LINEAR PROGRAMMING

Course Syllabus

Fall 2013 Csci 628 Anke van Zuylen

Basic information

- Class time & location: MWF 9:00-9:50 a.m., Jones Hall 306
- Instructor:
  Anke van Zuylen
  Jones Hall 125
  Phone: (757) 221-2036 (Office)
  Email: `anke@wm.edu`
  Office Hours: MT 2:45-4:15pm

Prerequisites:

Linear algebra, Calculus, and some rudimentary ideas of optimization models and algorithms.

Description:

Linear Programming is perhaps the most recognized and widely used optimization tool in the world today. It has its origins in planning and operations models from World War II through the seminal work of George Dantzig and his development of the simplex method. Alternatives to the simplex method termed interior point methods have gained popularity in the last twenty years.

In this course, you will learn how to model real world problems as linear programs, you will learn how to solve them with state-of-the-art solvers, and we will study the theory behind linear programming solvers. Topics we cover include the simplex method, linear programming duality, sensitivity analysis, network-type problems, interior point methods and (if time permits) an introduction to discrete optimization and integer programming.

Text book:

The course does not have a required text book. Lecture notes will be posted to the course web site at `blackboard.wm.edu`.

- V, Chvátal, *Linear Programming*. On course reserve at Swem library. T57.74.C54 1983
- R. Fourer, AMPL: a modeling language for mathematical programming. On course reserve at Swem library. QA402.5. F6872 2003
  Available online at `http://www.ampl.com/BOOK/download.html`
- R.J. Vanderbei, *Linear Programming: Foundations and Extensions*. Available online at `higherintellect.info/texts/math/LinearProgramming-FoundationsandExtensions.pdf`
- S.P. Bradley, A.C. Hax, T.L. Magnanti, *Applied Mathematical Programming*. Available online at `http://web.mit.edu/15.053/www/`.

Topics (tentative):

- Linear programs, graphical solution method, optimal solutions, unboundedness, transforming to standard form
- Linear programming formulations, solution using AMPL
- Linear algebra review, geometry of linear programming
- The simplex method
- Initialization, detecting optimality and unboundedness
- Degeneracy, anti-cycling methods, fundamental theorem of linear programming
- Linear programming duality
- Revised simplex method
- Sensitivity analysis
- Game theory
- Large scale linear programming
- Network flow problems
- Introduction to integer programming, branch and bound
- Interior point methods

Grades:

There will be a midterm exam and a final exam. The midterm exam will count 30% and the final exam 35% of the final course grade. The midterm exam will be a take home exam, and is tentatively scheduled for October 18. The final exam is scheduled for Monday, December 16 from 9:00 to 12:00. For both exams you will be allowed to consult your own lecture notes and homeworks, but you are not allowed to use any text books, online materials, etc.

Homework assignments will be given periodically throughout the semester and together will count 35% of the final course grade. Some of these homework assignments will require the use of software which will be introduced in lecture.

Homework Policy:

- You are allowed (and even encouraged) to discuss the homework problems with your classmates. However, you *have to write down the solutions on your own*, without checking your written solution with another student. Do not let other students read your solutions, or read another student's solution.
- If you find materials online or elsewhere that help you understand the lecture materials, and if this indirectly helps you in solving a homework problem, feel free to read and use the material. However, if you find the *solution* to a homework problem, you are not allowed to use it. If it is unclear to you whether something you found online can or cannot be used by you, please talk to me.
- For each homework set, please list who you talked to, and which resources you consulted. This is not used for grading purposes, it is merely good scientific practice to list your sources and the help you received.