

# CS4311

## Design and Analysis of Algorithms

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

# General Information

- Web page:  
[www.cs.nthu.edu.tw/~wkhon/algo09.html](http://www.cs.nthu.edu.tw/~wkhon/algo09.html)
- Lecturer: Wing-Kai Hon (韓永楷)
- TAs: Wisely (古宗翰)    Frank (邱聖元)  
      Foga (劉富翊)    Jenny (劉向瑄)
- Meeting Times
  - Tue: 10:10—12:00    Thur: 11:10—12:00
  - Extra tutorial hours (to be announced)

# This course is about Algorithm.

## So, what is an algorithm?

- We face many **problems** every day
  - Transform an **input** into a desired **output**
- **Example:** Given a list of 10 numbers, sorted in increasing order. Determine if the number "5" is in the list
  - what is the input? what is the output?
- **Algorithm:** A method of solving a problem, using a sequence of well-defined steps

# Algorithms for our Example

- **Algorithm 1: (Linear Scan)**
  - Look at every number in the list
- **Algorithm 2: (Binary Search)**
  - If the list has 1 element, answer directly
  - Else, 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

# Algorithms for our Example

- Both algorithms can be **extended** to solve a more general problem, for any sorted list of any length, and for any target number
- **Question:** When the length of the list is VERY long, say, 100000, which algorithm will you prefer? Why?

# What will we study?

- Look at some classical algorithms on different kinds of problems
- How to **design** an algorithm
- How to show that an algorithm works **correctly**
- How to **analyze** the performance of an algorithm

# Teaching Plan

- Part I: Basics
  - Growth of Function, Solving Recurrence
    - important in the analysis part
- Part II: Sorting & Median
- Part III: Basic Data Structures
  - Hash Table, Red-Black Tree, ...
    - Self study

# Teaching Plan

- Part IV: More Design & Analysis
- Part V: More Data Structures
- Part VI: Graph Algorithms
  - Minimum Spanning Tree
  - Shortest Path, Maximum Flow
- Part VII: Selected Topics  
(if we have time)



# Textbook & References

- Textbook:
  - Introduction to Algorithms, by Cormen et al.
  - Prof. Wang's notes (see our webpage)
- References
  - Introduction to Design and Analysis of Algorithms, by Lee et al.
  - Algorithms in C++, by Sedgewick
  - The Art of Computer Programming, by Knuth

# Assessments

7-8 Assignments (equal weights):

subtotal = 25%

2 Quizzes :

subtotal = 50%

1 Final Exam:

25%

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Total

100%

# Study Tips

- Have a fresh mind in lectures & tutorials
  - sleep well, don't over-eat before coming :-)
- Don't be shy, ask questions
- Try your best to do every assignment
  - can work in groups and exchange high-level ideas, but must do it separately in the end
- Study textbook, and try the exercises
- Most importantly: Have fun!