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Early Prediction of the Simulation Outputs¹ BOGDAN KUSTOWSKI, VIC CASTILLO, BRIAN SPEARS, YAMEN MUBARKA, Lawrence Livermore Natl Lab — Inertial confinement fusion (ICF) is routinely modeled using radiation-hydrodynamic computer simulations. Since such simulations are computationally expensive, researchers have made successful attempts to build surrogate models that predict simulation outputs from the inputs. Linear models fail to make accurate predictions, but neural networks have succeeded in mimicking the non-linear ICF process. In this paper, we run multiple types of simulations to investigate (i) what type of models can be used to make accurate predictions and (ii) how to build surrogate models more efficiently. Current results indicate that making predictions from time histories sampled a couple of nanoseconds before the energy production peak may allow us to use a simpler surrogate model than the model required for predicting from the simulation inputs. Leveraging this fact, we also propose an early-termination strategy for the simulations that are not bringing enough new information to the model. This strategy may potentially enable moving computational resources to more valuable simulations and building the surrogate model in a more efficient way.

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Bogdan Kustowski
Lawrence Livermore Natl Lab

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