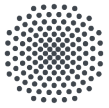

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Scientific Writing

Guidelines

v1.0

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We present general guidelines that should be followed by students working on a master's thesis, bachelor's thesis, or any other research project at the Service Computing Department of the University of Stuttgart. If you are about to write a scientific paper for another venue or community, then different rules may apply. It is important to carefully read the specific instructions and other papers appeared at a particular venue or community and adapt your paper accordingly.

Structure

Scientific paper

Structure of a scientific paper

- Abstract
- Introduction
- Background Information
- State of the Art
- Design of Solution
- Realisation of Solution
- Validation\Evaluation of Solution
- Conclusions and Outlook

Abstract

- Reflects all parts of your paper in a shortened form
- Structure
  - General area of the problem.
  - What problem did you study and why is it important?
  - What methods did you use to study the problem?
  - What are the key results?
  - What is new about them?
  - What are the conclusions and perspectives based on the results?
- Often poorly written (e.g., lacks important information, presents biased information)
- Avoid a copy-paste (from the introduction) approach i.e., write a unique and effective summary
- Do not cite references

Introduction

- Context of research (need and importance)
- Brief overview of state of the art
- Gaps in the state of the art
- Research question
- Methodology
- Original contribution
- Contents of the paper
- Preview the remainder of the paper

Background Information

- Theories and concepts that may be unfamiliar to the audience and are essential for understanding the remainder of the paper
- Should be focused however relevant to a broader audience
- Should be critical, consistent and logically structured

State of the Art

- Describe areas related to the research
  - Overview of each area and respective state of the art
  - For each related work, say what it is, whether and how it builds on previous approaches, and what its limitations are
- Place your research contributions to the field in this context
  - It should be clear and simple

Design of Solution

- It represents the abstract design of the solution
- It can be an architectural design, an algorithm or another form
- The title of this section depends on the content

Realisation of Solution

- It provides implementation details
  - How is the design practically realised?
- The title of this section depends on the content

Validation/Evaluation of Solution

Mathematical proof

- Axioms
- Lemma
- Theorem
- Corollary
- Conjecture

Statistical validation, use cases, case study

- Evaluation metrics
- Experimental setup
- Execution
- Data representation
- Data analysis
- Data interpretation

Conclusion and Outlook

- State the most important outcome of your work
  - Interpret your findings
- Show whether (or to what extent) you have succeeded in addressing the research question
- Include perspectives
  - What can be still done in relation to the research question
- Do not summarise the points already made in the paper
  - Do not repeat directly the information from the Introduction in the Conclusion

Language

Scientific paper

Use formal, simple and concise writing

Language

- Use **we** instead of **I**
- Use active voice whenever possible (check the venue about this, some prefer passive)
  - Active: *We present an approach to automation.*
  - Passive: *An approach to automation is presented.*
- When to use passive voice [1]:
  - To emphasise the action rather than the actor
    - *After long debate, the proposal was endorsed by the long-range planning committee.*
  - To keep the subject and focus consistent throughout a passage
    - *The data processing department recently presented what proved to be a controversial proposal to expand its staff. After long debate, the proposal was endorsed by the long-range planning committee.*
  - To be tactful by not naming the actor
    - *The procedures were somehow misinterpreted.*
  - To describe a condition in which the actor is unknown or unimportant
    - *Every year, thousands of people are diagnosed as having cancer.*

Language

- Use present tense whenever possible
- User short sentences
- Text flow must be guaranteed
  - No breaks in the text between two paragraphs, sections etc.
- Avoid opening the paper, section, or a paragraph with *This* or *In this*
- Connect section titles, figures, tables and other ancillary elements to the main text by referencing
  - When referencing them, capitalise the references
    - “Table 1”, “Section 2”, “Figure 3” or “Fig. 3”, “Algorithm 1”, etc.

Language

- Spelling and punctuation should be perfect
- Be consistent
  - Spelling of technical terms, use of terminology, acronyms, etc.
  - For example, avoid using synonyms for technical terms
    - If several terms are available, choose one and use it consistently
- Correct spelling of established terms
  - For example, "**A**rtificial **I**ntelligence", "**W**eb", etc.
- Do not use contractions

Language

- Avoid noun strings
- Use pronoun references carefully
  - All pronouns must clearly refer to definite nouns
  - Unclear: *Alan Turing was an excellent mathematician and logician. This is how he was able to investigate machine intelligence.*
  - Clear: *Alan Turing, who was an excellent mathematician and logician, used his ability with numbers and logic to investigate machine intelligence.*

Language

- Define an acronym the first time used in the body of the paper
  - First comes the full name and then the acronym
    - *Institute for Architecture of Application Systems (IAAS)*
  - Do not repeat the definition again
- Do not overflow the paper with acronyms
  - Define acronyms only if actual terms occur frequently in the work

Referencing

Scientific paper

Referencing

- Plagiarism is not allowed
- Plagiarism is claiming someone else's work as your own
- Plagiarism can be avoided by using quotation and referencing
- If you copy a text from somewhere and paste it in your paper, you must
  - Quote it (short quotations in double quotes and longer quotations in block quotes) and
  - Provide reference for it
- If you paraphrase a text, you must provide reference for it
- If you copy an illustration from another source, you must provide reference for it
  - Check its copyright

- Read [2]

Referencing

- Use scientific references
  - Papers in scientific conference proceedings, articles in scientific journals, standard reference books, etc.
  - Limit the use of references to Wikipedia
- When using a link in or as a reference, the date when the Webpage was last visited must be specified
  - Option 1: specify separate date in each citation. Check the `@online` entry (and its `urldate` field) of the BibLaTeX package.
  - Option 2: put a sentence about the last time links were checked directly below the bibliography list.
    - *All links were last followed on September 15, 2020.*

Referencing

- Document the source of facts, ideas or evidence used in your work by putting an appropriate reference at the end of the corresponding sentence as exemplified here [Lastname1 and Lastname2, 2016].
- If there are up to three authors, write down all the names. If there are more than three, use Lastname1 *et al*.
- If multiple references are appropriate, group them together [Lastname1 and Lastname2, 2016; Lastname1 *et al*. 1999; Lastname, 2019].
- Acknowledgement of contributions can be also accomplished by using authors' names. For example, the book of Lastname1 *et al*. [1999] is a standard reference book on this matter.
- References can be used as subjects in sentences only in the form Lastname [2019], Lastname1 and Lastname2 [2016], Lastname1 *et al*. [1999] and so on. If references are numeric, they cannot be used as subjects.

Referencing

If you need to summarise someone else's information in several sentences, you should use a lead-in at the beginning of the paragraph and refer to the source when needed. Check the following paragraph for example.

Artificial Intelligence (AI) planning can be used to save energy in non-residential buildings. Lastname1 and Lastname2 [2016] designed, developed and deployed an approach for smart control of lighting in office buildings using AI planning. Lastname1 and Lastname2's research shows that when AI planning is used, an office building achieves more energy savings than using only movement sensors for lighting control. Another piece of evidence from Lastname1 and Lastname2 is that "the average savings between the scenario of manual control and the one with our system is 89%" [p. 21].

Referencing

- Provide full citation information (authors, title, conference title or journal name, page numbers, volume number for journals, publishing year, publisher)
- Format citations correctly
  - Pay attention to special characters, capitalisation of abbreviations in titles, etc.
- Be consistent in citations that share data
  - For example, if two references are published in the Artificial Intelligence journal, use *Artificial Intelligence* or *Artif. Intell.* as a journal name for their citations, but not both names interchangeably. Similarly for *Proceedings* vs. *Proc*, *Conference* vs. *Conf.*, etc.
- Be consistent in the citation information across all citations
  - For example, either always use abbreviations of conferences or never (`Series` field in Bib(La)TeX)

References

- [1] Writing Center, The Writer's Handbook: Use the active voice, University of Wisconsin – Madison, USA. URL: https://writing.wisc.edu/handbook/style/ccs_activevoice/ (visited on 30.09.2020)
- [2] Roig, Miguel, Avoiding plagiarism, self-plagiarism, and other questionable writing practices: A guide to ethical writing. URL: https://ori.hhs.gov/sites/default/files/plagiarism.pdf (visited on 30.09.2020)

Further Reading

- Justin Zobel. 2015. Writing for Computer Science (3rd Ed.). Springer Publishing Company, Incorporated.
- The University of Chicago Press Editorial Staff . 2017.The Chicago Manual of Style (17th Ed.). The Essential Guide for Writers, Editors and Publishers. The University of Chicago Press.
- Peter Coxhead, Writing a Project Report, University of Birmingham. URL: https://www.cs.bham.ac.uk/~pxc/proj/ProjectReport.pdf
- Wilhelmiina Hämäläinen. 2006. Scientific Writing for Computer Science Students, University of Joensuu. URL: http://cs.joensuu.fi/pages/whamalai/sciwri/sciwri.pdf
- William J. Rapaport (2018) How to Write (How to Prepare Technical Reports), State University of New York at Buffalo. URL: https://cse.buffalo.edu/~rapaport/howtowrite.html