

Topics for CprE 528: Probabilistic Methods in Computer Engineering

Applications

1. Randomized Min-Cut Algorithm
2. Polynomial Identity Testing
3. Reservoir Sampling
4. Randomized Quicksort (expected runtime and high probability bound)
5. Randomized Selection
6. Rabin-Karp Pattern Matching Algorithm
7. Router Stamping to Identify the Source of IP Packets
8. Parameter Estimation
9. Spread of a Rumor/Contagion over a Network
10. Pagerank Citation Ranking??
11. Locality Sensitive Hashing: Finding Similar Documents in a Database
12. Small Space Algorithms
 - a. Bloom Filter
 - b. Probabilistic Counter
 - c. Distinct Counting
13. Primality Testing

Probability Techniques

1. Rules of Probability
2. Random Variables, Linearity of Expectation
3. Coupon Collector
4. Markov, Chebyshev, Chernoff Bounds
5. Balls in Bins
6. Random Graphs
 - a. Erdos Renyi model, properties of resulting graphs
 - b. Preferential Attachment Model