

Quantifying the Uncertainty of Changepoints in Time Series

Christopher F. H. Nam*

Department of Statistics, University of Warwick, Coventry, UK c.f.h.nam@warwick.ac.uk

John A. D. Aston

Department of Statistics, University of Warwick, Coventry, UK j.a.d.aston@warwick.ac.uk

Changepoint (CP) detection and estimation in time series is an important aspect of both applied and theoretical statistics. Many methods exist in the literature based on different assumptions on the time series and the type of change suspected. However, these often provide different results and generally fail to capture fully or explicitly the uncertainty regarding CP characteristics such as their number and location. It is thus important to report the uncertainty of CPs in providing a better understanding of the data. This talk will review methods proposed in my PhD thesis concerning quantifying the uncertainty of CPs. This is in light of parameter uncertainty and considers changes in mean, variance and covariance. These methods combine recent work on Hidden Markov Models to model both the observed time series and CPs, and Sequential Monte Carlo samplers to account for parameter uncertainty. This leads to flexible, computational efficient procedures in which the underlying state sequence does not need to be sampled. We demonstrate good estimation of posterior CP distributions on a variety of applications including econometric data.

Key Words: Hidden Markov Models, Sequential Monte Carlo Samplers, Finite Markov Chain Imbedding