CSCI 270: Introduction to Algorithms and the Theory of Computing

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Course Information

- Instructors: Jiapeng Zhang
- Lecture: Mon/Wed 5:30 - 6:50 pm at THH 102
- Discussion: Friday 2:00 -3:50 pm at THH 301
- https://sites.google.com/site/jiapeng0708/teaching/algorithm

What are algorithms?

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Wikipedia: *In mathematics and computer science, an algorithm is a finite sequence of mathematically rigorous instructions, typically used to solve a class of specific problems or to perform a computation.*

Algorithmic problems

An algorithm is a method to solve computational problems.

- Input: a particular format to represent a computational problem
- Output: the solution of the computational problem

In algorithm design, we consider:

- Accuracy
- Efficiency

What will we study in this class?

- Design efficient algorithms.

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- Design efficient algorithms.
- Rigorous analysis of algorithms.

Summation

- Input: give an integer n
- Output: calculate $1 + 2 + \cdots + n$?

Two summation algorithms

Two summation algorithms

- Running time analysis
- Accuracy analysis

Sorting problem

- Input: give an integer n and a list of numbers $a_1, \ldots, a_n$
- Output: a permutation of $a_1, \ldots, a_n$ with a monotonic order

Sorting algorithms

Sorting algorithms

- Running time analysis
- Accuracy analysis

What will we learn in this class?

- Greedy algorithms
- Divide-and-conquer
- Dynamic programming
- Max-Flow/Min-Cut
- Reductions
- NP-hardness
- Computability theory
- More?

Matching Problems

- Given n professors and n students
- $P = \{p_1, \ldots, p_n\}$, $S = \{s_1, \ldots, s_n\}$
- Each student has a preference list of P
- Similarly, each professor has a preference list of S.

Question:
Can we connect advisors and students in a manner that makes many people satisfied?

Perfect Matching

Stable Matching

Thanks!