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Artificial Neural Network Subgrid Models of Compressible Magnetohydrodynamic Turbulence[1] SHAWN ROSOFSKY, University of Illinois at Urbana-Champaign, ELIU HUERTA, National Center for Supercomputing Applications — We explore the suitability of deep learning to capture the physics of subgrid-scale ideal magnetohydrodynamics turbulence of 2-D simulations of the magnetized Kelvin-Helmholtz instability. We produce simulations at different resolutions to systematically quantify the performance of neural network models to reproduce the physics of these complex simulations. We compare the performance of our neural networks with gradient models, which are extensively used in the extensively in the magnetohydrodynamic literature. Our findings indicate that neural networks significantly outperform gradient models at reproducing the effects of magnetohydrodynamics turbulence. To the best of our knowledge, this is the first exploratory study on the use of deep learning to learn and reproduce the physics of magnetohydrodynamics turbulence.

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