

# **A Semi-parametric CUSUM Scheme Using Copula Formulation for Higher-order Autocorrelated Processes**

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## **Abstract**

In the Industry 4.0 era, rapid operations, characterized by the four V's (Volume, Velocity, Variety, and Veracity), often encounter challenges related to autocorrelation in data streams. This manuscript presents a novel monitoring approach designed for autocorrelated processes, overcoming constraints on the order and magnitude of autocorrelations and distributional assumptions. The proposed phase II semi-parametric copula-based Cumulative Sum (CUSUM) control chart effectively detects shifts in location within continuous autocorrelated processes without relying on distributional assumptions. A study on average run length (ARL) performances against a distribution-free strategy demonstrates the efficacy of the proposed method, showcasing adaptability in handling various autocorrelation magnitudes. Application of this CUSUM method in the selective laser melting (SLM) process produces prompt signals, validating its effectiveness in real-world datasets.