

CS2040S Data Structures and Algorithms

Lecture Note #0

Course Admin

(AY2021/22 Semester 1)

Lecturer

- ❑ Module coordinator

Dr Chong Ket Fah











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Tutors

❑ TAs for this course

Description	Facilitators	Readings	Weblinks	Timetable	Library Resources
	 Bryan Wang Peng Jun Manager Email: e0540007@u.nus.edu Tutor				
	 CAO YUCHEN Manager Email: e0261966@u.nus.edu Tutor				
	 Cheng Yu Feng Manager Email: e0602115@u.nus.edu Tutor				
	 CHUA JIA CHENG, JON Manager Email: e0308967@u.nus.edu Tutor				
	 He Xinyue Manager Email: e0424635@u.nus.edu Tutor				
	 HO HOL YIN Manager Email: e0308993@u.nus.edu Tutor				
	 Huang Po Wei Manager Email: e0602114@u.nus.edu Tutor				
	 ISAIAH KOH MING YEW Manager Email: e0411057@u.nus.edu Tutor				
	 LIM BING SEN Manager Email: e0360580@u.nus.edu Tutor				
	 LIM DAEKOO Manager Email: e0310243@u.nus.edu Tutor				

❑ And more !



Stuff you need

JDK (Java Development Kit) 11.0.12

(Need it to compile and run Java programs)

- <https://www.oracle.com/java/technologies/javase-jdk11-downloads.html>

Installation Guide for Windows/Linux/Mac OS

- <https://docs.oracle.com/en/java/javase/11/install/overview-jdk-installation.html#GUID-8677A77F-231A-40F7-98B9-1FDOB48C346A>



LUMINUS

<https://luminus.nus.edu.sg>

- ❑ **Announcements:** Check regularly
- ❑ **Workbin:** For Lecture notes and tutorials
- ❑ **Forums:** Use Facebook group
 - <https://www.facebook.com/groups/241724769269875>

NUS CS2040

Public group

About

Discussion

Chats

Members

Events

Videos

Photos

Files

Group insights

Moderate group

VISUALGO
visualising data structures and algorithms through animation

Search

Sorting
bubble select insert merge

Bitmask
bit manipulation boolean array

Linked List, Stack, Queue, Deque
sack queue single doubly

Binary Search Tree, AVL Tree
table set map BST

Binary Heap
priority queue heap sort recursive

Joined Notifications Share More



Kattis

<https://nus.kattis.com/>

The screenshot shows the Kattis website for the National University of Singapore. The header includes the university logo, navigation links (COURSES, PROBLEMS, HELP, ADMIN), a search bar, a 'Submit' button, and a user profile for 'Chong Ket Fah Admin, Teacher'. The main content area welcomes users and lists current courses in a table.

COURSE	OFFERING(S)
Data Structures and Algorithms (Java) - CS2040	CS2040_S4_AY2021 (teaching)
Data Structures and Algorithms (Java) - CS2040S	CS2040S_S1_AY2122
Data Structures and Algorithms (C++) - CS2040C	CS2040C_S1_AY2122
Optimisation Algorithms - CS4234	CS4234_S1_AY2122
Data Structures and Algorithms (Python) - IT5003	IT5003_S1_AY2122

- **Create an account here using your nusnet email and your username should be the same as your name that is shown in Luminus. If you already have an account please don't create another.**
- **Later during the 1st lab you will be given the registration key to register for the course (don't do it now)**



Other Important Links

Java API Specification Edition 8

(need to refer to it regularly in the course)

<https://docs.oracle.com/javase/8/docs/api/>

StackOverflow

(find answers to most programming questions you have, but need to filter through a lot of information)

<http://stackoverflow.com/>



IDE for program development

<http://www.sublimetext.com/download>

Sublime Text is a simple general purpose IDE you may use for Java programming. If you have experience with other IDE's you can use those too.

Reference Text

- **CP4: Competitive Programming**

Not compulsory (actually a CS3233 text book)

Written by Dr Steven Halim and his brother Felix Halim



- Available at Popular bookstores (e.g the one at Clementi)
- There are 2 books, book 1 and book 2, but only book 1 is most relevant for the course so buy only that one if you want the reference text (about \$27)

Introducing VisuAlgo

**Dr Steven Halim's data structures & algorithms
visualization Tool:**

<http://visualgo.net>

(still an evolving project)

VisuAlgo will be very heavily used especially in 2nd
half of the lectures and tutorials

(bring your laptop/tablet)*

VisuAlgo Online Quiz Tool

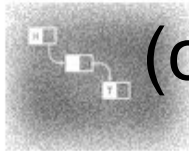
7 VISUALGO TRAINING MODE

My Training Stats

Login

Select the topics you want to practice:

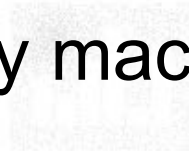
There will be short online quizzes using Visualgo,
(completely machine graded)



Breadth First Search



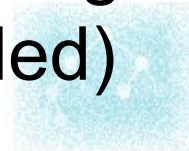
Depth First Search



Shortest Path



Heap Sort



Quick Sort

<http://visualgo.net/training.html>



Do lots of training on Visualgo !



Binary Tree



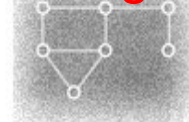
AVL Tree



B+ Tree



Hash Table



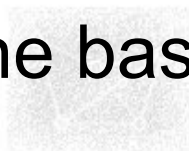
Graph

Make VisuAlgo as your personal tutor 😊

Bookmark the base URL; tell the world it exists!



Graph Traversal



BST



Stack

Queue/Deque/Stack

Hash Map

Submit

Lectures, Tutorial, Lab Timings

- All are online through Zoom
- Lectures (a recording of the Zoom session will be uploaded to Luminus)
 - Wednesday 10am-12nn
 - Thursday 5pm-6pm
- Tutorials
 - Monday 10am to 6pm (check your tutorial group timing)
- Labs
 - Thursday 10am to 4pm (check your lab group timing)
- Course Schedule
 - Check schedule on Luminus under Module Details → Description → Schedule

Assessments: Overview

- ❑ 10 **graded 1 day lab assignments** (starting from lab 2) which will be released 10am on Thursday and ends at 10am on Friday the next day. (Solve 1 problem)
 - You can start doing when the problem is released
 - Everyone will have a lab on that day where the TA will talk about the problem, show Java classes to solve the problem and help you with the assignment (without directly giving you the answer)
 - ❑ 4 **graded take home lab assignments** (Check schedule when they are released)
 - Will be released on Tuesday 10am
 - Deadline is usually due Tuesday 10am 2 weeks later
 - Solve 2 harder problems (some take home lab have an additional optional challenge problem)
 - ❑ 2 **online quiz** (30 mins)
 - Happen during lab (16th September and 11th November)
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Assessments: Overview

- ❑ 1 **Midterm** (2nd October, time to be determined)
 - ❑ 1 **Final** (27th November Tuesday, 1pm-3pm)
 - ❑ Both midterm and final will be done online using Luminus Quiz and will be proctored using Zoom.
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Assessments: Overview

Activities	Weightages
Tutorial attendance/participation	3%
Lab attendance	2%
In-lab Assignments	15% (1.5%/problem)
Take Home Assignments	12% (1.5%/problem)
Online Quiz	8% (4% each)
Midterm	20%
Final Exam	40%

- ❑ Tutorials and Labs start on the 3rd week.
- ❑ Midterm and Final exam are **open-book**
- ❑ Visualgo quiz is also open book

Lab Assignment: Marking Scheme (1/2)

- Will use Kattis for autograding
- Calculation of grades for assignments (same day/take home) =

$$\left\lfloor \frac{\# \text{ correct test cases}}{\text{total test cases}} \times 1.5 \right\rfloor - (\text{programming style violations})$$

Lab Assignment: Marking Scheme (2/2)

- Programming style:

1. Modularity
2. Meaningful comments
 - Student particulars and program description
 - A description for each user-defined method
 - Appropriate pre- and post-conditions
 - Other comments to explain complex codes (where necessary)
3. Meaningful/descriptive identifiers
4. Proper indentation

- **0.5 mark** deducted if programming style is terrible (*make our eyes bleed*) on all of 4 main categories

- This means you should not have marks deducted unless your coding style is really terrible

Rules for Assignments (1)

1. You can discuss the solution to the assignments (1 day or take home) at the algorithmic level (i.e English description or pseudo-code)
 - ❑ **NO JAVA CODE OR ANY OTHER CODE MUST BE INVOLVED**
 - ❑ List down all your collaborators in your program file
2. You **CANNOT**
 - ❑ **Copy another person's code.**
 - ❑ **Look at another person's code, understand it and then write your own code.**
 - ❑ **Submit someone else's code just to check if it “passes the time limit”** (*all your submissions are logged so we can check ...*)
 - ❑ **Look at another person's code, period** (*even if it is to help them debug their code*).

Rules for Assignments (2)

3. The only code you can refer to/modify from is the code given to you with the lecture notes
4. You have to write the Java code yourself! Labs are all about individual implementation of the algorithmic solution
5. **Do not submit to any alternate account you have created.** If you are caught “plagiarizing” yourself, I will still take it as plagiarism
6. **Contravening 1, 2 and 5 is counted as plagiarism**

Rules for Assignments (3)

- 6. Offender caught plagiarizing will be referred to the Board of Discipline**
- 7. There is automatic and manual plagiarism checking and students have been caught before**

Summary and advice

- The labs focus more on your **programming skills**:
 - Ability to translate idea/algorithm into actual program
 - Online quiz test your **basic to intermediate** understanding of the working of the algo/DS
 - Midterm/Final exam focus more on your **problem-solving skills**:
 - Ability to understand and reason about the problem
 - Ability to apply your knowledge to formulate solution
 - You need to spend time on:
 - Actually coding to improve your programming skill
 - Thinking deep/exploring/do all your tutorials to hone your problem-solving skills as **memorization does not help much**
 - **Asking** questions! (Use the facebook group.)
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