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/2016WS/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 (Stotz)

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

A03 Monday, 14:00–16:00, 03.10.011 (Sperr)

B04 Tuesday, 12:00–14:00, 03.11.018 (Kohler)

B05 Tuesday, 14:00–16:00, 00.08.038 (Matl)

B06 Tuesday, 16:00–18:00, 00.08.036 (Sperr)

C07 Wednesday, 10:00–12:00, 01.13.010 (Stotz)

D08 Thursday, 10:00–12:00, 00.08.038 (Kraft)

E09 Friday, 12:00–14:00, 00.13.009 (Kraft)

E10 Friday, 14:00–16:00, 00.08.036 (Matl)

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

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

- ▶ It will improve by 0.3 or 0.4, respectively.
  Examples:
    - ▸ 3.3 → 3.0
    - ▸ 2.0 → 1.7
    - ▸ 3.7 → 3.3
    - ▸ 1.0 → 1.0
    - ▸ > 4.0 no improvement

Assessment

Requirements for Bonus

- ▶ 50% of the points are achieved on submissions 1–7,
- ▶ 50% of the points are achieved on submissions 8–13,
- ▶ 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

📄 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 Publishing Company: Reading (MA), 1997

2 Literatur

Donald E. Knuth:
The art of computer programming. Vol. 3: Sorting and Searching,
3. Auflage, Addison-Wesley Publishing Company: Reading (MA), 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