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Generalization of Machine Learning Criteria for Ignition Prediction FAUSTINO MARTINEZ, PAVEL POPOV, San Diego State University — We present work on machine learning criteria for the prediction of the outcome of an attempted ignition. A hotspot of varying shape and peak temperature is introduced in a partially-premixed two-dimensional flow with a random velocity field following the Kolmogorov 5/3 law, and a random stoichiometric surface. The machine learning ignition criteria predict whether the ignition will eventually be successful or not, based on temperature and radical information known early on during the ignition process. A successful prediction of this binary outcome can reduce computational effort in simulations of turbulent flow ignition. The criteria are trained on 1000 realizations of the random velocity and composition fields, and are tested on a separate set of 200 realizations. The performance of convolutional neural networks is compared to that of densely-connected networks. We examine how well both types of networks generalize for new values of the random field parameters, specifically the fuel sheet thickness and stoichiometric surface curvature, as well as the velocity field fluctuations' expected amplitude. The feasibility of an ignition criterion prior to any radical generation – based purely on the velocity and composition field at the time of hotspot deposition – is also examined.

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