Change Point Detection in Hidden Markov Models

Cheng-Der Fuh

Zhejiang University City College, China

Abstract

In this talk, I give a brief summary of change point detection in general hidden Markov models, including single-molecule experiments, an epidemic model for the COVID-19 outbreak, financial time series and Boltzmann machine in recurrent neural networks. Then present a theoretical result, in which the pre-change distribution f^{θ_0} is given, while the post-distribution f^{θ} after change is unknown. The problem is to raise an alarm as soon as possible after the distribution changes from f^{θ_0} to f^{θ}, under a restriction on the false alarms. I investigate theoretical properties of a weighted Shiryayev-Roberts-Pollak (SRP) change point detection rule, to show that it is second-order asymptotically optimal. To illustrate the method, I apply the results to linear state space models with simulation studies.