

# A Primer On Writing a Technical Paper

Dr. Armando A. Rodriguez, Ph.D.

Professor of Electrical Engineering  
School of Electrical, Computer and Energy Engineering  
Ira A. Fulton School of Engineering

Arizona State University  
Tempe, AZ

February 3, 18, 2011

# Why Should You Care?

- As engineers, all of you will have to write technical papers, reports, proposals, memos, etc.
- This is how you communicate your ideas to others  
(you will also be expected to do this via presentations!)
- Having publications on your resume can help you get a job!

# Poor Writing Skills Can Hurt You!

- If you want to climb that “technical ladder,” you better learn to write well
- Good writing skills are often essential in any type of leadership/management position
- Poor writing can significantly hinder your progress
  - you can lose your job if you mess up a critical paper/report/proposal/etc...

...do NOT let this happen to you!

# General Outline for a Technical Paper

Title

Abstract

1. Introduction and Motivation: Problem Being Addressed, Overview, and Contributions
2. Description of Approach Taken
3. Main Results
4. Summary and Directions for Future Work

References

1-4 above should be sections within your paper

# Title

1. Should communicate main distinguishing ideas of paper
2. Should not be too long

# Abstract

1. Should summarize the main contributions of the paper
2. After thinking a great deal about the paper, I typically try to write this first – knowing that I will have to rewrite it later;

I might update it a few times as I progress through the paper – in an effort to sharpen the abstract

# Section 1 - Introduction and Motivation: Problem Being Addressed, Overview, and Contributions

As concisely as possible, this section should address:

## **1. Introduction and Motivation: Problem Being Addressed**

What problem are you working on?

Why is it important? i.e. worth consideration

## **2. Literature Survey**

How have others addressed the problem?

## **3. Description of Approach**

What is your approach?

Each of the above can be subsections within your paper

# Section 1 - Introduction and Motivation: Problem Being Addressed, Overview, and Contributions

As concisely as possible, this section should address:

## 4. **Contributions of Work**

What is worthwhile about your approach?

What are your contributions (relative to what has been done by others in the field)?

This is the hardest piece to write! (It requires having some understanding of the state of the field as it relates to your problem. It requires understanding the so-called “big picture.”)

It’s also the most important part of the paper!

Work hard to get this right!!

(Expect to revisit this several times to get it right)

**NOTE:** Your contributions need not be revolutionary!

(e.g. Einstein: special theory, general theory, photoelectric effect, gravitational theory....WOW!!!!)

You might just be conducting an important systematic and detailed comparison of prior approaches – a comparison that would be useful to professionals in the field



# Section 1 - Introduction and Motivation: Problem Being Addressed, Overview, and Contributions

As concisely as possible, this section should address:

## **5. Organization of Paper**

How is the rest of your paper organized?

Summarize what is in each subsequent section

This can be a subsection within your paper

# Section 2: Description of Approach Taken

As concisely as possible, this section should:

1. Describe your approach to the problem via figures, tables, equations, etc.
2. If there are a set of ordered steps, be careful to describe each step as precisely as possible
3. If you do not have enough room (some papers have page limits), then you might reference a more comprehensive report that you maintain on the web for all to access

# Section 3: Main Results

As concisely as possible:

1. Use figures, tables, and equations to summarize the main results of your work
2. How do your results compare to those found by others in the field?

How does your approach compare to other approaches that have been taken by others in the field?

Some comparison of your results to those of others is essential to properly illuminate the contributions of your work....makes sense?

# Section 4: Summary and Directions for Future Research

## 1. Summary of Work

Give a summary of your approach, the main results, and the contributions of the paper

## 2. Directions for Future Work

Give directions for future work.

What are the next logical steps that are worth pursuing?

Each of the above can be subsections within your paper

# General Tips

## 1. Outline

Always start with an outline – get the logic/order right!

## 2. Figures and Tables

Decide what figures and tables will go into the paper early on (ideally, before you write anything!)

- figures/tables are each worth “1000 words”  
i.e. they each convey a lot of information
- in principle, if well done, figures and tables should convey most of your story!

# General Tips

## **3. Start with Bullets**

Before writing, summarize each figure and table via bullets; these will be the “meat” of your story! Make sure that you get these right. These will be very useful for you to figure out the story you wish to tell.

## **4. Get Your Story Straight**

Make sure that you figure out what is the story that you wish to tell before writing anything; what are your main points? what are your main contributions? If you lack answers to these, then you are not ready to write

## **5. Brainstorming Partners**

Find people to brain storm regarding the story you wish to tell

## **6. Start Writing**

Now you are ready to start writing

# General Tips

7. Use small sentences; i.e. avoid long sentences
8. Get the grammar right; if in doubt, look for relevant examples
9. Make sure you spell check your work; bad spelling/grammar will be considered as very unprofessional!!!
10. Remember: figuring out your contribution is the hardest thing for students to do; give this a great deal of thought!
11. Find people to go over your first draft
  - seek big picture critique (the most important)...
    - ....if you mess up the big picture...that's it, game over !!!
  - seek technical critique (also important)...
    - ...a technical mistake can doom your paper
  - seek writing critique (grammar, etc.)



**THANK YOU**

**VERY MUCH !**