

# Boğaziçi Math Seminar

## Generalized Hawkes Shot-Noise Processes

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### Abstract:

Recent research on marked Hawkes processes focuses on functional central limit theorems. Self-exciting nature of the process is hidden in the compensator of the corresponding random measure, which we call a Hawkes random measure. Previously, the marks are either taken as independent of the arrival times of the events, or they depend only on the arrival time. In present work, we define a Hawkes random measure with a compensator based on a more general self-exciting mechanism, proposed earlier in the context of multivariate Hawkes processes. In this setting, the distribution of the next mark depends on the current time as well as the times and marks of the past events. For construction, a sequence of random counting measures is introduced as building blocks of the Hawkes random measure which form the generations of a branching process with immigration. The compensator of the Hawkes random measure is identified based on this construction and is shown to satisfy a stochastic Volterra equation as a result. Although marked Hawkes processes have been applied in areas such as seismology and epidemiology, the motivation of the present work comes from turbulence. A Hawkes shot-noise process is defined as an integral with respect to the Hawkes random measure. For demonstration, self-exciting eddies are proposed to form a Hawkes shot-noise process, which in turn represents the velocity field observed in coastal areas.

**Date :** Wednesday, November 20, 2024

**Time:** 13:30

**Place:** TB 130, Boğaziçi University