Exact Bayesian inference for off-line change-point detection in tree-structured graphical models

Loïc Schwaller[*†1] and Stéphane Robin[‡1]

[1]AgroParisTech (AgroParisTech) – Institut national de la recherche agronomique (INRA) : UMR518, AgroParisTech – AgroParisTech 75231 Cedex 05, Paris - France, France

Résumé

We consider the problem of change-point detection in multivariate time-series. The multivariate distribution of the observations is supposed to follow a graphical model, whose graph and parameters are affected by abrupt changes throughout time. We demonstrate that it is possible to perform exact Bayesian inference whenever one considers a simple class of undirected graphs called spanning trees as possible structures. We are then able to integrate on the graph and segmentation spaces at the same time by combining classical dynamic programming with algebraic results pertaining to spanning trees. In particular, we show that quantities such as posterior distributions for change-points or posterior edge probabilities over time can efficiently be obtained. We illustrate our results on both synthetic and experimental data arising from biology and neuroscience.

[*]Intervenant
[†]Auteur correspondant: loic.schwaller@ens-lyon.org
[‡]Auteur correspondant: stephane.robin@agroparistech.fr