Contribution ID: **19** Type: **not specified**

Nonparametric Control Charts for Change-Points Detection: A Comparative Study

Tuesday, 12 September 2023 17:50 (20 minutes)

Distribution-free control charts have received increasing attention in non-manufacturing fields because they can be used without any assumption on the distribution of the data to be monitored. This feature makes them particularly suitable for monitoring environmental phenomena often characterized by highly skewed distribution. In this work we compare, using two Monte Carlo studies, the performance of several non-parametric change point control charts for monitoring data distributed according the Generalised Inverse Gaussian (GIG) distribution. The aim is to identify the most suitable monitoring algorithm considering jointly the ability in detecting shifts in location and/or scale and the percentage of missed alarms. The choice of the GIG distribution is motivated by the fact that on the one hand it is often used to describe environmental radioactivity data, but on the other hand it has never been considered in connection with non-parametric control charts. For our purposes, aware of being non-exhaustive, we consider a non-parametric change-point control chart based on the Mann-Whitney statistic; a distribution-free control chart based on Recursive Segmentation and Permutation (RS/P); a monitoring algorithm using the Kolmogorov-Smirnov test; and a chart which relies on the Cramer-von-Mises statistics. The results reveal that the monitoring algorithm based on recursive segmentation and permutation has the best performance for detecting moderate shifts in the location, whereas for the other scenarios examined the Kolmogorov-Smirnov control chart provides the best results both in terms of out-of-control ARL and missed alarms.

Keywords

change detection, control charts, nonparametric; simulation experiments

Classification

Mainly application

Primary author: SCAGLIARINI, Michele (University of Bologna)

Presenter: SCAGLIARINI, Michele (University of Bologna)

Session Classification: CONTRIBUTED Modelling 2

Track Classification: Modelling