Writing A Resources/Good Paper

When writing a technical paper, it is critical that one follows a good structure. This is a brief document describing what that structure is. If you are using AI tools for writing, it is suggested to feed this document as a prompt or writing instructions

What I say below is applicable not just in writing, but also in doing research and giving presentations. Basically, there is a well-tested general algorithm (or set of guidelines) to writing papers, doing presentations and doing research. I would encourage all of you to internalize and follow this set of guidelines (and of course, specialize for particular papers, presentations, or research).

A paper is the artwork of a researcher. It is important to treat it that way and be very thorough with it.

Overall Guidelines

Always remember:

1. **You are writing for the reader (not for yourself).** A reader is someone who does not have background on the topic, who is extremely busy, and get the key points quickly. They are smart, but you cannot assume they know and they will magically interpret everything the way you think they would interpret them. Which means you need to give them a lot of contexts and hold their hand in explanations. As a writer, it is worth taking the time to focus first on what your readers will bring to the table when they try to read what you write. If you keep your readers always in mind while you are writing, they will have a better chance of understanding what you have to say.
2. **Think and write in top-down.** Give the high level first and then go into the low level. Give an overview first, set the context and then go into components and details.
3. **Be direct.** You are writing to bring about the insights. Be explicit about the key insights, key problems, key ideas, key goals. Do not hide them. Tell them again and again.
4. **Use simple sentences, make them short and clear.** No need to make sentences long or connect sentences that have no connection. Simple sentences will also lead to fewer errors in writing/grammar. It is okay to end a sentence with a preposition. Short sentences are better than an awkward sentence. Better still to rework the sentence so it does not come out awkward and does not end with a preposition.
5. **Use simple word.** Small words (less syllable, more common, and easier to understand) are better than big. The verb is the most important word in the sentence. There are plenty of go

od, usable, legitimate verbs already out there. It is not necessary to stick "ize" at the end of any random noun and invent a new one.

6. **Use simple present tense.** A paper lives on timeless. Simple present is the right tense for ev erything in the paper, unless for some reason it is absolutely necessary that you need the no tion of some other time.
7. **Use singular.** Explaining concepts is easier when done in singular than in plural. "Compute rs are electronic devices that aid the lives of humans" is harder to read than "A computer is an electronic device that aids human life."
8. **Be methodical.** Saying "also", "in addition", "moreover" or having a laundry list of items a re usually problems of non-methodical writing. Methodical writing:
    a. Organizes things in logical groups. "This system has three advantages. First, ... Sec ond, ... Third, ..." is much better than the following: "This system is good at ... Als o, it is good at ... Moreover, it is extremely good at ..."
    b. Prioritizes important things.
    c. Follows a structure for each (similar) paragraph.
9. **Be consistent.** Consistency is critical. Use consistent names and terms. It is okay to use the same word again in the same paragraph. A thesaurus can be put to better use propping up t he small leg of a four-legged table than providing a word that means almost the same thing as the word you really want to use for the second time in that paragraph.
10. **Nitpick on everything.** Every single word is important. You win or lose a reader with a sin gle word, sometimes. If the reader/reviewer read the title, abstract and intro, and they are n ot convinced by the end, the paper is unlikely to get accepted.
11. **Use active tense.** The reader can focus easily this way and follow who is doing what exactl y. Passive tense hides the subject or makes things convoluted. Also, passive tense leads to l onger sentences. Count the characters: "The subject is hidden or things are made convolute d by passive tense."
12. **Make the first impression.** Be serious on everything, not only writing. The figures, tables, a lgorithms and their placement are important for first impression. People always scroll the e ntire paper before getting into it. Get the good impression in this stage is the key to let you r paper accepted.
13. **Mistake is not acceptable!**

Paper Structure and Guidelines for each Section

A paper usually contain abstract, introduction, background and motivation (they are separated som etime), mechanism, implementation (if space is available), performance evaluation, related work an d conclusion.

Abstract

The problem you are solving needs to be clear from the get-go. Why it is important needs to be cle ar right afterward. Then, your goal in the paper, Then, the key ideas you develop to solve the probl em. Then, the mechanisms (at a high level). Then, the key experimental results.

Introduction

Introduction is the Same as abstract except it is extended with more background and contributions. I will copy from above and expand:

The problem you are solving needs to be clear from the get-go. Why it is important needs to be cle ar right afterward (perhaps with a motivational figure). Then, clarify why this problem is important and challenging. This usually include necessary background and related work to tell the reader wh y the existing studies cannot solve the problem and the progress they made to deal with your probl em. Then, clearly define your goal in the paper. Then, the key ideas you develop to solve the probl em (in more detail than the abstract). Then, the mechanisms (at a high level, but again in more deta il than the abstract). Then, the key experimental results (with thorough descriptions of the compari son points). And, finally, end with contributions.

Background

Give enough and necessary background to ensure the paper is understandable to someone who doe s not know the area.

The purpose of the background is to guide the reader into your thought, not to teach them. Provide the background if and only if it is needed. If you start writing the background first, make sure to re vise it after finish the following section (to check if all necessary background is provided). Figure i s always needed in this section for better understanding.

Motivation

Show observation (if needed) and/or motivational experiment and arguments, motivating the probl em in a deeper way and the approach. Reiterate the goal and the challenge at the end. Again, provi de an overview first. For each, observation and motivational experiment/example, provide the insig ht.

Mechanism (Proposed Approach)

Start with a high-level overview with a figure for the system architecture. Describe the key compo nents first and their goals in the overview. Describe how they tie together. Give a roadmap of what is coming next and what the reader should expect in the result of the section.

Always use top-down to explain your approach. Your goal, then main idea, then explain following to the figure. Last, if needed, detailed using equation and algorithm. Avoid showing the implement

ation and parameters (in your experiment) in here. They are annoying and difficult to let the reader understand your idea. Leave them in implementation and setup section.

Implementation

Again, give a high-level overview first. Only after that, you can delve into details. Implementation is important (if space is available, especially writing a long-length paper) to guide the reader how t o reproduce your research.

Performance Evaluation

1. Experiment Setup (Methodology)

This should be simple, but thorough.

2. Experiment Result

In the results section where you can be extremely methodical in i) describing the goal of the experi ment, ii) describing the experiment, iii) describing the figure, iv) drawing N key observations in de scending order of importance, v) drawing a major conclusion at the end ("We conclude that ...")

Below are some useful templates:

In general, a results section is very easy to write, so this should not be a limiter of a technical write up. Here is a template that I would strongly suggest in the writeup for explaining a figure:

"To show [...], we study [...] ... [explain what the study is and what the goal is, if needed]

Figure XXX shows ... [explain carefully what the figure shows, what the metrics are, what x and y axes are]

We make N major observations. First, ... [explain with insight and reasoning]. Second, ... Third, ..., [...] Finally, ...

We conclude that ... [draw a final conclusion]"

Almost all results can be explained with this template. Of course, you will need to add a lot of insi ght everywhere, but this is the first step in organizing a strong and clear section for explaining a fi gure. Once you have this template, everything else becomes easy to add.

See some of our previous works for this kind of methodical writing. The goal is to make people un derstand, so using a writing method is very important. The results explanations of the PAR-BS pap er [ISCA 2008] and the ATLAS paper [HPCA 2010] are good examples of this method for writing results.

Related Work

The different between related work and background. Background only tell the necessary backgroun d knowledge and information will be used in the following paper; Related work cover (as complete d as possible) the background knowledge of the research domain.

First, start with the following sentence: "To our knowledge, this is the first paper to ..." Then: "We have already compared extensively to ...". Then: In this section, we describe other related works in X, Y, Z." Then, provide each set of related works in a subsection. In each subsection, it is best to c ategorize, describe the approach, and compare in bulk.

For example: "Several works try to solve the same problem by doing X. Compared to these, our ap proach is much lower cost because ..., as we have already shown in Section Y."

Basically, compare to approaches when possible, citing multiple previous work that belongs to that approach, instead of trying to compare to individual works. Only compare to individual works whe n necessary.

Conclusion

Reiterate what you have done in this paper, focusing on the key contributions, key results, and key conclusions.

Figure and Placement

Place each figure right after it is referenced in the text. Every single figure should be self-explanato ry. The reader should look at the figure and get the idea. This is true for results figures also. Which means things need to be labeled clearly, organized in a logical way

Clearly, not every paper will be the same, so specialization of this high-level structure will make

Let figures tell the story. Make figures large and easy to read and follow. When the reader looks at a figure, they should simply get it and understand it, without any outside text. The figures need to b e intuitive and also easy to read. The fonts need to be easy to read in figures (Suggestion: same siz e as text in paper)

Try to be clear and beautiful.

Explain clearly everything on the caption and legend:
Principle: Every figure should provide some good basic understanding, without requiring the reade r to read the text. Ideally, a figure should be completely understandable on its own.

Focus on explaining the figure first and giving the key observations next

For evaluation figures, it is better to have the average (AVG) item and make it in bold.

Pay attention to annotation, legend, word space, and font size.

Algorithm

Writing is an algorithm and an art at the same time. It is important to treat every single paper as a d elicate piece of artwork and optimize. Every word matters. Every single figure matters. Basically, t reat a paper as a caring artist treats their artwork: they optimize and perfect every piece of it.

I ask you all to internalize the writing and exposition style and the thoroughness of the writing goi ng forward. The more detail and time you put in to understand the structure of writing and how arg uments are made and how each sentence is picked, the better.

Additional Tips and Resources to Take Care

1. Be serious on reference format, including author names, the consistency of conference nam es, and acronyms.
2. Avoid unnecessary words. Example: More recently studies propose methods for optimizing DRAM latency.
3. Always use present tense unless some other case is absolutely required.
4. Consistency is critical. Use consistent names and terms.
5. Find good phrases and use them over and over instead of sub-optimal phrases.
6. Breaking titles with correct logical boundaries.
7. After writing. I would suggest reading the paper as if you know nothing and nitpicking on all that is written. A fresh set of eyes who can do this would be very valuable.
8. Never use “on the other hand” when you mean “in contrast”.

Resources: http://users.ece.utexas.edu/~patt/writing/

Each paper revision should be substantially improved. It is not good to submit the same paper with minimal changes. So, work with all your co-authors to improve this.
Research and writing should not happen only close to the deadlines. It is a continuous process. Yo u always keep improving the writing by iterating on '*it,*' and improve the research by making it mo re and more solid (irrespective of the deadline). It takes time to do this, and time is not well served if it is restricted to the week before the deadline.
We need to reinforce and apply the following '*heavily in*' the group. A paper is done only when we are absolutely happy with a paper and we have exhausted the research related to it. It is *not* done when the deadline passes and the paper is submitted. Research and paper writing '*are*' a continuous process. A submission deadline is simply an asynchronous event that forces a '*submission,* If the w

ork is deemed ready to submit. It should not kill the research only to be restarted with the result of the submission. "Ready to submit" or "submitted" '*are* not equal to "done with the paper/research."

About the Generative AI Tool

Remember that AI (e.g., ChatGPT, Claude2, etc.) is just a tool. Use it to help you improve your wr iting, don’ t use them write for you. “Project” is nice way to manage and write your paper. Her e is useful instruction to guide the AI revising your writing.