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Disruption Prediction with different wall conditions based on multi-scale deep hybrid neural network on EAST

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With the upgrading of the tokamak device, the performance of the plasma disruption prediction model will be affected. In 2019, EAST upgraded the lower divertor of carbon material to tungsten-copper divertor, and EAST upgraded from non-all-metal wall to all-metal wall. In this study, a variety of diagnostic signals (such as radiation array and magnetic probe array, etc.) are selected for the main disruption types of EAST, and a multi-scale deep hybrid neural network model is built according to the physical information of different diagnostic signals. A large amount of non-metal wall experimental data is used to train the multi-scale deep hybrid neural network model. The performance of the model is better under the test of non-metal wall experimental data, and the recall rate is >90%. However, the experimental warning performance of all-metal wall is decreased, and the recall rate is only ˜80%. By adding a self-attentional structure into the multi-scale deep hybrid neural network, the network pays more attention to the features closely related to the disruption and reduces the interference of some factors on the model. The test results show that the new network structure model has good warning performance for both non-metal wall experiment and all-metal wall experiment, the recall rate is all >90%. In the future, the network model will provide real-time warning on EAST and verify the model's cross-device warning capability in conjunction with other tokamak devices.

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