

Data Structures and Algorithms

Session 1. January 21, 2009

Instructor: Bert Huang

<http://www.cs.columbia.edu/~bert/courses/3137>

Session Plan

- * Administrative overview
- * Introduction to course content

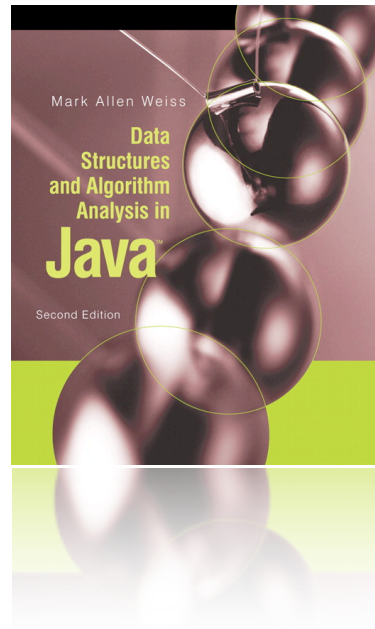
About the Course: Description

- * Lectures: Monday/Wednesday 2:40-3:55 PM
Mudd 633
- * We will study:
 - * commonly used data structures and algorithms,
 - * how to analyze these data structures and algorithms.

About the Course: Staff

- * Bert Huang
Office hours: Monday 4-6 PM (after class)
CEPSR/Schapiro Building 624
bert@cs.columbia.edu
- * TA's:
Priyamvad Deshmukh, prd2112@columbia.edu
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About the Course: Reading



- ✱ *Data Structures and Algorithm Analysis in Java, 2nd Edition* by Mark Allen Weiss.
ISBN-10: 0321370139

About the Course: Resources

- * Course homepage:
<http://www.cs.columbia.edu/~bert/courses/3137>
- * Courseworks: <http://courseworks.columbia.edu>
- * Textbook Errata:
<http://users.cs.fiu.edu/~weiss/dsaajava2/errata.html>
- * Textbook Source Code:
<http://users.cs.fiu.edu/~weiss/dsaajava2/code/>

About the Course: Prerequisites etc.

- * COMS W1007: Object-Oriented Programming and Design in Java (or equivalent)
- * Co-requisite COMS W3203: Discrete Mathematics
- * COMS W3134: Data Structures and Algorithms (less intense but covers similar topics for non-majors)

About the Course: Grading

- * 50% Homework Assignments (six)
- * 20% Midterm Exam (closed book, closed notes)
- * 30% Final Exam (closed book, closed notes)

About the Course: Academic Honesty

- * You **must** read the Computer Science department's academic honesty policy listed at <http://www.cs.columbia.edu/education/honesty/>
- * Additional Comments:
 - * Plagiarism is easy to catch.
 - * All homework and exams in *this class* are individual assignments. No collaboration.

About the Course: Expectations

- * Attend class
 - * Ask questions
- * Read assigned text
- * Start homework early
- * Write well and clearly
- * Get help when you need it

About the Course: Grievances

- * Write reports of grading disputes on paper
 - * Provide clear explanation of the disagreement
 - * Give report to TA, TA will decide if correction is warranted
 - * If there is still disagreement, submit grading dispute report to me

Definitions

- * Data Structure - abstract way to organize information
- * Algorithm - abstract way to perform computation tasks

Data Structures

- * Variables: boolean, int/byte/short/long, float/double, char
- * Arrays, Strings
- * We'll go over more advanced structures: linked lists, trees, heaps, graphs, hash tables, etc.
- * Smarter data structures can be abstracted

Benefits of Abstraction

- * Consider Java Strings
 - * We use them all the time
 - * How is the text in a String object stored?
 - * When we call the `length()` method, how does it find the length?
 - * How does it concatenate strings?

Course Goals

- * A series of case studies on common data structures and algorithms
- * Gain intuition about how to design useful and efficient data structures
- * Understand how to analyze any data structure or algorithm

Algorithm Analysis

- * We must analyze algorithms' and data structures' running times and memory requirements.
- * Input data nowadays are huge. Need efficient algorithms.
 - * Over 100 million facebook.com users with profiles, photos
 - * Google's system indexes over 1 trillion (1,000,000,000,000) URLs

Next Class

- * We will discuss how to formally analyze algorithms
- * Big-Oh notation

Reading

- * Course Website:

<http://www.cs.columbia.edu/~bert/courses/3137>

- * Academic Honesty policy

<http://www.cs.columbia.edu/education/honesty>

- * *Weiss* Chapters 1 and 2

- * Ch. 1 should be about 75% review