universität innsbruck

Introduction to Scientific Working

Cezary Kaliszyk

Organisation

Time and Place

VU (Group 3) Mondays, 12:15–13:45, HSB 7

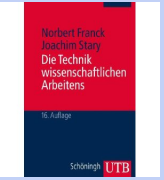
Presence

- “VU hat immanenten Prüfungscharakter”
- at most two unexcused absences

Material

Literature

1. T. Oetiker, Hubert Partl, Irene Hyna and Elisabeth Schlegl
   The Not So Short Introduction to LaTeX
   `https://tobi.oetiker.ch/lshort/lshort.pdf`
2. *Communication of the ACM*
3. Norbert Franck, Joachim Stary
   Die Technik wissenschaftlichen Arbeitens:
   Eine praktische Anleitung



Online

2. Slides and information on the course webpage

Evaluation (1)

Seminar papers

- Topics will be distributed that should be worked out completely.

  deadline: 08. January

- The papers should be 5 pages, must be typeset using LaTeX, can be done in groups of two
- The evaluation of the papers will be based on the following criteria:
  1. Content and literature selection
  2. Construction
  3. Citations
  4. LaTeXsource code
- You can get at most 40 points for this part

Evaluation (2)

reviews

- Furthermore, you will receive three papers of your colleagues to review deadline: 22. January
- The evaluations will be performed using the standard reviewing procedures at scientific conferences
- The evaluation of the reviews will be based on the following criteria:
  1. Completeness of the review
  2. Fairness
- You can get at most 20 points for this part

Homeworks

Weekly (20 points total) + Presentation (20 points)

Additionally

1. Active participation in the PS can be awarded with +/- 5 points

Grade Key				
	Punkte	$\geqslant 90$	$\geqslant 75$	$\geqslant 60$
	Note	Sehr Gut	Gut	Befriedigend
	Punkte	$\geqslant 50$	< 50	
	Note	Genügend	Nicht Genügend	

Example (Topic)

Computing with Classical Real Numbers

Example (Paper)

Computing with Classical Real Numbers

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There are two incompatible Coq libraries that have a theory of the real numbers; the Coq standard library gives an axiomatic treatment of classical real numbers, while the CoRN library from Nijmegen defines constructively valid real numbers. Unfortunately, this means results about one structure cannot easily be used in the other structure. We present a way interfacing these two libraries by showing that their real number structures are isomorphic assuming the classical axioms already present in the standard library reals. This allows us to use O'Connor's decision procedure for solving ground inequalities present in CoRN to solve inequalities about the reals from the Coq standard library, and it allows theorems from the Coq standard library to apply to problem about the CoRN reals.

1. INTRODUCTION

Coq is a proof assistant based on dependent type theory developed at INRIA [CDT08]. By default, it uses constructive logic via the Curry-Howard isomorphism. This isomorphism associates propositions with types and proofs of propositions with programs of the associated type. This makes Coq a functional programming language as well as a deduction system. The identif cation of a programming language with a deduction system allows Coq to reason about programs and allows Coq to use computation to prove theorems.

Coq can support classical reasoning by the declaration of additional axioms;

Example (Review)

```
----------------------------------------------------------------
*** REVIEW FORM ID: <Number>
*** SUBMISSION NUMBER: 1
*** TITLE: Computing with Classical Real Numbers
*** AUTHORS: <Student>
*** PC MEMBER: Cezary Kaliszyk
----------------------------------------------------------------
*** REVIEW:

Summary:
--------

Review: The authors present a dataset extraction method, dataset and
first interesting results for machine-learning supported computations
with real numbers. The experimental results are impressively good
for a first baseline and with an accuracy higher than 0.83 in
relevance classification a lot better than chance, and encourage
future research in this direction. The paper is well-written in terms
of presentation and argumentation and leaves little room for criticism.

[...]

*** OVERALL EVALUATION:

*** 3 strong accept
*** 2 accept
*** 1 weak accept
*** 0 borderline paper
*** -1 weak reject
*** -2 reject
*** -3 strong reject
```

Introduction

Goals

Learn Goals

1. research
2. scientific writing
3. typesetting with LaTeX
4. evaluation and
5. presentation

of scientific works

Definition (Research)

- How to find the appropriate literature for a given topic (efficiently)?
- What internet resources can be used?

Example

- Topic: Higher-order logic. search for literature on the topic

Definition (Writing)

- How to present the found results?
- How to avoid plagiarisation?
- How to make the results understandable?
- How to correctly cite other work?

Example (Continued)

- The topic refers to a mathematical foundation, it is covered as part of the LICS lecture
- How to summarise the content of the lecture concisely (say 4 pages) and in a comprehensible manner? Exercise: Try to present it now

Definition (Typesetting with LaTeX)

How to typeset the work with a word processor? Exercise: Sum of matrices.

Example

```
\documentclass[12pt]{article}

\usepackage[T1]{fontenc}
\usepackage{amsmath}
\title{Higher-order Logic}
\author{John Smith}

\begin{document}

[...]

\end{document}
```

Definition (Evaluation)

- Is the given work comprehensible?
- Is the work correct?
- Is the work original?

Definition (Presentation)

- How to prepare the written material for a presentation?
- How to present it?
- How to prepare for questions after the presentation?

Example

Exercise: How to present in 15 minutes a complicated technical protocol which relies on a lot of theory, which I do not myself understand well despite spending two days reading the definitions and examples? (don't put audience to sleep!)

Lecture Content

Research and Understanding

Understanding of scientific text, Literature research, Internet search, Citing, Practical scientific work (**Exercise:** Compare Universities, Research Groups, Researchers)

Structuring Scientific Works

Kinds: Seminar, Bachelor and Master theses more?, Topic analysis and structuring

LaTeX

Interaction, Typesetting of text, Images/Diagrams, Mathematical formulae, Lists, Tables, Fonts, Special cases

Evaluation, Checking and Presentation

Evaluation of work of others, Review system in computer science, ~~Introduction to presentation~~

Work now / Homework

- Find and look at the last Volume/Number of *Communications of the ACM*.
  1. Shortly describe the *Communications*.
  2. Classify the texts in the issue based on their scientific content.
  3. Does it quote other research? How? And how would you cite it?

- Find and read “An Almost Optimal Algorithm for Unbounded Search with Noisy Information” by Gan et al, 2022.
  1. Summarise the text shortly.
  2. Is the text comprehensible to a second year student?
  3. Is the text scientific? Explain.