Lecture 15

- Final
Chapter 1

- Algorithm Analysis
- Need to know:
  - How to compute complexity of an algorithm.
  - Big O/Theta/Omega notation
  - Complexities of various algorithms from class
Chapter 2

- Basic Data Structures
- Stacks & Queues
  - Linked structure implementation
  - Array-based implementation
- Vectors, Lists, & Sequences
  - Implementations
  - Interfaces
Cont’d

- Trees
  - Definitions - height, depth, proper, binary
  - Classes of nodes - internal, external
  - Traversals - in-order, pre-order, post-order
- Priority Queues
  - Interface
  - Implementations
- Heaps
  - Heap properties - what is a heap
  - Implementation
Cont’d

- Dictionaries
  - Interfaces
  - Implementations
- Hash tables
  - Interfaces
  - Implementations
Chapter 3

- Binary Search Trees
  - Basic operations (insert, remove, search)
  - Complexity
- Skip lists
Chapter 4

- Heap Sort
- Merge Sort
- Quick Sort - be aware of worst case behavior
- Radix Sort
- Lower bound on comparison sort complexity
- Advantages/disadvantages of each sorting algorithm
- Selection problem (find the ith smallest item in list of unsorted items)
Chapter 5

- Greedy Algorithms
  - Fractional Knapsack Problem
  - Activity Selection Problem
- Dynamic programming - know the various results
  - Matrix Chain Multiplication Problem
  - 0-1 Knapsack Problem
Chapter 6

• Graphs - basic definitions
  DAGS/Directed/Undirected/...
• Data Structures to store graph (adjacency list/matrixes)
• Directed Graphs
• Depth First Search
• Breadth First Search
Chapter 7

• Single Source Shortest Path
  • Bellman Ford
  • Shortest path in DAG
  • Dijkstra
• All Pairs Shortest Path
  • Matrix-base Algorithm
  • Floyd-Warshall Algorithm
  • Johnson’s Algorithm
• Minimum Spanning Trees
  • Prim’s
  • Baruvka’s
  • Kruskal’s
Chapter 8

- Network Flows
  - Statement of problem
  - Structure of graph (Source can’t have incoming edges, Sink can’t have outgoing edges)
  - Network Cut Definition
  - Theorem for Cuts, Augmenting Paths, and Max Flow
- Maximum Flow
  - Relation between network cut/max flow
  - Definitions
  - Ford Fulkerson Method
  - Edmonds-Karp Algorithm
- Maximum Bipartite Matching
Chapter 13

- P vs. NP
- NP Completeness
- NP Complete Problem
- Approximation Algorithms