THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

JAMES RENEGAR

School of Operations Research and Information Engineering
Cornell University

A Framework for Applying First-Order Methods to Conic Optimization Problems

TUESDAY, May 12, 2015 at 3:00 PM
Ryerson 251, 1100 E. 58th Street

ABSTRACT

The study of first-order methods has largely dominated research in continuous optimization for the last decade, and yet the range of problems for which efficient and easily-applicable first-order methods have been developed remains limited. The limited range is due to the methods relying on subroutines that for efficiency require pronounced problem structure (e.g. orthogonally projecting a point onto a ball or box is easy, but projecting onto a general polytope is not).

We show that any convex conic optimization problem can be readily transformed into an equivalent convex optimization problem whose only constraints are linear equations and whose objective function is Lipschitz continuous, with Lipschitz constant no greater than 1. Virtually any subgradient method can be applied to solving the equivalent problem. The computational complexity ramifications are explored for a well-known "optimal" subgradient method.

Moreover, we show that for a broad class of optimization problems (namely, hyperbolic programs), the equivalent problems can be naturally “smoothed,” thus allowing accelerated gradient methods to be applied, resulting in superior iteration bounds.

Perhaps most surprising is that the transformation is simple and so is the basic theory, and yet the approach has been overlooked until now, a blind spot.

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.