

Fast Online Changepoint Detection via Functional Pruning CUSUM statistics

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Abstract:

Many modern applications of online changepoint detection require the ability to process high-frequency observations, sometimes with limited available computational resources. Online algorithms for detecting a change in mean often involve using a moving window, or specifying the expected size of change. Such choices affect which changes the algorithms have most power to detect. We introduce an algorithm, Functional Online CuSUM (FOCuS), which is equivalent to running these earlier methods simultaneously for all sizes of window, or all possible values for the size of change. Our theoretical results give tight bounds on the expected computational cost per iteration of FOCuS, with this being logarithmic in the number of observations. We show how FOCuS can be applied to a number of different change scenarios, can allow for an unknown pre-change mean, and detail its incorporation into algorithms used for detecting gamma ray bursts for cubesats.

This is joint work with Gaetano Romano, Kes Ward, Guillem Rigaiil and Idris Eckley.