Universität Göttingen
Institute for Computer Science / GWDG
Julian Kunkel, Jonathan Decker

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

Project Overview

In this seminar you combine a small practical project with a focused study of the state of the art. You select a topic and a use case, present the topic, implement and evaluate a small-scale solution, and present your results. The project is individual: each student covers their own aspects of the topic and is graded individually. Collaboration among students working on adjacent topics is possible.

Students pick a topic from the course web page or suggest their own. A supervisor is then assigned. The supervisor helps define the project scope and goals and gives feedback on the practical work, the presentations, and the report.

The course has four deliverables:

1. a **topic presentation** introducing the topic and the state of the art (15 minutes, not marked),
2. a **practical project** with a reproducible implementation and an evaluation of performance and scalability,
3. a **result presentation** describing the project and its results (25 minutes, marked, 30% of the grade), and
4. a **report** of 10 to 15 pages covering the project and its evaluation (70% of the grade).

Assessment criteria

The core evaluation criteria are **content** and **form**. They are broken down into the following categories.

Content Depth of understanding, correctness, quality of the practical work, soundness of the evaluation, interpretation of the results even when the desired outcome was not achieved, and the ability to explain and discuss the work.

Form Structure and clarity of both presentations, quality and timing of the slides, delivery, project structure, and the structure, writing, and citation quality of the report.

Learning goals and expectations

1. **Understand the topic and the practical work in depth.**
   - You can explain the problem, the design, the implementation, the assumptions, the results, and the limitations of your project.
   - You can distinguish your own contribution from prior work and from results you did not produce.
2. **Give a high-quality, well-practiced result presentation.**
   - The result presentation has a clear narrative, fits the allotted time, and uses slides that support the argument rather than duplicate it. The topic presentation serves as initial practice.
   - You have sufficiently rehearsed the result presentation, with your supervisor, a peer, or by recording yourself.
   - You can explain every figure, table, and number you show.

3. **Discuss your topic and answer in-depth questions.**
    - Beyond the presentations, you can discuss your design choices, measurements, and limitations with the group.
    - You attend the presentation sessions and engage with the other talks through questions and discussion.
    - You contribute substantive questions, comments, and feedback during the sessions.
4. **Evaluate the practical work.**
    - You measure runtime, speedup, efficiency, or another metric that fits the problem, and you interpret the observed behavior.
    - You assess whether the results support your conclusions, distinguish measurement noise from a real effect, and state the limits of your evaluation.
    - You document how to reproduce the setup and the experiments.

For a very good grade, we expect you to include recent papers and position your practical work in the state of the art.

Schedule

1. 29.10.2026 – First meeting: course format, topics, and presentation guidelines.
2. 06.11.2026 – Submit your selected topic by email to jonathan.decker@uni-goettingen.de.
3. 13.11.2026 – Supervisor and presentation dates are assigned.
4. 26.11.2026 onward – Topic presentations in the first half of the semester.
5. January 2027 – Result presentations in the second half of the semester.
6. 31.03.2027 – Submit the final report and code repository.

Your supervisor will agree on intermediate deadlines for the project plan, a prototype, and a draft of the report. The expected milestones are:

- three weeks before a presentation: structure or rough sketch of the presentation,
- two weeks before: sketch of the slides,
- One week before the presentation: send the current slide draft to jonathan.decker@uni-goettingen.de. **If the draft is not sent, the presentation is cancelled and if this was the result presentation, you fail the course.**

Topic presentation

The topic presentation is 15 minutes and is not marked. It should cover:

- the problem and its relevance,
- the state of the art and the relevant tools and prior work,
- the use case you will investigate,
- your project plan, including the planned implementation and evaluation,
- what a successful outcome would look like, and
- open questions.

The presentation should make clear what you will build and how you will measure whether it works.

Practical project

Talk to your supervisor to define the scope and goals of the project work before you start. The project must be small enough to finish in one term but substantial enough to produce a meaningful result. Suitable projects include:

- evaluating a tool practically on GWDG systems or your laptop,
- writing your own use case to demonstrate a framework or tool,
- performing a performance analysis or writing a benchmark,
- comparing different tools in theory and practice, or
- extending an existing tool.

The project should include:

- a working implementation or a documented extension of an existing tool,
- a reproducible setup, including build and run instructions,
- an evaluation with concrete configurations and measurements,
- a discussion of efficiency and scalability, and
- a code repository that your supervisor can access.

A negative result is acceptable if the work is sound and the evaluation explains what was learned.

Result presentation

The result presentation is 25 minutes plus 5 minutes of questions and 5 minutes of feedback, with a leeway of ±5 minutes. It is marked and accounts for 30% of the grade. It should cover:

- the problem and the project goal,
- the design and implementation,
- the experimental setup and the configurations measured,
- results, including graphs for the relevant scaling behavior,
- an explanation of the observations, including unexpected results,
- limitations and what you would do next.

Report

The report has 10 to 15 pages of core content (excluding references and appendix), accounts for 70% of the grade, and is written in English or German. It should be a self-contained description of your work and follow an outline like this:

1. Introduction and motivation
2. Background and state of the art
3. Evaluation methodology and experimental setup
4. Results, including performance and scalability analysis

5. Discussion, limitations, and lessons learned
6. Conclusion and outlook
7. References
8. Transparency report on AI usage, as required by the report template
9. Appendix: code and additional measurements

Using AI assistants

AI assistants may support literature search, understanding, language editing, and code experimentation. They do not replace your own understanding, and they are not permitted where the examination rules forbid them.

1. **You own what you submit.** Every claim, number, and line of code is yours once you hand it in. You may be asked to explain your reasoning.
2. **Verify before you rely.** Check citations, numbers, command flags, API names, and package names against a source you can open or a run you performed. Agreement from the assistant is not confirmation.
3. **Document your use in the transparency report.** The report template includes a transparency report; it must cover AI usage in the report and in the presentations.
4. **Never paste secrets or other people's data.** This includes credentials, personal data, and unpublished third-party results.

Generated code is untrusted third-party code: read it, test it, check its dependencies and licence, and record what produced the result.

Assessment

The final presentation accounts for 30% and the report for 70% of the grade. The topic presentation is formative and provides feedback before the practical work. Both graded parts are assessed against the content and form criteria above.

Submission

Submit the result presentation as a PDF, the final report as a PDF, and a link to the code repository to jonathan.decker@uni-goettingen.de. The report must include the transparency report on AI usage for both the report and the presentations. State whether you do not want your work to be published on the course website; refusing publication does not affect your grade.