Mathematics, Statistics, and Computer Science **@ UIC**

Statistics and Data Science Seminar

Posterior Contraction and Credible Sets for Filaments of Regression Functions

Subhashis Ghoshal (North Carolina State University)

Abstract: The filament of a smooth function f consists of local maximizers of f when moving in a certain direction. The filament is an important geometrical feature of the surface of the graph of a function. It is also considered as an important lower dimensional summary in analyzing multivariate data. There have been some recent theoretical studies on estimating filaments of a density function using a nonparametric kernel density estimator. In this talk, we consider a Bayesian approach and concentrate on the nonparametric regression problem. We study the posterior contraction rates for filaments using a finite random series of B-splines prior on the regression function. Compared with the kernel method, this has the advantage that the bias can be better controlled when the function is smoother, which allows obtaining better rates. Under an isotropic Holder smoothness condition, we obtain the posterior contraction rate for the filament under two different metrics — a distance of separation along an integral curve, and the Hausdorff distance between sets. Moreover, we construct credible sets of optimal size for the filament with sufficient frequentist coverage. We study the performance of our proposed method through a simulation study and apply on a dataset on California earthquakes to assess the fault-line of the maximum local earthquake intensity.

Based on joint work with my former graduate student, Dr. Wei Li, Assistant Professor, Syracuse University, New York.

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