CS 337 Performance Modeling in Computing, Fall 2023

Prof. J. M. Calvin

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Prerequisites

CS 114 and (Math 333 or Math 341).

Objective

This course introduces probability models and techniques useful in computer science. The emphasis is on evaluating the performance of algorithms and computing systems, using both analytical methods and computer simulation. Other topics include optimizing systems and machine learning.

Reference Books

"Think Stats: Probability and Statistics for Programmers", by Allen B. Downey; see web page at

`http://www.greenteapress.com/thinkstats/`

This is a computing-oriented introduction to probability and statistics. If your probability skills are rusty, this is a good source for a review.

"From Algorithms to Z-Scores: Probabilistic and Statistical Modeling in Computer Science", by Norm Matloff; see the web page

`http://heather.cs.ucdavis.edu/probstatbook`

"Probability Models in Computer Science", Sheldon Ross, Harcourt, 2002.
This book contains most of the theory we will cover in this course.

Software

You will need to write some programs during the course.

Course Materials and Communications

We will be using the Canvas system (canvas.njit.edu). All class information (including this syllabus) will be posted there. I will post announcements on Canvas as needed.

If you have a personal issue that you wish to bring to my attention (for example if you want to inquire about your grade, or inform me that you need to miss class due to illness) you should email or call me, or speak to me in person. For other communications, you should use Canvas (for example, questions on homework or what will be on the exam).

Grading

Homework will be assigned each week. Assignments may include programming. Each Wednesday there will be a quiz based on the homework and readings of the previous week. You must be present in the classroom, and have your working computer, to take the quiz. The final grade will be based on the quizzes (70%) and final (30%). The lowest three quiz grades will be dropped. The grading scale (out of 100) is: $85-100$ A, $75-84$ B+, $65-74$ B, $50-64$ C+, $40-49$ C, $32-39$ D+, $25-31$ D. In addition, a grade of at least 20% is required for each component (quizzes and final) to pass the course. I reserve the right to modify the scale.

In order to be excused from a component of the course that contributes to the final grade, you must supply documentation explaining your absence to the office of the dean of students, and they will in turn contact me. **Exception:** If you feel sick on the day of the class, notify me by email *before* the start of class and you will be excused from the quiz on that day. If this happens more than once, you will be given an oral makeup exam.

Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

`http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf`.

Please note that it is my professional obligation and responsibility to report any academic misconduct to the Dean of Students Office. Any student found in violation of the code by cheating, plagiarizing or using any online software inappropriately will result in disciplinary action. This may include a failing grade of F, and/or suspension or dismissal from the university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu.

All work that you submit must be your work only. Any evidence of cheating on a graded course component will result in a grade of zero for that component.

Tentative Course Outline

- Probability review.
- Inequalities.
- Convergence concepts.
- Central limit theorem.
- Markov chains.
- Continuous-time processes.
- Queueing models.
- Simulation modeling.
- Simulation output analysis.
- Markov chain Monte Carlo.

- Optimization.
- Simulation-based optimization.
- Machine learning.