Seminar

Speaker: Professor Rob Strawderman, Cornell University

Title: MM algorithms for penalized regression problems

Date: Wednesday, April 21, 2010

Time: 3:20 p.m.

Place: 552 Hill Center

Abstract

The study of penalized objective functions in connection with high dimensional regression problems has increased dramatically in recent years. In problems where the goal is to simultaneously select variables and estimate regression coefficients in settings of relatively high dimension, the use of nondifferentiable penalty functions, such as the convex L1 norm and concave SCAD and MCP penalty functions, have been proposed for this purpose. In the case of convex and concave penalty functions, substantial attention has been paid to the understanding of statistical behavior (e.g., oracle properties) of the resulting estimators; however, in the case of concave penalties, considerably less attention has been paid to the development of general algorithms with known performance guarantees.

In this talk, I describe a general class of majorization minimization (MM) algorithms for this purpose that, for a large and interesting class of penalized regression problems, results in the (M)inimization by (I)terated (S)oft (T)hresholding (ie, MIST) algorithm. The use of iterated soft-thresholding, which can be implemented componentwise, allows for very fast, stable parameter updating while avoiding the need for high-dimensional matrix inversion. We summarize the local convergence properties for this new class of algorithms, introduce some interesting variations, and demonstrate the surprising effectiveness of acceleration methods. As an illustration, we propose a new algorithm for fitting Cox regression models subject to the minimax concave penalization recently introduced in Zhang (2008, 2010) and then use it to analyze the relationship between gene expression data and survival in lymphoma patients, comparing the genes selected to those obtained under Fan's SCAD penalization.

This is joint work with one of my PhD students, Elizabeth Schifano, and my colleague Martin T Wells.