

Reading advice 2024

If you aim at grade X you can skip the topics marked with a number greater than X.

Lecture 1: Introduction

- (3) Stable matching algorithm
- (3) Algorithm analysis

Lecture 2: Data structures

- (3) Hash-tables
- (3) Conclusion about α but *not* explaining how it was derived (since that needs more background than is required for this course)
- (4) Quadratic probing
- (4) Double hashing
- (3) Graph representations
- (3) Depth first search
- (3) Breadth first search
- (4) Tarjan's algorithm

Lecture 3: Greedy algorithms

- (4) Two proof techniques — main ideas
- (4) Greedy scheduling algorithms

Lecture 4: Shortest paths and minimum spanning trees

- (3) Dijkstra's algorithm (idea and correctness, time complexity)
- (4) Safe edges when creating a minimum spanning tree
- (3) Jarnik's algorithm (Prim)
- (3) Kruskal's algorithm
- (3) Union-find

Lecture 5: Divide and conquer and convex hull

- (3) Main ideas of divide and conquer
- (3) Main ideas of master theorem
- (3) Jarvis march
- (3) Graham scan
- (3) Preparata-Hong
- (3) Finding nearest points in a plane

Lecture 6: Dynamic programming

- (3) Main ideas
- (4) Bellman-Ford algorithm
- (3) Sequence alignment (sv. inpassning)

Lecture 7: Network flow

- (3) Ford-Fulkerson algorithm main ideas
- (3) Time complexity of Ford-Fulkerson
- (4) Correctness of Ford-Fulkerson
- (3) Bipartite graph matching
- (5) Preflow-push algorithm main ideas
- (5) Correctness of preflow-push
- (5) Time complexity of preflow-push

Lecture 8: Hollow heap

- (4) Linear initialization of a binary heap from an array
- (5) Hollow heap with multiple roots
- (5) Rank
- (5) Main ideas of insert, update key, delete (not min), delete min operations but *not* deriving time complexity of delete-min

Lecture 9: NP-completeness

- (3) Complexity classes
- (3) Vertex cover
- (3) Independent set
- (3) Set cover
- (4) Circuit satisfiability
- (4) Formula satisfiability (SAT)
- (4) 3-SAT
- (4) Hamiltonian cycle
- (3) Traveling salesperson problem
- (3) Graph coloring

Lecture 10: Linear and linear integer programming

- (3) Linear and integer linear programming main ideas
- (4) Main ideas of intopt pseudo code
- (4) Graph coloring example with integer linear programming
- (5) Instruction scheduling example with integer linear programming