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Title:

"Efficient Parameter Estimation of Sampled Random Fields"

Abstract:

We provide a computationally and statistically efficient method for estimating the parameters of a stochastic Gaussian model observed on a spatial grid, which need not be rectangular. Standard methods are plagued by computational intractability, where designing methods that can be implemented for realistically sized problems has been an issue for a long time. This has motivated the use of the Fourier Transform and the Whittle likelihood approximation. The challenge of frequency-domain methods is to determine and account for observational boundary effects, missing data, and the shape of the observed spatial grid. In this paper we address these effects explicitly by proposing a new quasi-likelihood estimator. We prove consistency and asymptotic normality of our estimator, and show that the proposed method solves boundary issues with Whittle estimation for finite samples, yielding parameter estimates with significantly reduced bias and error. We demonstrate the effectiveness of our method for incomplete lattices, in comparison to other recent methods. Finally, we apply our method to estimate the parameters of a Matérn process used to model data from Venus' topography.

This is joint work with Arthur Guillaumin, Adam Sykulski and Frederik Simons