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Analysis and Modeling of DIII-D Experiments With OMFIT and Neural Networks[1] O. MENEGHINI, ORAU, C. LUNA, Arizona State U., S.P. SMITH, L.L. LAO, GA, GA THEORY TEAM — The OMFIT integrated modeling framework is designed to facilitate experimental data analysis and enable integrated simulations. This talk introduces this framework and presents a selection of its applications to the DIII-D experiment. Examples include kinetic equilibrium reconstruction analysis; evaluation of MHD stability in the core and in the edge; and self-consistent predictive steady-state transport modeling. The OMFIT framework also provides the platform for an innovative approach based on neural networks to predict electron and ion energy fluxes. In our study a multi-layer feed-forward back-propagation neural network is built and trained over a database of DIII-D data. It is found that given the same parameters that the highest fidelity models use, the neural network model is able to predict to a large degree the heat transport profiles observed in the DIII-D experiments. Once the network is built, the numerical cost of evaluating the transport coefficients is virtually nonexistent, thus making the neural network model particularly well suited for plasma control and quick exploration of operational scenarios. The implementation of the neural network model and benchmark with experimental results and gyro-kinetic models will be discussed.

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