Research Papers: Audience

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Any document is written for an audience. The audience can have a huge impact on the tone and level of the document, even after deciding the content.

- Students? Industry professionals? Researchers?
- Readers in the field? Out of the field?
Raising Audience Share

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- Explain terms
- Avoid Jargon
- Use good style
- Even an expert won’t be offended by a little bit of extra explanation (within reason)
- Always pitch a little low
Structure and Organization

- Top-down paper design
- First step: Explicitly write down a small number of contributions, issues, points, etc. that the paper is “about”. This allows you to:
  - Write the abstract
  - Budget space (do this early!)
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- Support the skim reader
  - Important results should have a visual tag
What is in a Paper?

- Title
- Author/address list
- Date (or version)
- Abstract
- Keyword list
- Body of paper (intro, exposition, conclusions, future work)
- Figures and captions
- Statistics and other presentations of quantitative data
- Lists
- Theorems/proofs
- References
- Acknowledgments
Title

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Goals of the title

- Help someone decide whether to read abstract, or paper (when scanning ToC or reference list)
- Give description of content
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Ideally, the title would be an abstract of the paper
Who is an Author?

Most papers have multiple authors.

Who gets listed as an author? There are many types of contributions. Not all make an author.
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- Gives key idea behind the work
- Discusses ideas with other contributors
- Writes the paper
- Codes, does labwork
- Develops proofs
- Collects data
- Analysis (statistics, etc)
- Edits paper
- Lends credibility
Ordering Authors

What is the order of listing? Lots of possibilities
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- Who is most senior?
- Who can “sell” the paper best?
- Alphabetically or randomly?
- Sometimes lab director is last
- Sometimes students are first, or last
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Warning: Decide on your professional name, and its rendition, and **stick with it**!
- Be sensitive to your co-author’s name rendition. Its not your right to decide.
Versioning

The key point is not to become confused about which version you are editing.

- Coordinating with co-authors
- “Passing the pen”
- SVN/CVS can help
- “Alternate” drafts to experiment with something can let you confuse yourself
- One strategy is to put a date stamp or version number into the document
The Abstract

Purpose: To summarize the contents of the paper. Explicitly, to enable the reader to decide whether to read the whole paper.

- Indicate key conclusions. Mention findings, not just say “analysis was conducted”
- (In a research paper), claim some new result
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Warning: Abstract is often read separately from the paper (e.g., abstract service).

- The rest of paper might not be available
- Abstract must stand on its own
- No ability to reference anything in document (figures, citations)
- Avoid equations or heavy typesetting (might not transfer)
- Make easy to understand by non-native speakers
The Abstract (cont)

- Bad: Build abstract from sentences in intro.
- Good: Write a one paragraph mini-paper, designed for that purpose
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  - Strategy 1: Write abstract *after* the paper is essentially complete
  - Strategy 2: Write abstract first as part of planning (then revise at end)
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- An “extended abstract” is a different animal. That is really a short paper (say 2-3 pages).
Keywords

The purpose of a keyword list is to support computer search of documents.

- You need to predict what potential readers of your paper will search for.
- Typically, don’t need to repeat words found in the title (they often get picked up automatically).
The Introduction (1)

The first sentence of the paper is crucial

- This is another opportunity to hook the reader... or to lose them
- Definitions are boring

Often, the initial opening sentence you come up with is so generic that it can be dropped from the paper with no loss. If that is true, then do so!!

Try to keep introduction section short
The Introduction (2)

Goals of the introduction:

- Define problem (what is this about?)
- Motivate the problem (why do I care?)
- Outline content of paper (what is plan of attack?)
- Usually summarize results (what is the solution?)

Typically give an outline of the paper at end of introduction, with a sentence for each section.
Reporting Results

- In general, you need to provide enough information that the knowledgeable reader could reproduce the work.
- Enough data need to be provided so the reader can have confidence in the analysis and conclusion.
- Clearly state assumptions.
- Clearly state limitations.
  - Tell what you *didn’t* do as well as what you *did*.
  - Might be an opportunity for future work.
- If appropriate, use a standard analysis or a standard testbed. That means less uncertainty to the reader, so more confidence in the result.
- When possible and appropriate, present in terms of the traditional scientific approach of hypothesis-experiment-conclusion.
Displays and Captions

Displays are things like tables, figures, algorithms, etc., that are set apart from the text, and have a caption.

In general, the caption should summarize (briefly) the display.

Captions need to be self contained. Skim readers might well ONLY read the displays and their captions, not the paper.

Within the paper text, you need to clearly refer the reader to the display at appropriate times (don’t count on them noticing the display on their own).
Conclusions

The Conclusions section should not simply be a repeat of prior material in the paper.

If its there, it should provide conclusions.

If there is nothing new to say, leave this section out.

This section often includes suggestions for future work (and might be titled “Conclusions and Future Work”).
Citations (1)

Citation here means the place where an item in the reference list is referred to.

Approach 1: Give a number

- Usually [1,2] or cite\(^1,2\)
- No info to the reader about the reference, but it's easy to find in reference list
- Compact (especially the superscript form)
- Often good style to mention the author(s) when using this form, for the most significant references
- The order might be alphabetical (better) or by cite (worse)
Citations (2)

Approach 2: Give a tag, usually derived from names and dates

- Such as [Shaf98a] or maybe [CLR90]
- Potentially gives a clue to the reference content, but not much
- Not necessarily easy to find
- Reasonably compact
Approach 3: Give information such as name and date
- Such as the book by Shaffer (2001a) or maybe some other good books (Cormen, et al. 1990, Preperata and Shamos 1985)
- This might tell the reader a lot about the reference.
- Takes a lot of space
- Not at all easy to find in reference list, in fact could be ambiguous
- Some references don’t have obvious authors, how to construct citation?

Occasionally, the full reference appears in the text, not in a list at the end (so the citation is the reference info).
Reference Lists

The reference list says a lot about a paper.
- What is the paper about?
- Is the author adequately familiar with prior work?
- Where can I go for more background, or to learn the field?

There are many variations on reference style
- It's usually specified for you what style to use... so use it!
- When done manually, reference lists are one of the biggest sources of bugs
- **Never** do it manually. **Always** use something like BibTeX or Endnote. If your document processing system doesn’t give you equivalent support for formatting reference lists, switch to a real document processing system.
Reference Lists (cont)

When using reference software, put as much data into the database as possible, even if not all of it will actually appear in that citation style. You might need it later.

A good reference list style will

- Give the reader enough information about the reference to recover it
- Give the reader enough information to easily recover it/understand what it is
- Not take up more space than necessary
Examples of Reference List Styles


Names: Typically initials, sometimes last name first, sometimes last name last, sometimes mixed.

Journal title might contain abbreviations

Issue number might or might not be given, volume number is **always** given

The year might be in the cite identifier (if there is one), after the author, or near the end of the reference
Examples of Reference List Styles (cont)

I believe in giving the reader more information, over saving space in the reference list (if you need more space, drop some of the less important citations)

Some information commonly given is a holdover from olden times, and is now useless for real people. Prime example: City of publication for books.

Of course, you often have no choice in style to use
Reference List Hotspots

Views on citing URLs are in flux. Stay tuned.

“Personal Communication” is a valid citation (though a weak authority because the reader cannot recover the source).

There is nearly always some typesetting involved

- Some part of the title is always italic
- Some items are often bold (volume number)
- Some styles use a small-caps font for the authors
Acknowledgments

Acknowledgments can come at the beginning of the work, at the end of the work, or in a footnote in an appropriate place.

If the work was supported by a grant, **always** say that somewhere. Give a grant number (sponsor’s nomenclature) if there is one.

Also you will likely want to acknowledge those who helped proof the draft, gave ideas, or otherwise helped.

“I would like to thank...” You **are** thanking them so there’s no “would like to” about it!
Revising a Paper

“Simply go through what you have written and try to curb the length of sentences, question every passive verb and if possible make it active, prune redundant words, and look for nouns used instead of verbs.”

“Every single word that I publish I write at least six times.”

Typical process I follow:
- Get it all typed in (at terminal)
- Major reorganization into rough form, with initial scan for style/correctness (at terminal)
- First copy-edit round with significant alteration/modification/reorganization
- 1-4 more copy-edit rounds
Tips for Revision

A person can look at something “fresh” only so many times.

- Time can help... let it sit a couple days if schedule permits
- Don’t give it to coauthor/advisor-helper prematurely. If you do, they will merely tell you what you would have discovered yourself on the next proofreading.

For research paper writeups, the writing should not all wait until the end!
Checklist

- Delete any word, phrase, sentence whose loss does not change the force or meaning
- Replace unnecessary long words with shorter (utilize → use)
- Refactor sentences and paragraphs to put similar parts together
- Look for ambiguous phrases, unnecessary repetition, passive voice
- Are all claims supported?
- Check the math, then do it again.
- Is the notation as simple as possible?
- Did you cite enough? Too much?