PhD Dissertation Presentation

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“NON-PARAMETRIC CHANGE POINT ANALYSIS: TACKLING IRREGULAR CONDITIONS IN UNI-VARIATE AND MULTIVARIATE DATA”

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Abstract

Change point analysis has emerged as a critical area of research in Statistics over the past seven decades, with applications spanning various domains, including Physics, Epidemiology, Finance, and more. This thesis aims to develop innovative, non-parametric methodologies for change point analysis that can effectively operate without relying on stringent regularity conditions for the data, which are often violated in real-world scenarios. We introduce a novel framework for change point analysis that is liberated from strong regularity conditions for the signal of the data following the potential change point and propose a pioneering framework for statistical inference of change points in the presence of temporally dependent and non-stationary noise processes. Furthermore, we extend these frameworks to a multivariate setting, addressing the growing interest in detecting change points in multivariate or high-dimensional data.

We derive theoretical results to validate our proposed methodologies and demonstrate their efficacy through both synthetic data analysis and real data applications. While our proposed methods exhibit robust performance in low-dimensional settings, they are susceptible to the curse of dimensionality in high-dimensional scenarios. We encourage future research to build upon these contributions to overcome the challenges associated with high-dimensional change point analysis under these irregular conditions, paving the way for more reliable and accurate detection of change points in complex, real-world data.