



THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

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Regression on Graphs – Lipschitz and Isotonic

THURSDAY, November 12, 2015 at 4:30 PM
133 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

In this talk, we'll discuss how to use observations on some vertices of a graph to draw inferences on the remaining vertices. Given real-valued observations on some vertices, we seek a smooth extension of these observations to all vertices. We propose the absolutely minimal Lipschitz extension, which is the limit of p -Laplacian regularization for large p .

We'll present algorithmic results for computing these extensions efficiently. Our algorithms naturally apply to directed graphs, and run on graphs with millions of edges in a few minutes. These extensions are particularly suited for regularization and outlier removal, which is surprising since outlier removal is NP-hard for other natural extensions. We'll present some experimental results for detecting spam webpages using our algorithms.

Finally, we'll demonstrate that these extensions are intimately connected to a classic problem in Statistics, Isotonic Regression: Given a directed acyclic graph G , and observations on all vertices, the goal is to compute the "closest" set of observations that are non-decreasing along the edges. We give algorithms for Isotonic Regression that achieve the best asymptotic running times on sparse graphs, and also run quickly in practice.

This is joint work with Rasmus Kyng, Anup Rao, and Daniel Spielman.

Organizers:

Lek-Heng Lim, Department of Statistics, lekheng@galton.uchicago.edu, Ridgway Scott, Departments of Computer Science and Mathematics, ridg@cs.uchicago.edu, Jonathan Weare, Department of Statistics and The James Franck Institute, weare@uchicago.edu. SSC Seminar URL: http://www.stat.uchicago.edu/seminars/SSC_seminars.shtml.

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