Mathematical Sciences Colloquium Series

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The University of Texas at El Paso

In person at Bell Hall 130 and online via Zoom

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Friday, January 27 **3pm**

Inverse Regression for Spatially Distributed Functional Data

Abstract

Spatially distributed functional data are prevalent in many statistical applications such as meteorology, energy forecasting, census data, disease mapping, and neurological studies. Given their complex and high-dimensional nature, functional data often requires dimension reduction methods to extract meaningful information. Sufficient dimension reduction is one such approach that has become very popular in the past two decades. We consider one popular sufficient dimension reduction method, called inverse regression, for functional data observed at irregularly positioned spatial sites and include a spatially independent nugget effect which includes the function-specific variation. For estimation, we consider local linear smoothing with a general weighting scheme (Zhang and Wang, 2016), which includes the schemes, equal weight for observation, and equal weight for a subject, as special cases. This framework enables us to present the asymptotic results for different types of sampling plans over time such as non-dense, dense and ultra-dense. We discuss the domain-expanding infill (DEI) framework (Lu and Tjostheim, 2014) for spatial asymptotics, which is a mix of the traditional expanding domain and infill frameworks. The DEI framework overcomes the limitations of traditional spatial asymptotics in the existing literature. Under this unified framework, we develop asymptotic theory and identify conditions that are necessary for the estimated eigendirections to achieve optimal rates of convergence. Our asymptotic results include pointwise and L2 convergence rates. The performance of the proposed method is demonstrated using simulations and data analysis.

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