Syllabus, CS 6515 (Graduate Algorithms)

Note: the syllabus and course schedule are subject to change. Any changes to the syllabus and/or course schedule after the semester begins will be relayed to the students during lectures and/or Canvas.

Instructor: Gerandy Brito

Introduction

Welcome to Graduate Algorithms! This course aim to cover classical algorithmic paradigms and discuss its connections. There will be two main segments: the first one devoted to deterministic algorithms and the second one will dive into randomized designs.

We will use several textbooks including

- `Algorithms` by S. Dasgupta, C. Papadimitriou, and U. Vazirani.
- `Probability and Computing` by M. Mitzenmacher and E. Upfal.
- `Markov Chains and mixing times` by D.A. Levin, Y. Peres and E.L. Wilmer.

You do not have to read them all (well, you can and they are all great books, but you can succeed without reading these books entirely). Suggested reading will be recommended for each topic.

Prerequisites

This is not a coding class. You will be asked to analyse the design of multiple algorithms, and use similar ideas to solve a variety of problems. Solutions to assignments will be in plain English and will ask you to *show the correctness of your design*. Very much like proving theorems in a math class. We will consider the performance of our design, but won't dive too deeply into it. Familiarity (at the undergraduate level) with Data Structures, Linear Algebra, Basic Probability, Graph Theory and Discrete Math is recommended.

Tentative list of Topics

- Graph algorithms. Search, connectivity, shortest path.
- Flows on networks.
- Linear Programming. Theory and Applications.
- Dynamic Programming.
- (Very fast) Intro to Randomized Algorithms.
- Randomized Rounding.
- Random Walks.

Grading

The breakdown of the grading will be as follows

(i) Homework: free response (40%) + MCQs (10%.).

(ii) Two exams: 25% each.

Grade assignments

After *all* grades are in and all overall percentage scores for students have been computed using the weights described above, grades are assigned. The cutoffs will be as follows.

A: [90%, 100%] B: [80%, 90%) C: [70%, 80%) D: [60%, 70%) F: [0%, 60%)

So, to guarantee an A, get 90% or better overall (not 89.9)
To guarantee at least a B grade, get 80% or better overall, etc.

These cutoffs *might* be adjusted, but only in the downward direction (to make letter grades higher). A final curve is unlikely.

Homework

Homework will be posted on Canvas and submitted on Gradescope. You will have a week to complete each homework. There will be a grace period to submit a late homework. Only under very special circumstances a homework will be accepted after the grace period. Once grades are released, you will have the opportunity to ask for a regrade, if you consider that your homework was unfairly graded. Please, be considered to your TAs and only do such request if you detect a mistake in your grading. You may collaborate with your peers, but you have to write your own solutions from scratch. When submitting your homework, list all your collaborators and all the references you used, both online and physical.

Exams

Exams will be conducted on Gradescope. Exams will be held in person, during regular class times, please see Canvas for the exact days. By registering to take this class, you are responsible for taking the exam during these days. Bring your personal laptop to class the day of the exams. If you do not have one, please contact us to arrange for an alternative way to take the exam. There will be no make up exam unless you have an official excuse from Student Services. If that is the case, make sure to contact the staff at least a week in advance. There are obvious exception to this rule (which hopefully won't happen). Final decision is at the sole discretion of the instructor. The regrade policy for exam is the same as for homework.

Students with Disabilities and/or in need of Special Accommodations

You should contact the staff about your accommodations as soon as possible. We need to receive an official letter detailing your accommodations. If you are granted an extension for assignments such as homework and exams, you must contact us at least 48 hours before the deadline. If you fail to do this, your request will be denied. In particular, do not wait to the duedate to request an extension. There are obvious exceptions to this rule, but those are really special circumstances.