Advanced Programming for Financial Engineering 2 - IEOR 4729y

Spring 2014

- Lecturer: Professor Daniel Bienstock. Office hours: by appointment
- Teaching assistants: Hal Cooper
- Textbook:
  - The C Programming Language, by Kernighan and Ritchie
  - Further reading materials to be provided during the course.
- Instructor's permission is required to attend the course

Course Outline

This course will develop the ability to deploy high-performance implementations of selected Financial Engineering topics using modern techniques. Some of the background in Financial Engineering will be provided.

Topics/structure:

a. The bulk of the programming in this course will be carried out in the C language, with additional tasks carried out in Python, and some in C/Python. Some C++ material will be covered, as well. We will cover advanced programming techniques in C, but it is expected that students taking this course have some background in C/C++.

b. The operating environment will be Linux, with some work in the Windows environment, and some projects involving both Linux and Windows machines if time permits. An introduction to the Unix command-line will be provided.

c. Programming techniques to be covered:
   - Synchronization using the file system
   - Synchronization using threads
   - Synchronization using sockets
d. Some computational techniques to be covered:

- High-performance implementations of SVD-like algorithms
- High-performance implementations of selected optimization methods
- More topics to be added if time permits

e. Some Financial Engineering topics to be covered:

- Robust/stochastic portfolio optimization
- Robust/stochastic portfolio management
- Portfolio execution models
- More topics if time permits

The course is restricted to OR/FE students in the programming track. A prerequisite to this course is "Advanced Programming for FE, 1" or equivalent.

Organization

Students taking this course will be organized into small teams (up to two people per team). A significant programming load throughout the term will be the norm. The course will be centered on a series of projects. These will account for 1/3 of the grade. There will also be a final, more substantial project, which will account for 1/3 of the grade also. Class participation accounts for the remaining 1/3. This split is a rough guideline and adjustments will be made based on individual cases.

Also note that class attendance is required, and will be taken into account when assigning the final grade.