RESOURCES FOR WRITING A PAPER

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Synopsis

In this document, I wish to collect a series of tips found online across various sources, properly acknowledged at the end in the references. Sections split macro areas.

CONTENTS

1 CHECKLISTS

I find it useful to prepare some bullet points to validate a section and the whole final work. These are inspired by the sections below.

Final

- ▫ Write authors part.
- ▫ Only first letter of first word in section/subsection title is capitalized.
- ▫ Solve all warnings on Overleaf.
- ▫ Solve all warnings on VScode.
- ▫ Check that there are no "??" blocks (wrongly referenced stuff).
- ▫ Check that all the TODOs have disappeared. Namely, before commenting out this section, do a ctrl+F on the downloaded doc and make sure that there are only these results for TODO, TODOs, and any potential accidental inverse of this keyword.
- ▫ Check that the word "This" was not repeated much. Do a full search on the doc.
- ▫ Check notation is consistent.
- ▫ Is there an opening to each section?

- ▫ Does each paragraph have a consistent theme? Otherwise breakup / rearrange
- ▫ Does each paragraph open with the topic?
- ▫ Does each paragraph end with the clincher/memorable point?
- ▫ Do paragraphs flow into each other?
- ▫ Do sentences flow into each other?

Intermediate

- Are you summarizing the section in the first paragraph? Saying what you do and briefly how?
- Is the notation consistent?
- Are there any rows that go beyond margin?
- Are there any grammar mistakes?
- Are sentences short and concise?
- Is every paragraph discussing one idea, and asking one question (possibly answering it, but not necessarily)?
- Are section headings descriptive?
- Do not use nouns as adjectives (e.g. Probability bound, use instead probabilistic bound).
- Reference "this that which" with the explicit subject they refer to after.
- Do not use passive voice.
- Complete all comparisons (with comparative adjectives, state clearly the objects compared in the same sentence).
- Avoid ambiguous relative pronouns ("This, These, That, Which").
- Is it simple, coherent, and effective?
- Minimize "however, thus", and any conjuction. Science writing must be simple.
- Are you providing context?
- Is every object well defined?
- Are you avoiding footnotes and parenthesis?
- Are you minimizing acronyms?
- Do not use the word "paradigm".
- Are the explanations clear and sound?
- Are the proofs correct? Please redo them
- Are the proofs clear?
- Are the images clean?
- Is the good LaTeX typesetting respected?
- If there are acronyms/abbreviations, were these introduced before in text?
- Are all equations/claims properly labelled and referenced?
- Are all the section and subsection titles written with starting capital letters and without punctuation?
- Are all the equations properly typeset with punctuation?

- Did you repeat the word “this” too often?
- Did you properly use the “command for naming stuff” and not some variants such as ”command for naming stuff”?
- Shorten the language;
- replace jargon;
- minimize adverbs;
- reduce filler sentences;
- break up noun strings;
- avoid “of”;
- use active voice.
- Specify sentences with openers like “it, there”.
- Lists are preferrably made of three elemements, not one more, not one less.
- Check comma use.

2 GENERIC TIPS

There are plenty resources online that suggest how to write. Many of them are not from CS/Physics/Machine Learning.

2.1 *Main concepts*

- Title is one sentence of paper, abstract is one paragraph of paper, intro is one page of paper.
- A paper is not only for presentation, but also for planning research.
- write the paper first, then do research
- Writing is the best use of limited time;
- you need to skectch the writing, understand the low level dynamics of your narrative, even before starting to jot down. Details come later.
- It is better to have a well-written paper with lesser experiments than an unintelligible paper with good experiments.
- It is more important to be understood than to form a grammatically correct sentence / a bulletproof argument.
- By writing, the idea develops better;
- can discuss/ask for feedback.
- “Much of good science is opportunistic and revisionist” (Whitesides 2004);
- 90% of writing is editing
- The whole paper should convey one theme and two or three points to remember (a takeaway message);
- each paragraph should pose a question and pass one message. Potentially the question can be unanswered.
- Take advice from JMLR, “clarity” means that one must write in a way such that an interested reader with basic background in ML could appreciate the results.
- the aim of writing is that in one read the main message is passed on;

- the idea should be like a virus to the reader;
- your message should be useful and reusable;
- you need only one clear and sharp idea, be explicit about it;
- create a narrative: interest, non-triviality, idea, why it works, comparisons.
- you need a tasty hook, a slant to join it with narrative;
- each paragraph should have a topic sentence, when drafting, you should be able to write the topic sentence before the paragraph.
- each paragraph has a clincher sentence that seals the deal for that block.
- focus on the central contribution, which is essentialized in the Title. A reader should be able to tell the contribution after one pass.
- use the C-C-C scheme of context-content-conclusion at each scale. For the whole body, for each section, and for each paragraph.
- parallelize argumnets, if there are many analogous reasons, touch upon them with the same words. In such case, repetitions are allowed to stress the connection.
- put yourself in the shoes of the reader, avoid acronyms and abbreviations, introduce technical terminology
- in the results, you need to convince the reader of the solution with data and logic.
- make statements clear, both limitations and surprise, subsection titles need to be descriptive.
- develop your style of understanding and writing.
- discuss potential extensions;
- reproducibility is to the level of a skilled graduate student.
- do not "grand mother": especially in introductions, it is common to place boilerplate sentences that are useless to the people that known the field, and useless to the people that do not come from it. Practically, the text is marignally meaningless and made of buzzwords. Just get to the point.
- justify your contribution before discussing the general field, as the field does not justify the contribution.
- related work, background and problem statement (if novel) in the first part. Compare, contrast, introduce.
- contribution is the pivot of the whole document, support it, explain it, relate it, test it.
- State your contribution: three macro areas, insight, performance, capability. Possibly in the abstract.
- discuss relevance before details about mathematics when starting a paper
- point out pros and cons in related references.

2.11 *Good habits*

- start from the outline of the paper;
- Every paper should have at least one picture
- Good ideas on coding in the doc.
- consider introducing a simple and self-contained image in the first page (a figure abstract)
- Draft sections with bullet points that become paragraphs to avoid writers' block!
- Include error bars.
- Against paragraph with list of sections in introduction; rather mention the specific positions while narrating. Subsections are already bolded in a document.

- Enable change-tracking in Overleaf and share directly with the email addresses of your collaborators.
- Title of the figure should highlight the conclusion of its analysis.
- Define acronyms at their first occurrence.
- When you are done, read your work aloud.
- Typos are allowed but should not be abundant.
- It is better if one author drafts the main doc, and then all of them iterate over the starting draft.
- Authorship order must be discussed clearly, honestly and has multiple facets that do not go just int erms of the paper (e.g. who gives talks after publishing? A minor collaborator might be asked not to).
- Have first figure in the introduction.

2.III *Practicalities of writing*

- section headings are descriptive, densely informative, can be technical;
- Use simple writing: short sentences, logical structure, no jargon.
- respect structure, section subsection paragraph, sentence. A paragraph describes a *single idea*: its start and end glue it.
- Provide Continuation Markers, i.e. sentences that glue sections together at beginning.
- Keep it simple, coherent and effective.
- "Is it possible to preserve my original message without that punctuation mark, that word, that sentence, that paragraph or that section?".
- Remove extra words or commas whenever you can.
- Avoid footnotes, jargon, buzzwords, technical language
- Simple sentence structure.
- Keep a simple vocabulary.
- Never start sentences with displayed math;
- use well `\parencite` and `\textcite` or the corresponding commands in `natbib`;
- avoid "e.g." and "i.e." in favour of "for example" and "in other words".
- Paragraphs should have at least three sentences.
- Footnotes go after punctuation.
- Do not write "it is easy".
- Always use spelling checkers.
- Delete every unnecessary word.
- Break down complex sentences;
- refactor sentences for clarity and flow.
- References are not nouns, the sentence should flow without, unless one mentions the authors explicitly;
- Never say "has attracted interest in the research community";
- "On the other hand" shouldn't come without "On the one hand".

2.iv *Workflow Sketch & some relevant questions*

- Write a draft introduction first: this helps understand if you need further expriments and arguments to support your claim.
- Write your own ideas.
- Write the literature review, to compare your own ideas.
- Before running the experiments, draft the experiments section.
- Why did I do this work?
- What does it mean?
- What hypotheses did I mean to test?
- What did I eventually test
- What were the results?
- Did the work yield a new method? Is it heuristic or theoretical?
- What experiments did I make?

2.v *How to fix the writers' block*

- vary your routine;
- imagine narrating it to a colleague, or even start from a five year old;
- draft something awful and then fix it (best advice)
- force yourself to avoid distractions;
- divide & conquer: split everything into small sub-tasks;
- write on paper.

3 specific tips

3.1 *Structure*

Below a draft for a conference paper.

- title
- abstract
- introduction
  - 1 page;
  - problem (use an example);
  - contribution (well stated, possibly bullet listed, well exposed);
  - introduce claims, in body of work support them;
  - avoid summarizing content at the end, in the introduction there should be a full narrative of the paper (in contrast with others' opinions);
  - Related work (at the end; contrast) gets in between your work and the reader;
- problem
  - conveying intuition is the primary objective;
  - choose the most direct route to get to the formulation, not the one you took.

- main idea
- details
- related work
- conclusion

3.11 *Writing the abstract and the introduction*

A fundamental piece of any scientific text is the preliminary description of findings. The narrative takes place in the abstract and in the introduction in parallel, with different styles.

Introduction

- The introduction is a *crescendo* of gaps towards your proposed solution.
- Five paragraphs;
- motivation, high-level importance, broader audience, large context;
- specific area topic and background;
- "In this paper, we show that..." one paragraph that summarizes the results
- approach and significance emphasized;
- high level difference with works of others;
- contributions as bullet points is a new trend.
- "The remainder of this paper is structure as follows". List of sections, avoid repetitions.
- A good introduction has:
  - objective;
  - justifications;
  - background;
  - guidance to the reader;
  - summary/conclusion.

Abstract

- abstract: broad-narrow-broad structure.
- what, why, how in experiments, how in theory.
- motivation: why do we care? Importance and impact. If the problem is well known, push its presentation to the first sentence.
- statements: what is the problem and the scope of the work? No jargon.
- approach: how did you solve it? Is it experiments, theory or both? What is the extent of your results. What are the key variables you are able to control or explore?
- results: what is the result? Do not use vague quantifiers. Only one allowed is "by orders of magnitude". Do not place misleading numbers either.
- conclusion: discuss implications and generality of the result.
- structure
  - one or two sentences with non-expert introduction to the field. Must be understandable to anyone
  - two/three sentences with more detailed background

- one sentence, general problem to be addressed
- One sentence summarizing the main result
- two/three sentences to argue what result reveals compared to previous knowledge
- one/two sentences to place result into general context.
- two/three sentences for broader perspective, readily understandable by non-experts.

3.III *Delivering the conclusion*

- a good conclusion gives a significance contribution about what was read, so it should not summarize the content of the paper.
- emphasize previous statements only if necessary;
- make a high level view instead;
- make the significance explicit;
- summarize work in few sentences.

3.IV *Grammar Rules*

- do not use nouns as adjectives (e.g. probability bound, use instead probabilistic bound);
- use active voice;
- complete all comparisons (with comparative adjectives, state clearly the objects compared in the same sentence);
- avoid ambiguous relative pronouns ("this", "these", "that", "which"), or reference the precise subject they refer to;
- minimize "however", "thus", and any conjunction, science writing must be simple;
- avoid eccessive commas;
- we capitalize "Section 3" but not when we talk about some section;
- acronyms have capitalized letters but only proper nouns must be capitalized, e.g. GRBF is Gaussian radial basis function;
- active voice and simple sentences;
- "so" is a conjunction, not at the beginning of sentences;
- "thus", "therefore" and "hence" are adverbs, not likely in the middle of a sentence;
- "who" and "whom" refer to people, "that" and "which" to objects;
- numbers less than 11 need to be written out in plain text;
- avoid "can", "shall".

3.V *LaTeX standards*

When writing a scientific publication the most widespread language is LaTeX , which requires some familiarity. Additionally, there are fixed rules to handle its usage.

1. end proofs with using `\qedhere` command;
2. Use math mode spacing `\,` `\:` `\;` if expressions are too cluttered;
3. use ampersand before equals in align environment;

4. expressions should have punctuation;
5. put ~between Figure and ref so they stay in the same line;
6. put curly brackets around expressions so they wont split on line breaks;
7. use Paired Delimiters.

3.vi *Bad examples*

Some relevant examples of badly written papers are (Oppenheimer 2006; Perec 1980; Sokal 1994). The list below is based on (D. Fredò 2003).

- write the paper for yourself, thinking the reader knows what you know;
- do not provide context, avoid defining the problem, comparing and describing the state of the research in the field;
- write a grocery-shopping list paper, a list of statements, no links, no comments, no takeaway message;
- focus on technical details for a large portion of the document;
- use footnotes and parenthesis;
- be obscure, use counterintuitive notation (x is function, f is value), change notation, use rare and strange acronyms;
- copy-paste literature review from other papers;
- be obnoxious;
- oversell and overgeneralize;
- use the word "paradigm" (apparently much hated and experimentally less cited);
- vocabulary inflation, buzzwords, and over technical sentences;

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