Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Towards predicting pedestal evolution in fusion plasmas using machine learning methods[1] ABHILASH MATHEWS, JERRY HUGHES, AMANDA HUBBARD, ANNE WHITE, Massachusetts Institute of Technology, DAVID HATCH, University of Texas at Austin — Edge transport barriers strongly influence energy and particle confinement, and in turn the energy gain of tokamaks, yet a fully predictive model of pedestal formation and transport is lacking. Pedestal structure is constrained by magnetohydrodynamic limits when approaching instability due to edge localized modes (ELM), but a general model for ELM-free regimes is absent. Towards this target, computational methods for predicting edge pedestal evolution by training plasma simulations against two-dimensional (i.e. radius and time) experimental profiles are explored on Alcator C-Mod. Gaussian processes with an adaptive kernel are capable of systematically constructing pedestal evolution training data with quantified uncertainties based upon plasma diagnostic measurements. This pathway can be extended across tokamaks for cross-machine validation to advance predictive capability of pedestal dynamics.

[1]Supported by U.S. DoE award DE-SC0014264.

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Date submitted: 29 Jun 2019 Electronic form version 1.4