Computational Instability of Inverse of Spatial Covariance Matrices

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Abstract

The computing an inverse of a covariance matrix is seen very often in statistics. For example, Gaussian likelihood function involves the inverse of a covariance matrix. Spatial prediction called Kriging involves the computation of the inverse of a spatial covariance matrix. For the computation of the inverse of a spatial covariance matrix, numerically unstable results are found when the observation locations are getting dense. In this paper, we investigate why and when computational instability in calculating the inverse of a spatial covariance matrix makes maximum likelihood estimator (MLE) or Kriging unreasonable for the Mat\'{e}rn covariance model in the ill-conditioned sense. Also, some possible apporaches to relax such computational instability are also discussed.