A Bound on Log Likelihood from Lyapunov Exponents

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In 1977 Pesin[1] proposed a kind of relation between Lyapunov exponents of differentiable dynamical systems and their entropy rates. Subsequent work by many investigators, including Young[2], proved that similar relations hold for many classes of systems. The Pesin relation suggests a bound on the log likelihood for any probabilistic model of time series generated by a chaotic system. In this poster, I summarize numerical experiments[3] in which I calculated a sequence of log likelihoods for time series from the Lorenz system[4]. Each element of the sequence represents the performance of an HMM with more hidden states than its predecessors. I found that it takes a remarkably large number of hidden states to approach the bound.

References


Topic: graphical models
Preference: poster