CS 4540: Advanced Algorithms
Spring 2024 Syllabus

Summary

This course studies advanced algorithms beyond the standard curriculum in CS3510 and CS3511. It aims to develop a deeper understanding of approaches used in current research trends. The course is divided into 5-7 modules, introducing graduate material and providing a good transition for those planning to pursue graduate studies in theory.

Teaching Team

Instructor
Dana Randall
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Office Hours: Wednesdays,
4:45-5:30pm in Klaus 2140

Head Teaching Assistant
Sarthak Mohanty
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Office Hours: TBD

Teaching Assistant
Aadit Trivedi
atrivedi@gatech.edu
Office Hours: TBD

Teaching Assistant (TBD)

Lecture Format

Lectures are Mondays and Wednesdays from 3:30-4:45pm in Kendeda 210. Lectures will not be recorded.

Textbooks

Recommended references (both of these can be found online):

- *Algorithms, by Cormen, Leiserson, Rivest, and Stein [CLRS]*
- *Algorithm Design, by Kleinberg and Tardos [KT]*

Grading

- **Homeworks and Grading (25%)**
- **Midterms (40%)**: Tentative dates are February 21 and April 3.
- **Final (35%)**

Homeworks

Homeworks will be posted on Canvas and submitted on Gradescope. You are encouraged to type your homework. If you choose not to, please be considered of your TAs and write clear and legible. We will penalize your score if your homework is not readable. Once grades are released you will have a week to dispute your grade through a regrade request. Regrade request must be based on solid arguments and frivolous requests won't be addressed.

Exams

Exams will be conducted individually and in-person. Exams will be held during regular class times. There will be no make up exams.

Online Resources

- Announcements and files will be posted on Canvas. Assignments will be submitted and graded on Gradescope.

- We are using Ed Discussion as a tool to ask questions, discuss problems, form study/project groups, etc. Unless your question is personal in nature, please do not make a private post — if you have a question you are probably not the only one, and other students may benefit from seeing the discussion.

- We recommend using Overleaf to typeset your homework submissions (Your @gatech.edu email address gives access to "Premium" features.)

Students with Special Accommodations

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services at disabilityservices@gatech.edu as soon as possible to make an appointment, discuss your special needs and obtain an accommodations letter.

Syllabus (Tentative)

I. Stable Marriages:

II. Randomized Algorithms

- Universal Hash Families
- k-wise independence, linearity of expectation
- Min-cut

III. On-line Algorithms

- Intro to on-line algorithms: page
- Randomized paging
- k-server problem
- Ski-rental

IV. Tail inequalities

V. Approximation Algorithms

- Vertex cover, traveling salesman, set cover
- Knapsack and PTASs

VI. Computational Geometry

- Convex Hulls
- Voronoi regions
- Delaunay triangulations

VII. Optional topics

- Random Walks and Markov Chain Fundamentals
- Optimization
- Shaders
- FFT