CS2351
Data Structures

General Info, Scope, Textbook, Assessment, ...
General Information

- Web page:

- Lecturer: Kai (韓永楷)

- TAs: Wisely (古宗翰) Iming (陳一鳴) Jenny (劉向瑄) Simon (張光瑜)

- Meeting Times
  - Tutorial hour, Lab
Algorithms & Data Structures

• We need to handle **problems** every day
  - Transform an **input** into a desired **output**

• **Algorithm**: A method of solving a problem, using a sequence of well-defined steps

• **Data Structures**: Some ways to organize the data smartly so that an algorithm can run faster
Algorithms & Data Structures

- **Ex:** Given a sorted list of 7 numbers. Check if the number “5” is in the list

- **Algorithm 1:** (Scan)
  - Look at every number in the list

- **Algorithm 2:** (Binary Search)
  - Compare the middle number $M$ in the list
    - Case 1: If equals, answer “YES”
    - Case 2: If $M$ is bigger, search left half
    - Case 3: If $M$ is smaller, search right half
Both algorithms can be extended to solve a more general problem, for any sorted list of any length, and for any target number.

**Question 1:**
If the length of the list is VERY long, which algorithm do you prefer? Why?

**Question 2:**
How to store the data (smartly)?
What will we study?

• Fundamental data structures used in many algorithms
• How to design algorithms, with the help of data structure, to solve problems
  – Also, correctness + analysis
• Practice on implementing an algorithm
What will we study?

Discrete Math  Programming

This Course

Algorithms
Teaching Plan

1. Basics
2. Fundamental Data Structures
   - Linked List, Queue, Stack, Tree, Graph
3. Graph Traversals
   - BFS, DFS, Connected Components, ...
4. Searching Set Data
   - Hashing, Search Trees
Textbook & References

• Textbook:
  - Introduction to Algorithms
    by Cormen and others
  - Fundamentals of Data Structures in C++
    by Horowitz and others

• References
  - Algorithms in C++, by Sedgewick
  - MIT Opencourse, Prof. Poon’s notes, ...
Assessments

Theory:
- 3 Assignments 15%
- 3 Exams 30%

Programming:
- Lab 15%
- 3 Online Exams 30%

Term Project: 10%

Total 100%
Study Tips

• Have a fresh mind in lectures & tutorials
• Don’t be shy, ask questions
• Try your best to do every assignment
  - Work in groups → exchange high-level ideas
  → do it separately in the end
• Study the textbook, try the exercises
• Most importantly: Have fun!