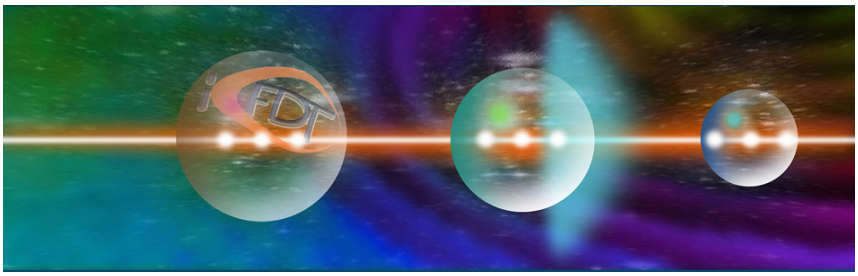

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Adaptive Learning for Disruption Prediction

Thursday, October 4, 2018 5:10 PM (20 minutes)

Accurate prediction of catastrophic events is becoming an important area of investigation in many research fields. In Tokamaks, detecting disruptions with sufficient anticipation time is a prerequisite to undertaking any remedial strategy, either for mitigation or for avoidance. Traditional predictors based on machine learning techniques can be very performing, if properly optimised, but tend to age very quickly. Such a weakness is a consequence of the i.i.d. (independent an identically distributed) assumption on which they are based, which means that the input data are independent and are sampled from exactly the same probability distribution for the training set, the test set and the final actual discharges. These hypotheses are certainly not verified in practice, since nowadays the experimental programmes of fusion devices evolve quite rapidly and metallic machines are very sensitive to small changes in the plasma conditions. This paper describes various adaptive training strategies that have been develop to preserve the performance of disruption predictors in non-stationary conditions. The proposed techniques are based new ensembles of classifiers, belonging to the CART (Classification and Regression Trees) family. The improvements in performance are remarkable and the final predictors satisfy the requirements of the next generation of experimental devices.

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