Waseda Seminar on Mathematical Statistics

Date: January 31 (Fri.), 2025

Venue: Meeting Room (Dept of Pure & Appl. Math), Building 63-1, Nishi-Waseda Campus, Waseda University
(Access map: https://www.waseda.jp/top/en/access/nishiwaseda-campus)

Program

13:00 ~ 14:30

Bias-correction and Test for Mark-point Dependence with Replicated Marked Point Processes

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Abstract: Mark-point dependence plays a critical role in research problems that can be fitted into the general framework of marked point processes. In this work, we focus on adjusting for mark-point dependence when estimating the mean and covariance functions of the mark process, given independent replicates of the marked point process. We assume that the mark process is a Gaussian process and the point process is a log-Gaussian Cox process, where the mark-point dependence is generated through the dependence between two latent Gaussian processes. Under this framework, naive local linear estimators ignoring the mark-point dependence can be severely biased. We show that this bias can be corrected using a local linear estimator of the cross-covariance function and establish uniform convergence rates of the bias-corrected estimators. Furthermore, we propose a test statistic based on local linear estimators for mark-point independence, which is shown to converge to an asymptotic normal distribution in a parametric root n-convergence rate. Model diagnostics tools are developed for key model assumptions and a robust functional permutation test is proposed for a more general class of mark-point processes. The effectiveness of the proposed methods is demonstrated using extensive simulations and applications to two real data examples.

14:30 ~ 14:45

Coffee Break

14:45 ~ 15:45

Integrated Discussion