



THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

GARY L. MILLER

Computer Science Department
Carnegie Mellon University

The Revolution in Graph Theoretic Optimization Problems

THURSDAY, November 5, 2015 at 4:30 PM
133 Eckhart Hall, 5734 S. University Avenue

ABSTRACT

Over the last several years there have been major breakthroughs in the design of approximation algorithms for such classic problems as finding the maximum flow in a graph. Maximum flow for undirected graphs can now be approximately solved in almost linear time. This result by researchers at Berkeley and MIT, I claim, is only the beginning of a new era in efficient algorithm design.

Graph theoretic optimization problems, that have been dormant for fifty years are now seeing new and exciting algorithms. These advances have been made possible by Spectral Graph Theory, the interplay between linear algebra and combinatorial graph theory. One application of this interplay is a nearly linear time solver for Symmetric Diagonally Dominate systems (SDD). This seemingly restrictive class of linear systems has received substantial interest in the last 15 years. Both algorithm design theory and practical implementations have made major progress. Surprisingly, there is an ever growing list of problems that can be efficiently solved using SDD solvers including image segmentation, image denoising, finding solutions to elliptic equations, computing maximum flow in a graph, graph sparsification, and graphics. All these examples can be viewed as special cases of convex optimization problems that arise from graph problems. I can imagine a world where such optimization problems that seem to require at least quadratic work will all be solvable by practical algorithms guaranteed to run in near linear work and are very parallel.

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.

If you wish to subscribe to our email list, please visit the following website:
<https://lists.uchicago.edu/web/arc/statseminars>.