CS 4104: Data and Algorithm Analysis

August 26, 2014

Course Information

- Instructor
  - Sharath Raghvendra, 2160H Torgerson, 231-6256, sharathr@cs.vt.edu
  - Office Hours: 2:30pm–4:30pm, Wednesday and by appointment
- Teaching assistants
  - Sorour Ekhtiari Amiri (Graduate TA), esorour@vt.edu
  - Office Hours: To be determined
  - Gustavo Arango Argoty (Graduate TA), gustavo1@vt.edu
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- Class meeting time
  - Tuesday and Thursdays 2:00pm–3:15pm, Lavery 320

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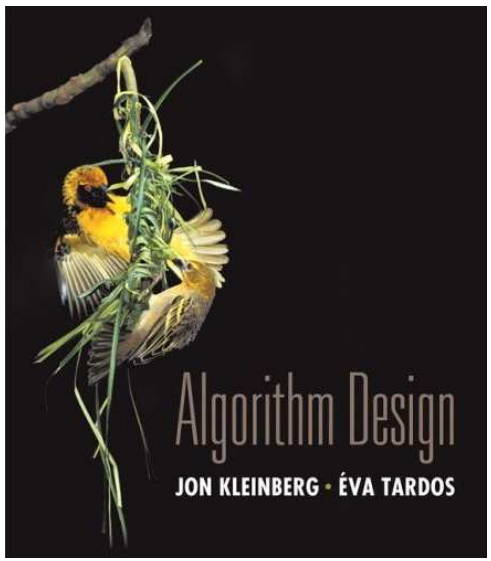
- Class meeting time
  - Tuesday and Thursdays 2:00pm–3:15pm, Lavery 320
- Prerequisite: Grade of C or better in CS 3114; P or better in MATH 3034 or MATH 3134

Keeping in Touch

- Course web site `http://courses.cs.vt.edu/~cs4104/sharath/fall2014`, updated regularly through the semester
- Scholar web site: grades, slides and homework/exam solutions
- Scholar mailing list: announcements
- Piazza sign-up link: Signup Link `piazza.com/vt/fall2014/cs4104`
- Force/add survey: `https://www.cs.vt.edu/F14Force-Adds`

Required Course Textbook



- Algorithm Design
- Jon Kleinberg and Éva Tardos
- Addison-Wesley
- 2006
- ISBN: 0-321-29535-8

Reading Assignments

- Reading assignment available on the website.
- Read **before** class.

Lecture Slides

- Will be available on course website.
- Usually posted before class.
- Class attendance is extremely important.

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- Usually posted before class.
- Class attendance is extremely important. Slides may not be available for a few lecture classes.

Homeworks

- Posted on the web site $\approx$ one week before due date.
- Announced on the class mailing list.

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- Collaboration allowed but prepare solutions individually and acknowledge those who you collaborated with.
- Hand in hard-copy of the solution.
  - Hand-written solutions must be legible, otherwise no credit will be awarded.
- Homework grading policy: strict for easy questions, lenient for the "hard" questions.

Examinations

- Take-home midterm.
- Take-home final (comprehensive).
- 1 week deadline from the time of release.
- No collaborations on exams, submit hard-copy of the solutions.

Grades

- Homeworks: $\approx$ 6-8, 60% of the grade.
- Take-home midterm: 15% of the grade.
- Take-home final: 25% of the grade.

Funding

- Some Undergraduate Research Assistant positions available for summer.
- Please talk to me if interested.

Course Goals

- Model "real-world" problems mathematically
- Paradigms and principles to design efficient algorithms.

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- Model "real-world" problems mathematically
- Paradigms and principles to design efficient algorithms.
- Learn techniques to prove **correctness**, **efficiency** and **lower bounds** for algorithms.

Topics

Course roughly follows topics suggested in textbook

- Measures of algorithm complexity ($O(\cdot)$, $\Omega(\cdot)$ etc.)
- An Example Problem (Stable Marriage Problem)
- Graphs (BFS, DFS with applications)
- Greedy algorithms
- Divide and conquer
- Dynamic programming
- Network flow problems (Bipartite Matching, Max-flow etc.)
- Linear Programming (Duality, Hungarian algorithm)
- NP-completeness (Concept of reductions)
- Approximation algorithms
- Streaming algorithms

What is an Algorithm?

What is an Algorithm?

Chamber's A set of prescribed computational procedures for solving a problem; a step-by-step method for solving a problem.

Knuth, TAOCP An algorithm is a finite, definite, effective procedure, with some input and some output.