Course summary: Data Structures and Algorithms (FS 2014)

Below you find the exam relevant topics discussed in the Data Structures and Algorithms lecture held in spring 2014, along with suggested readings in English. Please note that not every topic is discussed at the same level as in the german book accompanying the lecture.

Literature


Topics relevant for the exam


[Cormen, Ch. 1 – 3]


[Cormen, Ch. 4.1]

27.2.2014 Searching I: Searching. Computing the Median. Linear search, binary search, interpolation search, lower bounds. Randomized median computation. Blum’s algorithm for computing the median. [Cormen, 2.1-3, 2.2-3, 2.3-5, Ch. 9]

28.2.2014 Searching II: Hashing. Hash tables, hash functions, universal hashing. Collision resolution by chaining, open hashing, probing. [Cormen, Ch. 11]


[Cormen, Ch. 2, Problem 2.2-2, 2-2, Ch. 8.1]

  [Cormen, Ch. 6, 12.1–12.3]

  [Goodrich, Ch. 3.2]

  [Cormen, Ch. 17, esp. Problem 17-5]

  [Cormen, Ch. 4.2, 15.2 – 15.4, 35.5]

27.3.2014 Dynamic Programming II. Knapsack problem, FPTAS.
  [Vazirani, Ch. 8.1 – 8.2]

  [Cormen, Ch. 15.5 & Goodrich, Ch. 3.4]

3.4.2014 [Backtracking, Branch and Bound.] Not relevant for the exam.

  [Cormen, Ch. 22.1, 22.4]

10.4.2014 Graph Algorithms II. Graph traversal: BFS, DFS. Connected components. Minimum spanning trees: introduction, greedy algorithms, Kruskal’s algorithm with union find structure.
  [Cormen, Ch. 22 – 23]

  [Cormen, Ch. 19, 23]

  [Cormen, Ch. 24.1 – 24.3]

  [Cormen, Ch. 26.1 – 26.2]

9.5.2014 Graph Algorithms VI: Flows in Networks II. Shortest augmenting path algorithms, $O(m^2n)$ algorithm by Edmonds-Karp, $O(mn^2)$ algorithm by Dinic. Matchings in bipartite graphs. Hall’s theorem.
  [Ahuja, Ch. 7.5 & Cormen, Ch. 26.2 – 26.3, Problem 26.3-4]

  [Cormen, Ch. 33.1 – 33.3 & deBerg, Ch. 1.1 – 1.2]
16.5.2014 *Geometric Algorithms II*. Intersection of arbitrarily oriented line segments: checking and reporting. Intersection of axis-parallel rectangles, 2-dimensional range trees. [deBerg, Ch. 5.3]

22.5.2014 *Geometric Algorithms III*. Intersection of axis-parallel rectangles using segment trees, tile trees/interval trees, and priority trees. [deBerg, Ch. 10.1 – 10.3]

23.5.2014 *Geometric Algorithms IV*. Geometric divide and conquer: pair of nearest neighbors in set of points. Intersection of orthogonal line segments. Intersection of rectangles. [Cormen, Ch. 33.4]

30.5.2014 *External Memory Structures*. External storage model, idea of locality. B-Trees: structure, searching, insertion, deletion, amortized analysis of the insertion, space consumption. Dynamic hashing. [Cormen, Ch. 18]