Writing a Paper

By

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1. Contingent titles

As your research develops, try to develop a vision of the paper that you will result from your work. It's fun to think of titles that describe the results you have obtained so far and that you expect to obtain. These potential titles can also help you focus your work.

2. Choose authors carefully

Deciding who should be an author requires tact and wisdom. If you are a graduate student, this decision would normally be made by your advisor, who will choose authors carefully based on the extent and depth of the contributions of collaborators. Do not list authors until a final decision has been reached.

3. Write while you do research----inside out

As you complete portions of your research, it can be immensely valuable to carefully write up portions of your results. Plan to write your paper "inside-out." First, write out your core result as precisely as you possibly can. Keep honing it until the result and all crucial details (such as proofs) are perfect. This result will be the foundation upon which the rest of your paper will be built. Since any errors or ambiguities will propagate throughout the paper, be sure that your main result is correct and stated precisely. You will need carefully chosen notation and terminology. Everything else in the paper will flow from this "high potential energy" core.

4. Work out the principal consequences.

Next, write out the principal consequences of your core result. Work out special in as much detail as possible. Your readers may be interested only in special cases. Therefore, try to connect your main result to as much related and specialized work as possible. These are your "hooks."

5. Examples of gold

It's almost impossible to overstate the importance of examples. A single example can motivate an entire area of research, or it can demolish an entire approach. Although we view theoretical ideas as the pinnacle of intellectual thought, an example can capture the key idea with such clarity and directness that the theory becomes infinitely clearer.

6. Illuminating Examples

Simple examples are useful for illustrating basic concepts. More complex examples can show the power of a methodology. Examples that fall outside the bounds of a theory or method can show how the method succeeds or fails in uncharted territory. A great way to construct a paper is to begin with a motivating example and later return to that example along with others. Reconsidering examples by prior researchers can help show the effectiveness of your approach.

7. Use your reference list to establish a frame of reference.

The references that you cite provide a frame of reference for your paper. Cited works show the reader that your work was influenced by a specific collection of ideas or a particular applications area. Be sure that you research the literature thoroughly, including conferences, journals, and books, in all languages. Don't assume that work of "obscure" authors is less worthy of citation than the work of "famous" researchers. Work that is not peer reviewed (such as unpublished dissertations and technical reports) may be suspect and may not warrant citation. At the very least, do not build your paper on work that is not carefully vetted. Finally, be specific in your citations, such as "Theorem 12.3 on page 723 of [19]."

8. Write the introduction and state your contribution

Only after all of the above steps are completed should you begin to write your introduction. Spend a lot of time thinking about what you want to say before you write it. First outline your thoughts into a story line that reflects the order of ideas as you would describe them to a reasonably knowledgeable person. To do this you need to imagine what that person might or might not know about background work on your topic. One of the most critical components of your introduction is a clear statement of the contribution of your paper. Reviewers will look for a crucial sentence such as "The contribution of the present paper is an approach to spectral analysis that goes beyond earlier work by ..."

9. Write the conclusion.

Repeat a few key points from the introduction in the conclusion section and then add some additional perspective on the work. For example, you might comment on the potential applications of the work, possible shortcomings, and directions for future work.

10. Write the abstract.

Last of all, write the abstract. Compress the introduction into a few key sentences. Imagine that you are a researcher who has only the abstract of your paper. Could you figure out what is in your paper and what its contribution is? An abstract is the ultimate compression of the contribution of your work. Good work has been overlooked due to an obscure abstract, so take the time to do this carefully.