NUS National University of Singapore

School of Computing

CS2040S Data Structures and Algorithms

Lecture Note #0

Course Admin

(AY2022/23 Semester 1)

Lecturer

- Module coordinator

Dr Chong Ket Fah
COM2-02-66
chongket@comp.nus.edu.sg

Stuff you need

JDK (Java Development Kit) 11.0.12 (Need it to compile and run Java programs

Can use other versions if your are taking other modules that have a requirement on the JDK version)

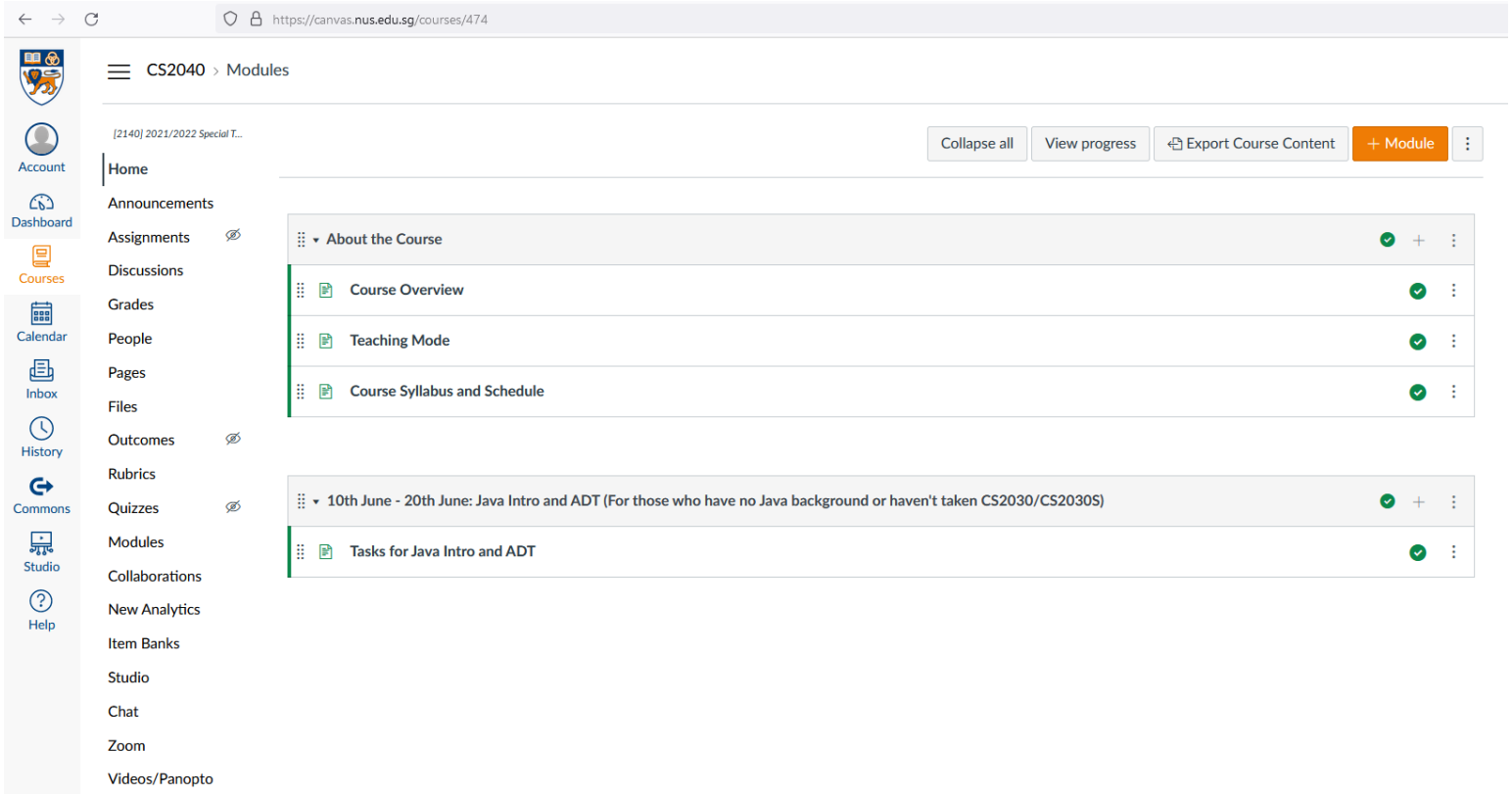
- https://www.oracle.com/java/technologies/javase-jdk11-downloads.html

Installation Guide for Windows/Linux/Mac OS

- https://docs.oracle.com/en/java/javase/11/install/overview-jdk-installation.html#GUID-8677A77F-231A-40F7-98B9-1FD0B48C346A

CANVAS https://canvas.nus.edu.sg

- Announcements: Check regularly
- Files: For Lecture notes and tutorials
- Discussions: Used as forum



Kattis

https://nus.kattis.com/

Welcome to Kattis at National University of Singapore

Welcome to the Kattis System! We would appreciate if you report any issues you find to contact@kattis.com.

Current courses + Create course

COURSE	OFFERING(S)
Data Structures and Algorithms (Java) – CS2040S	CS2040S_S1_AY2223 (teaching)
Data Structures and Algorithms (C++) – CS2040C	CS2040C_S1_AY2223
Optimisation Algorithms – CS4234	CS4234_S1_AY2223
Data Structures and Algorithms (Python) – IT5003	IT5003_S1_AY2223

Recent courses

COURSE	OFFERING(S)
Data Structures and Algorithms (Java) – CS2040	CS2040_S4_AY2122 (teaching) (Ended 2022-08-04) CS2040_S2_AY2122 (Ended 2022-05-16) CS2040_S4_AY2021 (teaching) (Ended 2021-08-09)
Competitive Programming – CS3233	CS3233_S2_AY2122 (Ended 2022-05-07)

- Create an account here using your nusnet email (your eXXXXXXX@nus.edu.sg email and not the one that uses your name as alias) and your username should be the same as your name that is shown in Canvas. If you already have an account please don't create another, just use your existing account.

- The registration key to register for the course will been sent out to your Canvas email by the time of this lecture.

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

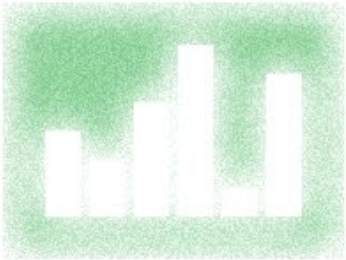
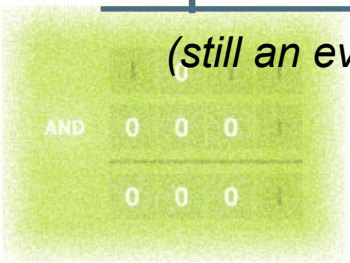
- Available at Popular bookstores (e.g the one at Clementi)
- There are 2 books, book 1 and book 2, but only book 1 is most relevant for the course so buy only that one if you want the reference text (about $27)

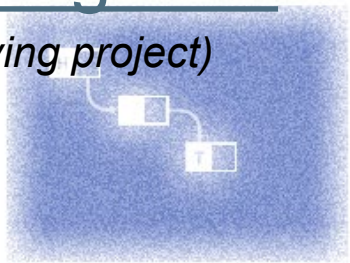
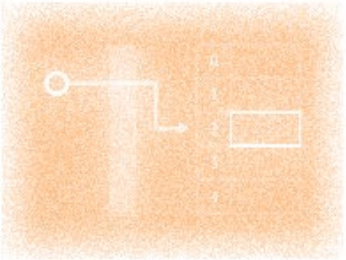
Introducing VisuAlgo

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

http://visualgo.net

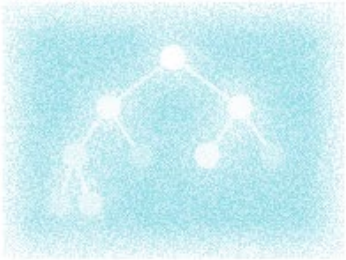
(still an evolving project)

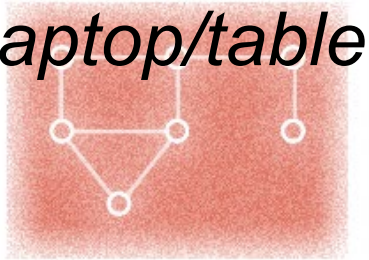



VisuAlgo will be very heavily used especially in 2nd half of the lectures and tutorials

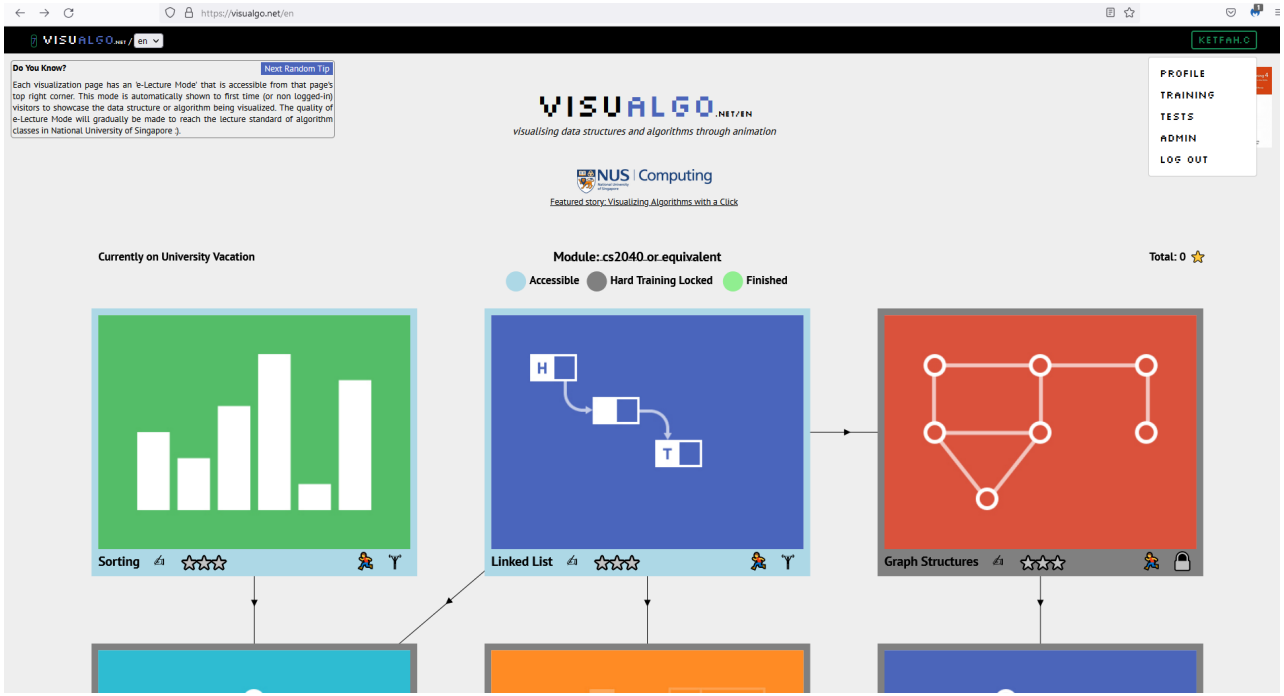
(bring your laptop/tablet)*



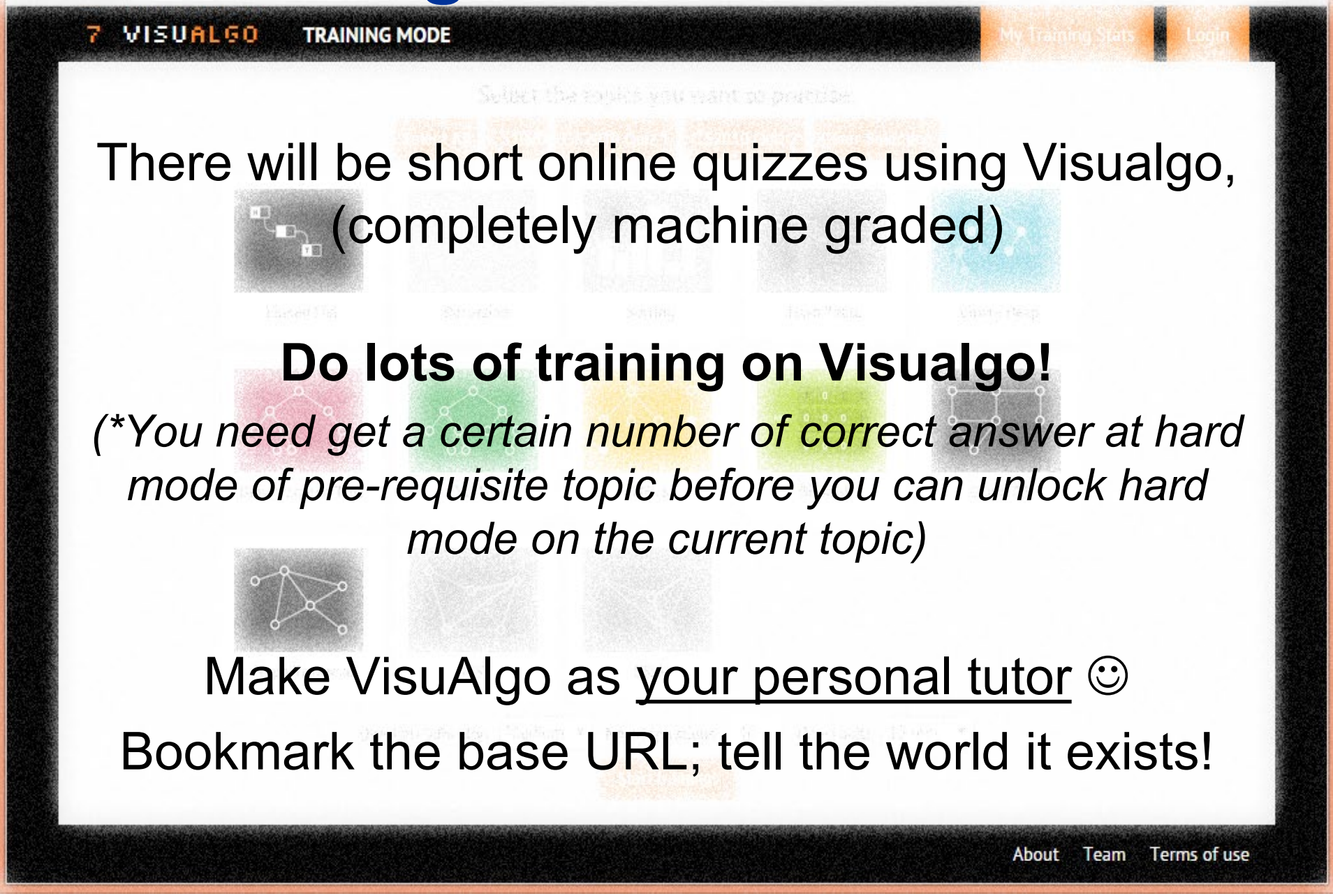



VisuAlgo Online Quiz Tool

1. An account will be created for you using your NUSNET email (eXXXXXXX@nus.edu.sg email again) and you will get an email containing the password for logging into your account latest by end of this week (first week). **Please don't create an account by yourself**
2. Once you have verified, you can log in and set your profile so that "Preferred Layout" is "cs2040 or equivalent"



VisuAlgo Online Quiz Tool



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

Do lots of training on Visualgo!

*(*You need get a certain number of correct answer at hard mode of pre-requisite topic before you can unlock hard mode on the current topic)*

Make VisuAlgo as <u>your personal tutor</u> ☺

Bookmark the base URL; tell the world it exists!

Lectures, Tutorial, Lab Timings

- All are online through Zoom
- Lectures (a recording of the Zoom session will be uploaded to Canvas)
  - Wednesday 10am-12noon
  - Thursday 5pm-6pm
- Tutorials
  - Monday 10am to 5pm (check your tutorial group timing)
- Labs
  - Thursday 10am to 4pm (check your lab group timing)
- Course Syllabus and Schedule
  - Check on Canvas under Home → About the Course → Course Syllabus and Schedule

Zoom Consultation Sessions

- Starting from the 3rd week, there will be a weekly 1 hour long consultation sessions on Zoom on Monday for you to clarify any doubts or questions you have on the material taught
  - Monday 6:00pm to 7:00pm

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 (15th September and 11th November)

Assessments: Overview

- 1 Midterm on the 7th week, the week after recess week (1st Oct Saturday, 4:30pm-6pm, zoom proctored so need to be in zoom session by 4pm)
- 1 Final on the 26th Nov Saturday 1pm-3pm (again zoom proctored so must be in zoom session by 12:30pm)
- Both midterm and final will be done online using Canvas Quiz and will be proctored using Zoom.

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**.
- Online quiz, Midterm and Final exam are open-book (but not open internet)

Lab Assignment: Marking Scheme (1/2)

- Will use Kattis for autograding

- Calculation of grades for assignments (same day/take home) =

$$\left\lceil \frac{\#\ correct\ test\ cases}{total\ test\ cases} \times 1.5 \right\rceil$$-(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)

7. **Offender caught plagiarizing will be referred to the Board of Discipline**

8. 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 Canvas discussion.)

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