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DI INFORMATICA, BIOINGEGNERIA,
ROBOTICA E INGEGNERIA DEI SISTEMI

A few tips on scientific writing

Additional Useful Knowledge

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What is scientific writing (by examples)

Today we discuss how to write a scientific document

What is a scientific document?

- It can be a scientific paper
- It may be a thesis (master or PhD)
- it can also be a scientific report, *including the ones reporting your hand-on / lab experiences*

So, what are we here for?

1. To discuss **how to write a good scientific report** (useful skill since day 1 of your master)
2. To provide you with an introduction and links to the art of **thesis writing** (this will be usefull in a year from now)

3. **Here we will not discuss scientific paper writing** because this is not supposed to be your job during your master
   you *might* be involved in paper writing by your thesis supervisor, in that case he/she will instruct you on this

Key elements

- Sound content
- Clear structure
- Proper english (no slang, no contractions, not even one!)

When and how

If you are required to write a report, or even the thesis, the document preparation should also function as a guideline to your work

This means the sooner you start writing the better

If your document contains several formulas and technicalities, then Latex is the best solution for you

Otherwise you may also resort to the usual WYSIWYG applications, such as MS Word

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Scientific reports structure

Structure

Quite magically, all scientific papers share more or less the same structure

- Title
- List of Autors
- Abstract (~150, 200 words)
- Main paper
- (Sometimes) appendices with non essential but useful material

Structure

Quite magically, all scientific papers share more or less the same structure

Main paper:

- Introduction
- Background/state-of-the-art/related works
- Algorithms/Methods: in scientific papers they should be novel, in reports and master thesis not necessarily... they are the methods you are basing your work upon
- Experiments: Datasets/Implementation details/Results/Comparative analysis/Ablation studies
- Conclusions and Future works
- References (easy to do in Latex / hard in Word)

Abstract

A brief (stand-alone) summary of the content of the document

It should be written only after the paper is complete

It should contain

- The problem or topic addressed by the document (and explain why it is relevant)
- A brief explanation of the approach and the experimental evidence (if any)
- Summary of the conclusions

Introduction

It’s the first section of the report. It must be entitled “Introduction”

It should:

- define the context

- Summarize relevant works in the field (even in scientific report it is expected you possess a grasp on the state of the art)

- Explain your choices (algorithms and experiments)

- Summarize the structure of the rest of the report, section by section

Algorithms/Methods

You should first provide an overview of the overall methodology or of the main algorithm

Then you should organize in sub-sections the sub-parts

Often times a piece of pseudo-code may help you reducing the technical details of the text

If the method depends on parameters, they should be discussed in this section (while the specific values you select should be detailed in the experimental section)

Experimental analysis

Depending on the topic, your work should report an appropriate experimental session where the methodologies are assessed

You should provide

- a description of the benchmarks used
- Specify the metrics adopted
- Report your results (if your method is based on parameters choice, the analysis should include a critical assessment of that choice)
- Report, if possible, a comparison with other methods
- Report, if possible, an *ablation study*, showing the experimental importance of different components of the methodology you are adopting, by eliminating them

Conclusions

- Summarize your choices and your findings
- Summarize good and bad results
- Clarify if the work is finished or if you are just presenting preliminary results
- It’s interesting but not mandatory for a report to include also future works (this is instead very important when writing a Master Thesis)

References

Bibliography: a general list of papers and books which a reader may find useful

References: items specifically relevant for the paper

Academic papers contain only references

Books and theses may contain both

Purpose of references:

- Show familiarity with the field
- Relate the work with prior reseach
- Tell readers where to find related methods

References

You should refer only well known sources, better if international peer reviewed journals or conference proceedings

References must be consistent and complete: all information needs to be provided: authors, title, publisher, year

Arxiv are a popular and useful way to share recent finding with the research community prior a peer review process, they have not been reviewed by independent researcher , thus *they are not ideal citations.* They make sense for very recent papers, it is weird to cite arxiv from 2020 (there are exceptions though)

Citing blogs and websites is not appropriate (but you may add links to useful code/datasets)

A few more details: figures and tables

Figures

- Each figure should have a definite purpose and be meaningful
  - Figures should be used for information which will be easier to grasp by means of a picture
- *Figure caption:* it should be short, even if some authors favor long explanatory captions (but this may interrupt the flow of the paper)
- Every figure should be referred to in the main text explicitly
  - The main text should contain the explanation of each figure
  - The text within a figure and the caption need to be consistent with the main text: same terminology and symbols have to be used
- The symbols and text in the figure should be readable

A few more details

Mathematical notation

- Be consistent with the mathematical notation used in your field:
  - e.g., matrices are represented by italics upper case letters, angles are usually denoted by Greek letters
- All mathematical symbols should be defined
- Make sure that each symbol is used with *only a single meaning*
- Use *easily remembered names* as much as possible
  - e.g., P for a point and L for a line

- In *mathematics*, variables and functions are given *names with a single letter*, maybe with a subscript, unlike in computer science where long names are used

Plagiarism is a serious matter

If you are writing an “internal” report, such as the ones that are required for our projects, then you must be careful and

1. Do not copy and paste sentences from published sources as your instructors might be running anti-plagiarism tools (Aulaweb has one)
2. If using images/plots taken from other sources you must at least cite the sources in the captions

- If you are writing an open document (such as your thesis) or submitting a paper for publication, then the rules are much stricter (see next slide)

Use of copyrighted work and plagiarism

- To reproduce copyrighted work of others, such as an illustration, it is not enough to mention it in the acknowledgements or in the figure caption
  - Need for a written permission by the copyright holder
  - Sometimes a license fee will be requested
- Always state the source of copyrighted material at the point where you use it
- Taking pieces of text from other papers (even your other papers) and using them in your own paper is considered *plagiarism*, even if you cite such papers
  - All journals run a plagiarism check software on each submission and one can be banned from submitting again to that journal
  - Some conferences are also doing it
- Of course, taking ideas from some other paper, even if you change the wording, is plagiarism

How about LLM?

From ECCV 2024 submission policy "***LLM policy:*** ***Authors may use any tools they find productive in preparing a paper***, *but must be aware that* ***they are responsible for the entire content of their paper*** *including any misrepresentation, factual inaccuracy, or plagiarism. Papers containing citations of non-existent material will be rejected when found, and may be rejected without review. Similarly, papers containing obvious factual inaccuracies will be rejected when found and may be rejected without review.* ***It is not a defense to a charge of plagiarism or of inaccuracy to argue that "an LLM did it".*** *Authors are responsible for what they submit.* ***The authors should be aware that LLMs may repeat part of their training data, which could cause plagiarism issues."***

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A few more specific details on your thesis

A few words on the master thesis

When and how to choose your thesis

In our Master of Science the thesis is worth **approx ¼** of the whole effort and it covers approx 1 semester

(second semester second year)

Students are allowed to access the **thesis bidding** when they have less than 18 credits left

A few words on the master thesis

When and how to choose your thesis

A list of topics proposals is published every few months, students may bid on their favourite 3 and will be assigned one

The list may include thesis in collaboration with external entities (research labs in Italy or abroad, companies, …) but **has always a MAIN internal supervisor (the topic proponent)**

Once a thesis is assigned to you

As the thesis is proceeding…

… you are encouraged to keep track of what you read, understand, test, the experiments you carry out …

This will save you time when you start writing the manuscript

Thesis structure

1. Introduction and motivations
2. Background
3. Related work

What was available before you started

4. Requirements
5. Methods design
6. Implementation

Your work

7. Experiments / Discussion

Assessment of your work

8. Conclusions and future work

A. Appendices (code fragments, additional theory, proofs, ...)

Thesis structure

1. **Introduction and motivations**
2. Background
3. Related work
4. Requirements
5. Design
6. Implementation
7. Experiments / Discussion
8. **Conclusions and future work**

A. Appendices

} Highlight the main objectives

} Summarize the results and open problems

What to write last

Useful link

Guidelines to thesis writing and on the entire process can be found on Aulaweb

Look for “Final Dissertation” module

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