New York University Tandon School of Engineering
EL-GY 9343: Special Topic Course in Telecom Networks
Data Structure and Algorithm
Fall 2020

Instructor: Pei Liu

Course Prerequisites
1) Basic knowledge of fundamental data structures.
2) Basic programming language skills, such as C/C++, Java, Python
If you are not sure you have the proper preparation, you must talk to me before taking this course. Additionally, you should not take this course if you have taken a similar course, such as CS6033 with a 'B' or better grade.

Course Description
- Review of basic data structures and mathematical tools.
- Data structures: priority queues, binary search trees, balanced search trees.
- Algorithm design and analysis techniques illustrated in searching and sorting: heapsort, quicksort, sorting in linear time, medians and order statistics.
- Design and analysis techniques: divide and conquer, dynamic programming, greedy algorithms.
- Graph algorithms: elementary graph algorithms (breadth-first search, depth-first search, topological sort, connected components, strongly connected components), minimum spanning trees, shortest paths.
- Brief introduction of complexity and NP-completeness.

Textbook

Cormen, Leiserson, Rivest, and Stein,
Introduction to Algorithms, 3rd Edition, MIT Press, 2009;

ISBN-13: 9780262033848; The paperback international version has ISBN-13 9780262533058. It is known as CLRS. We have free access to CLRS (on the library web site https://library.nyu.edu, search the name of the book under "Books & More").
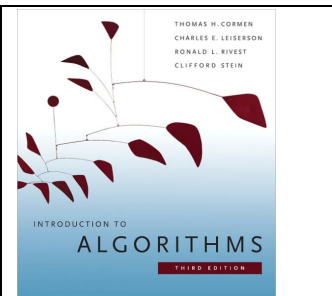
Course Work and Grading
Your final grade will be determined roughly as follows: Homework 10%; Midterm 40%; Final 50%.

Teaching Assistant:

Hao Gao: hg1587@nyu.edu

Lectures:

Every Tuesday 5:00PM-7:30PM on Zoom:

Join URL:
https://nyu.zoom.us/j/98715476128?pwd=YmRxNmE0aHJYL3VpWlZWWDAvVEYxZz09
Passcode: 9343

You are encouraged to log in to nyu.zoom.us prior to your Zoom session. Make the most of your session by following these best practices .

You can also find the link to join on course website, under page "Zoom". You will be muted upon entry. You can stop me at any time and ask questions. Please unmute yourself and speak. You can also ask questions using the chat function. However, I might be able to see your questions promptly.

Office Hours:

Friday 11:00AM-12:00PM

Join URL:
https://nyu.zoom.us/j/91449260015?pwd=YnBSTnl5djRhZlNJaGlzZ1lrcmljdz09
Passcode: 9343

Homework:

Homework is due in one week after it is released. To submit your homework, you need to download an APP called "Adobe Scan" on your phone, and use it to scan your homework. Please submit in a single PDF file, instead of multiple files.

Tentative Schedule

- Week 1 (September 8): Introduction to algorithm: correctness and performance. Best-, worst-, and average-case performance. Asymptotic notation: big-O, big-Ω, and big-Θ; little-o, and little-ω.

- Week 2 (September 15): Recurrence and solving methods: iteration, substitution and master theorem

- Week 3 (September 22): Divide and conquer algorithms, introduction to sorting: insertion sort, bubble sort

- Week 4 (September 29): Sorting: MergeSort, Heap and HeapSort,

- Week 5 (October 6): Sorting: quick sort, randomized algorithms, lower bound for comparison sorting, counting sort and radix sort

- Week 6 (October 13): Order statistics and selection problem, Midterm Review

- Week 7 (**Date TBD**): Midterm

- Week 8 (October 27): Hashing and Universal Hashing, Binary search tree

- Week 9 (November 3): Graph Basics: Breath-First Search, Depth First Search

- Week 10 (November 10): Directed acyclic graph and topological ordering, strongly connected components

- Week 11 (November 17): Dynamic Programming

- Week 12 (November 24): Greedy Algorithm, Minimum Spanning Tree

- Week 13 (December 1): Single-source Shortest Paths

- Week 14 (December 18: NP-Completeness

- Week 15 (**Date TBD**): Final (Between Dec 15-Dec 21)

DON'T make travel arrangement for Christmas holidays before Dec 21 until the final date is set!