

COLLOQUIUM

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Modeling Point Processes with Spatially Dependent Marks: A Case Study in Fingerprint Analysis

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Abstract

Spatial data includes geostatistical data, lattice data, and point patterns, etc. We briefly explain each data type and focus on point patterns which arise when the variable of interest is the location of events. The data from fingerprints consists of location and orientation information which can be considered as a realization of a marked point process with two important characteristics: (1) clustering tendencies in the spatial domain and (2) spatially dependent orientation within cluster. We introduce classes of marked point process models that can capture such characteristics and inference is carried out in a Bayesian MCMC framework. The proposed class of models is fitted to the simulated data as well as several fingerprint images in the NIST Special Database 4 to demonstrate flexibility of fit to different kinds of fingerprint feature patterns. We use the fitted models to study fingerprint individuality, which aims to determine to what extent a fingerprint uniquely identifies an individual.

This is joint work with Sarat Dass.

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