Guaranteed Conditional Performance of Control Charts via Bootstrap Methods

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Abstract

To use control charts in practice, the in-control state usually has to be estimated. This estimation has a detrimental effect on the performance of control charts, which is often measured for example by the false alarm probability or the average run length. We suggest an adjustment of the monitoring schemes to overcome these problems. It guarantees, with a certain probability, a conditional performance given the estimated in-control state. The suggested method is based on bootstrapping the data used to estimate the in-control state. The method applies to different types of control charts, and also works with charts based on regression models, survival models, etc. We show large sample properties of the adjustment. The usefulness of our approach is demonstrated through simulation studies. We will point a connection to giving confidence intervals for predictions.

Keywords: Monitoring; CUSUM; Bootstrap; Guaranteed performance; Confidence interval; Control chart.

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