Chapter 0
Introduction

Algorithm Theory
WS 2012/13

Fabian Kuhn

About myself…

Fabian Kuhn

- PhD: ETH Zurich (2002)
- Afterwards: Microsoft Research, ETH, MIT, U. Lugano (CH)

- In Freiburg since April 2012
  Chair of Algorithms and Complexity

- Background/Research:

  Theory, algorithms (esp. distributed algorithms)

Organization

Lecture (Room 101-00-026):

- Tuesday 8:15 – 10:00
  - Should we make it 8:30 – 10:00 without a break in the middle?

- Wednesday 16:15 – 18:00 (Oct. 24, Oct. 31, then bi-weekly)
  - Should we also skip the break?

- Lecture will be in English

Exercises: (tentatively, details tomorrow)

- Wednesday 16:15 – 18:00
  - Rooms will be announced

- There will be bi-weekly exercises
  - Hand-in (in Wednesday lecture), first hand-in: Oct 31
  - First exercise class: Nov 7

- It is OK to work in groups of up to 3 people on the exercises

Exam

Exam:

- Final exam will take place after the semester (end of February)
  - Exact date to be announced
- Admission: 50% of exercise points
  + one presentation in exercise class

Webpage:

- Contains slides, recordings, exercise sheets (+some solutions)

  http://ac.informatik.uni-freiburg.de
  → Teaching → WS 2012/13 → Algorithm Theory

About the Course

Design and analysis techniques for algorithms

- Selection of (possible) topics:
  - Divide and conquer
  - Greedy
  - Dynamic programming
  - Randomization
  - More on heaps, hash tables, …
  - Graph algorithms
  - Amortized analysis
  - Approximation algorithms
  - Competitive analysis

Requirements

- I assume that you have some mathematical maturity and some knowledge of basic algorithms and data structures
  - E.g., from the Bachelor course Informatik 2

- In particular, you should be (at least partly) familiar with
  - Math. induction, basic (discrete) probability theory, …
  - Big-O notation and Landau notation more generally
  - Searching and Sorting (binary search, mergesort, quicksort)
  - Binary search trees, balanced binary search trees
  - Priority queues (heaps)
  - Hash tables
  - Basic graph-theoretic definitions
  - Representations of graphs
  - Basic graph algorithms: traversal (depth-first, breadth-first), minimum spanning trees, shortest paths

Literature

- T. Cormen, C. Leiserson, R. Rivest, C. Stein:
  Introduction to Algorithms, Third Edition
  MIT Press, 2009

- T. Ottmann, P. Widmayer:
  Algorithmen und Datenstrukturen
  4th Edition, Spektrum Akademischer Verlag,
  Heidelberg, 2002

- J. Kleinberg, E. Tardos:
  Algorithm Design
  Addison Wesley, 2005

- Original literature