Model combination for geostatistics using a SURE criterion

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Abstract

Geostatistical models are often used to predict spatial variables of interest, but the parameters involved in the spatial correlation function usually cannot be well estimated even if the sample size is large enough under a fixed domain. This would result in the spatial predictor being inaccurate and unstable. In this talk, we apply a data perturbation technique to propose a new spatial predictor which is not only continuous but also differentiable with respect to the response variables even after plugging-in the estimated model parameters. Therefore, it is more stable. Moreover, it is known that different spatial predictors obtained from different methods generally have different levels of performance under different circumstances. To avoid the uncertainties inherent in a selection process, in this talk, we propose an estimation method of weights based on Stein's unbiased risk estimate to combine candidate stabilized spatial predictors, leading to a weighted spatial predictor that is adaptive to the underlying spatial process. Validity for the proposed method is justified both numerically and theoretically. An application of a real data set for the precipitation levels in the Colorado State is also presented.

Keywords: data perturbation, estimation uncertainty, mean squared prediction error, stabilization, Stein's unbiased risk estimate