G36 – Research Fellows Meeting

Presenter's Abstract

3 April 2019

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Lagged Exact Bayesian Online Changepoint Detection with Parameter Estimation

Identifying changes in the generative process of sequential data, known as changepoint detection, has become an increasingly important topic for a wide variety of fields. A recently developed approach, which we call EXact Online Bayesian Changepoint Detection (EXO), has shown reasonable results with efficient computation for real time updates. The method is based on a forward recursive message-passing algorithm. However, the detected changepoints from these methods are unstable, and it is not clear how to estimate the parameters associated with regimes before and after the changepoints. We propose a new algorithm called Lagged EXact Online Bayesian Changepoint Detection (LEXO) that improves the accuracy and stability of the detection by incorporating time lags to the inference. The new algorithm adds a recursive backward step to the forward EXO and has computational complexity linear in the number of added lags. Estimation of parameters associated with regimes is also developed. Simulation studies with three common changepoint models show that the detected changepoints from LEXO are much more stable and parameter estimates from LEXO have considerably lower MSE risk than EXO. We illustrate applicability of the methods with two real world data examples comparing the EXO and LEXO.