

Introduction to Data Structures

cgregg@cs.tufts.edu

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Part I

Course Goals

This course aims to teach you to program efficiently. It's not enough to just write code. You need to refactor that stuff so it doesn't destroy the CPU. We're going to analyze the costs associated with coding choices and solve real-world coding problems. Hopefully, we'll have some fun as well.

Part II

4 Lists

We want to study data structures because they teach us to manage a ton of data efficiently in a short time frame. So:

- Let's create 4 "List-Like" containers for our data.
- Let's add 100,000 integers to each container (the even integers between 0 and 200,000)
- We search for the integers from 0-50,000
- We erase the integers from 0-20,000

With a 2.4GHz processor:

Structure	Overall (s)
Array	9.80517
Linked List	23.38263
Hash Table	0.01826
Binary Tree	0.06077
Sorted Array	4.87678

Data structures are no joke, obviously. But what's interesting is when we break down the structures, different parts have different problems. Inserting is

much faster on an array than a sorted array, while searching is the other way around. Why are there these discrepancies? Well, the bottom line is that some structures contain more information by design. And manipulating structures *always* takes time. The computer hardware knows only a giant array. Our job with C++ is to change the way this data is laid out.

How can structures have information contained within them? Well, look at a sorted array. Because we know that every number to the left of the index is lower, every number to the right is higher. Unfortunatley, this is also a tradeoff. Inserting numbers sucks in sorted arrays because you have to run some crappy insertion sort algorithm to put anything in the list.

Part III

The Wait List and YouTube

Everyone on the waitlist is enrolled. Done. Also all classes will be uploaded to YouTube.

Part IV

Staff

Professors

- Dr. Gregg - Grew up in Upstate NY, studied EE ant Johns Hopkins, and was recruited into the navy where he became a cryptologist. During that time he went to San Diego, the Middle East, Thailand, Malaysia, you get the idea. He was then posted to Australia where he went surfing often, and decided to become a teacher, getting his Masters in Education at Harvard. He then taught at Brookline HS down the street from Tufts, taught at UC Santa Cruz, got his PhD in computer engineering from UVA, and was sent to Africa by the Navy Reserves (He's since stayed in the Navy Reserves, and has to go to Seattle once a month.) He was then grabbed from Africa by Tufts.
- Bruce Molay - A cool guy who brings popcorn into lab. He wasn't here to tell us about himself.

TA's

- Tomoki Shibata
- Hugo Akita

- Tons of undergrads.

Part V

Resources

The Magic of the Internet

- Course Website - cs.tufts.edu/comp/15
- Piazza - Private StackOverflow for this class - piazza.com/tufts/fall2014/comp15/home
- Some other stuff I couldn't write down because I was busy tripping over people.

Textbooks

Data Structures and Algorithm Analysis, 4th Edition, Mark A Weiss
people.cs.tufts.edu/~shaffer/Book/c++3elatest.pdf

Part VI

Labs

Lab signups will begin at 6PM *tonight*. First come first served on the class website. Labs are mandatory. 22 people per lab.

Part VII

Eclipse

Part VIII

Assignments

Assignment 0

Assignment 1