Julian Kunkel, Jonathan Decker

Seminar with Practical: Scalable Computing Systems and Applications in AI, Big Data and HPC

Seminar with Practical: Learning Objectives

- Describe approaches for the development of scalable systems and apps
- Sketch efficient algorithms and concepts
- Analyze and summarize state-of-the-art concepts, tools and research papers
- Deliver a technical presentation for a professional audience
- Explore and apply concepts or tools to improve scalability for a use case
- Quantify efficiency and scalability of selected use cases

Seminar with Practical

- The module consists of the parts:
  - Chosing a topic and use cases
  - Presentation during term: Introducing the topic (15 min, not marked)
  - Practically working on the topic (individually) - 60/90 h (5/6 Credits)
  - 30%: End of term (possibly lect. free time): results presentation (20-25 min)
    - + 5 min Q&A + 5 min feedback
    - It may not be less than 20 minutes!
  - 70%: Report about the topic and your results
    - 10-15 pages (core content, without preamble/appendix)
- We aim to publish all presentations and reports on our webpage
  - Please consider and agree
- Please check also organisational remarks
- A supervisor for formative assessment will be assigned per student
- Today, you can pick topics from the webpage!

Practical Aspect

- You'll look deeper into the selected topic, various options:
  - Evaluate practically a tools (on GWDG system and/or your Laptop)
  - Write your own use case to demonstrate framework/tool
  - Perform a performance analysis, write a benchmark
  - Compare different tools (theoretically and practically)
  - Extend the existing tool(s)
- Create a presentation and report from your findings with content such as:
  - Your problem description
  - Background (tool, context), existing knowledge
  - Your methodology
  - Your results
  - Your conclusion
- For best results, involve your supervisor:
  - Discuss proposal of activities
  - Discuss results

Recommended Schedule for Preparation of the Results Presentation

- 3 Weeks **before** presentation
  - Submission of a structure/rough sketch of the presentation to the supervisor
  - Receive feedback and optional discussion with the supervisor
- 2 Weeks **before** presentation
  - Sketch of the slides, feedback of the supervisor
  - Recommendation: practice the slides to find gaps
- 1 Week **before** presentation
  - Submission of the presentation slides as PDF (possibly print version)
  - Recommendation: practice slides for smooth transitions
- **Before** the end of the semester
  - Submission of the report as PDF per email to Jonathan[1] & supervisor

[1] jonathan.decker@uni-goettingen.de

Outline

Overview

Orientation

- Navigation bar is helpful for the orientation of readers
- Section separators (last slide), helps too

Content

- Rule of thumb: create 4-5 high-level sections
- Easy start/introduction
- Followed by a deep dive of selected content
  - Technical content is expected for CS audience
- Include appropriate pictures
- Provide backup slides in the appendix for details
  - There is **NO** excuse for delivering a too short presentation

- Tools: LaTeX Beamer (preferred, we provide a template), may use LibreOffice/Powerpoint/Keynote
- Primarily bullet points
  - The reason is that long sentences are typically read by a speaker which isn't the purpose of a presentation and even a "reading" lecture. Also attendees are often distracted, reading the text and won't listen to you the whole time. The bullets should help you to remember what you like to say and help listeners to keep track where you are / revisit content.
- Include „Slide Nr/Slide count" on **every** slide
- Text must be easily readable
  - No red on black, sufficiently large font
- Don't use weird backgrounds
  - Prints - white background preserves ink
  - Readability for the audience (and visually impaired)
  - Create a print version PDF
- Animations: Don't use them, except if **really illustrative**

Slide Design

- **Prevent** multiline bullets with fragments at beginning of the 2nd line, like this
  - Either rewrite lines to be single line,
  - or text on 2nd line to be at least 1/3rd
  - Much better: create subbullets / new keywords
- Slides should be (mostly) understandable without narration
- Rules of thumb for design of content:
  - Bullets should be readable from top to bottom
  - Bullets on one level should have a similar structure
  - Subbullets should suit the bullet
  - Bullets should fit to the slide title
  - Slide title should fit to the section
  - **Less is more**

Slide Design: Negative Example

- Processor architecture:
  - Describes the design and instruction set of a microprocessor
  - Think about 64 bit vs. 32Bits
  - follows Moore's law
- More about storage systems
  - There are various types:
  - HDD based vs. tape based
  - SSDs
  - Based on more charakteristica
- Definition: High-Performance Computing
  - High-Performance Computing (HPC - German: Hochleistungsrechnen) uses supercomputers and computer clusters to solve advanced computation problems. It is part of computer-aided computing and covers application that require high demand of computing or memory.

Slide Design: Improved Version

- Definition: High-Performance Computing

  “*[...] uses supercomputers and computer clusters to solve advanced computation problems.“ [Wiki16]*

- Processor architecture
  - Describes the design and instruction set of a microprocessor
    - Available control units
    - Instruction width in bits (e.g. 64 bits)
- Definition: Storage system

  “Storage systems are systems that can hold data for processing, or archive and backup data” Trans. [IT16]

  - Media technology
    - ...
  - Architecture
    - ...

Outline

Talk

- Motto: The presentation is for the **attendees**!
- Please speak freely and don’t read slides
  - Yes, attendees can read, too!
  - Reveal slides gradually, direct attendees’ attention
  - Slides should support the speaker
- Stick to the expected presentation time
  - Optional slides help to ensure you don’t be too fast
  - Check the clock periodically or practice, practice, ...
  - Delivering a presentation less than minimum time will lead to bad marks!
- Prepare yourself in time
  - Do **at least** one test presentation
    - Even for another person (or record yourself)
    - You can also hold it in front of your supervisor

Talk

- Prepare in advance
  - Try the presenter (colors, resolution)
  - Try the video conference system / upload presentation
  - Clean blackboard
  - Check clock, lights (always keep lights on)
- Stay in touch with the attendees
  - Look at them not the screen
  - Check your stance - don’t put hands into your pockets
- Attend questions confidently
  - Answer short questions immediately
  - Postpone long questions/discussions

Outline

Citations

- **Purpose**: “Das Zitat muss einen Zweck erfüllen.“ [Zit14]
- **Mark, show unmodified**: “Du musst das Zitat kennzeichnen und darfst den Inhalt nicht verändern.“ [Zit14]
  - You may include thoughts in [..] boxes
- Cite **only what is necessary** - (Trans. [Zit14])
  - Remember: Rewritten content of a citation is still owned by the original author(s)
- Add sources to the bibliography
- **Cite images** if not self-made

Figure: Karl-Theodor zu Guttenberg. Source: "Christoph Braun" [Wiki11]

Wrapup and Final Slide: what should stick with the people?

Don’ts

- Stay on a weird end slide ("Questions", "The End", "Bibliography")
- Thank people for "listening"
- Undermine yourself

Do’s

- Show slide during Q&A as it may inspire more questions
- Optimal slide: Summarize the "Contributions" you made
- Alternative slide: Summarize the talk
  - Key items people should remember
- Optional: Include your contact details (email)
- Last spoken sentence something like:
  - "With that I look forward to your questions"

"*Students shouldn’t go into life without the ability to communicate.*

Your success in life will be determined largely by...
- your ability to speak,
- your ability to write, and
- the quality of your ideas,

in that order."

— Prof. Patrick Winston

Wiki16 "High-performance computing", https://en.wikipedia.org/wiki/High-performance_computing, 2022-04-02

Zit14 „Quellen korrekt angeben“, http://www.kreisgymnasium-neuenburg.de/unterricht/itg/quellen-korrekt-angeben, 2014-04-07

Wiki11 „Karl-Theodor zu Guttenberg, 2011“, http://de.wikipedia.org/wiki/Karl-Theodor_zu_Guttenberg, 2011-04-07

IT16 „Speichersystem :: storage system“, http://www.itwissen.info/definition/lexikon/Speichersystem-storage-system.html, 2016-04-06

GWDG Academy

- Find more course offerings via
  https://academy.gwdg.de/
- Most courses take half a day or less
- Also available to students for free
  - Useful as preparation for project work or final thesis
  - Do not give uni credits
- See, for example: *Deep Learning with GPU Cores*
  https://academy.gwdg.de/academy/course?course=1448