

Abstract: Some of the most popular models for Gaussian random fields in statistics and machine learning can be formulated as solutions to fractional stochastic partial equations (SPDEs). In this talk, we show how one can obtain accurate numerical approximations of such models by a combination of finite elements and rational approximations of the covariance operator of the Gaussian field. We then consider some of the statistical properties of the models, where we in particular focus on the asymptotic accuracy of linear prediction based on the models with misspecified parameters.

The proposed methods have been implemented in an open-source R package with an interface to the popular R-INLA software for computationally efficient inference of latent Gaussian models. We finish by illustrating the methods and software via an inverse problem application in environmental statistics.