CS3230 Lecture 1

Overview

Diptarka Chakraborty

Wing-Kin Sung, Ken

CS3230: Design and Analysis Algorithms

- Course Objectives:
  - Learns tools to analyse the performance of algorithms
  - Learns techniques to design an efficient algorithm.

- After the course, students will be able to
  - Perform analysis of the asymptotic performance of algorithms.
  - Design efficient algorithms to solve problems.
  - Demonstrate knowledge of common algorithms.

What to do?

- Attend lecture
- Attend tutorial
- Discussion through internet (LumiNUS)
- Assignment
- Reading
- Final Exam

Pre-requisite

- CS2010 or CS2020 or CS2040/C/S Data Structures and Algorithms
- CS1231/S or MA1100 Discrete Structures

Attend lecture

- 2 hours lecture every week
  - Thursday (4:00pm – 6:00pm), I3-AUD
- Lecturers:
  - Ken Sung (ksung@comp.nus.edu.sg)
  - Diptarka Chakraborty (diptarka@comp.nus.edu.sg)
- Tutors:
  - Eldon Chung (eldon.chung@u.nus.edu)
  - Govind Venugopalan (gv94@u.nus.edu)
  - Tran Tan Phat (e0196695@u.nus.edu)
  - Joshua Casey Darian (joshuac@comp.nus.edu.sg)
  - Le Quang Tuan (e0313526@u.nus.edu)
  - Wei Liang Gan (e0030014@u.nus.edu)

Attend tutorial

- 1 hours tutorial every week (starting from week 3)

Group	Day of Week	Start	End	Venue
T01	Tuesday	16:00	17:00	COM1-0203
T02	Wednesday	13:00	14:00	COM1-0203
T03	Friday	13:00	14:00	COM1-0114
T04	Monday	11:00	12:00	COM1-0207
T05	Wednesday	12:00	13:00	COM1-0203
T06	Tuesday	10:00	11:00	COM1-0203
T07	Friday	10:00	11:00	COM1-0114
T08	Wednesday	15:00	16:00	COM1-0203
T09	Wednesday	14:00	15:00	COM1-0203
T10	Friday	12:00	13:00	COM1-0114
T11	Monday	10:00	11:00	COM1-0207
T12	Tuesday	11:00	12:00	COM1-0203
T13	Tuesday	17:00	18:00	COM1-0203
T14	Friday	11:00	12:00	COM1-0114

Mode of learning

- Lecture
  - Two third of the lecture is on presentation
  - One third of the lecture is on recitation (Q&A) using Archipelago.
    - Bring your computer or mobile device for participation
    - Pen and paper to do the work

- Tutorial
  - Need to prepare answers for 1-2 questions before tutorial. The rest of the questions are disclosed during tutorial.
  - Work through problems using Archipelago.
  - Same workflow as in recitation, but student needs to present each question on the white-board after group discussion.
  - Bring your computer or mobile device for participation, pen and paper to do work.

Syllabus

Week No.	Date	Topics	Lecturer
1	16-Jan-20	Reasoning and asymptotic analysis (analysis)	Ken
2	23-Jan-20	Recurrences and Master Theorem (analysis)	Ken
3	30-Jan-20	Divide-and-Conquer Algorithm (design)	Ken
4	6-Feb-20	Sorting Lower Bounds (analysis), Sorting in Linear Time (design)	Ken
5	13-Feb-20	Probabilistic Analysis, Randomized Algorithms --- Hashing and Quicksort (analysis)	Ken
6	20-Feb-20	Searching, Median Find, Order Statistics (i.e. Select) (design)	Ken
	27-Feb-20	Recess week	
7	5-Mar-20	Amortized Analysis (analysis) + mid-term test (7 Mar: 10am-12noon)	Diptarka
8	12-Mar-20	Dynamic Programming (design)	Diptarka
9	19-Mar-20	Greedy Algorithms (design)	Diptarka
10	26-Mar-20	Graph algorithms (design) and Problem reductions (analysis)	Diptarka
11	2-Apr-20	More NP-Completeness (analysis)	Diptarka
12	9-Apr-20	Approximation Algorithms (design)	Diptarka
13	16-Apr-20	Summary and Revision	Ken/Diptarka
	5-May-20	Examination (9:00am-11:00am)	

Discussion through internet

- LumiNUS
  - Overview
  - Module details
  - Gradebook
  - Files
  - Share your opinion in the discussion forum
    - Post your questions and feeling here
  - Visit LumiNUS frequently

Assignment

- There will be 3 written assignments and 2 programming assignments and 1 term test.

- You are encouraged to handin assignments using double-sided print.

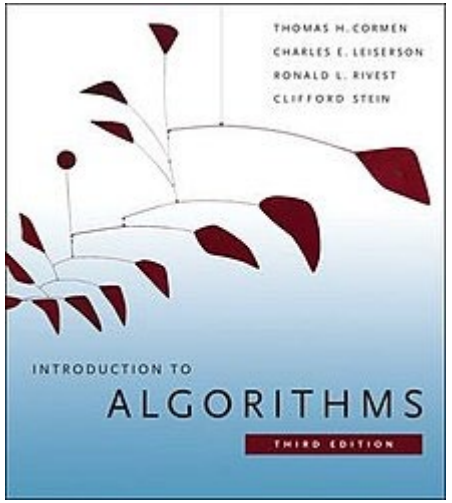
Detail of the homeworks (tentative)

- HW1 (24 Jan – 7 Feb)
  - Recurrence and Master theorem
- HW2 (7 Mar – 21 Mar)
  - Amortization
- HW3 (3 Apr – 17 Apr)
  - NP hardness

- Prog1 (14 Feb – 6 Mar)
  - Divide-and-conquer or linear sorting
- Prog2 (20 Mar – 10 Apr)
  - DP or Greedy

Textbook

- Main Textbook:
  - [CLRS09] Introduction to Algorithms, (3rd edition)
    - by Cormen, Leiserson, Rivest, Stein, 2009.



- Reference Material:
  - [HH13] Competitive Programming, (3rd edition)
    - by Steven Halim and Felix Halim, 2013.
  - [KT06] Algorithm Design, by Kleinberg & Tardos
    - by Addison-Wesley, 2006.

Assessment

- Continuous assessment: 40%
- Miderm test: 20% (Sat of week7 (7 Mar 2020) 10am-12noon)
- Final Exam: 40%

Continuous assessment

- Continuous Assessment:
  - 3 written assignments (7 marks each): 21 marks
  - 2 programming assignments (7 marks each): 14 marks
  - Participation (measured through Archipelago recitation and tutorial exercises, and IVLE forum. Based on effort rather than correctness. Make sure you participate!): 7 marks
  - Challenge questions: 1 mark each
- Total: 42 marks possible if you do not do any challenge questions, but capped at max of 40.

Academic Policy (on Plagiarism)

- Do your work YOURSELF
- If you are REALLY stuck,
  - Approach instructor/tutor for help
- If you want to discuss with fellow students
  - Discuss general approach (not detailed answers)
  - You MUST write up YOUR OWN answers.
  - You must write down names of collaborators
- Do NOT copy/compare answers!
  - If you do so, for the first attempt, deduce that assignment mark from 7 marks to 0 marks.
  - For the second attempt, CA mark from 40 marks → 0 marks.
- Please do not post assignment questions and do not put your code in public repositories
  - For example, should NOT post anything on stackoverflow.
  - You can ask question on Luminus

Any questions!

- Hope that you enjoy this class