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Title: Spatio-temporal change-point detection using vector autoregressive models

Abstract:
When analysing spatio-temporal data in applications such as in environmental, ecological, or epidemiological settings, detecting abrupt changes over space and or time gives insight into the underlying mechanics of a system and can have a significant impact in the interpretation of the evolution and future state of the process. In these settings vector autoregressive (VAR) models are utilised for their dynamic modelling approach to multivariate times series, however fitting these models requires many parameters to be estimated. There are several approaches to this problem of estimating these parameters withing the VAR framework where for example sparse VAR models are applied to reduce the dimension of the problem. This approach has been further extended to utilise the gained accuracy of fitting low-rank plus sparse VAR models where the objective function can easily be modified to optimise over this additional constraint that naturally allows for change-point detection. We propose a further adaptation of this method to apply to specific scenarios where there is a distance metric in the way that the time-series have locations relative to each other as represented by some network. Utilising this structure combined with covariances derived from the spatial statistics literature we hope to improve efficiency and accuracy of estimating the parameters and detecting change-points while also keeping down the dimension of the problem.