TIN093/DIT602, Algorithms, 7.5 hec, HT, 2018–2019

Examiner: Peter Damaschke
Course responsible: Peter Damaschke
Course Assistants/supervisors:
Markus Aronsson, Victor Lopez Juan, Aristide Tossou, Yu-Ting Chen, Elena Pagnin, Oskar Abrahamsson

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Course content

Time complexity, O-notation.
Greedy algorihtms. Example: interval scheduling.
Dynamic programming. Examples: weighted interval scheduling, subset sum, knapsack, string editing.
Divide-and-conquer: searching, skyline problem, recurrence equations, sorting, median finding, counting inversions, fast multiplication.
Complexity theory: reductions, NP-complete problems, SAT and 3SAT.
Graph algorithms: graph traversal, connectivity, 2-coloring, topological order, shortest and longest paths.
Additional topics, as far as time allows.

Learning outcomes

After the course you should be able to

- describe algorithms in writing, prove that (and explain why) they are correct and fast,
- recognize non-trivial computational problems in real-world applications and formalize them,
- recognize computationally intractable problems,
- apply the main design techniques for efficient algorithms to problems which are similar to the textbook examples but new,

- perform the whole development cycle of algorithms: problem analysis, choosing, modifying and combining suitable techniques and data structures, analysis of correctness and complexity, filling in implementation details, looking for possible improvements, etc.,
- perform simple reductions between problems,
- explain what NP completeness means,
- critically assess algorithmic ideas,
- explain why time efficiency and correctness proofs are crucial.

Course structure

Lectures, exercise sessions, hand-in assignments, written exam.

Examination form

Grading is based on the written exam.
Point limits: 28/38/48 of 60 for 3/4/5 (CTH), 28/48 of 60 for G/VG (GU).

Course literature

Jon Kleinberg, Eva Tardos: Algorithm Design. Pearson/Addison-Wesley

Schedule

Monday 8:00–9:45 lecture, 10:00–11:45 exercises
Wednesday 10:00-11:45 lecture, 13:15–17:00 exercises

Additional information

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