[CSIE 1212 Class 02]

Data Structure and Algorithms

資料結構與演算法

- Course Information

Prof. Michael Tsai

Spring 2019

Data Structure and Algorithm – What are they?

- Data structure –
  store, represent, and manipulate DATA in the computer.

Memorize

- Algorithm –
  well-defined computational procedure that take some value(s) as input and produces some value(s) as output.

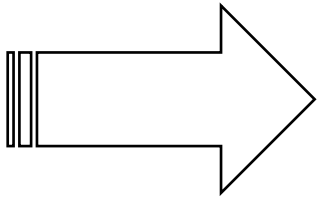
Compute

What are we learning?

- "Cookbook style"
  - introduction of the most commonly used data structures

- Transformation of concept to program
  - Learn by examples (C and pseudo code)
  - **LOTS** of opportunities (in-class exercises and homework)

Know how to manipulate the data **"graphically"** in a **step-by-step** manner



Know how to implement the data structure (its operations) using computer programs


不合适啊？还有


JEDI TRAINING
CAMP

What are we also learning?

- Learn how to analyze the running time of your program / algorithm
  - So that you write good, fast, efficient programs

- Some commonly used software development tools & methodology (if time permits)

We are NOT learning…

- Object-oriented programming – C++ or Java
  - C++ is NOT permitted in all homework assignments and exams – strictly C only

- Some topics that will be covered in "Algorithm Design and Analysis"
  - Advanced graph algorithms
  - Divide-and-conquer
  - Dynamic programming

Topics to be covered

Before Midterm:

- Stack & Queue
- Linked List
- String Matching
- Sorting
- Tree
  (tree traversal and binary search tree)
- Heap

After Midterm:

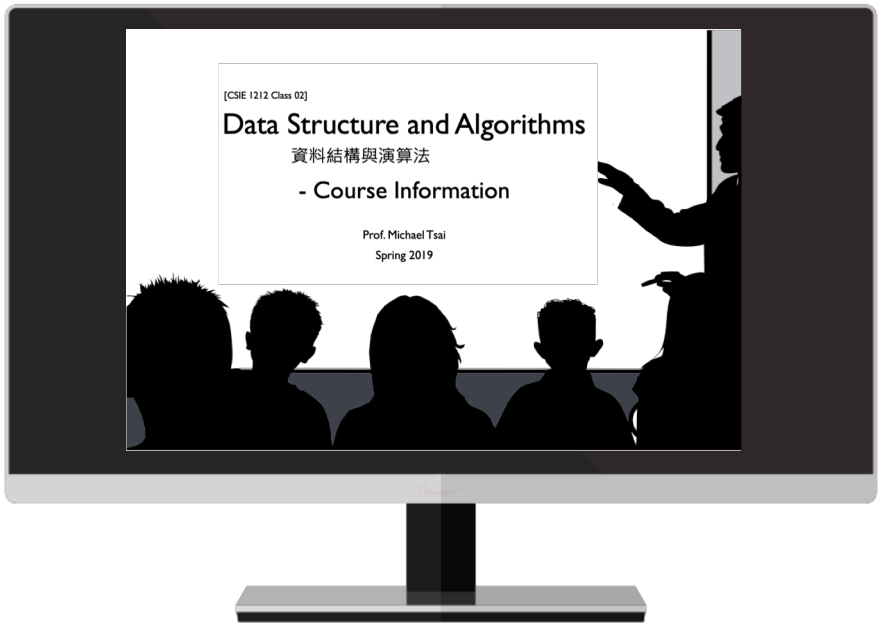
- Hash table
- Disjoint set
- Sorting in linear time
- Advance tree structure
- Graph basics
- Fast Fourier Transform (tentatively)

Guest Lecture by Prof. 孔令傑

- 台大資訊管理系 副教授
- 前數位學習中心
  公共課程組組長
  - NTU MOOCs的關鍵力量之一
- 翻轉教學的先驅
- 服務學習+程式設計
- 教授多門程式設計課程:
  - 程式設計(資管系)
  - 資料結構與進階程式設計(資管系)
  - 商管程式設計(管理學院)
- Time & Topic TBD

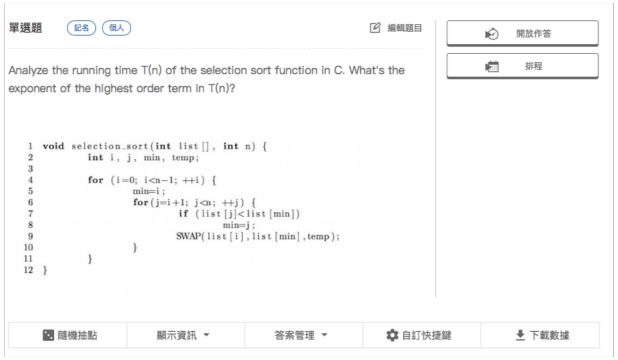
Experimental DSA: Version 2.0

Teaching with Video



Interactive classroom

課堂程式競賽、程式除錯、
分組討論、上台報告...



Teaching with Video: Why?

- **Background**: students have diverse background and learning speed
- **Optimized learning:** You can adjust your own
  - learning speed;
  - time / location to learn;
  - skip some topics if you already know them.
- **Online Interaction:**
  - Ask questions specific to a time point in video
  - Get answer from your classmates or us
- **Digital footprint:**
  We (teaching team) can track how individual and entire class of students are learning

數位互動

影片內留言

時間軸標示有留言的影片時間

輸入您的留言

匿名留言 留言於 0:05

針對特定時間點留言

統計數據 評論

林禹安 編輯於 1 個月前 10:28

我認為低薪的產生 可能也與專業技術需求高的工作有關 因為台灣其實在平均所得上是遠遠超過22K的 然而為何大部分人卻常常陷入低薪的情況 我認為與個人專業和技術能力有很大的關係 這也牽扯到工作替代性的問題

回覆

留言內容可回覆

新留言定期email通知

張蘅 1 個月前 7:30

想請問教授，在這邊的「綜合浮現的問題」，是不是已經超過「引發問題的事件」的範疇了？因為問題是「公司表現不如預期」，那麼整體績效變差、股價下跌、市佔率下降等可能是用來歸納出這個「抽象問題」的「具體問題」，而不是「引發問題的事件」。

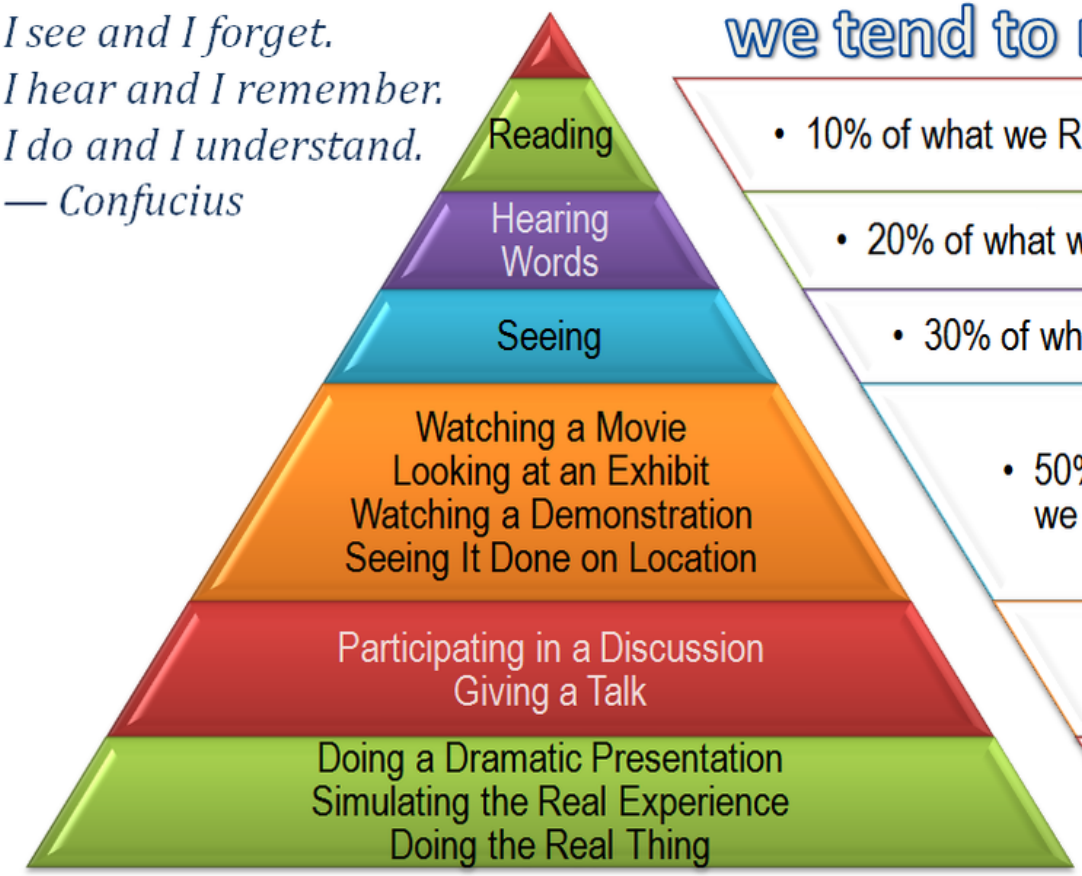
回覆

Interactive Classroom: Why?

The Cone of Learning

sparkinsight.com

I see and I forget.
I hear and I remember.
I do and I understand.
— Confucius



After 2 weeks, we tend to remember ...

- 10% of what we READ
- 20% of what we HEAR
- 30% of what we SEE
- 50% of what we SEE & HEAR
- 70% of what we SAY
- 90% of what we SAY & DO

Passive

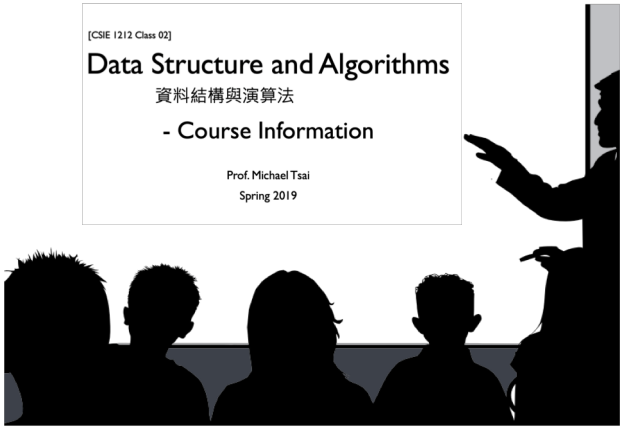
Active

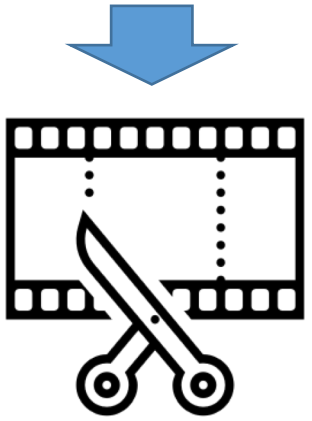
Source: Edgar Dale (1969)

Teaching Modes

1. Conventional classroom teaching + recording + interactive problem solving

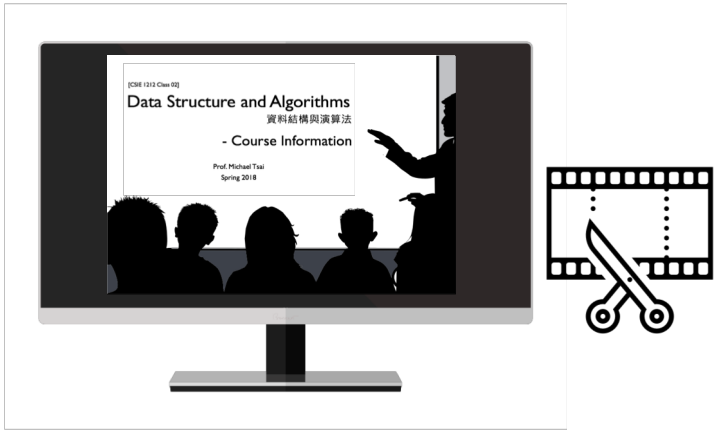
   - I will teach in the class (~20 min segments)
   - Problem solving with Zuvio (counted toward your grade)
   - Recorded video will be available on NTU COOL after the class





Teaching Modes

2. Flipped Classroom



You watch the video at home

- You are <u>REQUIRED</u> to watch and learning from the video on NTU COOL before the class

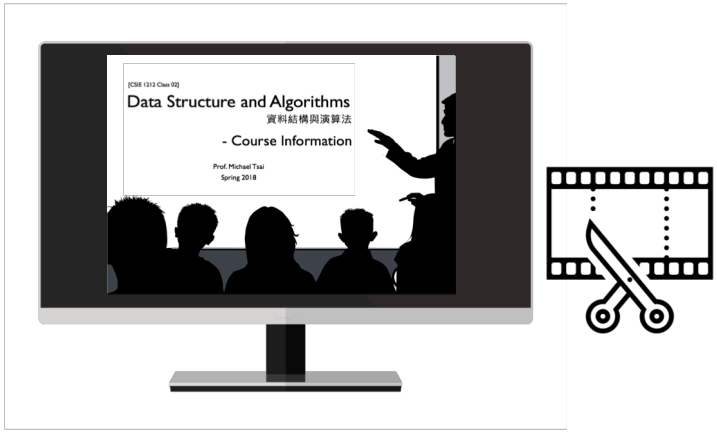
- 2-3 hr of activities during the class (counted toward your grade)

In-class activities during the lecture time

Teaching Modes

3. Video teaching + interactive problem solving

   - Video will be played (~20 min segments)
   - Problem solving with Zuvio (counted toward your grade)
   - You can also ask us questions about the video in the class



Video is played during the class

In-class activities or problem solving

My teaching style

- GOAL: 80% of the students will understand 80% of the content
- NEW GOAL: hopefully DURING THE CLASS
- I will ask you questions
  (or nudge you if you fall asleep during class)
- I will repeat until you understand
  (looking for signs of comprehension)
- I tell icy jokes (to keep you awake)


小菜
有一個人叫做小菜
然後他就被端走了

For students who have not yet got in…

- Maximum number of students: up to capacity of R103 (~160)
- Priority:
  1. 資訊工程系大一雙班(不小心退選了?)
  2. 資訊工程系大四(及以上)>大三>大二>大一(單班)
  3. 資訊學群研究所
  4. 電機資訊學院學生
  5. 其他學院學生
  6. 外校學生 台師大、台科大學生 (三校聯盟) >其他外校學生
- Please fill out the registration form (next slide).
  - Deadline: 2/19, 23:59.
  - Tentatively, registration code will be sent out by Friday, 2/22.
- Students who have special reasons and REQUIRE to take this course this semester:
  please come to the stage and talk to me today.

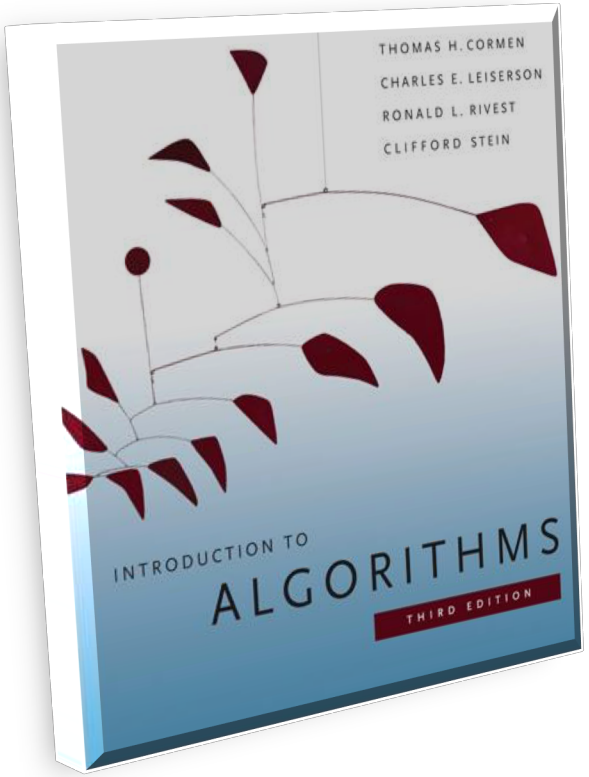
Registration Form

https://goo.gl/chsafQ

Textbook

Introduction to Algorithms, 3rd edition, 2009, MIT Press

by Cormen, Leiserson, Rivest, and Stein

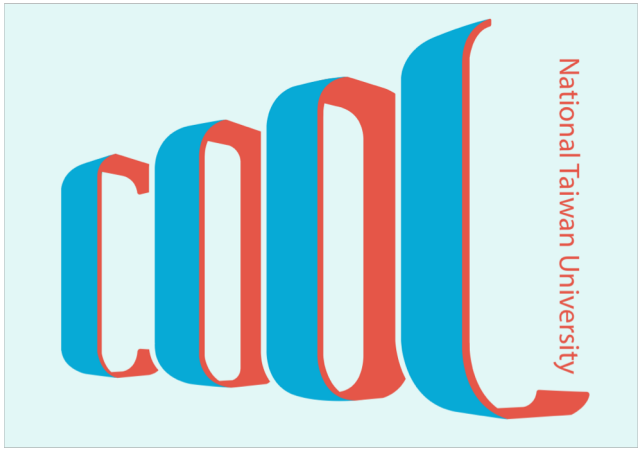


*借用呂學一老師2010 Fall投影片中的圖片

Zuvio

- Allow real-time, in-class problem solving
- Most will be graded, counted toward your grade
- Accounts are already created for registered students
- Login using your NTU email at https://irs.zuvio.com.tw or download the app (ios or android)
  - Default password: 123
- If you're not added to the course yet:
  - Add course using course id: 26976330
- Try now!

NTU COurse OnLine (COOL)

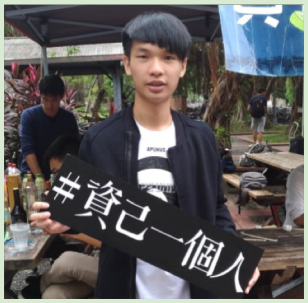


- A next-generation NTU online learning platform
- Course video will be available on the platform
- Course materials (slides, reading materials) will also be available there
- Ask your questions in the discussion forum
- Video watching behavior will be tracked
- Log in with your NTU CC account (try now)

Teaching Assistants (Your Coach!)

吳崇維

wayne4125
@gmail.com
11:00~12:00, Tue.
紅沙發



楊皓丞

howard41436
@gmail.com
TBD

林品諺

b04902029
@ntu.edu.tw
TBD

江緯璿

b04902077
@ntu.edu.tw
TBD

Office hours before homework deadline are usually very crowded! Avoid them!

Teaching Assistants (Your Coach!)

馬揚格

b04902032

@ntu.edu.tw

11:00~12:00, Mon.

紅沙發

蘇多門

b05902094

@csie.ntu.edu.tw

TBD

劉俊緯

b04902127

@ntu.edu.tw

19:20~20:20, Tue.

217

王行健

b04902008

@ntu.edu.tw

17:20~18:20, Tue.

217

Office hours before homework deadline are usually very crowded! Avoid them!

Teaching Assistants (Your Coach!)

邱　譯

b06902030
@ntu.edu.tw

13:00~14:00, Mon.
紅沙發

楊舒瑄

b04902007
@ntu.edu.tw
13:00~14:00,
Thur.
紅沙發

曾千育

b04902008
@ntu.edu.tw
TBD

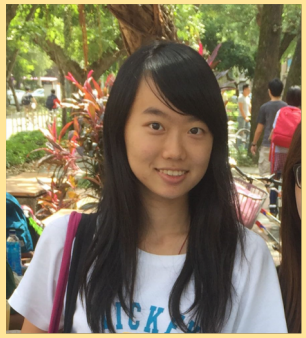
劉瀚聲

b04902012
@ntu.edu.tw
14:00~15:00,
Thur.
紅沙發

謝議霆

b05902031
@ntu.edu.tw

TBD



Office hours before homework deadline are usually very crowded! Avoid them!

Grade

- 32% 4 Homework assignments
- 33% In-class performance (zuvio + activities)
- 15% Midterm exam (programming + analysis)
  - Covers all content before midterm
- 20% Final exam (programming + analysis)
  - Covers all content taught in this semester
- Conversion between raw score & letter grade will be determined by the instructor
  (different from the university conversion table)
- Based on our experience:
  "**只要作業都有寫有交**, 考試考卷每題都有寫不放棄, 就**很難被當**"

Homework

In each assignment:

- ~2 Programming problems
  - Will be graded by online judge
  - Maximum of **5** code submissions per day
  - Learn how to test your own code!
    (do NOT ask us for test input + output)
- ~2 additional, non-programming problems
  - Proofs, analysis
  - Or design data structure / algorithm by "hands"

Homework: references

- We encourage discussion
- Please note references for all problems
  - Example 1: Reference: wikipedia page at [URL]
  - Example 2: Discussion with B87506055
  - Example 3: Reference: book [title] p.xx
- No COPYING!
  (write with references in front of you)
- We will use tools to monitor code similarity
- CONFIRMED case of PLAGIARISM: F grade

Homework: submission

- Electronic submission only
  (details to be announced, likely git)
- Late submission: up to one day after the deadline
  - For all late submission, you get linearly increased penalty for that assignment.
  - Example: you submit your homework 3 hours late. Then you get (1-(3600*3/86400))*100% = 87.5% of your score.
- Detailed rules will be available at the beginning of each homework problem description document.

Exams

- 3-hour exam during the regular midterm & final exam time

- Both exams will feature
  - Programming problems + online judge
  - Additional hand-written problems

Lecture time

- Official time: Tuesdays, 678 (13:20-16:20)
- Breaks: will be adjusted dynamically
  (usually two 10-min breaks)

Try to stay awake!

Communications

Typical DSA office hour
(when no HW due soon)

- Course website:
  to be updated
- How do you reach us?
  1. Please come to our office hour
     (especially for homework-related questions)
  2. Use the forum on NTU COOL
  3. Email to dsa1@csie.ntu.edu.tw
- How do we reach you?
  - Email to your NTU mailbox (via NTU COOL)
    [id]@ntu.edu.tw
  - Announcements can be viewed on NTU COOL too.

TODO

- Get your textbook (required!)
- We recommend you bring a laptop to the classes (for exercises and activities)
- Make sure that you can receive your NTU emails (NTU COOL)
- Test out your NTU COOL and Zuvio accounts
- Sleep well and prepare for a productive new semester

Let's chat a bit.

- Visualize to understand
- Put less emphasis on grades.

  Re-think your purpose.
- Review things you just learned.