Guidelines for Writing Good Computer Science Papers in a Page

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Abstract

Write the abstract first; then rewrite it last. If you can't capture your idea in an abstract then you probably don't know what you are doing. The abstract should contain four points: (i) problem statement, (ii) your contribution, (iii) results, and (iv) meaning or interpretation of results. Keep it short and keep technical terms to a minimum. Avoid acronyms.

1 Introduction

Start telling your **story** (not a chronology of what you did). Describe the problem and its broad impact. Explain the *scientific gap*, i.e., what technical aspects of the problem have not yet been solved. Clearly articulate the contributions of your work. Claims must be refutable and substantiated in the remainder of the paper. Summarize your approach and how it addresses the scientific gap. Do not waste space with "the remainder of this paper is structured as follows" for short papers; they are all the same!

2 Related Work or Background

Discuss work that directly relates or motivates your work. Contrast the prior work to yours in addressing the scientific gap. Distill ideas, don't explain every detail. Don't make others look bad; give credit where it is due. Expect most people to skip background sections.

- Author plurality: "First", "First and Second", "First et al." for three or more (don't forget the dot)
- Don't use citations as nouns, e.g., use "Gould et al. [3] proposed ..." instead of just "[3] proposed ..."

3 Method (but Non-generic Title)

This is the payload of your paper. Keep the **story** going. Include everything that is necessary but focus on what is important—your paper must provide the details but first convey the ideas. Remember your audience. Defend your approach. Be precise—if your writing is sloppy the reader will assume your research was sloppy. Include examples and give intuitions. Explain all notation and acronyms. **Tell the reader what they need to know when they need to know it.** Some common technical errors/tips:

- Properly use the/an, then/than, plural/singular.
- Use words for numbers between zero and ten.
- Use standard mathematical notation when possible.
- Don't use multiple terms to refer to the same thing.
- Don't overload symbols and technical terms.
- Don't squeeze in too much (whitespace is good).
- Don't use abbrv. or informal language (like "don't").
- Use "we" (the authors and reader) instead of "I".
- Don't start a sentence with a mathematical symbol.
- Keep capitalization to a minimum (only for names).

4 Experiments

Not all papers have experiments, e.g., theory papers may just prove theorems. Experiments must be reproducible—if possible release code and data. They should be scientific: designed to test hypotheses. Don't just show good results, show poor ones too. Give intuitions into when your method works and when it fails. Show trends.

Use scripts to collate results and generate tables and graphs. This will be very useful near submission deadlines.

5 Conclusion or Discussion

Summarise your work; don't just repeat what you've done. Give intuitions—often people are reading your paper to get ideas for their own research. It is very rare that a paper ends research in a field, discuss what work is left to do. The last sentence is the one your audience will remember most (if they've gotten this far); **end on a high**.

5.1 Proofreading and Rewriting

Good writing comes with practice and lots of revisions. When you have finished the draft of your paper you still have a lot of work to do. Proofread and revise your draft multiple times. During your first proofread look for consistency and flow. Are you telling the right story? Have you introduced things in the right order? Is there enough information for your reader to follow your thoughts? You may have to throw out entire sections and rewrite them. Next, proofread looking for typos and spelling mistakes. Finally, read through and polish each paragraph—as an exercise try remove one line from each paragraph.

Take a break. Read through your paper ignoring everything in parentheses, skipping footnotes and proofs, reading mathematics like English, and bypassing figures and tables. Does it still make sense? If not, **rewrite**. Try reading it out loud. Does it *sound* right? If not, **rewrite**.

5.2 Final Checklist (see also Appendix A)

- Does the paper meet the venue's formatting rules?
- Should the review version be anonymous?
- Double check the submission deadline (and timezone).
- Have you spellchecked your paper?
- Has someone other than you read the paper?
- Are all figures and tables referred to in the text? Are all the references consistent (Fig. vs. Figure, etc.)?
- Do figures enhance understanding of the paper? Is the text readable? Are axes labeled?[1]
- Are all cross-references correct? Are all equations, tables and figures numbered? Are captions complete?
- Do you explain all symbols in equations? Are your technical terms consistent?
- Are all claims supported (by citation, formal proof, or data from an experiment)?
- Does your paper have the same "feel" as other papers at the same conference or in the same journal?
- Does your repo have the latest version that you intend to submit? This will be important when it comes time to revise the paper. Use systematic filenames.
- Have all co-authors given final approval?

References

Use `bibtex` to manage your citations. The `natbib` package supports `citet` and `citep` macros for citing as a noun or reference, respectively. Include authors, title, venue and year. List venues consistently. Check spelling of names.

1. `https://en.wikipedia.org/wiki/George_H._Heilmeier`.
2. W. Strunk and E. B. White, "The Elements of Style," *Longman Publishing*, 1999.

[1] Designing good figures and visually communicating results/ideas is a whole other topic that is beyond the scope of these guidelines.

A Tips on Common Errors: A List

- Use correctly sized parentheses `\left(` and `\right)`
- Use `\citet` for textual citations and `\citep` for parenthetical citations, e.g., "Gould et al., (2022) proposed ..." or "... was proposed (Gould et al., 2022)".
- Use `\mid` instead of `|`, e.g., $P(A \mid B)$ not $P(A|B)$.
- Use `\ldots` for ellipsis (...).
- Put a non-breaking space (`~`) before all citations and between all Equation, Figure and Table references.
- Don't use `*` to mean "multiplied by." Use `\times` or `\cdot` or "-by-" if inlined within text (e.g., "n-by-m").
- Use scientific notation, 10^{-3} not 1e-3.
- Keep you LaTeX source clean (and revision controlled). Define macros for Equation, Figure and Table references. Use prefixes such as `fig:` for figures, `tab:` for tables, `eqn:` for equations. This makes it very easy to change referencing style last minute, e.g., `\newcommand{\figref}[1]{Fig.~\ref{#1}}` versus `\newcommand{\figref}[1]{Figure~\ref{#1}}`.
- Put a comma before and after every "e.g." and "i.e."
- Don't start a sentence with a symbol. Instead use "Here, x ... denotes" or "Variable x ...".
- Insert descriptive words before mathematical symbols, e.g., "pixel (u, v) in image I" not "(u, v) in I".
- Use `\noindent` when continuing a sentence through an equation (commonly with "where ...").
- The symbol f is a function; the symbol $f(x)$ is a value.
- Single character mathematical objects only. Superscript clarifications okay (see next point).
- Use `\text` in math mode to prevent italics, e.g., `x^\text{init}` for x^{init} versus x^{init}.
- Don't over capitalise. In general, only capitalise proper names, e.g., "Gaussian distribution" versus "logistic regression". Also capitalise enumerated nouns (e.g., Eqn. 1, Fig. 2, Tab. 3, and Prop. 4). It's okay to not capitalise spelled out acronyms, e.g., "multi-layer perceptron (MLP)."
- Let LaTeX decide where to place floats, usually at the top of the page. Use `\clearpage` if you need all floats to be displayed before moving to the next page.
- Use `-` for hyphenation, `--` for numerical ranges, and `---` for parenthetical comments—such as this one.
- Boldface the best result in a table/column.
- Give the full range for sums, etc. E.g., $\sum_{i=1}^{n}$ not $\sum_i$.
- Use `\log`, `\sin`, `\min` for log, sin, min, etc.
- Keep inline eqns. short and don't break across lines.
- If a figure (or table) is not original then include a citation in the caption (not just in the text).
- Give intuition before formal definitions/propositions.
- Avoid "etc." It has no place in precise writing.
- Use $x^\star$ (`x^\star`) for the optimal solution, not x^*.
- It's okay to write column vectors as $(x_1, x_2, \ldots, x_n)$. You don't need a transpose here.
- Enumerate lists within the text, "First, ... Second, ..." not "First, ... Then, ..."
- Don't introduce a symbol/acronym if only used once.
- Avoid notation with nested subscripts.
- Don't include a reference (citation) in the abstract.
- Inverted commas are `` `` `` and `''`, not `"`.
- For longer reports with tables of contents, and lists of figures, etc., make use of the optional argument in the `\caption[]{}` command to avoid overly long text in the contents, while keeping the caption descriptive and self contained where it appears in the report.
- Wrap subscripts and superscripts in `{}` to avoid problems with multicharacter indices. It also helps readability of the LaTeX source.
- Define macros for common symbols for consistency.
- Don't use similar symbols for different things, e.g., $c \in C \subseteq \mathcal{C}$ (the first is okay, the second is not). Likewise, avoid subtly similar symbols, e.g., x and x' unless they are clearly identified, e.g., "for any $x' < x$ ...". But do be consistent with the literature.
- Maths indexing is typically 1-based: the first element of a sequence or vector has index one (not zero).
- First, not firstly. Last, not lastly (or finally).
- Check spaces around punctuation (before brackets; after periods, commas, semi-colons, etc.).
- Don't reference sections of your paper/thesis in the abstract. Keep the abstract standalone.
- Use technical terms precisely. Don't overload or use colloquially. Use the same term each time.
- Don't over `\emph{}`asize. *It's distracting.*
- Refer to multiple enumerated items, e.g., figures, as "Figures 1 and 2" not "Figure 1 and Figure 2."
- Avoid using the words "it" and "this" when there is ambiguity to what is being referred.
- "Obviously" it not a proof. 51 is obviously prime!
- Avoid generic background. Apply to your context.
- Help the reader to understand your experimental results. Prioritise observations and discussion.
- Use braces in bibtex to enforce capitalisation.

B A Recipe for Introductions

There is no single correct way to write an introduction but the following recipe seems to work well. First, state the problem. Second, suggest an obvious/ideal solution, e.g., how the problem is solved today. Third, say why that doesn't work. Last, propose your approach. This recipe can be applied recursively. Also mention problems that you don't yet solve (i.e., limitations of your approach).

C Exercise to Improve Writing

A mechanism for implementing Strunk and White's *omit needless words* proceeds as follows: Go through the paper one paragraph at a time. Focus on just that paragraph and try rewrite it to remove one line. This will shorten the paper and often result in a clearer and stronger delivery.

D Feedback on Drafts

I highlight PDFs when providing feedback on drafts for work that is not my own: green for something especially good, yellow will be accompanied by a comment, e.g., suggesting a change, and red for an obvious typo, egregious error or repeat from earlier (usually without comment). Blue is used for things that I find interesting relating to contributions of the work, but which do not need fixing.

I won't highlight everything; often only the first instance of a repeated problem; you are expected to find and fix others. You are also expected to have read and followed the guidelines above, so any violation of things here will usually be highlighted in red. A red horizontal line across the page means that I have read up to that point and stopped. You should generalise all the comments from above the red line to the unreviewed part below the line.

If I am a co-author on a paper, then I will be actively involved in writing and editing the paper and will need access to the source. And will then do multiple reviews.