01 - Introduction and Overview

What is an Algorithm?
- Bubble Sort
- Dijkstra's Algorithm
- Huffman Coding

Beerbot?
- Money Counting
- People Detector
- Beer Detection
- Small Talk

Where
- Genomics
- Hardware
- AI
- Haptic
- Vision
Asymptotics and Recurrences

- You are familiar with $O(n)$...

\[ \omega(n) \quad o(n) \quad \Omega(n) \quad \Theta(n) \]

- $n \quad n \lg n \quad n^2 \quad 2^n \quad n!$

- Recurrence Relations

\[ T(n) = 2T(n/2) + n \]
Sorting

- How to put a collection of items in order

- We'll ignore the slow sorts and only think about those with times $O(n \log n)$, or better.

  Insertion, Bubble, Selection
Searching

How do we find items in a sorted list?

Binary Search $O(lg(n))$

Interpolation Search $O(lg lg n)$
Paradigms
- Abstract idea that can improve the performance of a class of problems.

Randomized Algorithms
- A challenge for adversaries
- A challenge for students

I'll make your algorithm run SLOWLY! Ha ha ha!

If I see one more %@#! Problem...
Graph Algorithms

Diagram:
- Physics
- Old Chem
- Bryan
- Parking Services
- LSRG
- Chapel
- Ciemas
- North
- Chapel Hill
String Algorithms

* Is a substring contained in a larger string/text?

* Are there strings of a certain format (i.e. mypic*.jpg) in a larger string/text?

Computational Complexity

* What algorithms can be run in a feasible amount of time?

* Can some problems not be solved at all?