



Topic Notes: Introduction and Overview

Welcome to Computer Science 211!

Why Take Data Structures?

You have programming experience, at least some in Java.

In this course, you will become a more sophisticated programmer, as you learn about designing correct and efficient algorithms and data structures for use in your programs. Along the way, you will:

- hone your problem solving skills,
- gain experience in programming in general, Java in particular,
- learn how to implement algorithms and data structures in Java,
- learn how to evaluate and visualize data structures and algorithms,
- learn how to understand (and prove) some properties of data structures and algorithms,
- learn how to consider the relative merits of different structures and algorithms, and
- learn how to design large programs (in an object-oriented way) so that it is easy to modify them

We will do very little with graphics and animations, instead choosing to focus on the relatively simple textual interface often used by advanced programmers. But the algorithms and data structures may be used in (and are often essential to) those graphical programs. Your additional programming experience will allow you to understand and make use of the extensive base of reusable code, Java and otherwise, that is available to today's programmers, even though we will use only a limited subset of those tools here.

Sample Problems

Here are some examples of the kinds of problems you will learn to solve.

1. Find the shortest path from South Hadley to Albuquerque on the national highway system (and do it efficiently).
2. Develop a game decision tree to allow a computer player for a game such as chess.

3. Design and implement a scientific calculator.
4. Design and implement a simulator that lets you study traffic flow in a city or airport.
5. Design and implement a pattern matching system to find a particular sequence of nucleotides in the sequenced DNA of a given organism.
6. Design and implement a simulation for some physical phenomenon (e.g., fluid flow).