European Network for Business and Industrial Statistics

Contribution ID: **150**   Type: **not specified**

Self-Starting Bayesian Hotelling T^2 for Online Multivariate Outlier Detection

Tuesday, 12 September 2023 18:30 (20 minutes)

Hotelling's T^2 control chart is probably the most widely used tool in detecting outliers in a multivariate normal distribution setting. Within its classical scheme, the unknown process parameters (i.e., mean vector and variance-covariance matrix) are estimated via a phase I (calibration) stage, before online testing can be initiated in phase II. In this work we develop the self-starting analogue of Hotelling's T^2, within the Bayesian arena, allowing online inference from the early start of the process. Both mean and variance-covariance matrix will be assumed unknown, and a conjugate (power) prior will be adopted, guaranteeing a closed form mechanism. Theoretical properties, including power calculations of the proposed scheme, along with root-cause related post-alarm inference methods are studied. The performance is examined via a simulation study, while some real multivariate data illustrate its use in practice.

Keywords

Bayesian statistical process control and monitoring, multivariate power prior, post alarm inference

Classification

Mainly methodology

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Session Classification: CONTRIBUTED Quality 2

Track Classification: Quality