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Coupling Radiation-Hydrodynamics Simulation with Machine Learning for Double Shell Capsule Design Optimization NOMITA VAZIRANI, Virginia Tech, MICHAEL GROSSKOPF, PAUL BRADLEY, Los Alamos National Lab, SCOTT ENGLAND, WAYNE SCALES, Virginia Tech — Advances in machine learning provide the ability to leverage data from expensive simulation of high-energy-density experiments to significantly cut down on computational time and costs associated with the search for optimal design of inertial confinement fusion (ICF) experiments. Machine learning methods can use these predictive physics simulations to identify designs of high predicted performance as well as novel designs with high uncertainty in performance that may hold unexpected promise. Here we present our application of cutting-edge Bayesian optimization methods to the design optimization of inertial confinement fusion experiments - specifically the Los Alamos National Lab double shell campaign. This is an alternative approach to achieving fusion by indirectly driving a double shell target inside a hohlraum. The double shell target is significantly less sensitive to laser plasma interactions and able to achieve burn at lower convergence ratios and implosion velocities. However, the target is more complicated to build and analyze, resulting in lower potential yield and an increased number of hydrodynamically unstable interfaces. By applying machine learning tools to the simulation design, we aim to optimize the target geometry and experimental laser pulse to mitigate the hydrodynamic instabilities and improve yield.

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