

# Guide for Technical Writing

## Overview

Technical papers are often very strict in requirements for both content and form. Content is the actual material that you're writing about, including major sections of the paper (introductions, conclusions and references). Form is how you write about it, and often needs to follow strict guidelines regarding formatting and referencing. This guide will give you some advice on how to best approach both.

## Content

What you're actually writing the paper about is understandably important. That being said, sometimes it is difficult to formulate exactly what YOU want to write about or the best way to do so. With the purpose of writing your CS 3991 Technical paper in mind, here are some general pointers.

### **Step 1: Consider the paper requirements.**

The requirements for this document involve a CompEng area of interest, possibly building off of one of the talks you've been given this semester. Think carefully about a topic that interests you, and possible ways that you could write about it. Taking a survey approach, for example, would mean researching some major studies relating to the topic, distilling the important facts and details, and then reporting on them in an interesting and concise way.

**Example:** You're interested in cloud computing. You want to write about the potential advantages for large organizations that use cloud computing. You might start your research by doing some initial searches online. This starts the search, but you'll need to go deeper in order to fully support your work with a strong factual basis (hint: citing Wikipedia does not give you a strong factual basis). Next, you will need to do some digging into academic journals, science and computing magazines, organizational white papers, and conference presentations. If you need help in finding academic sources, ask for assistance at the Marriott library, they'll be glad to help!

Once you find at least 5 academic articles, read them to get a better understanding of the topic. Don't be afraid to toss one out if it doesn't seem relevant, it'll be easier to find another to replace it instead of trying to shoehorn in something that doesn't fit. Once you have a good understanding of your topic, you'll need to formulate your first draft.

## **Step 2: Outline the paper.**

All papers need structure, technical papers more than others. Consider first any form requirements that will dictate how your paper is written. In this case, you'll need 4-6 pages and use IEEE format. The following is a PowerPoint overview of IEEE technical paper requirements:

<http://www.eng.utah.edu/~cs3991/documents/IEEEFormatting.pdf>

Reviewing this document shows that you'll need a title, an abstract, and introduction, the main body of the text and a conclusion. Each section has specific requirements, draft a rough outline of these requirements and see how your topic can best fulfill them.

**Example:** The introduction needs to communicate the research topic, provide context for the topic, and communicate the goals of the paper. If our topic is cloud computing, we need to explain what it is in a very broad and general sense, and then why we're talking about. There are a few ways we could contextualize the concept of the cloud:

Historical Context – explain how computers worked in the past, what the first cloud-like systems were, leading into the main body of the text.

Cultural Context – explain how computers are an important part of our culture, and how the two are developing in tandem.

Metaphorical Context – explain the concept of the cloud by drawing a direct comparison to a similar, better understood system.

There are other ways that an introduction can explain the topic of cloud computing, but to do any of them well you need to follow this simple rule:

### **Write for a general audience!**

Even for technical papers, the introduction is NOT the place where you want to be technical. Any non-engineer or programmer who reads through the introduction should at least understand the concept of what you're writing about, if not the actual science or mechanics.

Once you've provided context for the topic, you'll need to directly address the purpose of the paper. As this is a survey, perhaps you want to review the current state of the technology and speculate on real-world applications. For a more nuanced position, you may want to give an overview of all the positive impacts of this type of system, but also seriously consider the problems and drawbacks it brings with it. Either way, it needs to be clear what you intend to do for the remainder of the paper.

Once the introduction is outlined, do the same for the body of the paper and the conclusion.

### **Step 3: Write the paper**

Once you've outlined what you need to do to satisfy each section, the next step is just writing it all out. This will also require directly referencing your sources, either by quoting them directly or by putting their information into your own words. This can be a difficult thing to master as there are benefits and drawbacks to both.

Direct quotes:

Advantage: provides direct proof or factual evidence.

Disadvantage: too many will seem like its just copy and paste from other works.

Paraphrase:

Advantage: puts information in a context that works best for your paper.

Disadvantage: done poorly, this can dilute the factual basis and, even worse, will seem like plagiarism.

Direct quotes should be used when the original author writes it in such a way that paraphrasing it removes the original meaning. All quotes should be referenced correctly, with direct quotes using a citation system, while paraphrasing refers to the original author within the body of the text itself (Ex. According to Turing, an artificial intelligence can be proven to exist if...).

The following link has more details on writing in your own words.

<http://www.eng.utah.edu/~cs3991/documents/ConciseWriting.pdf>

It also has suggestions on writing concisely. Sometimes when we write we tend to be overly redundant, or dance around the purpose of a paragraph instead of directly stating it. It is always better to be concise and direct than verbose and engage and doublespeak. After writing a section, review it at least once to see if you can be more effective in saying what needs to be said.

Reviewing your work is also important to check for spelling and grammar. The following link presents a list of BAD grammar examples:

<http://www.eng.utah.edu/~cs3991/documents/grammar-styledebrief.pdf>

Please, do not emulate the problems you see in the above link. Your writing should avoid run-on and fragmented sentences. The writing should be consistent in tense and subject/pronoun agreement. It should use correct punctuation, be written in a formal manner, and have good transitions between ideas and sections.

For an outline of when to use certain punctuations, as well as what tense and voice to write in, use the following link as a reference:

<http://www.eng.utah.edu/~cs3991/documents/Grammar.doc>

## Form

Form is difficult if you've never done it before, but easy once you understand the requirements. Fortunately, you have resources that outline the specific requirements for this paper.

Why do we have form requirements at all? Largely, it's to make sure that all submitted documents are easy to read and edit. Imagine being a reviewer for an academic journal and getting 10 different papers all with different fonts, margins, means of referencing, and sections. The bulk of your reading would be spent figuring out where things were, instead of focusing on the content of the paper. For this reason, all academic journals and conferences have adopted strict requirements for submitted works. If you ever want to get your work published, you'll need to conform to their set standards.

If you used the first link on this guide to help outline your paper, you should have a decent idea of what the IEEE standards are. For more specifics, consult the following links:

The following has very detailed information on formatting, heading, text and reference requirements. Review it at least once before writing your paper, and keep it handy to double check if you're doing things right.

<http://www.eng.utah.edu/~cs3991/documents/instruct.doc>

As you'll need at least 2 equations in your paper, the following details important information on how to insert them into your text.

<http://www.eng.utah.edu/~cs3991/documents/equations%20handout.doc>

Finally, to give credit where credit is do, you'll need to reference correctly. The following shows how to cite in the paper, and also how to format your reference correctly.

<http://www.eng.utah.edu/~cs3991/documents/References.doc>

It may seem like a hassle to get everything right, but there's a few things that can help make the process go quicker.

Templates can be used to start you off on the right track. Consider that some of these examples you've seen could be re-used as a template for your own paper. If you want to see what IEEE itself recommends as a template (along with their far more detailed guidelines on references, figures and citations) view the following link and scroll down to the updated template link:

[http://www.ieee.org/publications\\_standards/publications/authors/authors\\_journals.html](http://www.ieee.org/publications_standards/publications/authors/authors_journals.html)

If you prefer to have code do the formatting for you, then you can have LaTeX compile your text files into the correct format. If you're interested in this option, ask Dr. Brunvald for more information. He'd love to sway you from the darkside of MS Word.

## Conclusion

I hope this overview gives you a good start on developing your papers. Don't be afraid to ask for help with revision from your CLEAR consultant, or even from your fellow classmates. A second set of eyes can catch things you didn't notice were wrong, or give you a fresh perspective on your topic.

Good Writing!