Quickest Detection on Dependent Data: Application to Seizure Prediction in Epilepsy Patients

Published date: March 24, 2015

Technology description

Technology Overview

Quickest detection is the problem of detecting, with as little delay as possible, a change in the probability distribution of a sequence of random measurements. This problem arises in a great variety of applications, such as speech and image processing, biomedical signal processing, machinery monitoring and finance. The design of quickest detection procedures typically involves the optimization of a trade-off between two types of performance indices. Our first invention is to directly apply Poor's algorithms to detect when EEG or spiking activity recorded from cortical or deep structures in the brains of epilepsy patients changes from inter-ictal to preictal to seizure states. These algorithms, however, require the observations to be independent and identically distributed (i.i.d.), which is generally not the case for such recordings. Our second invention is to extend the Bayesian quickest detection to the case where the observations are dependent with arbitrary differentiable cost functions of the delay. Unlike previous studies that try to address special cases of dependent data (where the likelihood ratio sequences are independent, or when the distributions become locally asymptotically normal), our results work for any dependent set of observations. We also explicitly show one way to implement quickest detection on dependent point process observations, which is applicable when the observations are spiking events of single neurons or spikes extracted form EEG signals recorded from patients.

Institution

Johns Hopkins University

Inventors

Sabato Santaniello
Postdoctoral Fellow
Biomedical Engineering WSE
Samuel Burns
Unknown
Munther Dahleh

Unknown
Sridevi Sarma
Associate Professor

联系我们

叶先生

电 话：021-65679356
手 机：13414935137
邮 箱：yeyingsheng@zf-ym.com