

How to Write and Present Research Papers?

Outline

- How to write a research paper in general?
- How to write a good system paper?
- How to present your research work?

How to Write Research Papers?

- Writing papers is like telling stories
 - **Title/Abstract:** *What is your story about?*
 - **Introduction:** Why should I listen to your story?
 - **System Model:** What is the background of your story?
 - **Approach/Algorithm Details:** main story content.
 - **Experiment Evaluation:** What is the practical value of your story?
 - **Discussion:** Lessons learned by listening to your story.
 - **Related Work:** What is so novel about your story?
 - **Conclusion:** Summary of your story.

Title and Abstract

Title and Abstract

- Title writing pitfall:
 - Don't put uncommon buzzwords here
 - Be specific enough but not too specific
- Abstract structure:
 - Short motivation (problem); Proposed solution; Evaluation; Summary of your finding
- Abstract writing pitfall:
 - Don't put unexplained or undefined terms whose meanings are not well known
 - Solutions: explain them; rephrase them using plain words; not get into too much detail

Introduction

Introduction

- The most important section
 - Why should I read your paper?
 - Do you address important problems?
 - Why previous work cannot solve the problems?
 - What is new about your ideas?
 - Proposed solution focusing on the novelty parts
 - “The paper makes the following major contributions + bulleted items”
 - Summarize evaluation results
 - Structure layout of the paper

Introduction- cont.

- Put your work in a big picture but don't over-claim
- Don't over-criticize other's work
- Use proper words
 - Don't: "Our approach is the first to ..."
 - Do: "To the best of our knowledge, our approach is the first to..."
 - Don't: "Our approach provides a foundation for this new field..."
 - Do: "We believe that our approach can provide a foundation for this new field..."

System Model/Preliminary Section

System Model/Preliminary Section

1. Layout the background of your work
2. Describe overall system architecture/framework
3. Formal definitions
 - Define terms
 - Define new concepts
 - Define the problems to be solved
 - Analyze the complexity of the problem
 - Provide complexity proof if the problem is NP-hard.

Approach/Algorithm Section

Approach/Algorithm Section

- Provide details of your approach
- Show the depth of your work! So, be thorough.
- Enumerate major approach/algorithm components
- Explain your ideas with examples and illustrations
- Provide pseudo-code of your algorithms

Experiment Section

Experiment Section

- Provide implementation details of your system
- Typically use hybrid testing environments
 - Simulation testbed: simulate network connection and node processing in distributed systems. (e.g., ns2)
 - Emulation testbed: simulate network connection but use real node implementation. (e.g., emulab)
 - Real prototype testbed: implement both network connection and node processing (e.g., PlanetLab)

Experiment Section (cont.)

- Explain your experiment setup
 - Benchmark workload and application data you used
 - Network topology you used
 - Evaluation metrics you use to quantify the *performance* and *overhead* of your approach
 - Alternative approaches you use to compare with your work
 - Theoretical optimal solution
 - Previous solutions if exist
 - Naïve solutions
- Explain results
 - Explain what does the curve or data mean, e.g., “We observed that ...”, “The experimental results show ...”
 - Summarize your findings, remember to get back to answer the hypotheses and questions;
 - It is ok to have an indecisive or negative answer based on the experimental results
 - Optional: discussion subsection; or you can put it as a separate section

Discussion Section

- Limitations and issues your approach/implementation currently cannot address
 - Optional: how are you going to address them in future work
- Other caveats (scope of your approach)
- It is often a good idea to list (obvious) limitations and discuss possible solutions for them rather than hiding them
 - Reviewers can often identify obvious limitations even if you don't state them; then they will criticize your work on these limitations (you often don't have a rebuttal against these criticisms in conference reviews).
 - If your paper discusses these obvious limitations as well as their potential solutions, the situation can be alleviated (it is like you have a rebuttal in your paper already before being criticized!).
- Possible applications of your approach that you haven't validated but are convincingly feasible or effective.

Related Work Section

- Don't make unjustified unobvious criticisms on related work if you don't have experimental results to back you up.
 - But you can cite others' experiments to back you up.
- Don't overclaim your work without justification
- Don't intentionally leave out your own very related previous papers (reviewers can find them out easily)
 - maybe even need to mention them in Introduction section and explain why the new work is different
 - reviewers often try to identify a marginal/incremental paper or a "least publishable unit (LPU)"

Conclusion Section

- Summarize your findings and contributions
 - Start with “In this paper, we have presented...”
- You can state the broader impacts of your approach
- You can optionally describe limitations and future work here if you don't have a discussion section for them and propose future work

How to Write a Good System Paper?

- Criteria for Evaluation of Submissions
 - Originality
 - Implementation feasibility
 - Lessons learned
 - Choices
 - Context
 - Focus
 - Presentation
 - Writing style

Originality

- Are the ideas in the paper new?
 - You must be familiar with the state of the art and current research in the area covered by your paper in order to know that your work is original.
- Can you state the new idea concisely?
 - Try writing each idea down in a paragraph that someone generally versed in the relevant area can understand.
- What exactly is the problem being solved?
 - Be specific. Be sure to explain why your problem couldn't be solved just as well by previously published techniques.
- Are the ideas significant enough to justify a paper?
 - Frequently, papers describing real systems contain one or two small enhancements of established techniques.

Originality (cont.)

- Is the work described significantly different from existing related work?
 - You should show that your work represents a significant departure from the state of the art.
- Is all related work related from references, and have you actually read the cited material?
 - Reviewers will be skeptical of the originality of your work unless you specifically distinguish it from previously published work
- Are comparisons with previous work clear and explicit?
- Does the work comprise a significant extension, validation, or repudiation of earlier but unproven ideas?
- What is the oldest paper you referenced? The newest? Have you referenced similar work at another institution?

Reality Check

- Does the paper describe something that has actually been implemented?
- If the system has been implemented, how has it been used, and what has this usage shown about the practical importance of the ideas?
 - Again, be specific,
- If the system hasn't been implemented, do the ideas justify publication now?
 - Write a design paper describing a new system, then follow it up in a year or two with an "experience" paper.
 - Include initial experience in the closing sections of the design paper
 - The subsequent experience paper then deals with the lessons learned from longer-term use of the system, frequently in unanticipated ways

Lessons

- What have you learned from the work?
 - If you didn't learn anything, it is a reasonable bet that your readers won't either, and you've simply wasted their time and a few trees by publishing your paper.
- What should the reader learn from the paper?
 - Spell out the lessons clearly
- How generally applicable are these lessons?
 - Be sure to state clearly the assumptions on which your conclusions rest.
 - Be careful of generalizations based on lack of knowledge or experience. A particularly common problem in "real system" papers is generalization from a single example
 - When stating your conclusions, it helps to state the assumptions again

Choices

- What were the alternatives considered at various points, and why were the choices made the way they were?
 - A good paper doesn't just describe, it explains.
 - You want to save future researchers from following the same blind alleys.
 - You also want to record potentially interesting side-streets you didn't happen to explore.
- Did the choices turn out to be right, and, if so, was it for the reasons that motivated them in the first place?

Context

- What are the assumptions on which the work is based?
- Are they realistic?
- How sensitive is the work to permutations of these assumptions?
 - It is always a good idea to perform **sensitivity study** in the experiment section.
- If a formal model is presented, does it give new information and insights?
 - Simply defining a model for its own sake is not very useful. One deep theorem is worth a thousand definitions.

Presentation

- Be focused:
 - Does the introductory material contain excess baggage not needed for you main development?
- Are the ideas organized and presented in a clear and logical way?
- Are terms defined before they are used?
- Are forward references kept to a minimum?
- Is the writing clear and concise?
- Are words spelled and used correctly?
- Are the sentences complete and grammatically correct?
- Are ambiguity, slang, and cuteness avoided?

How to Present Research Papers?

- Communication skills.
- Preparing the Talk.
- Delivering the Talk.
- Handling Q&A.
- 21 secrets to becoming a good speaker.

Passion: the Secret of Good Talks

- Most important factor is PASSION!
 - If you're passionate, your vocal & visual skills will come naturally.
 - Passion could come from subject, experience, or environment.
 - “There is just one sure cure for bad speeches – Get truly excited on the subject, and 99 percent of the faults of your speaking will disappear.”
-- *Robert Montgomery*

Verbal Skills

- Be simple and clear!
 - Don't ramble .
 - Stop to think if you need to.
 - Speaking is not like writing!!!
 - Use simple words.
 - Don't use complex sentences
 - Play your voice with pitch and tempo.
 - To amplify a point, slow down, speak loudly, exaggerate intonation, pause in the right places.

Visual Skills

- Visual Skills – THE most important:
 - Appear trustworthy & respectful.
- Components of Visual Skills:
 - Eyes.
 - Body.
 - Hands.
 - Face.

Visual Skills – Eyes

- Look forward at audience (trust).
 - Don't shift eyeballs; don't look in corner.
 - Don't look too much at computer screen or your notes.
- Look at people's faces (not eyes).
 - 3-6 seconds per person.
 - Shift randomly.
 - Nod, smile, use facial expression.

Visual Skills – Body

- Stand up when talking.
- Walk around = informal.
- Don't:
 - Rock, shake, lean too much.

Visual Skills – Hands

- Gesture complements talk.
 - Should come naturally, without thinking.
 - Make sure they match!
- Need to exaggerate a little
 - Especially with large audience.
- Don't fidget or put in pocket.
- Videotape whole talk & watch.
 - Can improve hand gesturing!

Visual Skills – Face

- Show emotion!
- Most of the time:
 - “I care a lot about this.”
 - “I really believe in this.”
 - “I love my work.”
- Sometimes (in response to questions).
 - “This is the most outrageous thing I’ve ever heard.”
 - “I will have nothing to do with this.”

Preparing the Talk

- **Always OVERPREPARE!!!!**
- Preparation includes:
 - Researching the background.
 - Organizing the talk.
 - Writing the slides.
 - Rehearsing the talk.
 - Last minute things....

Researching the Background

- When you're invited, find out:
 - How long is the talk?
 - What's the topic?
 - (Say no if you don't care about the topic).
 - Who's the audience.
- Once you say yes, you are COMMITTED to do a great job.

Organizing the Talk

- You're the salesman.
- First lesson for salesmen:
 - “Tell them what you're going to say.
 - Say it.
 - Tell them what you said”
- Very similar to a term/research paper!

The Central Message (it)

- People will not remember everything.
- Have ONE clear walk-away message.
 - What do you want people to remember in 3 months?
 - The answer to the question:
“How was the talk?”
- Repeat it!

Q&A

- Q&A is your chance to:
 - Amplify your points.
 - Increase your credibility.

Dealing with Questions

- Easy Questions.
 - Amplify your points!
- Hard Questions.
 - No need to answer directly.
 - But don't hide!
- Narrow Questions.
 - Take offline.

Q&A – Giving A Good Answer

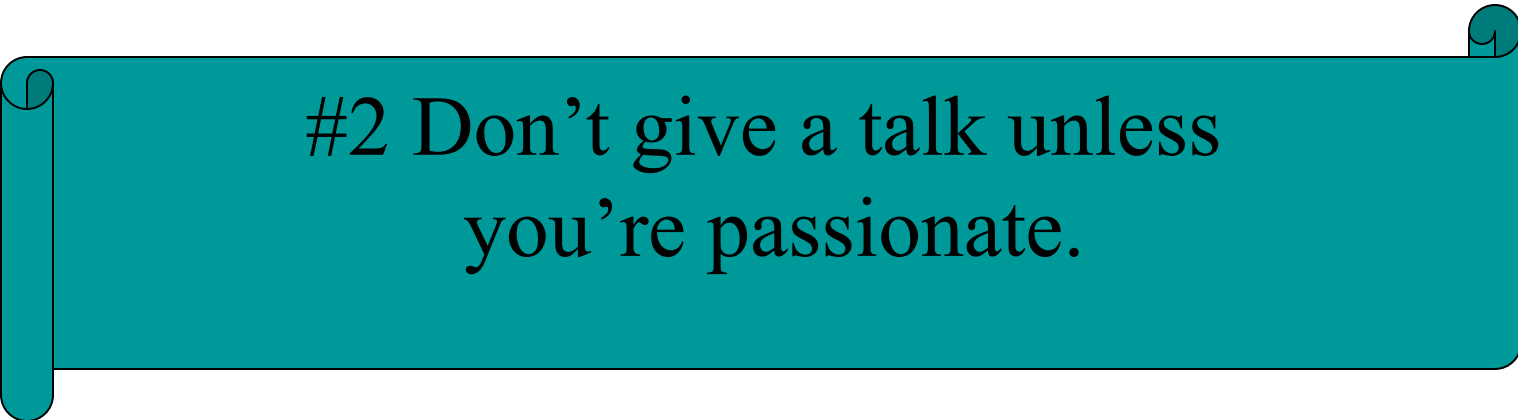
- Respect the listener.
- Right body language.
- Repeat the question.
 - Complete if people cannot hear.
 - Paraphrase to help amplify your point.
- If people are too shy, you start!
- Don't argue or dismiss a question.

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a slight 3D effect, containing the text.

#1 Anybody can learn to give a good talk.

21 Secrets

A horizontal teal-colored bar with rounded ends, designed to look like a scroll. It has a black outline and small circular details at the corners suggesting the binding of a scroll.

#2 Don't give a talk unless
you're passionate.

21 Secrets

A horizontal teal-colored scroll with a black outline. The scroll is unrolled in the center, with the top and bottom edges curled up like a scroll. The text is centered within the unrolled portion.

#3 Use simple and clear words.

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a small circular detail on the left side, containing the text.

#4 Play your voice to focus on key points.

21 Secrets

A horizontal teal-colored scroll with a black outline. The scroll is unrolled in the center, with the top and bottom edges curling upwards at the left and right ends, resembling a rolled-up document.

#5 Silence is a great tool.

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a vertical strip on the left side, resembling a rolled-up document.

#6 Over-prepare every talk.

21 Secrets

#7 Tell them what you're going to say.

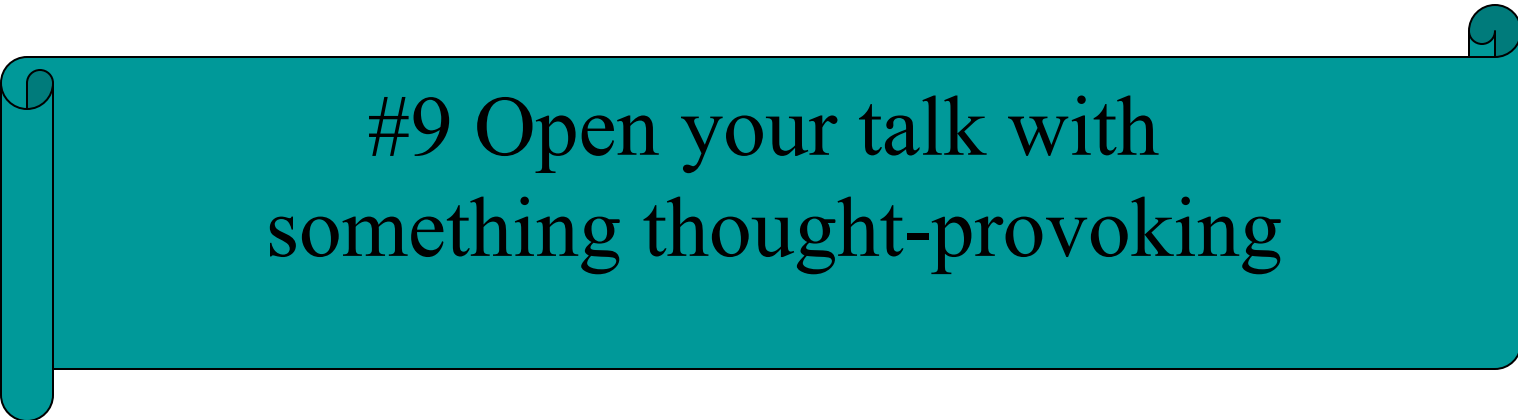
Say it.

Tell them what you said.

21 Secrets

#8 Have ONE clear central message for:
the question “How was the talk”

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a vertical strip on the left side, resembling a rolled-up document.

#9 Open your talk with
something thought-provoking

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a small circular detail on the left side, containing the text "#10 Slides should be simple & clear." data-bbox="100 320 890 610">

#10 Slides should be simple & clear.

21 Secrets

A horizontal teal-colored bar with rounded ends, designed to look like a scroll. It has a black outline and small circular details at the top and bottom edges that suggest the binding of a scroll.

#11 Don't read from your slides.

21 Secrets

A horizontal teal-colored scroll with a black outline. The scroll is unrolled in the center, with the top and bottom edges curling upwards at the left and right ends, resembling a rolled-up document.

#12 Order your demos.

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a small circular detail on the left side. It contains the text for secret #13.

#13 Rehearse & listen to each talk
at least twice!

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a small circular detail on the left side, containing the text "#14 Time your talk on every slide." data-bbox="100 320 890 610">

#14 Time your talk on every slide.

21 Secrets

A teal-colored horizontal scroll with rounded ends and a black outline. The scroll is partially unrolled, with the text visible on the flat surface.

#15 It may be OK to read from a script.

21 Secrets

#16 Stay awake!

Drink 3 cups of coffee before your talk.

21 Secrets

A teal-colored horizontal scroll with rounded ends and a small circular detail on the left side.

#17 It is possible to hide nervousness.

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a small circular detail on the left side. It contains the text for the 18th secret.

#18 Tailor your opening remarks
to the occasion.

21 Secrets

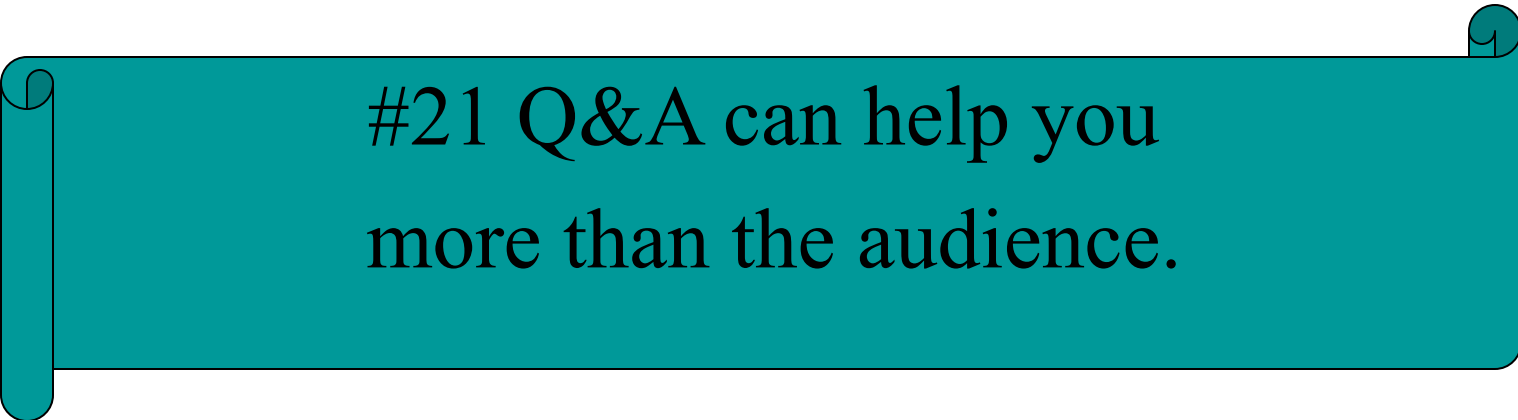
#19 “If you only remember one thing from this talk, you should remember XXX”

21 Secrets



#20 Humor & Interactivity must be relevant and well-planned.

21 Secrets

A teal-colored horizontal scroll graphic with rounded ends and a vertical strip on the left side, resembling a rolled-up document.

#21 Q&A can help you
more than the audience.

Conclusion

- Giving a talk is easy.
- It just takes:
 - A little passion.
 - A lot of practice!