A linear equation based on signal increments topredict disruptive behaviours and the time to disruption on JET

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Abstract:
This article describes the development of a generic disruption predictor that is also used as basic system to provide an estimation of the time to disruption at the alarm times. The mode lock signal normalised to the plasma current is used as input feature. The recognition of disruptive/non-disruptive behaviours is not based on a simple threshold of this quantity but on the evolution of the amplitudes between consecutive samples taken periodically. The separation frontier between plasma behaviours (disruptive/non-disruptive) is linear in such parameter space. The percentages of recognised and false alarms are 98% and 4%, respectively. The recognised alarms can be split into valid alarms (90%) and late detections (8%). The experimental distribution of warning times follows an exponential model with average warning time of 443 ms. On the other hand, the prediction of the time to the disruption has been fitted to a Weibull model that relates this predicted time to the distance of the points to the diagonal in the parameter space of con of consecutive samples. The model shows a very good agreement between predicted times and warning times in narrow time intervals (between 0.01 s and 0.06 s) before the disruption.