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Bayesian Nonparametric Multivariate EWMA Control Chart for Process Change-point Detection.

Multivariate control charts for monitoring multivariate process commonly assume that the observations are from multivariate normal distribution, which may not hold in many practical applications. And many multivariate control charts can only detect the shifts in mean instead of scale or both. In this paper, a Bayesian nonparametric multivariate exponentially weighted moving average control chart for sequential observations monitoring the process mean and variability simultaneously by a single control chart in phase II applications is proposed. We introduce a Bayesian nonparametric test statistic based on evolving density estimates. A novel evolving exponentially-weighted density estimate based on a Polya tree predictive rule, which is centered at the widely-used normal families, is found to have excellent power and robustness to detect both location and scale shifts, as well as shifts in skew and modality in simulations. The procedure is further demonstrated on multivariate real data example.

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