Taking into account uncertainty in spatial covariance estimation for Bayesian prediction

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Abstract

In practice, spatially varying phenomena are modelled using second order random fields, given by their mean function and covariance function. For estimation of the random field the so called Kriging predictor is used, which is known as the best linear unbiased predictor. But the optimality just holds on the assumption that the covariance function of the underlying random field is exactly known. The estimated covariance function, however, may lead to an underestimation of the prediction errors.
We take into account this uncertainty by developing a robust Bayesian predictor which applies to the whole family of plausible covariance functions. We get this family by means of a simulation strategy. Instead of getting a single predictor, we calculate the whole predictive densities at the points to be predicted.
This poster shows how bad plug in prediction as used in all facets of kriging can be. After giving details of the derivation of the Bayesian predictor and its calculation we give an example. The data set used deals with radioactivity measurements 10 years after the Chernobyl accident.