

XPE045SCWR Scientific Writing Course
Czech Technical University

How to write and present scientific papers

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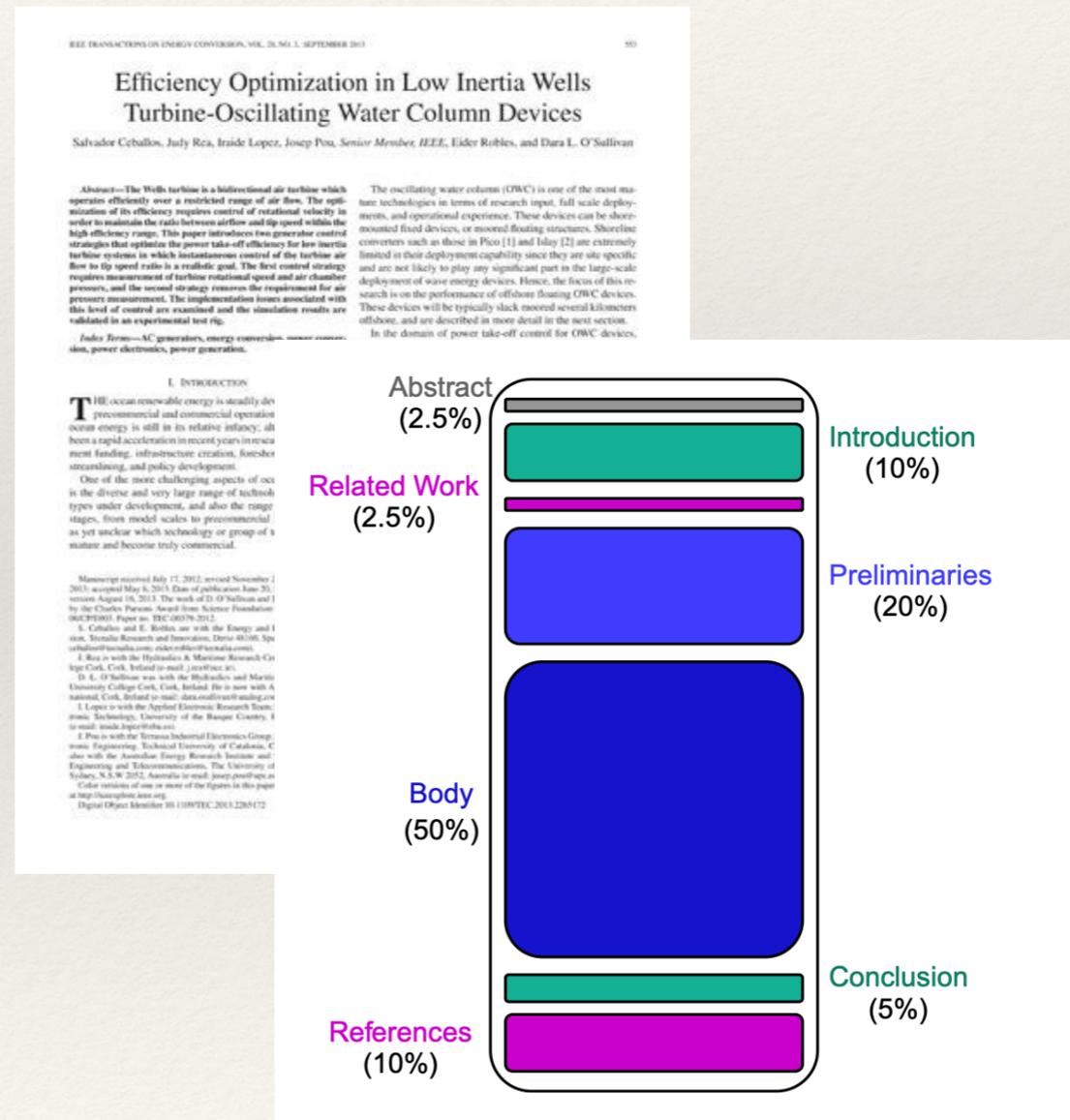
Announcements

- ❖ Collect HW#2
- ❖ Next week is individual consultation
- ❖ Who is planning to come?
- ❖ Karolov Namesti or Faculty lounge T2:B3-153, 9:15am to 10:45am.
- ❖ HW#3: Slides, Power Point, Keynote, or Latex

How to write a scientific paper

Research Paper

- ❖ An engineering research paper is a published report describing original research results.
- ❖ A research paper contains
 - ❖ Title
 - ❖ Abstract
 - ❖ Introduction
 - ❖ Materials and Methods
 - ❖ Results
 - ❖ Discussions and Conclusions
 - ❖ Acknowledgements, References



How to Prepare the Title

- ❖ Title is very important.
- ❖ A good title defines the work with the fewest words and adequately describe the contents of the paper.
- ❖ Title should describe the result of product of the research (e.g. Robust Antenna Control using PID Control)
- ❖ Length of the title (e.g. Sensors and Systems)
- ❖ Specific title should be used. (e.g. Studies on Control Systems)
- ❖ The title of a paper is a label. It is not a sentence.
- ❖ The title should almost never contain abbreviations, formulas, nor jargons.
- ❖ Series titles should be discouraged (e.g. Example: Studies on Digital Control Systems II).

How to Prepare the Title

- ❖ What makes this paper unique?
- ❖ Should grab attention of the reader
- ❖ Help them decide whether the work is relevant to their interests
- ❖ Try to incorporate a keyword
- ❖ Concise
- ❖ Maybe first thing to write but might need to be revised
- ❖ The last thing to finalize

How to Prepare the Title

- ❖ 12 words or less
- ❖ Avoid phrases such as “A Study of” and “Experimental Investigation of”, or “The results of”
- ❖ Don’t phrase as a question
- ❖ A good research paper title
 - ❖ condenses content in a few words
 - ❖ grabs the readers attention, “A high-fidelity method...”
 - ❖ Differentiates this work from other papers, “A novel Risk-Sensitive approach...”

How to Prepare the Title

Bad Title: How we solved an important problem in a certain application

Good Title: Color barcodes for mobile applications: A per channel framework

How to List the Authors and Addresses

- ❖ “If you have co-authors, problems about authorship can range from the trivial to catastrophic.”
- ❖ We should list authors, and only those authors, who actively contributed to the overall design and execution of the research.
- ❖ The order of the names (by contribution, alphabetically)
- ❖ The preferred designation is first name, middle initial, and last name.
- ❖ Usually do not put degrees or titles after the authors’ names.
- ❖ The addresses should be listed clearly for all the authors.

How to Prepare the Abstract

- ❖ An Abstract is a mini-version of the paper.
- ❖ The Abstract should provide a brief summary of each of the main sections of the paper: Introduction, materials and methods, results, and discussion.
- ❖ A well-prepared Abstract should enable readers to identify the basic content of a document quickly and accurately, to determine its relevance to their interests, and thus to decide whether they need to read the document in its entirety.
- ❖ The Abstract should be typed as a single paragraph.
- ❖ The Abstract should (1) state the principal objectives and scope of the investigation, (2) describe the methods employed, (3) summarize the results, and (4) state the principal conclusions.
- ❖ The most of the Abstract should be written in the past tense, because it refers to the work done.

How to Prepare the Abstract

- ❖ Not an outline
- ❖ Focus on the method and one / few key results
- ❖ What you did
- ❖ What you found out
- ❖ Present in a way that makes it easy for some to make comments
- ❖ Why you should read this paper
- ❖ Try to leverage keywords in abstract
- ❖ Do not use acronyms
- ❖ Do not cite other work
- ❖ Do not reference figures / tables from your paper
- ❖ Should be self-contained paragraph (100-200 words)

How to Write the Introduction

- ❖ Often the Abstract and the title is written after the paper is done, so the initial introduction is the first part of the paper that you write.
- ❖ The purpose of the Introduction is to supply sufficient background information to allow the reader to understand and evaluate the results of the study.
- ❖ Much of the introduction should be written in present tense.
- ❖ A good introduction (1) presents the nature and scope of the problem investigated, (2) reviews the pertinent literature, (3) states the method of the investigation, (4) states the principal results, and (5) states the principal conclusions.
- ❖ The road map from problem to solution is so important that a bit of redundancy with the Abstract is often desirable.
- ❖ Abbreviations
- ❖ Perhaps, the most difficult part of the paper to write. Need to revise after the paper is written.

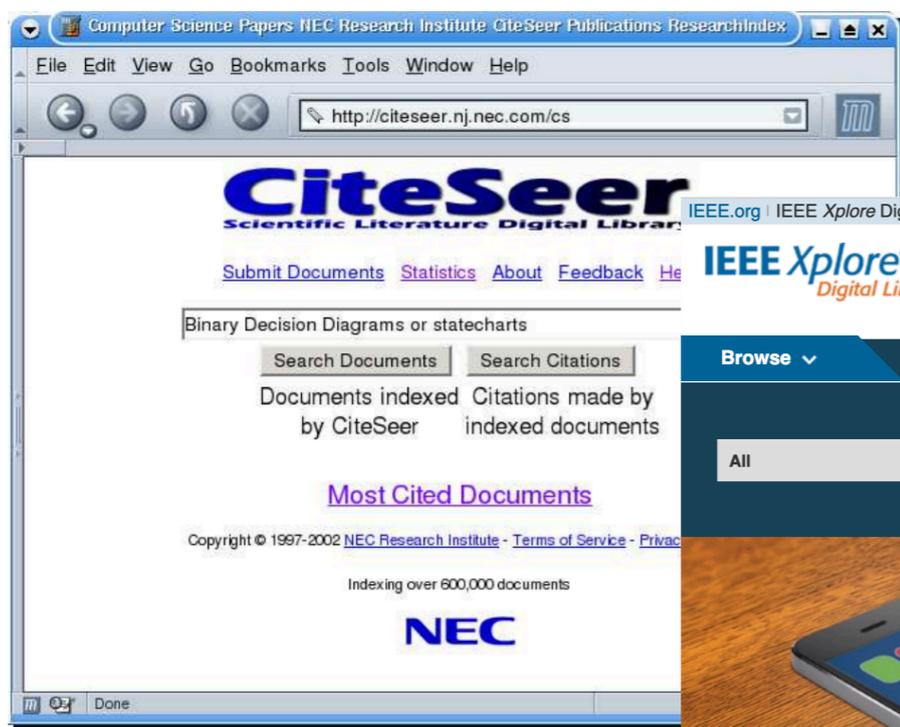
How to Write the Introduction

Generally known information about the topic

Prior studies' historical context to your research

Your hypothesis and an overview of the results

How the article is organized



The Evolution of Smartph

Follow the evolution articles dating back 2017 IEEE Spectru

Browse the article:

A screenshot of the PubMed website interface. The top navigation bar includes 'NCBI', 'Resources', and 'How To'. The main search area features a search bar with 'PubMed' entered and a 'Search' button. Below the search bar, there is a section titled 'The Evolution of Smartph' with a sub-header 'Follow the evolution articles dating back 2017 IEEE Spectru'. To the right, there is a 'PubMed' section with a description: 'PubMed comprises more than 29 million citations for biomedical literature from MEDLINE, life science journals, and online books. Citations may include links to full-text content from PubMed Central and publisher web sites.' Below this, there are three columns of links: 'Using PubMed' (including PubMed Quick Start Guide, Full Text Articles, PubMed FAQs, PubMed Tutorials, and New and Noteworthy), 'PubMed Tools' (including PubMed Mobile, Single Citation Matcher, Batch Citation Matcher, Clinical Queries, and Topic-Specific Queries), and 'More Resources' (including MeSH Database, Journals in NCBI Databases, Clinical Trials, E-Utilities (API), and LinkOut).

How to Write the Materials and Methods Section

- ❖ In the introduction the authors stated the methodology employed in the study; in this section he should give the full detail.
- ❖ Most of this section should be written in the past tense.
- ❖ The key is the “repeatability”: Enough information must be given so that the results could be reproduced by a competent colleague.
- ❖ Most readers will skip this section. Most good reviewers will carefully go over this section.
- ❖ If your method has been previously published in a standard journal, provide the literature reference.
- ❖ Correct form and grammar (e.g. “Blood samples were taken from 48 informed and consenting patients ... the subject ranged in age from 6 months to 22 years.”
Pediatr. Res. 6:26, 1972)

How to Write the Materials and Methods Section

- ❖ How many did you use?
- ❖ How are they different/same?
- ❖ Different set-ups? Side-by-side images?
- ❖ Are some methods very well known to your readers?
- ❖ Your goal is to figure out how many subsections
- ❖ End by telling your reader (again) that what you are going to do with these methods

How to Write the Results

- ❖ Provide overall description of the research results.
- ❖ Present the data, simulation, field test, etc.
- ❖ This section should be written in the past tense.
- ❖ Be careful not to include everything. “The fool collects facts: the wise man selects them.” John Powell, a geologist, 1888.
- ❖ Strive for short, sweet, and clear presentation.
- ❖ Do not repeat yourself in results.
- ❖ Do not be verbose in citing figures and tables.
e.g. It is clearly shown in Table 1 that the bang-bang control is not as robust as PID control.
PID control is more robust than bang-bang control (Table 1).

How to Write the Materials and Methods Section

Tables

Present representative data or when exact values are important to show



Graphs

Show relationships between data points or trends in data



Figures

Quickly show ideas/conclusions that would require detailed explanations



How to Write the Results

- ❖ How many figures / results contribute to your story?
- ❖ How are they different or same?
- ❖ Is there a baseline case? If so, use that to introduce the format that you are using to present the data
- ❖ Goal is to figure out how many subsections you need for results
- ❖ Develop each figure separately
- ❖ Are you comparing your results to prior work?
- ❖ What is novel?
- ❖ What is important?

How to Write the Discussion

- ❖ Discussion section is a hard section to write.
- ❖ Many discussion sections are too long and verbose.
- ❖ Components of a good discussion section:
 - ❖ Try to present the principles, relationships, and generalization shown by the results.
 - ❖ Point out any exceptions or any lack of correlation and define unsettled points.
 - ❖ Show how your results and interpretations agree with previous works.
 - ❖ Discuss the theoretical implications of your work as well as any possible practical implications.

How to Write the Discussion

- ❖ Where we discuss the results of your paper
- ❖ If you have a lot of different cases and are creating a summary table, then separated section might be needed
- ❖ If there are only few results presented, then discussion can be written with the results section
- ❖ There is no right answer. What works best for your study telling
- ❖ You don't want to present redundant text by creating a new section
- ❖ Recall that the key results will again be presented in the conclusion

How to Write the Conclusion

- ❖ What has your research achieved?
- ❖ Use to “quickly” remind the reader of key points from each section
- ❖ Written in past tense: “showed”, “demonstrated”. etc.
- ❖ Why was this problem important to study to begin with?
- ❖ What methods were used and why?
- ❖ What were the main benefits presented?
- ❖ Quantify the main result
- ❖ Main conclusion you want the reader to remember

How to Write the Conclusion

- ❖ Let readers know what is still left to do: future work
- ❖ Write this part in future tense: “will”
- ❖ What still are shortcomings ?
- ❖ How will this line of work have a real impact on the field?
- ❖ Two (maybe three) paragraphs

How to State the Acknowledgement

- ❖ Acknowledge any significant technical help that you received from any individual.
- ❖ Acknowledge the source of special equipment and materials.
- ❖ Acknowledge any outside financial assistance.
- ❖ Be courteous.
- ❖ Do not use the word, “wish.”
e.g. I wish to thank Albert Einstein....

How to Cite the References

- ❖ List only significant, published references.
- ❖ A paper that has been accepted for publication can be listed, citing the name of the journal followed by “in press” or “to appear.”
- ❖ Check all parts of every reference against the original publication.
- ❖ Make sure all references cited in the text are indeed listed in the Reference section and that all references listed under Reference section are indeed cited somewhere in the text.
- ❖ Follow the particular journal’s reference style (name and year, alphabet-number system, citation order system)

How to Cite the References

- ❖ American Psychological Association format:
 - ❖ Books: Author, A. A. (Year of publication). Title of work: Capital letter also for subtitle. Location: Publisher.
 - ❖ Articles: Author, A. A., Author, B. B., & Author, C. C. (Year). Title of article. Title of Periodical, volume number (issue number), pages.
- ❖ IEEE format, see American Control Conference Web site
- ❖ Referencing examples:
 - ❖ Control systems is fun [27]. (IEEE style, though even the IEEE is deviating from this these days across its journals)
 - ❖ Control systems is fun [Smith, 1987]. (APA format)

Three golden rules

- ❖ Clarity
- ❖ Clarity
- ❖ Clarity

Presenting a Scientific Paper

Plan

- ❖ Before You Start
- ❖ Organize your Ideas
 - ❖ Introduction: The rationale for the experiment (why did you do it?)
 - ❖ Preliminaries: Introduce the problem, other works
 - ❖ Body: The results obtained (what did you find?)
 - ❖ Technicalities: The methods that were used (how did you do it?)
 - ❖ Conclusion : An interpretation of those results (what does this mean?)
- ❖ Slides
- ❖ Speaking
- ❖ The Show
- ❖ Last Tips

Before You Start

- ❖ Know your Topic
(Be sure you have understood the paper)
- ❖ Know Your Audience
(Your talk must take the audience into account)
- ❖ Know Your Goals
(What are the expectations of the audience?)
- ❖ Know Your Limits
(how much time will be needed?)

Organize Your Ideas

- ❖ Identify the Key Ideas
(Make sure that all the key ideas of the paper are in your talk)
- ❖ Do not go into too many details
(Ignore the superfluous and focus on the essentials, use examples!)
- ❖ Use a Top-Down Approach
(starting wide, finishing narrow)
- ❖ Structure Your Talk
(Introduction, Preliminaries, Body, Technicalities, Conclusion)

Organize Your Ideas

- ❖ Introduction

- ❖ Define the Problem
- ❖ Motivate the Audience
- ❖ Discuss Earlier / Posterior Work (briefly)
- ❖ Emphasize the Contribution of the Paper
- ❖ Provide a Road-map

- ❖ Preliminaries

- ❖ Introduce Terminology and Notations or the Setting of the Experiment (but only the absolutely necessary ones)
- ❖ If Needed, Redefine the Problem more Technically

Organize Your Ideas

- ❖ Body
 - ❖ List Major Results
 - ❖ Explain the Meaning of the Results
 - ❖ Give some Examples
- ❖ Technicalities
 - ❖ Either Sketch the proof of an important result or Present some experimental results
- ❖ Conclusion
 - ❖ Remind the Main Results
 - ❖ Explain Your Opinions on the Paper
 - ❖ Indicate that Your Talk is Over

Slides

- ❖ Use them: computerized, printed or handwritten slides
- ❖ The Simpler, the Better! Minimal clutter.
(do not put the whole sentences you want to say on slides)
- ❖ Use Colors! (but don't **over use colors** !)
- ❖ Use Pictures (one picture is worth thousands of words)
- ❖ One Slide = 1–3 minutes (average) (think about timing)
- ❖ Organization should follow the paper

Speaking

- ❖ Speak Slowly, Steadily and Loudly (do not speak with yourself, drink something before the talk, avoid bubbles)
- ❖ Find the Right Words (prepare some full sentences to say during the talk)
- ❖ Transitions are the Keys (prepare transition between slides)
- ❖ Improvisation is Needed (whatever you do, you will have to improvise)
- ❖ Humor is OK but not Recommended (do not try to be funny!)

Speaking

- ❖ Show enthusiasm for your topic
- ❖ Control the time
- ❖ As you put up each slide, have in mind the key points that you want to make
- ❖ Speak in short sentences and use easy to understand language
- ❖ Use the laser pointer wisely

The Show

- ❖ Do not be monotonous (try to make your voice vary slightly)
- ❖ Make the Audience Participate (depends on the type of talk)
- ❖ Maintain Eye Contact (don't show them your back)
- ❖ Control Your Position (don't hide the podium)
- ❖ Control Your Time (do not forget the time)
- ❖ I made a Mitsake... The Show Must Go On

Last Tips

- ❖ Practice
- ❖ Practice
- ❖ Practice

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