CSE/Math 555 - Numerical Optimization Techniques
Spring 2011

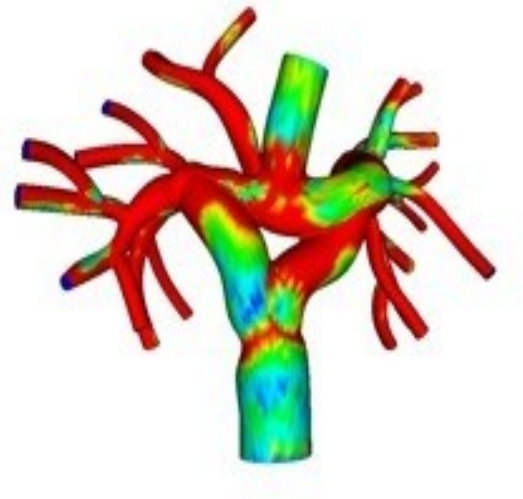

Image Credit: Prof. Alison Marsden, UCSD; see
http://maeresearch.ucsd.edu/marsden/AMarsden/Research.html

Course Description

The course will emphasize the design and mathematical analysis of numerical optimization algorithms (including related software issues) and applications. Topics will include: unconstrained optimization methods, automatic differentiation, nonlinear equations, constrained optimization methods, linear and quadratic programming, convex optimization, global optimization, and parallelism in optimization. The course will be lecture-based with homework assignments (comprised of mathematical exercises, algorithmic design, and programming problems) and exams.

Course Meetings

Mondays, Wednesdays, and Fridays, 9:05-9:55am; 112 Walker Building

Instructor

Dr. Suzanne Shontz
343J IST Building
Dept. of Computer Science and Engineering
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Office Hours: 2-3pm Monday and Wednesday (or send e-mail to make an appointment).

Teaching Assistant

None

Required Text

Numerical Optimization
Authors: Nocedal and Wright
Publisher: Springer
ISBN: 978-0387987934

Prerequisites

CMPSC (MATH) 456 or instructor approval.

Course Requirements

Lecture attendance is required, although attendance will not be recorded. The course requirements for CSE/Math 555 include six homework assignments, one midterm exam, and a final exam. The homework will require a combination of written exercises and programming. The exercises will involve the design and analysis of algorithms and will require mathematical proofs in some cases. The programming exercises will be done in Matlab, a high-level language for numerical computation. Prior knowledge of Matlab is not a prerequisite for the course.

Homework assignments will be due about one week after they are assigned. Due dates for the homework assignments will be announced in class. There will be a late penalty of 10% for homework handed in up to 24 hours late. No homework will be accepted more than 24 hours late.

There will be one midterm exam scheduled for **February 25-28** and a final exam scheduled for **April 29-May 2**. Please reserve these dates on your calendar. The midterm and final will be take-home exams and will run from 9:55 AM on the start date to 9:55AM on the end date. Students are allowed to consult their textbook and notes on the exams as well as outside references if proper citations are made. The final exam will not be comprehensive in nature. A make-up midterm or final exam will be given to any student who is absent from this exam for a compelling reason and gets permission from the instructor.

The exams will cover topics drawn from the lectures and homework, and from the underlying mathematics.

Grading

Homework counts for 40% of the final grade. The lowest scoring homework assignment **(out of the first five)** will be dropped. One of the first five homework assignments may be skipped, in which case this is the one that will be dropped. **Note that the sixth homework assignment will be a mini-project which will be weighted the same as two homework assignments in your final grade and may not be dropped.** The midterm exam will count for 30% of the final grade, and the final exam will count for 30%.

Class Schedule

The course calendar shows a week-by-week syllabus. The dates and order of topics are subject to change by the instructor. Any significant changes will be announced in class.

Course Website

There is a course website within ANGEL accessible via http://cms.psu.edu.

Computing Facilities

It is assumed that students in the course have access to computing facilities and Matlab through their departments and/or research labs. If this is not the case, arrangements may be made to obtain a CSE computer account for the duration of the course.

Books on Reserve

The following books have been placed on reserved for this course at the Physical and Mathematical Sciences Library: (1) Numerical Optimization (Nocedal and S. Wright, also available as an e-book), (2) Numerical Methods for Unconstrained Optimization and Nonlinear Equations (Dennis and Schnabel), (3) Numerical Linear Algebra and Optimization (Gill, Murray, and M. Wright), (4) Practical Optimization (Gill, Murray, and M. Wright), (5) Iterative Methods for Optimization (Kelley), (6) A Guide to Matlab: For Beginners and Experienced Users (Hunt), and (7) MATLAB Guide (Higham).

Academic Integrity

Students are allowed to collaborate on the homework assignments **(but not the mini-project)** to the extent of formulating ideas as a group. Each student is expected to write up the problem set by himself or herself. Students must not hand in homework that represents somebody else's ideas entirely. Students should do the coding for programming questions by themselves--no program code should be shared. ***No collaboration of any kind is allowed on the exams.***

Students are permitted to consult outside published material for the homework and the exams, although they will be fully based on lecture notes and the textbook. If a student consults a source other than the lecture notes and textbook, he or she must cite the source--failure to cite the source will be considered cheating. However, note that no online postings (to newsgroups, etc.) may be made in regards to either the homework or the exams.

The penalty for cheating will be an F for the course, following a hearing with the instructor as spelled out in the university's academic integrity policy. In extreme circumstances the instructor will in addition bring the case before the university's Academic Integrity Committee and/or the Office of Judicial Affairs.

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