ENTROPY COMPUTATION IN PARTIALLY OBSERVED MARKOV CHAINS

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Abstract

Hidden Markov Chains (HMC) [1] are widely used in speech recognition, image processing or protein sequence analysis, due to early availability of efficient Bayesian restoration (Forward-Backward, Viterbi) or parameter estimation (Baum Welch) algorithms. More recently, the problem of computing in an HMC the entropy of the possible hidden state sequences that may have produced a given sequence of observations has been addressed, and an efficient (i.e., linear in the number of observations) algorithm has been proposed [2].

Among possible extensions of HMC, Pairwise (PMC) [3] and Triplet [4] Markov Chains (TMC) have been introduced recently. In a TMC we assume that $t = (x, r, y)$, where x is the hidden process, y the observation and r a latent process, is a Markov chain (MC). So a TMC can be seen as a vector MC, in which one observes some component y and one wants to restore some part of the remaining components. In a TMC the marginal process (x, r) is not necessarily an MC, but the conditional law of (x, r) given the observations y is an MC; as in HMC, this key computational property enables the development of efficient restoration or parameter estimation algorithms. In this paper, we extend to TMC the entropy computation algorithm of [2]. The resulting algorithm remains linear in the number of observations.

References:

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