



Introduction to Scientific Working

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Exercise: Compare

Universities

how?

Research Groups

how?

Researchers

how?

Projects

how?

Seminar Topics

Topics

- “Voice in the Machine: Ethical Considerations for Language-Capable Robots”, CACM, Vol 66(8)
- “Improving Computing Education Research through Valuing Design”, CACM, Vol 66(8)
- “SI and Binary Prefixes: Clearing the Confusion”, CACM, Vol 66(8)
- “Why You Should Be Able to Make Your Own Individualized, Digital Nano-Currency”, CACM, Vol 66(8)
- “Legal Challenges to Generative AI, Part I”, CACM, Vol 66(7)
- “Achieving Green AI with Energy-Efficient Deep Learning Using Neuromorphic Computing”, CACM, Vol 66(7)
- “Operationalizing Responsible AI at Scale: CSIRO Data61’s Pattern-Oriented Responsible AI Engineering Approach”, CACM, Vol 66(7)

Seminar Topics (cont'd)

Topics

- “Challenges in Designing Blockchain for Cyber-Physical Systems”, CACM, Vol 66(7)
- “Digital Twins and Dependency/Constraint-Aware AI for Digital Manufacturing”, CACM, Vol 66(7)
- “On the (In)Security of ElGamal in OpenPGP”, CACM, Vol 66(6)
- “Better Algorithms through Faster Math”, CACM, Vol 66(6)
- “Standards to Secure the Sensors That Power IoT”, CACM, Vol 66(6)
- “Trust Is Not Enough: Accuracy, Error, Randomness, and Accountability in an Algorithmic Society”, CACM, Vol 66(6)
- “Research for Practice: The Fun in Fuzzing”, CACM, Vol 66(5)

Summary of last PS

Goals

Basic knowledge about:

- 1 literature research
- 2 scientific writing
- 3 typesetting with \LaTeX
- 4 evaluation and
- 5 presentation

of scientific work.

Note: actual research: experiments, proofs, ... are critical!

Example

Search for literature and information on the topic: “Higher-order logic”

Homework

- Find and look at the last Volume 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...”
 - 1 Summarise the text shortly.
 - 2 Is the text comprehensible to a second year student?
 - 3 Is the text scientific? Explain.

Lecture Content

Research and Understanding

Understanding and summarizing of scientific text, Literature research, Internet search, Citing, Practical scientific work

Structuring Scientific Works

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

L^AT_EX

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

Elaborating and understanding text

Remark

Understanding is a complex interaction between

- 1 Text features
- 2 Reading requirements
- 3 Reading activity

Example (“CACM”, “Joint Parsing and Semantic Role Labeling”)

Text features	technical journalism	scientific article
Requirement	none	some machine learning
Activity

Handling scientific literature

1 Meta-cognition

Reflect on your own learning process

2 Syntactic-semantic analysis

Clarify/Understand the used terms

3 Reduction

Reduce the text to its main statements

4 Reconstruction

Reconstruct the main features of the text using non-verbal methods

5 Elaboration

Confront the text in a critical way

Definition (Meta cognition)

- **Meta cognition** refers to reflecting about your own mental process
- When it comes to reading, this means reflecting on the following topics **before** the actual reading of the text:
 - 1 **Prior knowledge**
 - 2 **Requirement level**
 - 3 **Reading strategy**

Definition (Syntactic and semantic analysis)

- In order to understand the text, it is necessary to understand the **basic used terms**, as well as the introduced **definitions**
- For this, one can investigate:
 - 1 **Handbooks (scientific) and encyclopedias**
 - 2 **Overview articles**
 - 3 **Wikipedia**

Definition (Reduction)

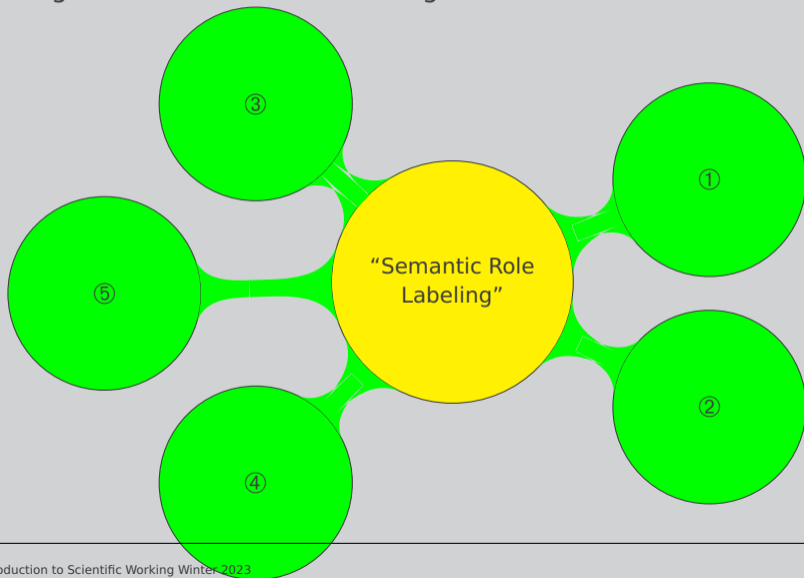
- Summary methods:
 - 1 Underlining
 - 2 Side remarks
which can give useful logical or content insights
 - 3 Itemization

Definition (Reconstruction)

- **Reconstruction** consists of depicting the text using non-verbal methods, as well as visualization of the concepts used in the text
- Visualization methods:
 - 1 Concept Maps
 - 2 Mind-Maps

Example (Mind Map)

see “Joint Parsing and Semantic Role Labeling”



Definition (Elaboration)

- **Elaboration** of a text refers to the creation of new content that extend/explain the work further, it involves new independent making
- The adoption/reception of a work is completed by a detailed and critical analysis

Example (“Computation Takes Time, But How Much?”, CACM)

Consider the following sentence: *Regarding the success in abstraction, pipelines are a counterexample*

- Syntactic and semantic analysis of terms in the excerpt: “abstraction”, “pipelines”, etc.
- Structuring of the excerpt together with sentences that follow
If possible visualised
- Finally summarized in own words
If possible verified in literature

Homework

- 1** Read “How to Read a Scientific Article” by Mary Purugganan and Jan Hewitt, Rice University
<http://www.owlnet.rice.edu/~cainproj/courses/HowToReadSciArticle.pdf>
- 2** Use the method described there to analyze: “Computation Takes Time, But How Much?”
- 3** For each of the 5 steps proposed in the slides, find a text excerpt and analyze it accordingly. Pay special attention to reconstruction.
- 4** Find and prepare to recommend other texts on reading scientific works.