



Chapter 0

Introduction

Algorithm Theory
WS 2015/16

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
contact me at kuhn@cs.uni-freiburg.de
- Background/Research:
theory, algorithms (esp. distributed algorithms)

Design and analysis techniques for algorithms

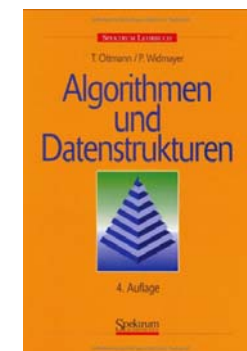
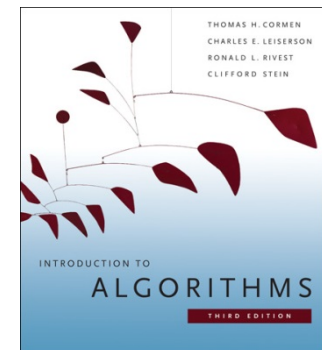
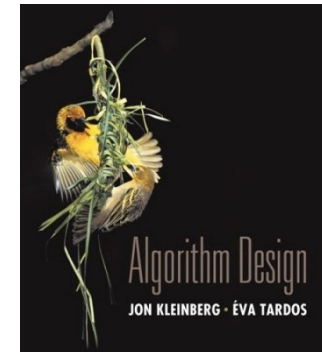
- Selection of (possible) topics:
 - Divide and conquer
 - Greedy
 - Dynamic programming
 - Advanced data structures
 - Amortized analysis
 - Graph algorithms
 - Randomization
 - Approximation algorithms
 - Competitive analysis
 - Parallel algorithms

Requirements

- I assume that you have basic algorithms and data structures knowledge as well as some mathematical maturity
 - E.g., from the Bachelor course Informatik 2 and basic math courses
- In particular, you should be (at least partly) familiar with
 - Math. induction, basic combinatorics & (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

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



Lecture

Lecture (101-00-026)

- Monday 14:15 – 15:00
- Thursday 10:15 – 11:45

Exercise Tutorials (101-00-026 + 082-00-006)

- Monday 15:15 – 16:00
- **First exercise tutorial on Mon, Nov. 2 (14:15 – 16:00)**

Language

- Lectures will be in English

General Remarks

- Theory lecture (there will be math)

Recordings

- Most lectures will be recorded
- **No guarantee that there's always a recording!**

Exercises

General Information

- There will be (theoretical) exercises to practice the material
 - We try to provide sample solutions (not always guaranteed)
- 1 problem per week (in most weeks)
 - Exercises handed out on Wednesday, due on Thursday the week after
- You need to do the exercises either alone or in groups of 2. We encourage you to team up and do them in groups of 2!
 - send email to Hamid Ghodselahi (hghods@cs.uni-freiburg.de)
 - indicate whether you'd prefer to have a German tutorial group
- 50% of all exercise points are needed to be admitted to the exam

Tutorials

- **Generally on Monday, 15:15 – 16:00 (there will be exceptions)**
 - In some weeks, the full 2 hours on Monday might be used for exercises or for lectures (will be announced on web page).

Exam



Final Exam

- Final exam will take place after the semester
 - Tentatively, 31.03.2016, 9:00
- 50% of the exercise points are required to be admitted
 - Solving exercises is the best exam preparation!
- You will be allowed to bring **5 A4 pages of handwritten notes** to the exam. No other material will be allowed
 - 5 A4 pages $\hat{=}$ 5 singly-sided A4 sheets
- We currently plan to do a test exam towards the end of the semester
 - Should help preparing for the exam
 - Possibility to collect additional exercise points if otherwise below 50%

Web Page



<http://ac.informatik.uni-freiburg.de>

→ Teaching → WS 2015/16 → Algorithm Theory

- We will publish all important information there!
 - Check in the next days for additional information on the exercises.
- Check the web page regularly!
- Recordings will be put online
 - Sometimes possibly with some delay...