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Department of Statistics

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Gaussian random fields on metric graphs

Tuesday, April 9th, 2024
11:50 AM
96 Frelinghuysen Road, CoRE Building, Room 431

Zoom Meeting: Meeting ID: 969 0606 4706
Password: 745339

https://rutgers.zoom.us/j/96906064706?pwd=ZklvbExpRVBJQ3c5dUhhYTFuR2ZrZz09

Light refreshments will be served in Hill 452, 11:15am

Abstract: There is a growing interest in the statistical modeling of data on compact metric graphs such as street or river networks based on Gaussian random fields. In this work, we introduce the Whittle-Matern fields, which is a class of models specified as solutions to a fractional-order stochastic differential equation on the metric graph. Contrary to earlier covariance-based approaches for specifying Gaussian fields on metric graphs, the Whittle-Matern fields are well-defined for any compact metric graph and can provide Gaussian processes with differentiable sample paths given that the fractional exponent is large enough.

We present some of the main statistical properties of the models and show how they can be used to perform exact likelihood-based inference and prediction. We then discuss non-stationary and spatio-temporal extensions and finally illustrate the usage of the models through an application to traffic data, where we use the recently introduced MetricGraph R package to fit and compare different models.

Bio: David Bolin is an associate professor of statistics at King Abdullah University of Science and Technology (KAUST) where he leads the Stochastic Processes and Applied Statistics research group. Prior to joining KAUST, he was an associate professor in mathematical statistics at the University of Gothenburg. He received his PhD degree in mathematical statistics from Lund University in 2012 and holds an M.S. in Engineering Mathematics from Lund University. Bolin 's main research interests are in stochastic partial differential equations and their applications in statistics, with a focus on development of practical, computationally efficient tools for modeling non-stationary and non-Gaussian processes.