CS2040C Data Structures and Algorithms

Introductory Material

What is this module about?

- This module introduces students to the design and implementation of fundamental data structures and algorithms.
- The module covers basic data structures (linked lists, stacks, queues, hash tables, binary heaps, trees, and graphs), searching and sorting algorithms, basic analysis of algorithms, and basic object-oriented programming concepts (based on C++).
- It is also about problem solving.

Syllabus

- Problem Solving
- Analysis of Algorithms
- Sorting
- Abstract Data Types (ADT)
  - Linked list, Stack, Queue, Deque
- Heaps
- Hash Table
- Binary Search Tree, AVL Tree
- Graphs

Mode of Teaching

- Semi-flipped classroom
- Lectures (3 hours per week)
- Tutorials (1 hour per week)
- Laboratory (1 hour per week)

Module Requirements

- 5 Problem sets (PS) (5 x 3% = 15%)
- VisuAlgo Quiz (12%)
- Tutorial participation (3%)
- Lab participation (3%)
- Mid-semester test (15%)
- Programming Exam (12%)
- Final exam (40%)

Our CS2040C Team

Lecturer

- Gary Tan
- COM2 #03-50
- 6516-6276
- gtan@comp.nus.edu.sg

- Admin: Vice Dean, Student Life

Tutor 1: **RANALD** Lam Yun Shao

- Takes Tutorials 02 (Mon 12-13) and 03 (Mon 13-14)
- Tutorial TA for CS2040C in AY17/18
- Lab TA for CS2040 in AY17/18 S4

Tutor 1: **RANALD** Lam Yun Shao

- Undergraduate Year 2
  - Course: Computer Science
- Alternative 'names'
  - 'Rar the Cat'
  - Habitat: COM1-02-15 (ACM ICPC Lab)
    or AS6-04-01 (IOI 2020 Room)
- Contact Details
  - Email: ranaldlys@u.nus.edu
  - Chat is OK/preferred for ***short*** queries
  - Telegram: @ranaldmiao
  - Codes/attachments should go via email
- Wish for CS2040C
  - Appreciate and know how to apply data structures in various fields
  - Keep trying, learn from mistakes and continue going ☺
  - Apply data structures in… preparing exam notes :O

Tutor 2: TAPAS NAYAK

- Graduate Student (Year 3)
- CS2040C – Classroom TA and LAB TA
- Tutorials 01 (Wed 8-9)?, 04 (Fri 12-13) & 05 (Tue 13-14)
- Lab 03 (Fri 13-14)
- Contact Details
  - Email: nayakt@u.nus.edu
  - Mobile: 98063758

Lab TA 1: **SIDHANT** Bansal

- Hey I am Sidhant (Undergraduate Year 2)
  - Exempted from CS2040
- You can call me
  - "sid" (Easier to pronounce)
- Contact details
  - Email: sidhant.bansal@u.nus.edu (preferred)
  - Facebook messenger
    (Find me in the CS2040C group)(profile pic →)
- Lab TA for CS2040C
  - Lab groups : Lab 04 (Friday 8-9)
  - Experience: TA'ed this course last semester + Took CS3233 in past
  - Open to feedback after every lab session :)
- Wish for CS2040C S1
  - Don't be scared to ask doubts/clarifications throughout the course. (Even if they seem silly)
  - Enjoy the content

Lab TA 2: (Louis) Tan **JUN AN**

- Taking Lab Groups 01 (Fri 16-17) and 02 (Fri 14-15)

Lab TA 2: (Louis) Tan **JUN AN**

- 4th/Final Year Student
- Contact me by:
  - Email: junan.tan@u.nus.edu
  - Facebook Messenger (find me through CS2040C group)
  - Telegram (@Yamidark)
- You can call me
  - Louis (if you prefer English name)
- TA'ed for CS2010 and CS2040C in previous semesters, also took CS3233 and CS4234
- Wish for CS2040C S1:
  - Everyone to have fun and enjoy learning the many different Data Structures + Algorithms (and most importantly, 'survive'!)

Tutorials/Labs

	0800 – 0900	1200 – 1300	1300 – 1400	1400 – 1500	1500 – 1600	1600 – 1700
Monday		T02 COM1 0209 Ranald	T03 COM1 0201 Ranald			
Tuesday			T05 COM1 0203 Tapas			
Wednesday	T01 COM1 0203 cancel?					
Friday	L04 COM1 B110 Sidhant	T04 COM1 0201 Tapas	L03 COM1 B110 Tapas	L02 COM1 B108 Jun An		L01 COM1 B110 Jun An

Software used

- Lecture notes (VisuAlgo https://visualgo.net)
- Mooshak (Online Judge)
  https://cs2040c.comp.nus.edu.sg/~mooshak/
- Kattis (https://nus.kattis.com)

VisuAlgo (https://visualgo.net)

- Built (since 2011) by Dr Steven Halim
- His dream is to have a virtual copy of himself available 24/7, very patient in explaining basic concepts, never complains, always available
- Your lecture notes (the e-Lecture mode)
- Your personal instructor/tutor (the exploration mode)
- Your examiner (the Online Quiz, login for tracking)
- Register an account

Mooshak Online Judge (OJ)

(https://cs2040c.comp.nus.edu.sg/~mooshak/)

- Clone of Dr. Halim's Mooshak, hosted on SOC servers

  Also 24/7 availability, online, automatic checker ("judge")

- An individual password has been sent to you

  Check your NUSNET email (and junk mail folder)

  - \$0RRψ about the cryptic password (prefer not to change it, keep that email intact)
  - User ID is your MATRICULATION number (UPPERCASE)

- Your gate keeper for 5 graded PSes (5x3%) and likely also for PE (12%)

  PS0 (not graded at all) is available, let's test the system (**demo subtask A**)

- For this module, it is set up to receive C++ (11) submissions only

  All submissions to the system are recorded

  - Any two submissions that are deemed 'too similar' will be flagged for manual review

Kattis Online Judge (OJ)

(https://open.kattis.com)

- Totally optional online judge for (much) more programming exercises
- Try solving a few simple problems with C++
  - hello, judgingmoose, timeloop, mia
  - statistics, treasurehunt

FLIPPED CLASSROOM

Help with semi-Flipped Classroom

- This module adopts a semi-flipped classroom style.
- This learning technique is likely very new for many of you
  - It takes lots of self-discipline to make it work
- Pre-read the e-Lecture slides @ VisuAlgo **before** coming to lecture
- Ask lecturer or tutor(ial) TAs for help, especially during early days

C++ IDE (or lack thereof)

- As you should have passed (or exempted from) CS1010 (/variant), I assume you know a bit about C (or C++ compiler)
- If you use **gcc** last time, you need to use **g++ -std=c++11**
- Use Sublime (see this)
  - Editor: Sublime Text 2 ("free"), Compiler: Cygwin64 or MinGW, install g++
  - Setup Sublime keyboard shortcut to run g++ and execute (CTRL+SHIFT+B)
- another alternative: CodeBlocks
- Instant stuff: https://repl.it/languages/cpp
  - But be careful to login and set code visibility to **PRIVATE**, otherwise your (PSes) code become the source of plagiarism by others who Googled

For Practical Exam (PE) on Week 11

- For PE on Week11, you actually just need **"any" text editor** and **g++** although you are free to use any tool available in our PLs
- You have 11 weeks from now (inclusive of recess week) to familiarize yourself with C++ related tools that we have in our various PLs
  - *You can start testing the C++ related tools in our PLs from Week 03*
- You will have to use a PC in our PLs for actual PE (controlled environment)

Setting Expectations

- You cannot S/U this level 2 module (it has pre-requisites)
- Work hard to self learn as many C++ components.
- We will help along the way, throughout this module
- CS2040C will not use very deep C++ concepts
- CS2040C assignments will be short (< 50 SLOC)