On change estimation in stochastic intensity-driven continuous time point processes through multiple testing

Moinak Bhaduri

Email: mbhaduri@bentley.edu

Department of Mathematical Sciences

Bentley University

Point processes stand as convenient instruments to model count data, and the relevance of observation-reliant underlying intensities remains undeniable even in the face of seemingly tempting simpler alternatives. Hawkes processes offer a sterling example, often leading to a branching process framework. We posit a new genre of change detection algorithms, engineered through permutations of trend-switched statistics and a judicious application of false discovery rate control. Quick, accurate change detection on both the immigrant and offspring kernels, coupled with the scarcity of false positives are a few optimal properties. Certain members of this family that remain asymptotically consistent and close to the ground truth (evidenced through some Hausdorff-similarity) are isolated to pinpoint estimated change locations. Efficient forecasting proves to be a natural corollary. Change point based clustering tools will also be offered. Examples will relate to economic announcements, global terrorism modelling, hurricanes and other natural hazards.

Keywords: Change detection, self-exciting intensity, Hawkes process, sequential testing, rare events