ACADEMIC SKILLS IN COMPUTER SCIENCE

Lecture 1: Introduction and Motivation

Sebastian Rudolph
Computational Logic
Slides by Markus Krötzsch

TU Dresden, 6th April 2020
Introduction and Organisation
Course Tutors

Sebastian Rudolph
Lectures

Maximilian Marx
Exercises
Organisation

Lectures
Monday, DS 2 (9:20–10:50), APB E005

Exercise Sessions (starting 21 April)
Tuesday, DS 5 (14:50–16:20), APB E001

Until further notice teaching is asynchronous and virtual, check course webpage.

Web Page
https://iccl.inf.tu-dresden.de/web/Academic_Skills_in_Computer_Science_(SS2020)

Lecture Notes
Slides of current and past lectures will be online.

Modules
INF-AQUA, INF-B-510, INF-B-520, INF-B-530, INF-B-540, MCL-CS
Goals and Prerequisites

Goals

• Understand key aspects of the **scientific process**
• Learn how to **write** and **present** in research and technology
• Get to know basic ideas from the **theory of science and knowledge**
• Obtain working knowledge about helpful **tools and methods**, including LaTeX
• Discuss aspects of **ethics and quality assurance**

(Non-)Prerequisites

• No particular prior courses needed

Examination

• The examination will be oral
• Most likely including a prepared part (e.g., a short presentation)
Motivation
What is Science?

“a systematic enterprise that builds and organizes knowledge in the form of testable explanations and predictions about the universe.” – Wikipedia, Science

“3 a: knowledge or a system of knowledge covering general truths or the operation of general laws especially as obtained and tested through scientific method” – Merriam Webster, Science

“the intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment” – Oxford English Dictionary, Science

“(ein begründetes, geordnetes, für gesichert erachtetes) Wissen hervorbringende forschende Tätigkeit in einem bestimmten Bereich” – Duden, Wissenschaft
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[“research activity producing knowledge (that is justified, systematic, considered certain) in a particular domain”] – Duden, Wissenschaft

Sebastian Rudolph, 6th April 2020
Academic Skills in Computer Science
Note on English usage

Traditionally, the word *science* in English only referred to what are now known as the *natural sciences* (astronomy, biology, chemistry, physics, . . .)

- still common, e.g., “science department”
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Computer science can connect to many of these areas:

- structural science: theoretical CS, formal logic
- engineering science: software and hardware design and building
- social science: communities & online interaction; Web science
- humanities: library studies; ontology and classification; digital humanities
- and many more . . .
What should we believe – and why?

- "The Earth is not spherical but flat"
- "Bacteria exist"
- "\( P, \neg P \)
- "\( \emptyset \) is a set"
- "It will rain tomorrow"
- "The Sun will turn into a red giant in approximately 6 billion years"
- "When humans die, their spirits enter the spirit world where they await resurrection"
- "If something has been observed many times, then it will also be observed in the future (with high probability)."
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Who can we trust?

Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity

Alan D. Sokal
Department of Physics
New York University
4 Washington Place
New York, NY 10003 USA

Rector: A Methodology for the Typical Unification of Access Points and Redundancy

Jeremy Slining, Daniel Agwae and Maxwell Kohn

ABSTRACT

Many physicists would agree that, had it not been for congestion control, the expansion of such networks might never have occurred. In fact, few hackers worldwide would disagree with the essential unification of voice over IP and public

I. Introduction

Many scholars would agree that, had it not been for active networks, the simulation of Edwin chauk might never have occurred. The notion that computer science with the

The rest of this paper is organized as follows. For starters, we motivate the need for hierarchies. After, we place our

B. Architecture

Our research is principled. Consider the early methodology by Martin and Burridge: our model is similar, but

Ambipolar pentacene field-effect transistors and inverters.

Schon JH1, Berg S, Klein G, Bafilegg B.


Topological field theory of the initial singularity of spacetime*

Grzegorz Bogdanov and Igor Bogdanov
Published 22 October 2001 • Classical and Quantum Gravity, Volume 14, Number 21

The field-effect transistors based on pentacene single crystals, prepared with an amorphous aluminum

7 and 1.7 square centimeters per volt per second at room temperature up to 121

Phone: 555-555-5555
Email: info@example.com
Science: Theory and Practice

Scientific theory:
- How is science justified? In fact: is it? What is “scientific”?
- Related: What is knowledge?

Scientific practice:
- What constitutes “valid” science?
- Who can we trust? How can we discover cheats and errors?
- Rules of good scientific behaviour
- And “minor” practical details: how to find research questions? how to publish? how to build a career in science?
Art or Craft?

Research as an Art: Research is all about creativity, intuition, and talent for solving problems

- Mostly natural?
- Hard to formalise (though many techniques were proposed)
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Research as a Craft: Academic research requires many skills that can be acquired through practise

- How to structure, write, and produce reports?
- How to prepare and deliver presentations?
- What makes a sound evaluation or argument?
Academic skills for the non-scientist

“I don’t want a career in research – why should I care?”
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Key aspects are important to everybody, in high-skilled jobs but also in life:
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- Understand how academic research works and what its weaknesses and limits are
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- Investigate a topic in detail
- Turns guesses & hopes into knowledge
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**Presenting results**
- Author reports, technical documents, etc.
- Present to audiences
- Your near future: seminar talks, project thesis, MSc thesis and defence
• **The Research Process**
  Quality assurance; peer review; publishing in computer science; public education

• **Information Gathering**
  finding literature; how & what to cite; bibliometrics; research questions; reading

• **Writing**
  goals & genres; structuring scientific reports; specific parts; style; layout; language

• **Typesetting in Computer Science: LaTeX**
  key concepts; document structure guidelines; bibliographies; figures & Tikz

• **Presentations**
  goals & genres; structuring presentations; general considerations
  presentation technique
  media usage: slides, board, multimedia, etc.
• **Theory of Science and Knowledge**
  Knowledge; Popper; critical theory; (un)scientific methods; argument and reason; (in)validation

• **Empirical evaluations**
  Goals, structure and content; experimental design; simple statistical evaluation; (mis)representing results; reproducibility

• **Ethics**
  scientific misconduct; (co-)authorship; conflicts of interest; ethical guidelines

• **Further advanced topics** *(time permitting)*