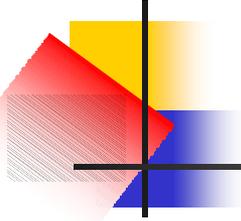# Writing a Thesis – Some Suggestions

Rich Maclin
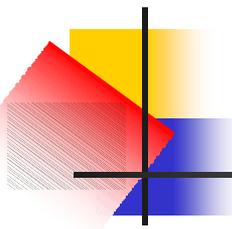
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Updated 8/13/2004
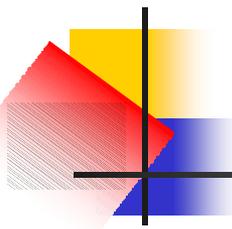
Overview

- Parts of a Thesis
- Thesis Statement
- Outlines
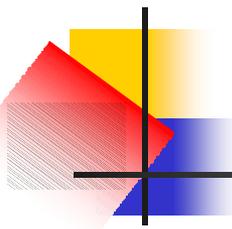- Background and Related Work
- Writing Tips
- Order Tips

Thesis Sections: Abstract, Intro, Background

- Abstract – short description of the entire thesis
- Introduction
  - Motivate the problem
  - Present a simple overview of the problem solution
  - Present the thesis statement
  - Discuss the format of the rest of the thesis
- Background
  - Material needed to understand the thesis problem and solution
  - Written to the level of the audience (knowledgeable about CS, maybe less so about the particular problem)
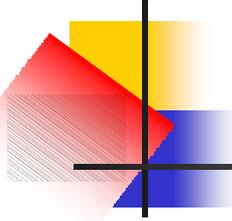
Thesis Sections: Solution, Experiments

- Solution – a presentation of your solution (your algorithm, proof, mechanism, etc.)
  - Should be complete and formal
- Experiments – what mechanisms have you used to verify your solution
  - For each experiment need:
    - Methodology – how did you perform your tests
    - Results – what data did you gather
    - Conclusions – what conclusions can you draw from these results
  - May divide up in various ways (if methodology the same across multiple experiments may have one methodology section)
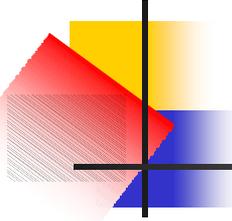
Thesis Sects: Related Work, Future Work, Conclusions

- Related Work – what research has addressed problems/solutions similar to yours and how does your work differ
    - Should try to organize into methods that are similar in approach
- Future Work – what are the next logical steps that should be taken (what should be addressed next)
    - Both large and small scale
- Conclusions – reiteration of the intro, what problem addressed, your solution, and conclusions that can be drawn from the experiments/proofs you created
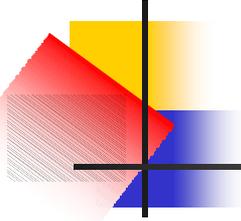
Thesis Statement

- Helpful (but not required) to derive a simple statement (possibly a very long sentence or paragraph) stating the *hypothesis* of the thesis
  - Thesis: that method X (introduced in this thesis) results in an improvement in the performance on problem Y.
  - The point of the thesis is then to support people understanding the problem you are trying to address, the method you propose, how you show that there is an improvement, and how your method fits into the set of solutions that have been proposed to solve this problem
- Think of the thesis as fleshing out the thesis statement (checking the hypothesis)
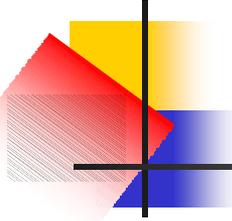
Outline

- Often useful to construct an outline of the thesis with the various sections centered around your central hypothesis
- Think in terms of how each section supports that hypothesis
- Don't worry about sticking precisely to that outline (or feel free to revise as you see fit)
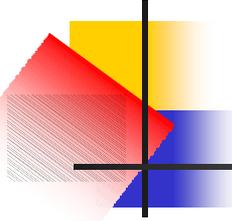- Don't focus on the outline to the point of not starting with writing

Background and Related Work

- It is critical that you properly place your work in context
  - Start with references provided by your advisor, from textbooks and classes
  - The web provides an excellent resource:
    - Use search engines such as google and key terms to look for similar papers
    - Look at citeseer for papers you have and follow them to other papers that reference those papers (these may be related)
- As much as possible, each statement you make that could be questioned should have a supporting citation
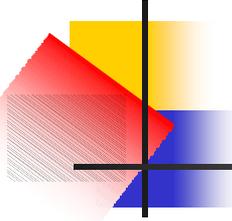
Tips on How to Write

- Write! Don't worry about making things perfect the first time around, that is what polishing is for
- It is sometimes useful to outline a section into paragraphs, then simply write each required paragraph
- In many sections it is best to start by creating diagrams, graphs, pictures, etc. to explain key concepts (e.g., a diagram showing the flow of control in your algorithm)
  - Writing then simply becomes explaining your diagrams and pictures
- Do not take comments on your writing personally, view them as an opportunity to make the work better (and to learn about writing)
- It is often useful to write in the active voice, giving a method a name sometimes makes it easier to write active sentences involving that method
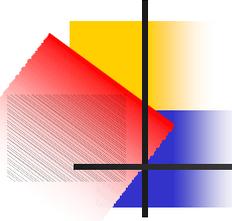
Tips on Ordering of Sections

- Do NOT write your Intro or Abstract first, save them (with the Conclusions for last)
- Best to start by figuring out the diagrams, graphs, etc. you plan to use and creating them
  - An outline of the overall thesis can make it clear what items will be needed
- Start by working on the Background, Solution, and Related Work simultaneously (and accumulate things for the Background and Related Work sections as they come up)
- Next, write Experiments and Future Work
- Last, write Intro and Conclusions, then make Abstract a summary of the entire thing
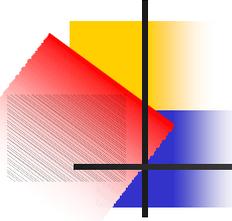
Writing Guidelines (1)

- Never submit anything you haven't **spell checked**. (I can't repeat this often enough.)
- If you have difficulty with grammar try inserting your sentences into MS Word and using its methods to check your grammar.
- Only capitalize in cases of proper names and abbreviations.
- Be spare in your use of commas.
- Be consistent in your usage (for example, in how you show variables, if you use italics one place use it every place).
- Semi-colons should only be used to connect two full sentences that are highly inter-related (and should be used sparingly).
- Avoid using contractions (don't, isn't, etc.).
- The use of etc. should be kept to a bare minimum.

Writing Guidelines (2)

- i.e. stands for "that is" and e.g. for "for example." When using them they should only appear in parenthetical material and are always followed by a comma (i.e., they should work like this).

- Figure captions go below figures. Table captions go above tables. Tables and figures by and large should be at the top (or bottom) of pages and should appear as soon after the reference to the figure as possible. Multiple tables and figures may appear at the top or bottom of a page.

- The words Figure, Table, Section, and Chapter when followed by a reference (as in Chapter 1) should be capitalized.

- In latex, use a tilde (~) between words (such as in creating a Figure reference as Figure~\ref{whatever} to get a space that doesn't allow a line break).

- Try to avoid bad line breaks (the word Figure at the end of one line and the number 1 at the start of the next line) and page breaks (a section title at the bottom of a page.

Writing Guidelines (3)

- Before you use an abbreviation, as in Machine Learning (ML), always spell out the words making up the abbreviation the first time, then show the abbreviation after it (as I did at the start of this sentence)
- I prefer captions for figures and tables that are long and consist of complete sentences that completely explain a figure or table (even if this is a bit redundant with the text).
- I prefer dataset as one word. Some prefer two (data set). Whichever you choose, be consistent.
- Never use the word optimal unless you are prepared to submit a proof that it is true.
- Don't bury the lead point in an Intro. Unless you really have a tough time, the main point should be in the first paragraph of the intro.
- Check your references carefully and make sure they are consistent. Find one reference style (APA, etc.) and follow that.