

Dr. Bohai Zhang,

Research fellow, Centre for Environmental Informatics, NIASRA, University of Wollongong

Title:

## **Smoothed Full-Scale Approximation of Gaussian Process Models for Computation of Large Spatial Datasets**

**Abstract:**

Gaussian process (GP) models encounter computational difficulties with large spatial datasets since its computational complexity grows cubically with sample size  $n$ . Although the Full-Scale Approximation (FSA) using a block modulating function provides an effective way for approximating GP models, it has several shortcomings such as the less smooth prediction surface on block boundaries and sensitiveness to the knot set under small-scale data dependence. To address these issues, we propose a Smoothed Full-Scale Approximation (SFSA) method for the analysis of large spatial dataset. The SFSA leads to a class of scalable GP models, whose covariance functions consist of two parts: A reduced-rank covariance function capturing large-scale spatial dependence and a covariance adjusting local covariance approximation errors of the reduced-rank part both within blocks and between neighboring blocks. This method can alleviate the prediction errors on block boundaries; it also leads to more robust inference and prediction results under different dependence scales due to better approximation of the residual covariance. We illustrate the effectiveness of the SFSA approach through simulation studies and a total column ozone dataset.