The University of Chicago
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PhD Thesis Presentation

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Kriging Prediction with Estimated Covariances

WEDNESDAY, May 2, 2012, at 8:30 AM

110 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

Under the setting of a Gaussian random field, we study the effect of using estimated covariances on the inferences based on kriging, or best linear unbiased prediction (BLUP). When the covariances are known, the standardized kriging prediction error follows the standard normal distribution. When, as is often the case, the covariances are unknown, it has been standard to use a simple plug-in procedure where certain estimates for the covariances are substituted for the true covariances and inferences are made based on the assumption that the resulting plug-in estimate of the standardized prediction error asymptotically follows the standard normal distribution. However, in the finite sample case or under fixed-domain asymptotics, the effect of estimation may not be negligible, which requires appropriate adjustments to be made to the procedure. As alternatives to the normal approximation, we provide two plausible approximations, one of which is suggested by Hulting and Harville (1991), that take into account such an effect both on the efficiency of the predictor and on the estimation of the mean squared prediction error. Some analytic approaches are considered in a hope to find a better alternative as well as to compare the two existing methods. They cover the randomized block design and a simple spatial model with evenly spaced observations. These methods are also compared through a simulation study and the analysis of precipitation data in the midwest US.

Information about building access for persons with disabilities may be obtained in advance by calling Matt Johnston at 773.702-0541 or by email (mhj@galton.uchicago.edu).