Systems Paper Writing

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Abstract

- What needs to be achieved and what will allow it? Give a one line example.
- Current setting, problem (even after taking precautions)
- Current approach, our point of view on current approach
- Our Solution: features, differences, and results
- What drove the solution?

Introduction

- Current Setting in detail. Provide Scale but do not put limits unless can be cited/justified.
- Why solve the Problem? List Applications and why they require the problem to be solved.
- Thesis statement should be clear.
- Other approaches and limitations.
- Give an example too why current approach is insufficient.
- The trend going in the future and how the limitations will hinder.
- Current requirements. If there are any complex requirements, how can we make it easier?
- Introduce new technologies.
- Our approach, how it is inspired by the past work.
- Any guarantees system provides? Why are these guarantees needed?
- Throw in a figure to give an overview of the system.
- Features, difference from current from current approach. If there are any drawbacks with our approach, how to overcome it?
- Any optimisations performed and when they are useful/useless?
- What do you achieve?
- Challenges faced and solution (also include limitation of the solutions)
- Installation and setup
- How evaluation is done and what do the results show.
- Any interesting observations
- List of contributions

Background and Motivation

- Traditional/Dominant design: Show comparison of both.
- Go by problem by problem
- Include the assumptions you take to generalise for your research.
- Include definitions.
- Show your testbed and how it is a reasonable equivalent of the industry.
- Trends observed in the test-bed. Show using graphs. Give reason for these trends.
- Mention features, scale, limitations, throw in figures and examples to illustrate it
- Limitation of features, size, and cost.
- Benefits of our approach

Design

- What do you want to achieve? How does it help? (Design Principles). This also may structure the design section.
- Give an overview of the solution: Key insight, define some definitions, how the solution is different from others
- Any changes to the regular system.
- Divide the solution into stages: Any variables you store and how is each stage different from other works, any assumptions you make. Show figure for edge cases.
- For each stage: What benefits it bring compare to related designs. Why it is well suited in the full design. How this stage will stay relevant in future.
- Show tables to illustrate the impact of design changes.
- Relate to current practices and how it will be useful.
- Nice to show in algorithmic form. Describe the steps too.
- Architectural constraints.
- Extensions

Implementation

- What are you validating?
- Hardware/Software used?
- Resources used in hardware/software?
- Make a separate subsection on how did you implement each component of design.
- Include any optimisations you made.

Evaluation

- What are you measuring?
- What are you comparing?
- Resources/Systems used?
- Configuration?
- Setup?
- Workloads
- Results and reasons for the results.
• Limitation of experiments

Related Work
• What work do you build on?
• Any papers, which attempt to solve similar problems?

Conclusion
• Setting, problem, solution, findings and potential.

General writing Tips
• Focus on communicating the idea rather than making it stylish and elegant for the first draft.
• Cut your words ruthlessly
• We want to avoid acronyms unless they're completely standard and well known throughout science
• Vague words: Reader cannot get a concrete picture of what the author is talking about. Some words have broad meanings and lead to confusion.
• Unless they are standard terms, most people aren't going to know your acronyms.
• Passive form is hard to read because it's not the way we talk.
• Omit needless proposition
• Affect is the verb form, effect is the noun form.
• When listing things, make sure all have the same grammar structure.
  ○ Search engine (noun) to machine learning (verb) is incorrect
  ○ Web search to machine learning is correct
• Avoid Dangling Modifiers.
• Well studied (might not be a fact, need citation). Well known (fact).
• Do not add ‘the’ to the system name.
• When in doubt how many examples to share, 3 is often a good number.
• Logical flow of ideas
  ○ Sequential in time
  ○ General to specific
  ○ Logical arguments
• Illustrations are more eye-catching than definitions. The term itself is less interesting, put it at the end.
• When drawing parallels, comparisons -> always draw the implication of it.
• If you are cautious about something; propose how to address it.
• Reviews generally jump directly to tables and figure. They have to be stand-alone. They have to be self-contained.
• The reader should not look at the text to understand what they mean. Acronym and experimental details should be defined.
Cite or prove each claim
Always explain why.
  ○ Why is X hard?
  ○ Why A lead to b?
Use mathematics when it is more compact than words.

Figures/Tables
Do not present the same data in a table and a figure
Figures: Visual impact, Show trends and patterns, Tell a story, highlight a particular result
Tables: Give many precise values
Tables: Stick to 3 horizontal lines.
Tables: Grey out alternate rows if necessary
Repeat the same keywords in title, text and figure/table

Specific Writing Tips
Eliminate there are/ there is. Example:
  ○ There are many ways in which we can ...
  ○ We can … in many ways.
Compared to: when pointing out similarities
Compared with: when pointing out differences
Which comes between commas and contains unimportant information.
That comes without commas and contains important information.

Writing with verbs
Verbs move the sentence along, whereas nouns slow down the reader.
Using strong verbs, avoiding turning verbs into nouns, and not burying the main verb
Don’t put too much distance between the subject of the sentence and the main verb.
User does not know where you are going with the sentence.
Example: words in parentheses replace the words preceding it to make it better.
  ○ Loud music came (exploded) from speakers.
  ○ Entire arena moved (shook)
  ○ Hungry crowd gets (leaped) on its feet.

Sentence and paragraph structure
Vary your sentence structure by using a variety of punctuations.
Dashes are versatile, you can add description, extra tidbit, description in the middle of the sentence and it works.
- Power of separation: least (separation) to most => comma, colon, dash, parenthesis, semi-colon, period.
- Increasing formality: dash, parenthesis, rest.
- Use dash and parentheses sparingly.
- Use semicolons to separate items in the list. Specifically, when the items in the list contain internal punctuation.
- Parentheses are used to insert afterthought, an explanation, or some additional details. Sentence is complete without the parenthesis. You are giving permission to your reader to skip it.
- Use colon after an independent clause to introduce a list, quote, explanation, conclusion or amplification.
- In some cases, colon can replace the semi-colon, but only when amplifying or building on the first clause.
- And, or, but need to follow same grammatical structure
- Subject, verb, object (and, or , but) subject, verb, object
- 1 paragraph = 1 idea
- Keep paragraphs short
- Give away the punch line early - similar to topic sentence, but topic sentence requires to write aim of the sentence first, which does not work best every time.
- Avoid transition words - limit to just "but" and "and".
- Reader will remember the first and last sentence of the paragraph

Writing Process

- Set realistic goals:
  - Write 400 words
  - Write 2 paragraphs

- Pre-writing
  - Collect, Synthesize, and organize information
  - Brainstorm take home messages
  - Work out ideas away from computer
  - Develop a roadmap/outline

- First Draft
  - Putting your facts and ideas together in organized prose
  - Get down the ideas in complete sentences and in-order.
  - Focus on logical organization more than sentence-level details.

- Revision
  - Read the writing out loud. You can hear awkwardness, repetition etc.
  - Do a verb check - passive, to-be verbs, buried verbs
  - Organizational review: tag each sentence that sums up the main point.
  - Move around paragraphs to combine the ideas.
Additional Resources

- Writing in Sciences on coursera: [https://www.coursera.org/learn/sciwrite](https://www.coursera.org/learn/sciwrite)
- Writing for computer science (Justin Zobel)
- Prof Sherry’s Systems Research Paper Evaluation Rubric: [https://docs.google.com/document/d/14g-4txTMwJ4YL61qOcaH6bJWKh59Pk1S-FB1Kj eMS4/edit](https://docs.google.com/document/d/14g-4txTMwJ4YL61qOcaH6bJWKh59Pk1S-FB1Kj eMS4/edit)