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Disruption Warning Database Development and Exploratory Machine Learning Studies on Alcator C-Mod[1] KEVIN MONTES, CRISTINA REA, ROBERT GRANETZ, MIT Plasma Science and Fusion Center — A database of about 1800 shots from the 2015 campaign on the Alcator C-Mod tokamak is assembled, including disruptive and non-disruptive discharges. The database consists of ∼40 relevant plasma parameters with data taken from ∼160k time slices. In order to investigate the possibility of developing a robust disruption prediction algorithm that is tokamak-independent, we focused machine learning studies on a subset of dimensionless parameters such as β_p, n/n_G, etc. The Random Forests machine learning algorithm provides insight on the available data set by ranking the relative importance of the input features. Its application on the C-Mod database, however, reveals that virtually no one parameter has more importance than any other, and that its classification algorithm has a low rate of successfully predicted samples, as well as poor false positive and false negative rates. Comparing the analysis of this algorithm on the C-Mod database with its application to a similar database on DIII-D, we conclude that disruption prediction may not be feasible on C-Mod. This conclusion is supported by empirical observations that most C-Mod disruptions are caused by radiative collapse due to molybdenum from the first wall, which happens on just a 1-2ms timescale.

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Kevin Montes
MIT Plasma Science and Fusion Center

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