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PhD Dissertation Proposal Presentation

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Understanding the Local Behavior of Unevenly Spaced Isotropic Stationary Gaussian Processes

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ABSTRACT

Consider the problem of estimating the parameters C and α of a stationary isotropic Gaussian process in $\mathbb{R}$ or $\mathbb{R}^2$ with a covariance function $\sigma(t) = \sigma(0) - C||t||^\alpha + o(||t||^\alpha)$ as $||t|| \to 0$ for $0 < \alpha < 2$. Estimating a variance function of a random process is important in getting an accurate prediction. Furthermore, when the process is self-similar, α has a nice simple relation with a fractal index D. Fractal theory has been well developed as one of the methods of quantifying the roughness of a curve or a surface. However most of the research has been limited to grid data assuming that the observations are evenly distributed. Also a high correlation between $\hat{C}$ and $\hat{\alpha}$ have made joint estimation hard.

This talk is on the expansion of the theory to unevenly spaced data to jointly estimate variance parameters. Here we assume a fixed-domain asymptotics as in the previous papers. We extend a concept of increments and suggest a nonlinear regression of squared increments to their expected values.

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