



# **Chapter 0**

# **Introduction**

**Algorithm Theory**  
**WS 2014/15**

**Fabian Kuhn**

# About myself...

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## 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)

## Design and analysis techniques for algorithms

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

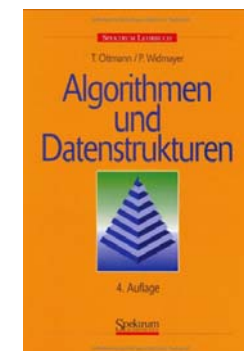
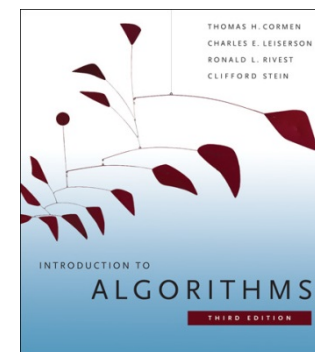
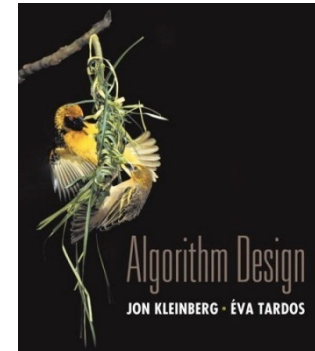
# Requirements

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- 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
- 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

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## Lecture (101-00-026)

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

## Exercise Tutorials (101-00-026 + ???)

- Monday 15:15 – 16:00 (starting next week)

## 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

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## General Information

- There will be (theoretical) exercises to practice the material
  - We try to provide **sample solutions** (not always guaranteed)
- 1 problem <sup>set</sup> per week (in most weeks)
- You need to do the exercises in groups of 2. Please team up with a colleague and let us know.
  - send email to Hamid Ghodselahi ([hghods@cs.uni-freiburg.de](mailto: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

- **Monday, 15:15 – 16:00 (starting next week, Oct 27)**
  - In some weeks, the full 2 hours on Monday might be used for exercises or for lectures (will be announced on web page).

# Exam

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## Final Exam

- Final exam will take place after the semester
  - Tentatively, end of February
- 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



# Web Page

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

→ Teaching → WS 2014/15 → 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...