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Administrativa

14 Oktober 2024

Prof. Dr. Sebastian Wild

Goals for Today

- ▶ give you some detail on **what** this module covers
- ~~ so that you can decide whether to keep it
 - ↑ if it is an elective module for you

Efficient Algorithms / Effiziente Algorithmen

- ▶ inform you about **how** EA is run
- ▶ inform you about how EA is **assessed**

Welcome to CS 566 – Efficient Algorithms

► Dozent: Prof. Dr. Sebastian Wild
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Betreuer: Nikolaus Glombiewski
glombien@informatik.uni-marburg.de

Tutor: Hannes Feil feilh@students.uni-marburg.de

► Module website: www.wild-inter.net/teaching/ea
→ your first address for any infos on CS 566



► *Campuswire*: collaborative Q&A (more on this later)
also used for announcements
→ please register via link from the ILIAS announcement
<https://campuswire.com/p/G1B550BF9>

PIN 3740

► *Slido*: student response system for formative feedback → bring a smart device to class!
► Final mark: 100% final exam (Klausur)
Zulassungsvoraussetzungen zur Klausur: 50% of points from exercise sheets

A Note on Languages

- ▶ Module is mostly in German
 - ▶ in particular examinations
 - ▶ except as prerequisite for English MSc admission
If that's you, stay tuned.
I'll come to that!
- ▶ some written material in English
 - ▶ in particular slides
- ▶ Why?
 - ▶ English is the *lingua franca* of our time
 - ~~ you profit from exposure
 - ▶ people (=future employers!) will assume you can at least read
 - ▶ in young computer science,
technical terms are already English
- ▶ Also, it's 2024! AI tools bridged lots of language gaps 🤖
Linguee & DeepL, Google Translate, ChatGPT



CS 566 for Credit vs. for Conditional Admission

► (Normal / for-credit version of) CS 566:

- ▶ Taken by students in various undergrad or masters programs
- ▶ Compulsory for German *BSc Data Science*
- ~~> Offered in German (including exams)

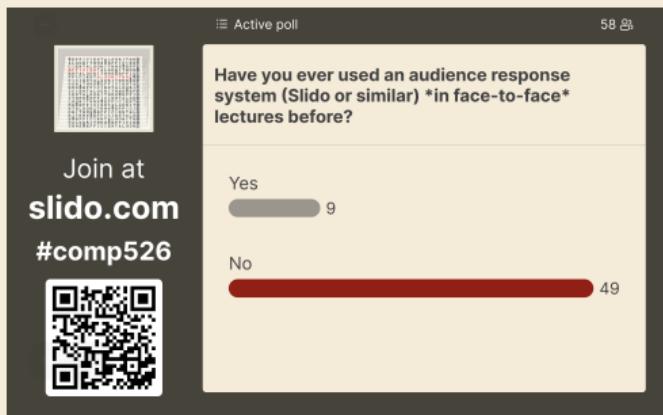
► CS 566 for conditional admission (into *MSc Data Science*):

- ▶ full program in English, international students
 - ~~> Separate English examinations
 - ▶ formally separate from CS 566
 - ▶ examination is pass/fail only
 - ▶ **If required for admission, you cannot also take CS 566 for credit.**
 - ▶ Examination based on English self-study materials (not full lectures) ~~> module website
 - ▶ Welcome to attend lectures, and tutorials (space permitting)
 - ▶ Join the Campuswire Q&A and team up with others to study!
- ~~> Required to do the conditional admission version?
- Join us **tomorrow (Oct 15), 4pm, Hörsaal A in H|05** for additional info!

Audience Response System: *Slido*

- ▶ Goal: Collect immediate, formative feedback
 - ▶ Stay focused and engaged! (“active learning”)
 - ▶ Quick feedback (for you individually) if you are on track.
 - ▶ Quick feedback (for me) whether (most of) you are on track.
- ▶ Slido has 2 useful features:

1. Quick Polls



2. Audience Questions

The screenshot shows the Q&A section with two questions. Sebastian Wild asked, "How can I ask a question in class?", and an anonymous user responded, "I'm a bit unsure, I'd rather ask this anonymously." It includes a QR code for joining and the hashtag #comp526.

| User | Question | Responses |
|----------------|--|-----------|
| Sebastian Wild | How can I ask a question in class? | 0 |
| Anonymous | I'm a bit unsure, I'd rather ask this anonymously. | 0 |

My approach to lectures

My conclusions (from years of own experience, a pandemic, and observing others)

irrespective of the mode of delivery!

0. Good explanations (intuitions!) and well-structure material are the most important aspect.
1. **Synchronous (live) lectures** beat videos in keeping up with class. (but recordings are great!)
2. Only a small minority of students asks questions in class. ↗ other backchannels
3. **Interaction** makes content memorable (and keeps brains awake!) ↗ *Slido* tasks

Components of EA

Slido questions

immediate feedback
simple questions

Lectures

new material
discussions
big picture

Tutorials

get practice solving problems
solve deep questions

Campuswire

collaborative Q&A knowledge base

Exam Question Gallery

collaborative pool of potential and past exam problems

Final Exam

summative assessment
of your acquired skills

Overview of the module

Goals:

- ▶ build / enhance your toolbox of algorithmic methods and techniques
 - ~~ here: focus on practical methods
- ▶ enable you to reason about and communicate algorithmic solutions
 - ~~ level of abstraction, proofs, mathematical analysis, vocabulary
- ▶ enable you to apply, combine and extend methods

Units: (preliminary plan)

- | | |
|---------------------------------------|------------------------------------|
| 0. Administrativa | 8. Clever Codes |
| 1. Proof Techniques | 9. Graph Algorithms |
| 2. Machines & Models | 10. Parallel Algorithms |
| 3. Fundamental Data Structures | 11. Greedy Algorithms |
| 4. Efficient Sorting | 12. Dynamic Programming |
| 5. Divide & Conquer | 13. Text Indexing |
| 6. String Matching | 14. Compressed Text Indices |
| 7. Text Compression | 15. Range-Minimum Queries |

Assessments

- ▶ **Module mark** = mark in final written exam
- ▶ **Final exam**
 - ▶ written examination
 - ▶ Preliminary dates:
 1. 25 Feb 2025
 2. 26 March 2025
- ▶ To pass the module, you have to pass either of the exams
 - ▶ If you pass the first exam, you *cannot* take the second to improve your mark
- ▶ **Admission requirements to final exam**
 - ▶ ≤ 2 exercise sheets with 0 points in your group
(not handed in implies 0 points)
stay tuned ...
 - ▶ $\geq 50\%$ of available points in sum over all exercise sheets
 - ▶ We plan with 12 marked exercise sheets in total

Tutorials

- ▶ *Exercise Sheet* (Übungsblatt)
 - ▶ released on module website every **Friday**
 - ▶ to be **handed in**
 - ▶ until 19:00 the Friday after release
(1 week to work it out)
 - ▶ in **groups** of 3 students
 - ▶ online on ILIAS
 - ▶ practice problems (some old exam questions, too!)
 - ▶ enhancement problems
- ▶ in *tutorials*
 - ▶ discussion of solutions (in the week after hand-in)
 - ▶ work on **in-class exercises** (Präsenzaufgaben)
 - ▶ to prepare you for next marked exercise sheet
 - ▶ *not* handed in or marked

Use the tutorials to practice your thinking! = Don't cheat yourself!

*"If I tell you to run 10km,
it isn't because I want you
to be 10km away from me."*

Generative AI

We live in exciting times!

LLMs (ChatGPT etc.), Media generators
(Midjourney etc.), GitHub CoPilot, ...

- ▶ Generative Artificial Intelligence (GenAI) is amazing!
 - ▶ full of flaws (hallucination, bias, copyright, data privacy, cost, ...)
 - ▶ and yet ... often helpful, surprisingly versatile
- ▶ Why not use for everything?
 - ▶ Need for *deeply skilled* humans here to stay (for now anyways)
 - ~~ Skill comes from practice! (We still teach mental arithmetic in primary school!)



~~ For our assessments:

Don't take away the thinking! = Don't cheat yourself!

assessments designed for upskilling *humans*

Acceptable use:

- ▶ preparatory research
(≈ Wikipedia)
- ▶ proof reading
(spelling, grammar)

Unacceptable use: (not exhaustive!)

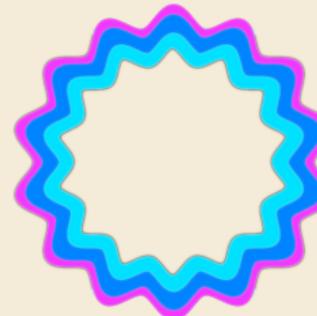
- ▶ use generated parts w/o acknowledgment & citation
- ▶ tools to paraphrase others' work to pass as own
- ▶ generated parts with inappropriate prompt,
e. g., "write me a conclusion for this essay"

What is Campuswire?

Campuswire is an online space for lectures

1. **Class Feed:** questions on material
2. **Chatrooms:** structured social space
similar to Slack or Discord

We use Class Feed for **collaborative Q&A**



Join via link on website:
campuswire.com/p/G1B550BF9

Use in browser
campuswire.com/c/G1B550BF9
or via app
campuswire.com/download

- ▶ Ask *public* questions
 - ▶ “Why is $\lg(n^3) = \Theta(\log n)$? ”
 - ▶ “Will there be classes on public holidays? ”
- ▶ **Answer** your peers’ questions!
 - ▶ Know the answer? → put it in!
 - ▶ Know a partial answer? → Post it, others can build on it!
 - ▶ Found a helpful answer (or question)? → Vote it up!
- ▶ Ask *private* questions
 - ▶ if your question might contain “spoilers” for assessments
 - ▶ if you feel the answer is only relevant for you personally

How to Campuswire

- ▶ Our goals for Campuswire Q&A:
 1. **be fair** Same answers for everyone
 2. **learning by teaching** YOU will answer most questions!
 3. **be inclusive** posts can be anonymous; you can take your time to ask and answer
- ▶ Therefore, we instructors will
 - ▶ redirect you to Class Feed for questions,
 - ▶ wait before answering, to give other students a chance to answer first,
 - ▶ explicitly mark good answers (and questions!) as such

ILIAS

- ▶ Official announcements
- ▶ Hand-in of exercise sheets
- ▶ Announcement of marks

... what can be on the public module website
goes to the public module website!



Exam Question Gallery

- ▶ We jointly collect a **pool of exemplary exam questions**.
 - ▶ *You add your questions to it.*
 - ▶ I will give feedback which questions are realistic.
 - ▶ *... and we will pick one if there's sufficiently many good ones!*
-
- ~~ great resource for exam preparation
 - ~~ We will answer selected questions in recap session (last week of classes)
-
- ▶ Engage in this early and pose great questions
 - ▶ Start today: <https://tiny.cc/ea-exam-question-gallery>

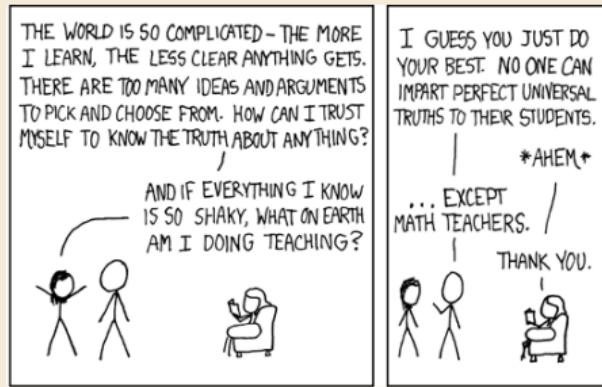
Philosophy of the module

CS 566 is part of a *scientific* course.

Less . . .



. . . and more



- ~~ Focus on *universal truths* of practical algorithms
 - ▶ model of reality (machines, programs, data)
 - ▶ quantitative predictions
 - ▶ validate model in experiments
- ~~ Need some math techniques. (up next)