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Computing and Visualising Regime Variability in Hidden Markov Models

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Abstract

Finite state Hidden Markov models (HMMs) are used in many applications to analyse data with unobserved components or regimes. While the estimated parameters in an HMM give much information about the data in question, they also imply many other distributions associated with the regimes which are not immediately apparent. These include distributions associated with the number of regimes, the length of regimes and the variability of the positions in time where these regime changes take place. Some asymptotic results can be easily formulated based on the Markovian theory underlying the model and are well known. However, less well known is the fact that the exact finite sample distributions for these regimes can also be computationally found using techniques such as finite Markov chain imbedding.

In this talk, the computation of these exact distributions will be discussed and it will be shown that it is possible to characterise these distributions efficiently, in particular in respect to the time needed to calculate approximate distributions using sampling methods. It will also be shown that these distributions can be used to visualise the variability that is implicit in the fitted HMM, and can be used to assess whether the amount of variability is reasonable given the application. The techniques will be demonstrated with reference to genetic data and econometric data.