Spatially adaptive covariance tapering

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Covariance tapering is a popular approach for reducing the computational cost of spatial prediction and parameter estimation for Gaussian process models. However, tapering can have poor performance when the process is sampled at spatially irregular locations or when non-stationary covariance models are used. This work introduces a non-stationary taper method in order to improve the performance of tapering in these problematic cases. This is achieved by introducing a computationally convenient class of compactly supported non-stationary covariance functions, combined with a new method for choosing spatially varying tapering ranges. Numerical experiments are used to show that the performance of both kriging prediction and parameter estimation can be improved by allowing for spatially varying taper ranges. However, although non-stationary tapering outperforms regular tapering for parameter estimation, simply dividing the data into blocks and ignoring the dependence between the blocks is often a better method.

This is joint work with Jonas Wallin.