CS253: Data Structures and Algorithms

This is an advanced programming course in computer science that teaches how to design structures and algorithms to process big data and standard methods to benchmark their performance for large-scale computing. The topics cover data structures such as *priority queues*, *search trees*, *disjoint sets*, and *graphs*, as well as their applications in the construction of efficient algorithms such as *sorting*, *searching*, *balancing*, *spanning*, and *optimization*. Throughout this course, students are expected to

- Have deep conceptual understanding in various data structures and algorithms.
- Implement their conceptual understanding in a programming language.
- Explore the most effective structures and algorithms for given tasks.
- Properly assess the quality of their implementations.

The prerequisite of this course is "CS171: Introduction to Computer Science II" (or equivalent). There are 10 weekly quizzes and 4 homework assignments that require sufficient skills in Java programming, Git version control, Gradle software project management, and LaTex writing.

Syllabus

General

- Course webpage: https://github.com/emory-courses/cs253
- Class hours: MW 1:00pm - 2:15pm, MSC N302
- Zoom: https://emory.zoom.us/j/95380639487
- Prerequisites: CS171 (or equivalent)

Instructors

- Jinho Choi - Professor of Computer Science
  : Office hours: MW 2:30pm - 4:00pm
  : Zoom: https://emory.zoom.us/j/94707085577
- Jiaying Lu - Ph.D. Student in Computer Science
  : Office hours: TuTh 1:00pm - 2:30pm
  : Zoom: https://emory.zoom.us/j/97291132910
- Instructors' email addresses
  : *firstname.lastname*@emory.edu
- Instructors get hundreds of emails daily, which makes them easy to miss. Please use GitHub Issues for questions that can be shared publicly and use emails for private matters.

Textbook

- No textbook is required. Feel free to use the following book for references:
  Data Structure & Algorithms in Java (6th Edition), Goodrich, Tamassia, Goldwasser

Classes

- Students are expected to digest assigned lecture notes in the course webpage and prepare answers to the questions in the notes prior to each class.
- The actual classes will be driven by discussions and coding exercises with the aim of minimum lecturing on the materials that are already covered in the notes.
- All students are expected to join virtually during the regular class hours although all classes are recorded for those who reside in different time zones.
- It tremendously helps instructors interpret how students are doing when their faces are shown so please turn on the videos if you can during the classes.

Grading

- 4 homework assignments: 60% (15 points each)
- 10 weekly quizzes: 40% (4 points each)
- No written exam

Homework Assignments

- They aim to assess conceptual understanding, programming ability, and analytical writing skills.
- Each homework can be submitted anytime within 3 weeks from the assigned date.

Weekly Quizzes

- They aim to check if students are keeping up with the weekly contents.
- Each quiz can be submitted anytime within 1 week from the assigned date.

Notes

- Submissions must be original and handed in individually through GitHub.
- Once answer keys are presented, no submission will be accepted for assignments and quizzes.
- Your work is governed by the Emory Honor Code. Honor code violations (e.g., copies from any source including your colleagues and internet sites) will be referred to the Emory Honor Council.
- Excuses for absence/reschedule and other serious personal events (health, family, personal related, etc.) that affect course performance must be accompanied by a letter from the Office for Undergraduate Education.

Schedule

Date	Topic	Lecture	Assignment
08/19	Introduction	md	quiz 0
08/24	Java Programming	md, pdf, src	
08/26	Java Programming	md, pdf, src	quiz 1
08/31	Priority Queues	md, pdf, src	
09/02	Priority Queues	md, pdf, src	quiz 2
09/07	Priority Queues	md, pdf, src	

Date	Topic	Lecture	Assignment
09/09	Sorting Algorithms	md, pdf, src	quiz 3
09/14	Sorting Algorithms	md, pdf, src	
09/16	Sorting Algorithms	md, pdf, src	quiz 4
09/21	Binary Search Trees	md, pdf, src	hw 1
09/23	Binary Search Trees	md, pdf, src	
09/28	Binary Search Trees	md, pdf, src	quiz 5
09/30	Tries	md, pdf, src	
10/05	Tries	md, pdf, src	quiz 6
10/07	Homework 1		hw 2
10/12	Disjoint Sets	md, pdf, src	
10/14	Minimum Spanning Trees	md, pdf, src	
10/19	Minimum Spanning Trees	md, pdf, src	quiz 7
10/21	Minimum Spanning Trees	md, pdf, src	
10/26	Topological Sort	md, pdf, src	quiz 8
10/28	Homework 2		hw 3
11/02	Network Flows	md, pdf, src	
11/04	Network Flows	md, pdf, src	
11/09	Network Flows	md, pdf, src	quiz 9
11/11	Dynamic Programming	md, pdf, src	
11/16	Dynamic Programming	md, pdf, src	quiz 10
11/18	Homework 3		hw 4
11/23	Review		