Change Point Detection Using Random Matrix Theory with Application to Frailty in Elderly Individuals

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Abstract : Detecting change points in time series data is a challenging problem, especially in scenario where there is limited prior knowledge regarding the data's distribution and the nature of the transitions. We present a method designed for detecting changes in the covariance structure of high-dimensional time series data, where the number of variables closely matches the data length. Our objective is to achieve unbiased test statistic estimation under the null hypothesis. We delve into the utilization of Random Matrix Theory to analyze the behavior of our test statistic within a high-dimensional context. Specifically, we illustrate that our test statistic converges pointwise to a normal distribution under the null hypothesis. To assess the effectiveness of our proposed approach, we conduct evaluations on a simulated dataset. Furthermore, we employ our method to examine changes aimed at detecting frailty in the elderly.