Abstract Submitted
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DIII-D disruption prediction using deep convolutional neural networks on raw imaging data[1] R.M. CHURCHILL, PPPL, DIII-D TEAM TEAM — Predictions for oncoming disruptions are made using a novel deep learning algorithm applied directly to the raw sensor output of the Electron Cyclotron Emission imaging (ECEi) diagnostic on DIII-D. The algorithm, deep convolutional neural networks with dilated convolutions, allows learning directly on high-dimensional, multi-scale data, such as ECEi. Using this deep learning algorithm, we obtain promising results of a 91% F1 score for predicting 300ms before the disruption, using only data from the ECEi diagnostic. Predictions at each time slice use long sequences of prior ECEi data, allowing identification of pre-disruption markers in time for disruption avoidance. The fine ECEi time resolution and long time coverage allow the algorithm to learn pre-disruption markers simultaneously from turbulence, MHD, and transport timescales. This work also opens the possibility of incorporating the raw data from multiple diagnostics to enhance disruption prediction, in addition to the global physics parameters often used in machine learning disruption prediction. Future directions on how to transfer these machine learning models to future devices such as ITER will be discussed.

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