한양대학교 자연과학대학
COLLEGE OF NATURAL SCIENCES
HANYANG UNIVERSITY

수학과
DEPARTMENT OF MATHEMATICS

Applied Statistics Seminar

Flexible multivariate spatio-temporal Hawkes process models of terrorism

Time: September 3, 2024 (Tuesday) 5:00 - 6:00 p.m.

Place: Natural Sciences Building #123

Speaker: Prof. Mikyoung Jun (University of Houston & Texas A&M University)

Abstract: We develop flexible multivariate spatio-temporal Hawkes process models to analyze patterns of terrorism. Previous applications of point process methods to political violence data mainly utilize temporal Hawkes process models, neglecting spatial variation in these attack patterns. This limits what can be learned from these models, as any effective counter-terrorism strategy requires knowledge on both when and where attacks are likely to occur. Even the existing work on spatiotemporal Hawkes processes imposes restrictions on the triggering function that are not well-suited for terrorism data. Therefore, we generalize the structure of the spatiotemporal triggering function considerably, allowing for nonseparability, nonstationarity, and cross-triggering (across multiple terror groups). To demonstrate the utility of our models, we analyze two samples of real-world terrorism data: Afghanistan (2002–2013) as a univariate analysis and Nigeria (2009–2017) as a bivariate analysis. Jointly, these two studies demonstrate that our generalized models outperform standard Hawkes process models, besting widely-used alternatives in overall model fit and revealing spatiotemporal patterns that are, by construction, masked in these models (e.g., increasing dispersion in cross-triggering over time).

∗ This is joint work with Scott Cook at Texas A&M University.

National Research Foundation of Korea

Host: Jaehong Jeong (Spatial Statistics Lab)