

MICHIGAN STATE UNIVERSITY
Department of Statistics and Probability

COLLOQUIUM

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Scalar-on-Image Regression via Soft-Thresholded Gaussian Processes

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10:20 a.m. - 11:10 am
Refreshments 10:00 am
C405 Wells Hall

Abstract

Scalar-on-image regression is a useful model to study the association between the scalar response and a large number of imaging predictors. The focus of this work is on spatial variable selection for scalar-on-image regression, for which a new class of Bayesian nonparametric models, soft-thresholded Gaussian processes are proposed and the efficient posterior computation algorithms are also developed. Theoretically, soft-thresholded Gaussian processes provide the large prior support for the spatially varying coefficients that enjoy piecewise smoothness, sparsity and continuity characterizing the important features of imaging data. Also, the soft-thresholded Gaussian process can lead to the posterior consistency for both parameter estimation and variable selection for scalar-on-image regression. That is, under some mild regularity conditions, the proposed approach can consistently select all true spatially-dependent imaging predictors and accurately estimate their effects on the response variable, even when the number of true predictors is larger than the sample size. The proposed method is illustrated by extensive simulation studies compared with existing approaches and an analysis of Electroencephalography (EEG) data in the alcoholism study.

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