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Tokamak Disruption Predictions Based on Deep Learning Temporal Convolutional Neural Networks GE DONG, Princeton Plasma Physics Laboratory, KYLE FELKER, Argonne National Laboratory, ALEXEY SVYATKOVSKIY, Microsoft Corporation, WILLIAM TANG, JULIAN KATES-HARBECK, Princeton Plasma Physics Laboratory — The onset of major disruptions is an important issue for advanced tokamak plasmas such as the ITER experiment. While advanced statistical methods have been used to address the problem of tokamak disruption prediction and control, recent approach based on deep learning have proven particularly compelling. In this presentation, we will introduce new improvements to the fusion recurrent neural network (FRNN) software suite, which had recently delivered disruption predictions with unprecedented accuracy for measured signals from the EUROFUSION/JET and DIII-D tokamaks. Up to now, FRNN was based on the long short-term memory (LSTM) variant of recurrent neural networks. Here, we introduce and implement the temporal convolutional neural network (TCN) architecture for the representation of the time-dependent input signals, thus rendering the FRNN architecture fully convolutional. Our results demonstrate that FRNN models based on TCN achieve improved computational performance and prediction results when compared with the LSTM architecture for a representative fusion database. This represents a step forward in establishing a plasma device performance prediction platform with flexible architecture, capable of being tuned and adapted for different prediction needs for experimental datasets.

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