Abstract Submitted
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Modeling Tokamak Transport with Neural-Network Based Models[1] O. MENEGHINI, Oak Ridge Associated Universities, C. LUNA, Arizona State University, J. PENNA, Massachusetts Institute of Technology, S.P. SMITH, L.L. LAO, General Atomics — This work uses neural networks (NNs) as a means to extract information from the massive volume of aggregated data that are available either from experiments or from simulation databases, and distill an accurate transport model for the heat, particle, and momentum transport fluxes as a function of local dimensionless plasma parameters [1]. The resulting model has been benchmarked with over 4000 DIII-D plasmas in different regimes, and it is able to capture the experimental behavior inside of $\rho < 0.95$ with average error <20% for all transport channels. The NN model was embedded into the ONETWO transport code and is now being used to develop time-dependent scenarios in support of DIII-D operations. The simulated temperature, density and rotation profiles closely match the experimental measurements, and a stiff response of the heat fluxes has been observed in the model for increasing source power. The numerical efficiency of the NN approach makes it ideal for real time plasma control and scenario preparation for current experiments and for ITER.

[1] O. Meneghini, et al., Phys. Plasmas **21**, 060702 (2014).

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