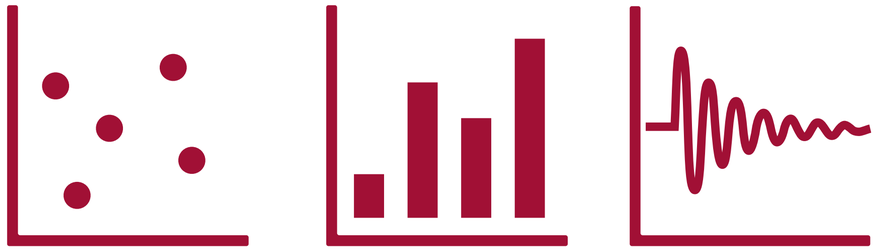
Software Modeling and Verification Chair

RWTH AACHEN UNIVERSITY

Seminar Reproducing Research Results in Formal Methods

WS23/24 — Introduction



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https://moves.rwth-aachen.de/teaching/ws-23-24/rrr

Formal Methods

- Specification, development, and verification of software and hardware systems

- Provide mathematically proven guarantees on
  - correctness
  - reliability
  - robustness

- Practical applicability is crucial
  - Assessed in (benchmark) experiments

Reproducing Research Results

> "An experimental result is not fully established unless it can be independently reproduced."
>
> —Association for Computing Machinery (ACM)

- Formal methods research papers increasingly often include an **artifact**, including
  - implementations,
  - benchmarks,
  - execution scripts,
  - ...

- Artifacts *should* facilitate reproducibility of the original experiments

Objectives of this Seminar

Study reproducibility of a selected article:

- Describe the **problem(s)** considered in the article and the necessary **background**
- Explain relevant **solution approaches** using an **adequate level of detail**
- Outline the **original experiments** and the drawn conclusions
- Report on the **reproducibility** of these results
  - Run your own experiments using the provided **artifacts**

Write a **report** and give an oral **presentation** covering the above points

Requirements on Report

- Independent writing of a report of **12 – 15 pages**
  - Font size: **12pt** with "standard" page layout (LaTeX template on website)
  - Do not stretch the content, e.g., with overly sized figures

- First milestone: detailed **outline** + **one page** of content
  - Provide overview of structure (section headers, main definitions/theorems)
  - Be specific — "*1. Introduction / 2. Main part/ 3. Conclusions*" is not enough!
  - Also write one page of actual content (in a main part of the report)

- **Complete** and **correctly cited** set of references to all consulted literature
  - **Plagiarism**: taking text blocks (from literature or web) without source indication causes **immediate exclusion from this seminar**

- Correct **spelling** and **grammar** is required; use german or english
  - More than 10 errors per page lead to abortion of correctio

Requirements on Talk

- **Total duration**: 30 minutes (25 minutes presentation time + 5 minutes for Q&A)
  - Finish in time — Overtime is bad

- Focus your talk on the **audience**, abstract away from details as necessary

- Descriptive slides (LaTeX template on website, can also use other software)
  - ≤ 15 lines of text per slide,
  - use (base) colours in a useful manner
  - number your slides

- Correct spelling! (German or English)

- Prepare for expected questions, e.g., with backup slides

Soft Requirements and Hints

- Get an understanding of the **practical** and **theoretical(!)** aspects of the article
  - **Reminder:** this is a seminar in theoretical computer science
  - Tinkering with the artifact is cool, but not the primary objective of the seminar

- Communicate problems to your supervisor as early as possible
  - In particular **technical issues** with the artifact

- Most artifacts use a **virtual machine** (.ova file; VirtualBox) or **Docker image**
  - Sometimes there is a reference VM (e.g. for TACAS papers)
  - Expect problems if you use an ARM-based system (Apple M1/M2)

- Carefully read the provided **README** for instructions on how to run the artifact

- If necessary, run a *reasonable* **subset of the experiments**
  - A couple of hours on a standard desktop or laptop machine usually suffices

Soft Requirements and Hints (Part 2)

- Find the right **level of detail**
  - Your report and talk should be **self-contained** and **understandable** by people not familiar with the original article
  - There is not enough space (report) and time (presentation) to fully address all details **plus** your reproduction results

- Discuss contents / ideas / problems with your **supervisor**
  - Contact them on time
  - Prepare the meetings

- Take your time
  - Seminar yields 4 credit points
  - Officially, this translates to around 4 * 30 = **120 hours of work**
  - Do not expect to write the report / prepare the talk in a single day ...

Artifact Quick Check

- Once the topics are assigned, **install the artifact** for your article

- **Check** if everything works as expected
  - Some artifacts document how to test it in their README

- When you are reasonably confident that you can evaluate at least the most relevant parts of the artifact **without technical problems**, let your supervisor know.
  - Include which sections of the README you have covered so far

- If you run into technical problems ask your supervisor for help
    - Describe the issue and the steps you have tried so far to solve them

- In any case, **contact your supervisor** ASAP but **not later than 30.10.2023**

Important Dates

19.10.2023: Topic preferences due (**Thursday**); see last slide

30.10.2023: Artifact quick-check due

20.11.2023: Detailed outline and one page of content due

18.12.2023: Full report due

15.01.2023: Presentation slides due

22.01. to 26.01.2023: Seminar talks (precise date will be announced soon)

Withdrawal

- You have **up to three weeks** to refrain from participating in this seminar

- Later cancellation (by you or by us) causes a not passed for this seminar and reduces your (three) possibilities by one.

Missing a deadline causes immediate exclusion from the seminar
Please notify us if you decide to quit

Selecting your Topic

- **Enter the poll** in the link you received via email
  - https://terminplaner4.dfn.de/.....
  - Do this until **Thursday 19.10.2023**

- We do our best to find a *good* topic-student assignment
  - It helps when you indicate multiple topics

- Topic assignment will be announced on **Friday**

- Your **supervisor** will be indicated early next week on the seminar webpage

We wish you success and look forward to an enjoyable and high-quality seminar!