B503 Algorithm Design and Analysis

§1 Introduction

Qin Zhang

Brief self-introduction:

My name: Qin[Chin] Zhang

I've worked in theoretical computer science for 18 years;

My main interest is *Algorithms for Big Data*, and *Theoretical Foundations of Machine Learning*

I've published extensively in all top conferences/journals in theoretical CS

I write experimental papers too, and have published in all top databases, data mining and machine learning venues

Today's agenda

1. A brief introduction of the course

2. A touch-base quiz

3. A briefly discussion on the solutions

Course topics

1 : **Introduction/Review**
  - Big-O notations, common running times
  - BFS, DFS, DAG, topological sorting

2 : **Greedy Algorithms**
  - Interval scheduling, MST, shortest path

General
techniq

3 : **Divide & Comquer**
  - Mergesort, counting inversions, closest pair

4 : **Dynamic Programming**
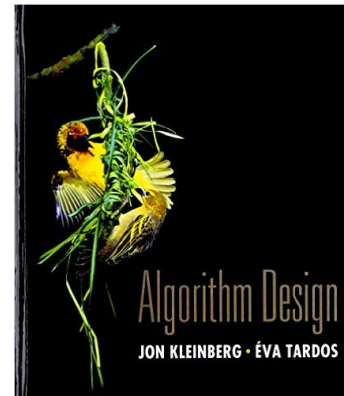 - Weighted interval scheduling, subset-sum, edit distance

5 : **Approximate and randomized algorithms**
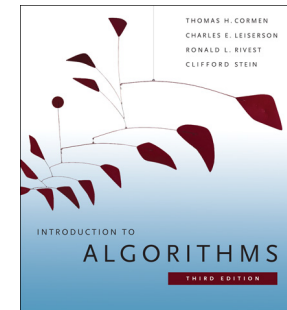
6 : **Electives**

Textbooks

Required textbook

- Algorithm Design
  by J. Kleinberg and E. Tardos
  Pearson Education

Other textbooks

- Introduction to Algorithms
  by T. Cormen, C.Leiserson, R. Rivest, C. Stein
  3rd edition. MIT

- **Course website**
  `http://homes.sice.indiana.edu/qzhangcs/`
  `B503-24-fall-algorithm/`
  - Various information (e.g., office hours, exam dates)

- **Canvas**
  1. Posting homework assignments and solutions; homework collection
  2. Announcements
  3. Course lecture notes

Instructors

- Instructor: Qin Zhang
  Email: qzhangcs@indiana.edu
  Office hours: Wednesdays 10-11pm @ Luddy 3044

- AI: Kaiwen Liu
  Email: kaiwliu@iu.edu
  Office hour: Tuesdays 4-5pm Luddy 2040 area

Grading

- Assignments 30%
  Four written assignments

  The answers should be submitted via Canvas.
  Please typeset in your favorite software.

  No extensions or late homework will be granted
  (unless emergencies; medical emergencies need doctor's note).

- Exams 70%: Mid-term (30%), Final (40%).

- The final grades will be **curved**.
  (We will post some percentiles after each homework/exam)

More practice

Practice is very important to master algorithm design.

1. Subsections in the textbook that we do not cover in class

2. Solved exercises in the textbook

3. Other exercises in the textbook (do not appear in homeworks).
   Feel free to ask us questions if you meet any difficulty
   (email us the question first so that we can get prepared).

4. Any other questions that you can find online
   – there are tons of algorithm design questions online.
   Again, feel free to ask us questions if you meet any difficulty.

Prerequisites

Participants must have a background in **math analysis**, **discrete math** and **data structures**, and have taken (IU equivalent)

1. C241 Discrete Structures for Computer Science

2. C343 Data Structures

   `https://iu.instructure.com/courses/1560867/`
   `pages/schedule?module_item_id=14976212`

3. MATH-M 216 "Analytic Geometry and Calculus II" (or MATH-M 212 CALCULUS II)

Thank you! Questions?

Next: a touch-base quiz