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Study of the effectiveness of Bayesian kriging for the decommissioning and dismantling of nuclear sites.

Wednesday, 15 September 2021 14:00 (20 minutes)

The decommissioning of nuclear infrastructures such as power plants arises as these facilities age and come to the end of their lifecycle. The decommissioning projects expect a complete radiological characterization of the site, of both the soil and the civil engineering structure to optimize efficiency and minimize the costs of said project. To achieve such goal, statistical tools such as geostatistics are used for the spatial characterization of radioactive contamination. One of the recurring problem using kriging is its sensitivity to parameters estimation. Even though tools such as the variogram are available for parameter estimation, they do not allow for uncertainty quantification in parameter estimation, leading to over-optimistic prediction variances. A solution to this problem is Bayesian kriging, which takes into account uncertainty in parameter estimation by considering parameters as random variables and assigning them prior specifications. We chose to study the efficiency of Bayesian kriging in comparison with standard kriging methods, by varying the size of the data set available, and tested its effectiveness against misspecification, such as wrong priors hyperparameters or covariance models. These comparisons were made on simulated data sets, as well as on a real data set from the decommissioning project of the G3 reactor in CEA Marcoule.

Keywords

Geostatistics, Bayesian, Small Data

Special/invited session

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