



Introduction

Algorithm Theory

Winter Term 2020/21

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Design and analysis techniques for algorithms

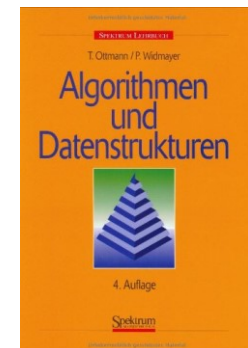
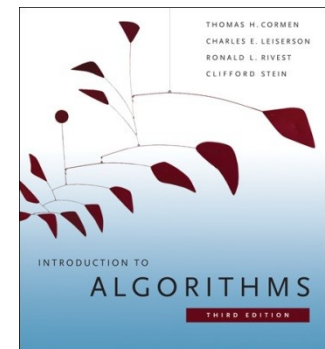
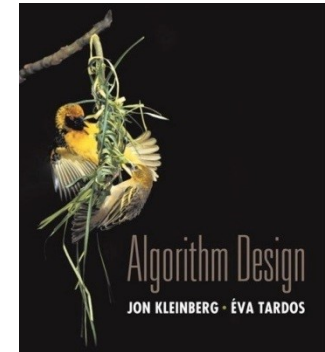
- Topics of the course (tentative):
 - divide and conquer
 - greedy
 - dynamic programming
 - advanced data structures
 - amortized analysis
 - graph algorithms
 - randomization
 - approximation algorithms
 - online algorithms
 - parallel algorithms

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



Video Lectures

- There will be approx. 60 mins of video lectures every week
 - broken down into shorter parts (where it makes sense)
- We try to put the video lectures online sometime on Monday

Live Q&A Sessions on Zoom

- Tuesday, 16:15 – 18:00
- Feel free to ask any questions you have on lectures / exercises
- We can also go over some exercise questions

Language

- Lectures will be in English

General Remarks

- Theory lecture (there will be math)

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

→ Teaching → Winter Term 2020/21 → Algorithm Theory

- We will publish all important information there!
- Check the web page regularly!
- Video lectures will be available through the course web page

- In addition to the web page, we use Zulip as an online **forum** for questions, online discussions, further information, etc.
 - Zulip is a group chat / forum (<https://zulip.com>).
 - Use Zulip to discuss questions regarding the lecture / exercises.
 - Also check Zulip for additional announcements.
- Information on how to sign up, see later slide...
- If you have a question about the lecture or the exercises, please **use Zulip instead of writing an email** to one of us!
 - Like this, all of us and also your colleagues see the question and can answer to it
 - We can directly answer a question for everybody
 - Of course feel free to also use Zulip to discuss anything related to the topics and organization of the lecture

Zulip has a 2-Level Hierarchy

- 1st level: streams
 - They are predefined by us (see below)
- 2nd level: topics
 - Every message is assigned to a topic. Messages of the same topic can be grouped. Please use short, but meaningful topic names when creating new topics.

Zulip Streams for Algorithm Theory:

- *AC-announcements*: **read-only**, general info for all lectures
- *algtheory2020/announcements*: **read-only**, general info by us
- *algtheory2020/exercises*: questions related to exercise sheets
- *algtheory2020/lecture*: questions related to the lectures
- *algtheory2020/misc*: further questions related to alg. theory

General Information

- There will be (theoretical) exercises to practice the material
 - We will try to provide *sample solutions* (not always guaranteed)
- 1 exercise sheet per week
- You need to do the exercises either alone or in groups of 2 or 3. We encourage you to team up and do them in groups!
 - Each of you should hand in a solution, if you work in a group, please hand in the same solution!
 - When you hand in an exercise, clearly write on your solution with whom you worked on it. (We don't want to grade the same solution twice. 😊)
 - If you want to work in a group, but don't have a partner, try to find somebody through Zulip. We will try to set up something on Zulip that should simplify this.

50% of all exercise points needed to pass the “Studienleistung”

Daphne

- We use the Daphne system to
 - Electronically hand in exercises and give feedback on exercises
 - Manage your exercise points
- Information on how to sign up, see next slide...

Exercise Schedule

- Exercise sheet will be published on Tuesday
- Exercises are due the following Tuesday at 16:00

Subversion (SVN)

- When signing up to Daphne, you get access to an SVN repository.
- You need to upload your solution to your repository
 - Up to the deadline, you can update your solution as often as you like

Signing Up to Zulip & Daphne

- Links to sign up are available on the course website
 - You need to separately sign up for both systems!

Zulip

- Sign-up link is on same page as the zoom link
 - Only accessible from within the university network (e.g., by VPN)
- If you already signed up to our Zulip for another lecture:
 - In this case, the link does not work
 - Follow instructions given on AC-announcements stream on Zulip
 - Send private Zulip msg. to Philipp Bamberger or Philipp Schneider

Daphne

- Sign-up link is on main course website
- Use your RZ account to sign up!

Final Exam

- Final exam will take place after the semester
 - It will be a written 120 min exam.
 - As soon as we know the date, we will publish it on the web page
- 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