

While I was in graduate school, I received a lot of great advice from my research advisors on how to write conference and journal papers. I've collected some of the most memorable points below, for the benefit of new graduate students:

- **Abstract:** In the abstract just give a little bit of intro and state your results; you do not have to say why your work is important until the introduction section. Generally, including citations in the abstract is not allowed.
- **Introduction:** When you have many (perhaps disjoint) results, each should have their own paragraph in the introduction; this paragraph can be short, but should generally describe the problem, solution, and why studying this problem is important. Toward the end of the introduction, include a paragraph beginning “In summary, our main results are as follows...” to concisely summarise all that you have done. A paragraph beginning with “This paper is structured as follows...” can also be included.
- **Citations and References:** Most citations will appear in the introduction section. A 6-page conference paper should cite about 20 related works, and perhaps more if cite a lot of your own results. Be cognizant of the fact that your reviewers are sometimes chosen from your references. When criticizing a cited article, criticize the paper and not the authors: say “the work [cite] is not applicable to the setting of...” not “the authors of [cite] do not explore the setting of...”
- **Preliminaries:** The preliminaries section should contain only well-known results and definitions. An expert on your paper topic should be able to skip the preliminaries section and understand the rest of the paper.
- **Main Results:** In the main results section, you have to state your problem setting, your assumptions and your results. Your assumptions are more important than your terminology; you can name your problem and methods whatever you want, but ultimately those things are defined by your assumptions. Be upfront about what are your results, and what are results taken from other papers. I personally like to use Theorem blocks for my results, and Proposition blocks for results from other papers. While discussion is important, “discussion” is not really a result, so either hold off on your discussion until the end of the section or include a separate discussion section following your main results section.
- **Math:** Equations should always be a part of a grammatically correct sentence. In a few instances, you can structure these sentences like “sentence” + colon + equation + period. However, generally, there should be text preceding and following each equation. In the case where multiple equations are presented sequentially, use the word “and” to break them up, and preserve grammatical correctness.
- **Symbols and Variables:** Make sure to include a description of each symbol used in your papers. Sometimes this can be handled through a Notation section either at the beginning of, or preceding, your Preliminaries section. Try not to abuse notation, and point out in the text when the same (or a similar) symbol can be used in multiple ways. If you're writing an equation with a well-adopted writing convention, don't change it: for example, don't rename the variables in $e = mc^2$ to $a = bc^2$.
- **Examples and Case Study:** Each major result of your paper should be demonstrated with at least one example. When the same system (or equation) is used in multiple examples, introduce the system using “we consider the system” + system + “previously studied in Example” + number. A final case study is used when a majority of the paper's results are demonstrable at once. When your case study doesn't include any real-world demonstrations—like a robotic implementation or a traffic simulation with real data—you'll want to title the section “Numerical Example.”
- **Figures:** Make sure figures are legible; the lines should be of sufficient thickness to see, and the text should be approximately the same size as the text in the rest of the document. Be cognizant of the colors each figure uses; should a reader print your paper in black and white, for instance, you want the colors to appear different. Figures should usually be Vector images or PDF files, although JPG files can be used in rare instances when the figure contains a lot of colors. Screenshots cannot be used as

figures. I suggest Tikz figures with LaTeX; Tikz allows for easy color matching and formatting across several figures, and text is generated in the Latex font (see Matlab2Tikz). Any time a figure is taken from another paper (in particular, one which you are not an author of) recreate the figure entirely on your own; you cannot just copy paste in a figure someone else created.

- **Figure Captions:** Figures do not need titles, but they do need captions; each caption should include a name for the figure that references which part of the paper it comes from (for example “Problem Setting of Section 3: Robust reachable sets ...”). A reader should be able to read a figure caption and understand the figure, even if they have not read the section the figure comes from.
- **Conclusion:** despite common belief, there is no reason to include “future work” in the conclusion section. Just restate what you did and sign off.
 - Pros of adding future work: it may encourage others to build off of the research that you are conducting, and to have a better view of its limitations.
 - Cons of adding future work: reviewers can be lazy and anything that you point out that you did not do, can be held against you.
 - Future work is a bit of a “why bother” thing. It’s extra text that doesn’t really fit the story, and usually it doesn’t make your results look better. Future work is just “extra” and extra things can usually be cut out all together.
- **i.e. and e.g. :** italicize words derived from Latin, such as *i.e.*, *e.g.*, *a priori*, and *mutatis mutandis*.
- **Numbers:** It can be a bit ambiguous as to when to spell out numbers and when to use numerals. Generally, if a number appears in a sentence (not an equation) and that number is less than ten, it should be written out in words. For example, use “The first entry of x is equal to 1,” as opposed to “The 1st entry of x is equal to 1”.
- **Lame Results:** When you want to include a result that maybe isn’t super profound or insightful on its own, it’s still important that you don’t criticize the result. After a Lemma for instance, you can include a sentence like “This result is not very surprising because of [this, perhaps known, theory], however, we make use of this result later in [this main result] where we show that [something bigger].”
- **Papers, lecture notes, and textbooks** all benefit from different writing styles:
 - When writing lecture notes, you want to include a complete derivation of your main results, and include many preliminaries, examples and smaller (more well-known) results. Your audience will be forced to keep with you in real-time, and continually reinforcing their understanding is paramount.
 - In a textbook, you want to include many corollaries and examples after your main result, so that the reader understands the situations in which your result can be applied. They can then practice these special cases on example problems, with your hope being that they apply your theory to real-world problems in their work.
 - When writing a conference or journal paper, you want to include only information that you believe would be beneficial to a well-versed reader, who came upon your work after reading related papers. They can figure out on their own how to apply your result to their setting. You’re there to document what you did and what you learned for the community. Writing a convincing story here is very important. This aim differs from those of lecture notes and textbooks, where “getting the reader to apply the results after reading” is the goal.
- **Writing:** It’s difficult to know your own before the Main Results and Discussion sections are drafted—so write these first and write Abstract, Introduction and Preliminaries sections last.
- **First Paper:** If you’re a new graduate student, your first draft of your first paper probably will likely need a lot of rework. Hopefully, your advisor can work with you, or—in the best case scenario—rewrite sections of your paper for you, to help you learn what the writing task actually was. If you get good thorough reviews on your first two paper submissions, it will be very very easy to write your third paper on your own.