Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Can reinforced learning be used to design ICF experiments? J. L. KLINE, B. T. WOLFE, W. P. GAMMEL, J. P. SUAPPE, S. M. FINNEGAN, G. MASKALY, Los Alamos National Laboratory — Machine learning technology continues to grow in expectations for solving a wide range of problems. Basic neural networks and ML techniques have been applied to a small number of plasma physics problems for a couple decades, but more recently are moving to the forefront for optimization problems. The approaches being employed for fusion require either large data sets or tens of thousands of simulations. However, techniques such as reinforced learning for optimization are not being exploited. Unlike optimization problems using machine learning that analyzes a given set of data, reinforced learning searches for a solution based on a reward/penalty system using the given state, a simple set of instructions called actions, and policies governing these actions. Thus, the algorithm autonomously searches the space based on the policy to reach the end state. For example, the algorithm can search a space to maximize quantities such as yield or find robust regimes maximizing the distance in parameter space away from degradation cliffs using the value of the yield as a reward or the distance from a cliff as a reward. In this presentation, we will show proof of principle examples and discuss the potential of such technology for fusion science. This work was supported by the US Department of Energy through the Los Alamos National Laboratory. Los Alamos National Laboratory is operated by Triad National Security, LLC, for the National Nuclear Security Administration of U.S. Department of Energy (Contract No. 89233218CNA000001)

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Date submitted: 03 Jul 2019 Electronic form version 1.4