

Computational Methods in Optimization

IE 496

Dr. Ted Ralphs

First Meeting
January 17, 2012

Administrivia

- Class Meeting Time
- Introductions
- Office Hours
- TA

What is the motivation for this class?

"Here is your book, the one your thousands of letter have asked us to publish. It has taken us years to do, checking and rechecking countless recipes to bring you only the best, only the interesting, only the perfect. Now we can say, without a shadow of a doubt, that every single one of them, if you follow the directions to the letter, will work for you exactly as it did for us, even if you have never cooked before."

- M c C a l l ' s C o o k b o o k (1 9 6 3)

What will this class be about?

- We'll talk about how computers work and how we can model them.
- We'll talk about how to use those models to analyze the efficiency of computational methods.
- We'll discuss and analyze the implementations of data structures and algorithms.
- Along the way, we'll discuss some tools for programming and development.
- The **ultimate focus** will be on the practical tools needed to solve real (optimization) problems using a computer.

Topic Coverage

- Fundamentals of Computer Systems
- Models of Computation and Complexity
- Programming Paradigms and Languages
- Data Structures
- Algorithms
 - Combinatorial
 - Numerical

Prerequisites

- Strong undergraduate mathematics background, especially linear algebra
- Some programming experience
- Graph theory helpful
- Optimization background helpful

Unified Approach

- We will talk about the design and implementation process from end to end
- As much as possible, we'll treat all subjects as a unified whole
- We'll assume parallel platforms and algorithms from the outset
- We'll try to emphasize modern hardware trends
- Programming projects will build on each other
- There is flexibility in the syllabus

What will I get out of this class?

- What you put into it
- In this course, we will raise a myriad of interesting computational issues
- We won't have time to resolve them all
- It is more important to have awareness of the issues
- The best solutions may differ over time and with different platforms

My approach to lectures

- There should be an active dialog between teacher and students
- This course will be loosely structured, so it's important that you ask questions!
- I will try to customize lectures them to the background of the students.
- Lectures will be an introduction to more in-depth reading.

More on lectures

- There will be a Web site for the class at

<http://coral.ie.lehigh.edu/~ted/teaching/ie496>

- I will do my best to post the lecture slides there before the class so that you can prepare if you want
- All handouts for the class will be available at the site
- All readings will also be posted there

Assignments and Exams

(Subject to change)

- There will be two types of assignments
 - Programming
 - Written
- Assignments will be given approximately once every two weeks
- There will be no formal written exams
- There will be no written final
- There will be a final project

Submitting Assignments

- Assignments can be submitted by e-mail as described in the syllabus
- For programming assignments, I would like **well-commented, formatted source code**.
- It would be helpful to have an accompanying write-up explaining the code.

Textbook

- There will be no single required textbook
- There are a few books that may be worth purchasing
- I will have references available in my office
- There will be readings available on the Web site

Programming Environment

- Operating Systems
 - Unix
 - Windows
- Languages
 - C/C++
 - Python

Questions?