Abstract Submitted
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Neural Network Computed Bootstrap Current for Real Time Control in DIII-D[1] ARSENE TEMA BIWOLE, Politecnico di Torino, STERLING P. SMITH, ORSO MENEGHINI, EMILY BELLI, JEFF CANDY, General Atomics — In an effort to provide a fast and accurate calculation of the bootstrap current density for use as a constraint in real-time equilibrium reconstructions, we have developed a neural network (NN) non-linear regression of the NEO code calculated bootstrap current j_{BS}. A new formulation for j_{BS} in NEO allows for a determination of the coefficients on the density and temperature scale lengths. The new formulation reduces the number of inputs to the NN, and the number of output coefficients is 2 times the number of species (including electrons). The NN can reproduce the NEO and Sauter coefficients to a high degree of accuracy ($< 1\%$ error). The toroidal (not parallel) component of the bootstrap current density calculated in NEO has been used as a constraint in an offline equilibrium reconstruction for comparison to the NN calculation. The computational time of this method (μs) makes it ideal for real time calculation in DIII-D.

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