B-CAVE: A robust online time series change point detection algorithm based on the between-class average and variance evaluation approach

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Onumanyi, Adeiza J
Council for Scientific and Industrial Research (CSIR)
Meiring Naude Drive, Pretoria, 0184
Email: AOnumanyi@csir.co.za

Change point detection (CPD) is a valuable technique in time series (TS) analysis, which allows for the automatic detection of abrupt variations within the TS. It is often useful in applications such as fault, anomaly, and intrusion detection systems. However, the inherent unpredictability and fluctuations in many real-time data sources pose a challenge for existing contemporary CPD techniques, leading to inconsistent performance across diverse real-time TS with varying characteristics. To address this challenge, we have developed a novel and robust online CPD algorithm constructed from the principle of discriminant analysis and based upon a newly proposed between-class average and variance evaluation approach, termed B-CAVE. Our B-CAVE algorithm features a unique change point measure, which has only one tunable parameter (i.e. the window size) in its computational process. We have also proposed a new evaluation metric that integrates time delay and the false alarm error towards effectively comparing the performance of different CPD methods in the literature. To validate the effectiveness of our method, we conducted experiments using both synthetic and real datasets, demonstrating the superior performance of the B-CAVE algorithm over other prominent existing techniques.