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Event detection from multiple spacecraft in-situ measurement using Deep Learning

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Machine learning algorithms represent a promising tool to tackle already large and ever-growing databases of in-situ spacecraft measurement. Their application in the field of space physics is currently flourishing. These methods have especially been used on solar image tasks such as the prediction of solar flares (Colak & Qahwaji (2009)) or the detection of sunspots (Yang et al. 2018) . Their application to event detection in time series has also been investigated through a classification method of data intervals containing Flux Transfer events (Karimabadi et al. (2009)) or detection of the starting and ending time of Interplanetary Coronal Mass Ejections (ICMEs) in streaming time-series (Nguyen et al. (2019), submitted).
These applications are especially useful to rapidly provide reproducible catalogs of events that can be used for further scientific investigations.
Using deep learning, we provide an automatic detection method of specific event characteristic signature in time series provided by multiple spacecraft in-situ measurement. We applied this method to the detection of two specific events: ICMEs from measurements by WIND and STEREO and magnetopause crossings from measurements by THEMIS, Cluster and Doublestar.