Optimal High-dimensional Change Point Testing in Regression Settings

Daren Wang

University of Notre Dame

Abstract:

Detecting changes in regression time series is a fundamental problem arising in a broad spectrum of applications such as dynamic pricing, predictive maintenance, signal processing, and many more. In this talk, we focus on multiple change-point testing in the high-dimensional linear regression setting. Specifically, we assume that the unobserved high-dimensional regression coefficients can potentially change over time in a piecewise constant manner. We propose a new statistic named the Covariance-based Quadratic CUSUM statistic (CQC) to test the existence of change points. We characterize the null and alternative limiting distributions of CQC. We show that CQC can not only consistently test the existence of change points but also achieve the optimal detection boundary. Furthermore, the proposed methodology enjoys broad applicability as it allows temporal dependence among the regression time series, even when the dimensionality of the regression coefficients grows exponentially with the sample size.