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Predictive Ratio Cusum (PRC): A Bayesian Approach in Online Change Point Detection of Short Runs

Wednesday, 18 September 2024 12:30 (30 minutes)

The online quality monitoring of a process with low volume data is a very challenging task and the attention is most often placed in detecting when some of the underline (unknown) process parameter(s) experience a persistent shift. Self-starting methods, both in the frequentist and the Bayesian domain aim to offer a solution. Adopting the latter perspective, we propose a general closed-form Bayesian scheme, whose application in regular practice is straightforward. The testing procedure is build on a memory-based control chart that relies on the cumulative ratios of sequentially updated predictive distributions. The derivation of control chart's decision-making threshold, based on false alarm tolerance, along with closed form conjugate analysis, accompany the testing. The theoretic framework can accommodate any likelihood from the regular exponential family, while the appropriate prior setting allows the use of different sources of information, when available. An extensive simulation study evaluates the performance against competitors and examines the robustness to different prior settings and model type misspecifications, while continuous and discrete real datasets, illustrate its implementation.

Type of presentation

Talk

Classification

Both methodology and application

Keywords

Statistical Process Control and Monitoring, Self-Starting, Phase I Analysis, Regular Exponential Family, Control Chart.

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