THE UNIVERSITY OF CHICAGO

Department of Statistics

SCIENTIFIC AND STATISTICAL COMPUTING SEMINAR

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A General Framework for Fast Stagewise Algorithms

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ABSTRACT

Forward stagewise regression follows a very simple strategy for constructing a sequence of sparse regression estimates: starting with all coefficients equal to zero, it iteratively updates the coefficient (by a small amount ε) corresponding to the variable that has maximal absolute inner product with the current residual. This procedure has an interesting connection to the lasso: under some conditions, it can be shown that the sequence of forward stagewise estimates exactly coincides with the lasso path, as the step size ε goes to zero. Further, essentially the same equivalence holds outside of the regression setting, for minimizing a differentiable convex loss function subject to an ℓ norm constraint (and the stagewise algorithm now updating the coefficient corresponding to the maximal absolute component of the gradient).

Even when they do not match their ℓ-constrained analogues, stagewise estimates provide a useful approximation, and are computationally appealing. Their success in sparse modeling motivates the question: can a simple, effective strategy like forward stagewise be applied more broadly in other regularization settings, beyond the ℓ norm and sparsity? This is the focus of the talk; we present a general framework for stagewise estimation, which yields fast algorithms for problems such as group-structured learning, matrix completion, image denoising, and more.

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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