Course Syllabus: STAT/BIOSTAT 534 Statistical Computing
Spring Quarter 2011

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Classroom
The class meets Tuesday and Thursday between 11:30am and 12:50pm in MEB 242.

Office Hours
Fridays between 9:30am and 12:30pm in Padelford Hall C-14B, or by appointment.

Textbooks

Prerequisites
Experience with programming in a high level language. Some background in statistics.

Course objectives
By the end of the course, you will be able to write code in R and C. You will be able to define and implement your own data structures that are tailored to the specifics of the problem you want to solve. You will gain notions and practical experience related to stochastic optimization, randomness and parallel programming.
Class requirements

The students will need to complete seven homeworks and a final project. The final project is worth three homeworks.

Schedule of Lectures

- **Lecture 1.** Introductions, course logistics, description of the final project.
- **Lecture 2.** A brief introduction to R.
- **Lecture 3.** Vectors and matrices in C. Higher-dimensional arrays.
- **Lecture 4.** Lists: single/double linked, stacks, queues, sparse matrices.
- **Lecture 5.** Recursion.
- **Lecture 6.** Sorting algorithms.
- **Lecture 7.** Trees.
- **Lecture 8.** Graphs (decomposability, maximal-prime components).
- **Lecture 9.** Randomness.
- **Lecture 10.** Parallel computing. Clusters of computers.
- **Lecture 11.** Parallel programming with MPI (I).
- **Lecture 12.** Parallel programming with MPI (II).
- **Lecture 13.** Random variable generation (Chapter 2 from textbook).
- **Lecture 14.** Monte Carlo integration (Chapter 3 from textbook).
- **Lecture 15.** Monte Carlo optimization (Chapter 4 from textbook).
- **Lecture 16.** Monte Carlo optimization - second part.
- **Lecture 17.** Metropolis-Hastings Algorithms (Chapter 6 from textbook).
- **Lecture 18.** Metropolis-Hastings Algorithms - second part.
- **Lecture 19.** Gibbs samplers (Chapter 7 from textbook).
- **Lecture 20.** Gibbs samplers - second part.

**Final projects due June 6.**