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Course Announcement
Spring 2014
ORIE 6310: Mathematical Programming II

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Instructor: M. J. Todd (mjt7@cornell.edu, Rhodes 229)
Prereq.: ORIE 6300 or permission of instructor
Text: None – just class notes. There will be a number of books on reserve.
Time and place: TR from 11:40 to 12:55, in Upson 211.

This course is concerend with extensions of linear programming, in particular the linear complementarity problem and nonlinear programming, with a stress on the complexity of algorithms or of problems. Topics will include the following:

- A very brief review/introduction to the KKT conditions for $\min\{f(x) : g(x) \leq 0\}$, f, g smooth

- The linear complementarity problem (LCP):

$$w = Mz + q, \quad w \geq 0, \quad z \geq 0, \quad w \cdot z = 0.$$

  - applications to linear and quadratic programming, and to Nash equilibria of bimatrix games;
  - complementary pivot algorithms

- Efficiency of pivoting algorithms

  - the diameter of polyhedra
  - expected number of pivots

- Informational complexity of convex programming $\min\{f(x) : x \in C\}$, f, C convex, f possibly nonsmooth

  - nonsmooth convex optimization, Lagrangian relaxation
  - lower bounds
  - the method of centers of gravity
  - the ellipsoid method

- Applications of the ellipsoid method

  - semidefinite programming
  - equivalence of separation and optimization

- Some examples of modelling using structured nonlinear programming

Work involved: There will be occasional homework sets (a total of around four) and a final exam (probably a 24-hour take-home). Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. In particular, I will provide strict guidelines for how much you can consult with other students on the homeworks, and of course the final can only be discussed with me.