

Bayesian non-parametric inference for the ETAS model

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The epidemic type aftershock sequence (ETAS) model, an example of a self-exciting, spatiotemporal, marked Hawkes process, is widely used in statistical seismology to describe the self-exciting mechanism of earthquake occurrences. The ETAS model is characterized by the rate of arriving earthquake events conditioned on the history of previous events, which is also called the conditional intensity function. Fitting an ETAS model to data requires us to estimate the conditional intensity function. Many previous methods, including parametric and non-parametric, have certain limitations in quantifying uncertainty since most estimation techniques deliver a point estimate for the conditional intensity function. The GP-ETAS model defines the background intensity in a Bayesian non-parametric way through the Gaussian Process prior, allowing us to incorporate prior knowledge and effectively encode the uncertainty of the quantities arising from data and prior information. Based on the GP-ETAS model, we have carried out some new research topics, and some work is still ongoing. This presentation introduces the GP-ETAS model and some developments we have made.