SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

SCALING MULTIDIMENSIONAL INFERENCE FOR BIG STRUCTURED DATA

DISSERTATION DEFENSE
By

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Abstract: In a world of increasing sensors modalities, cheaper storage, and more data oriented research, we are quickly passing the limits of traditional statistical inference methods. Accuracy alone can no longer justify unwarranted memory use and infeasible computational complexity. Improving the scalability of these methods for multidimensional data is a must. In this presentation, we consider scaling Gaussian processes regression for multidimensional input data. Gaussian processes (GP) have become a popular tool for nonparametric Bayesian regression. However, their use in many domains was limited due to their burdensome scaling properties. Naive GP regression has O(N^3) runtime and O(N^2) memory complexity, where N is the number of observations. Here I will present a novel algorithm for GPs with a multiplicative kernel structure when multidimensional inputs are on a lattice (GP-grid). We show an extension of the GP-grid algorithm to handle two limitations of the basic algorithm by allowing for incomplete data, and heteroscedastic noise. Lastly, we incorporate expressive kernels, which learn hidden patterns in the data. We use our GP method on several real world problems showing improved results over traditional methods. Finally, we use our GP-grid framework as part of a novel method for denoising fMRI data, which allows for tractable noise-based smoothing that avoid the sensitivity/specificity tradeoff of other methods.

DATE: **Friday May 9, 2014**
TIME: **1:10 p.m.**
PLACE: **Green Hall, Room 0120**

Dissertation advisor:
Dr. Arye Nehorai

This seminar is in partial fulfillment
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