

Statistics Seminar
Department of Mathematical Sciences

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| DATE: | Thursday, Mar. 18, 2021 |
| TIME: | 1:30pm - 3:30pm (NOTE THE SPECIAL TIME) |
| LOCATION: | Zoom meeting |
| SPEAKER: | Kexuan Li, Binghamton University |
| TITLE: | On the Characteristics of the Generalized Shiryav-Roberts Procedure for Quickest Change-Point Detection in Continuous Time |

Abstract

We consider the classical Pollak-minimax quickest change-point detection problem in continuous time where the aim is to control the drift of a “live”-monitored Brownian motion. We focus on the performance of the Generalized (headstarted) Shryaev-Roberts (GSR) detection procedure set up to “watchdog” the drift of the Brownian motion. We obtain analytically a closed-form formula for the GSR procedure's Pollak's average delay to detection (given that no false alarm has yet been sounded); the formula is valid for any change-point as well as any headstart. With the aid of the formula we then show numerically that the GSR procedure with a carefully designed fixed headstart is nearly minimax-optimal when the false alarm risk is vanishingly small. This is a continuous-time equivalent of exactly the same result previously obtained in the literature for the discrete-time version of the problem. We also touch upon the phenomenon of quasi-stationarity exhibited by the GSR detection statistic under the pre-change regime. It is known that if the GSR procedure's headstart is sampled from the respective quasi-stationary distribution, then the procedure is also asymptotically minimax-optimal as the false alarm risk goes down to zero. The quasi-stationary distribution itself has recently been found analytically, although the formula's value is largely numerical. We offer lower- and upperbounds for the distribution's cdf. The bounds are reasonably tight and sufficiently analytically simple to help better assess the characteristics of the corresponding randomized variant of the GSR procedure. As an aside we also provide an exact formula for the quasi-stationary distribution's moment of any given real order.

This is a PhD defense. Committee members are Aleksey Polunchenko (Chair; DOMS), Vladislav Kargin (DOMS), Qiqing Yu (DOMS), and Yu Chen (outside examiner, ECE Dept).

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