

The University of Chicago Department of Statistics

STATISTICS COLLOQUIUM

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Department of Statistical Science Duke University

Nonparametric Bayes Learning of Low Dimensional Structure in Big Objects

THURSDAY, January 26, 2012, at 12:00 PM

110 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

The first part of the talk will focus on Bayesian nonparametric models for learning lowdimensional structure underlying higher dimensional objects with special emphasis on models for 2D and 3D shapes where the data typically consists of points embedded in 2D pixelated images or a cloud of points in \mathbb{R}^3 . Models for distributions of shapes can be widely used in biomedical applications ranging from tumor tracking for targeted radiation therapy to classifying cells in a blood sample. We propose tensor product-based Bayesian probability models for 2D closed curves and 3D closed surfaces. We initially consider models for a single surface using a cyclic basis and array shrinkage priors. The model avoids parameter constraints, leads to highly efficient posterior computation, and has strong theoretical properties including near minimax optimal rates. Focusing on the 2D case, we also develop a multiscale deformation model for joint alignment and analysis of related shapes motivated by data on images containing many related objects. Efficient and scalable algorithms are developed for posterior computation, and the models are applied to 3D surface estimation data from the literature and 2D imaging data on cell shapes. In developing general purpose models for potentially high-dimensional objects and surfaces, it is important to consider theoretical properties. In the final part of the talk, we give an overview of our recent theoretical results on large support, consistency and minimax optimal rates in Bayesian models for regression surfaces and density regression.

For further information and inquiries about building access for persons with disabilities, please contact Dan Moreau at 773.702.8333 or send him an email at dmoreau@galton.uchicago.edu. If you wish to subscribe to our email list, please visit the following website: https://lists.uchicago.edu/web/arc/statseminars.