non-trivial symmetries in data sets. The loss function and the associated neural net are analysed both analytically and experimentally to study their ability to discover non-trivial symmetries. The loss function we propose is specific yet flexible, and may be adjusted to reflect various symmetry groups by a suitable choice of the mean squared error term.

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