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Machine learning design and prediction of polar direct drive experiments at the National Ignition Facility KELLI HUMBIRD, LUC PETERSON, CHARLES YEAMANS, GREGORY KEMP, ZACHARY WALTERS, HEATHER WHITLEY, BRENT BLUE, BRIAN SPEARS, Lawrence Livermore National Laboratory — Inertial confinement fusion (ICF) experiments are often designed using computer simulations that are approximations of reality, and therefore must be corrected to accurately predict experimental observations. We implement a nonlinear technique for calibrating from ICF simulations to experiments called "transfer learning". Transfer learning comes from the machine learning community, in which models trained on one task are partially retrained to solve a separate, but related task, for which there is a limited quantity of data. We use transfer learning to calibrate simulation-based models to experimental data from polar direct drive experiments performed at the National Ignition Facility. The calibrated models enable rapid exploration of design space to identify optimal experiments, and are updated throughout the campaign to continuously improve their predictive accuracy. Prepared by LLNL under Contract DE-AC52-07NA27344. LLNL-ABS-780050.

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