Part I

Organizational Matters

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- Modul: IN2003
- Name: “Efficient Algorithms and Data Structures”
  “Effiziente Algorithmen und Datenstrukturen”
- ECTS: 8 Credit points
- Lectures:
  - 4 SWS
    Mon 10:00–12:00 (Room Interim2)
    Fri 10:00–12:00 (Room Interim2)
- Webpage: `http://www14.in.tum.de/lehre/2017WS/ea/`

- Required knowledge:
  - IN0001, IN0003
    “Introduction to Informatics 1/2”
    “Einführung in die Informatik 1/2”
  - IN0007
    “Fundamentals of Algorithms and Data Structures”
    “Grundlagen: Algorithmen und Datenstrukturen” (GAD)
  - IN0011
    “Basic Theoretic Informatics”
    “Einführung in die Theoretische Informatik” (THEO)
  - IN0015
    “Discrete Structures”
    “Diskrete Strukturen” (DS)
  - IN0018
    “Discrete Probability Theory”
    “Diskrete Wahrscheinlichkeitstheorie” (DWT)

The Lecturer

- Harald Räcke
- Email: raecke@in.tum.de
- Room: 03.09.044
- Office hours: (by appointment)

Tutorials

A01 Monday, 12:00–14:00, 00.08.038 (Schmid)

A02 Monday, 12:00–14:00, 00.09.038 (Stotz)

A03 Monday, 14:00–16:00, 02.09.023 (Liebl)

B04 Tuesday, 10:00–12:00, 00.08.053 (Schmid)

B05 Tuesday, 12:00–14:00, 03.11.018 (Kraft)

B06 Tuesday, 14:00–16:00, 00.08.038 (Somogyi)

D07 Thursday, 10:00–12:00, 03.11.018 (Liebl)

E08 Friday, 12:00–14:00, 00.13.009 (Stotz)

E09 Friday, 14:00–16:00, 00.13.009 (Kraft)

Assignment sheets

In order to pass the module you need to pass an exam.

Assessment

Assignment Sheets:

- An assignment sheet is usually made available on Monday on the module webpage.
- Solutions have to be handed in in the following week before the lecture on Monday.
- You can hand in your solutions by putting them in the mailbox "Efficient Algorithms" on the basement floor in the MI-building.
- Solutions have to be given in English.
- Solutions will be discussed in the tutorial of the week when the sheet has been handed in, i.e, sheet may not be corrected by this time.
- You can submit solutions in groups of up to **2** people.

Assessment

Assignment Sheets:

- Submissions must be handwritten by a member of the group. Please indicate who wrote the submission.
- Don't forget name and student id number for each group member.

Assessment

Assignment can be used to improve you grade

- If you obtain a bonus your grade will improve according to the following function

$$f(x) = \begin{cases} \frac{1}{10}\text{round}\left(10\left(\frac{\text{round}(3x)-1}{3}\right)\right) & 1 < x \leq 4 \\ x & \text{otw.} \end{cases}$$

- It will improve by 0.3 or 0.4, respectively.
  Examples:
  - $3.3 \rightarrow 3.0$
  - $2.0 \rightarrow 1.7$
  - $3.7 \rightarrow 3.3$
  - $1.0 \rightarrow 1.0$
  - > 4.0 no improvement

Assessment

Requirements for Bonus

- 50% of the points are achieved on submissions 2–8,
- 50% of the points are achieved on submissions 9–14,
- each group member has written at least 4 solutions.

1 Contents

- Foundations
  - Machine models
  - Efficiency measures
  - Asymptotic notation
  - Recursion
- Higher Data Structures
  - Search trees
  - Hashing
  - Priority queues
  - Union/Find data structures
- Cuts/Flows
- Matchings

2 Literatur


Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman:
The design and analysis of computer algorithms,
Addison-Wesley Publishing Company: Reading (MA), 1974


Thomas H. Cormen, Charles E. Leiserson, Ron L. Rivest, Clifford Stein:
Introduction to algorithms,
McGraw-Hill, 1990


Michael T. Goodrich, Roberto Tamassia:
Algorithm design: Foundations, analysis, and internet examples,
John Wiley & Sons, 2002

2 Literatur


Ronald L. Graham, Donald E. Knuth, Oren Patashnik:
Concrete Mathematics,
2. Auflage, Addison-Wesley, 1994


Volker Heun:
Grundlegende Algorithmen: Einführung in den Entwurf und die Analyse effizienter Algorithmen,
2. Auflage, Vieweg, 2003


Jon Kleinberg, Eva Tardos:
Algorithm Design,
Addison-Wesley, 2005


Donald E. Knuth:
The art of computer programming. Vol. 1: Fundamental Algorithms,
3. Auflage, Addison-Wesley, 1997

2 Literatur


Donald E. Knuth:
The art of computer programming. Vol. 3: Sorting and Searching,
3. Auflage, Addison-Wesley, 1997


Christos H. Papadimitriou, Kenneth Steiglitz:
Combinatorial Optimization: Algorithms and Complexity,
Prentice Hall, 1982


Uwe Schöning:
Algorithmik,
Spektrum Akademischer Verlag, 2001


Steven S. Skiena:
The Algorithm Design Manual,
Springer, 1998