Analysis of the maximum-likelihood estimation of Hidden Markov Models

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Abstract

Hidden Markov Models have become a basic tool for modeling stochastic systems with a wide range of applicability in such diverse areas as robotics, telecommunication, econometrics and protein research.

The estimation of the dynamic of a Hidden Markov Model is a basic problem in applications. A key element in statistical analysis of HMM-s is a strong law of large numbers for the log-likelihood function. In previous works stability theory of Markov chains and the subadditive ergodic theorem were used. Although these tools are very powerful, they do not yield a LNN with guaranteed rate of convergence. An alternative tool that has been widely used in linear system identification is theory of L-mixing processes. The advantage of this approach is that, potentially a more precise characterization of the estimation error-process can be obtained, which, in turn, is crucial for the analysis of the performance of adaptive prediction.