CSE421: Algorithms

Professor: Anup Rao (anuprao@cs)
Algorithms

- A recipe for mapping inputs to outputs efficiently
- Studied before there were computers
- Eg: Gaussian elimination, gcd, multiplication
  ...
- How to design algorithms?
- How to analyze efficiency and prove correctness?
Approximate Schedule

**Weeks 1-2:** Introductions, asymptotics, some basic algorithms. Graphs, trees, connectivity, testing bipartiteness.

**Weeks 3:** Greedy algorithms for Interval Scheduling, Minimum Spanning Tree, Set Cover, Vertex Cover

**Weeks 4-5:** Divide and Conquer. Algorithms for Sorting, Selection, Closest, Multiplication. Midterm

**Week 6:** Dynamic Programming. Algorithms for Edit Distance, Longest Path, Knapsack.

**Week 7:** Flows and Cuts. Algorithms for Matching, Graph Partitioning.

**Weeks 8-10:** Linear programming, Randomized algorithms, NP-completeness.
Text Book

Everything you need to know will be in slides. Videos of lectures will be posted on website.
Evaluation

Final: 35%
  - take home
Midterm: 25%
  - take home
Homework every week: 40%
  - You must write up solutions by yourself, but you can discuss homework with others.
Time Outside Class

Office Hours:

To get the most out of this class...

• Start working on the homework early, problems are often deceptively hard.

• Talk to {professor, TAs, students}. Brainstorming sessions really really really help!
If two or more people need to compute a function that depends on all their inputs, how long does their conversation need to be?
Concrete Problems

How many bits need to be communicated to know if $X, Y, Z$ have a common element?

Alice

Bob

Charlie

$X, Y$

$Y, Z$

$Z, X$

Subsets of

\{1, 2, ..., n\}