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bayespm: BAYESian Process Monitoring in R

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The univariate Bayesian approach to Statistical Process Control/Monitoring (BSPC/M) is known to provide control charts that are capable of monitoring efficiently the process parameters, in an online fashion from the start of the process i.e., they can be considered as self-starting since they are free of a phase I calibration. Furthermore, they provide a foundational framework that utilizes available prior information for the unknown parameters, along with possible historical data (via power priors), leading to more powerful tools when compared to the frequentist based self-starting analogs. Use of non-informative priors allow these charts to run even when no prior information exists at all. Two big families of such univariate BSPC/M control charts are the Predictive Control Chart (PCC) and the Predictive Ratio Cusum (PRC). PCCs are specialized in identifying transient parameter shifts (i.e., outliers) of moderate/large size, while PRCs are focused on detecting persistent parameter shifts of even small size. Both PCC and PRC are general, closed form mechanisms, capable of handling data from any discrete or continuous distribution, as long as it belongs to the regular exponential family (e.g., Normal, Binomial, Poisson, etc.). In this work, we will present the R package bayespm which implements the PCC and/or PRC control charts for any data set that comes from a discrete or a continuous distribution and is a member of the regular exponential family. Real data examples will illustrate the various options that include online monitoring along with inference for the unknown parameters of a univariate process.

Keywords

R, self-starting, transient/persistent shifts

Classification

Both methodology and application

Primary authors: Dr KIAGIAS, Dimitrios (School of Mathematics and Statistics, University of Sheffield, UK); Dr BOURAZAS, Konstantinos (Dept. of Mathematics and Statistics & KIOS Research and Innovation Center of Excellence, University of Cyprus, Cyprus); Prof. TSIAMYRTZIS, Panagiotis (Dept. of Mechanical Engineering, Politecnico di Milano, Italy & Dept. of Statistics, Athens University of Economics and Business, Greece)

Presenter: Prof. TSIAMYRTZIS, Panagiotis (Dept. of Mechanical Engineering, Politecnico di Milano, Italy & Dept. of Statistics, Athens University of Economics and Business, Greece)

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