

# Introduction to Algorithms

## Topic 0 : Course Information

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University of Science and Technology of China (USTC)

Fall Semester 2022

## ► Instructors

- Prof. Xiang-Yang Li (科技实验楼 113, xiangyangli@ustc.edu.cn)
- Dr. Haisheng Tan (科技实验楼 103, hstan@ustc.edu.cn)

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- Dr. Haisheng Tan (科技实验楼 103, hstan@ustc.edu.cn)

## ► Lecture Time and Room

- Tuesday 2:00PM-3:35PM, Thursday 3:55PM-5:30PM
- Room 3C204

## ► Credit Hours: 60 (Theory) + 30 (Experiment), 3.5 points

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## ► Text Book and Recommended References

- **Textbook:** 《Introduction to Algorithms》, Thomas. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Glifford Stein.  
中文翻译版: 《算法导论》, 机械工业出版社. Thomas. H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Glifford Stein 著. 潘金贵, 顾铁成, 李成法, 叶懋 译
- Main Reference: 《Algorithm Design》影印版 (中文名: 算法设计), 清华大学出版社. Jon Kleinberg, Eva Tardos 著

- ▶ **Fundamental course for every subject in CS.**
  - ▶ Introduction to the design, behavior, and analysis of computer algorithms.
  - ▶ Searching, sorting, and combinatorial algorithms are emphasized.
  - ▶ Worst case and average bounds on time and space usage.
  - ▶ Besides, practicing efficient implementation of algorithms.
- ▶ **Prerequisite courses**
  - ▶ 程序设计，数据结构，高等数学，离散数学

# Course Outline

- ▶ Basic Concepts
- ▶ Asymptotic Mark and Recursive Equation
- ▶ Comparison Based Sorting Algorithms
  - ▶ insertion sort, shellsort, quicksort, etc.
- ▶ Sorting in Linear Time
  - ▶ counting sort, radix sort, bucket sort and order statistics
- ▶ Advanced Data Structure
  - ▶ binary search trees, red-black trees, and etc.
- ▶ Basic Algorithm Design Strategies
  - ▶ dynamic programming, greedy methods, divide-and-conquer
- ▶ Graph Algorithms
  - ▶ DFS, BFS, minimum spanning tree, shortest path
- ▶ String Matching Algorithms
  - ▶ brute-force, KMP, SHIFT-OR, BM, BMH, QS, KR
- ▶ NP Completeness and Approximation Algorithm

- ▶ Assignments and Experiments (25%)

- ▶ Assignments: 10 homeworks, assigned almost every week with **firm** deadlines
- ▶ 6 Experiments:

排序算法及性能对比

Tentative Date: 2022.10.11

高级数据结构：红黑树、数据结构扩张、二项堆

Tentative Date: 2022.11.06

动态规划法：LCS、矩阵链乘、最优二分检索树

Tentative Date: 2022.11.20

贪心算法：区间覆盖、K 进制编码、活动安排、背包问题

Tentative Date: 2022.11.29

图论算法：所有点对最短路径、强连通分量

Tentative Date: 2022.12.20

串匹配算法：KMP、BM、KR、Quick Search

Tentative Date: 2022.12.31

- ▶ Assignments and Experiments (25%)
- ▶ Midterm (20%) (Tentative Date: 2022.10.20)
- ▶ Final Examination (40%) (in the examination week)
- ▶ Class Attendance and Activity (15%)
  - ▶ Attendance and in-class quiz (10%).
  - ▶ Active students (e.g., interacting with instructors) will win the other 5 points.



# Grading Policy

- ▶ The instructor reserves the right to make adjustments to these weights based on his a posteriori evaluation of the relative difficulty of the exams and homework.
- ▶ Each problem will be graded 80% for correctness and 20% for style and clarity.
- ▶ **Final Grade**  $W = \frac{W_1 + W_2}{2}$ ,  $W_1$  is the final weighted score (Assignments and Experiments + Attendance + Midterm + Final) and  $W_2 = 100 \times \frac{W_1}{AverageTopFive}$ . Here *AverageTopFive* is the average of  $W_1$  of the best five students in the class. For example, if your  $W_1 = 70$ , and  $AverageTopFive = 90$ , then your  $W = \frac{70 + 70 \times 100 / 90}{2} \simeq 73.89$ .
- ▶ **No plagiarism will be tolerated**

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- ▶ 冯呈全, 1449627099@qq.com
- ▶ Weekly Recitation: 15:35 – 16:35 on every Tuesday (Tentative, to be discussed with students)
- ▶ Weekly Office Hours: every TA has some office hours (to be discussed with TAs), students can stop by during office hours.

# 彩蛋：企业实践访学

- ▶ 活动目的：为同学们提供与企业交流的平台，了解算法在企业的实际需求，理实交融；鼓励学生基于实际应用总结问题，并通过课题、大创等科研形式，在学校老师和企业工程师的帮助下，提出并解决科研问题；
- ▶ 具体安排：期中考试后，基于自愿报名，挑选全班约 10% 的同学，参访知名企业及其算法实验室（如 MSRA, 华为、阿里、腾讯、讯飞等）；
- ▶ 中国科大教学研究类重点项目“算法实践与算法教学质量提升”支持。

- ▶ Course Homepage: **<http://202.38.86.171>**  
All handouts and announcements will be posted there.
  - ▶ course information
  - ▶ course schedule and slides
  - ▶ assignments, exams and answers.
- ▶ Online Judge Website: **<https://202.38.86.171:1443>**
  - ▶ Your programs submitted and tested here.
  - ▶ [online discussion platform](#)
- ▶ FTP Server: **<ftp://202.38.86.171>**
  - ▶ Upload your assignments here
  - ▶ Writing assignments with Latex (highly recommended), MS Word, or just taking a photo of your answers on a paper.

Wish You Enjoy This Course!