



How To Give a Talk

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You need to acquire the skills, And you can acquire the skills

- Public speaking *is* in your future
- E.g., every technical position requires presentations from time to time
- E.g., the single most critical aspect of a job interview for a research position is the technical seminar
- It is possible to develop the right skills, even if you have no natural talent
- My goal is to get you started down the right path...



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What is the purpose of a technical talk?

- A technical talk is a sort of advertisement for your work and you
 - Convince them to read the paper!
- Even in an hour-long seminar, it's impossible to cover all details
 - Not the same as teaching a class
- Focus on big ideas and major impact
- Use simplifying assumptions
 - E.g., focus on 2D or 3D
 - E.g., present simple, visual examples



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You should get experience giving technical talks early & often

- Student seminars
 - E.g., form a graduate student seminar or reading group at your university
 - E.g., Toastmasters
- Internships
 - Give an end of the summer presentation
- Local & national meetings
 - Often have slots for contributed posters or short talks



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Planning for a Talk



Write Your Talk to Your Particular Audience

- Who is the audience?
 - Students vs. Professors/Researchers
 - Specialists in my subfield for field, e.g., Linear Algebraists or Applied Mathematicians
 - General audience, e.g., Engineers, Software Developers, Scientists
 - Other, e.g., Managers, Congressional Staff, Community Members
- For a mixed audience: give enough detail for specialists but enough of an overview for everyone else
- Challenge: Add audience-specific content, e.g., references



Your talk supports a thesis

- Consider the central argument of your talk
 - What's the big new idea?
- Consider the supporting and complementary messages as well
 - Your contributions to the project
 - Important points for building up to the big theme
- Example Theme: We have developed new methods for handling linear constraints in a derivative-free optimization context
- Avoid a chronological description of your work!

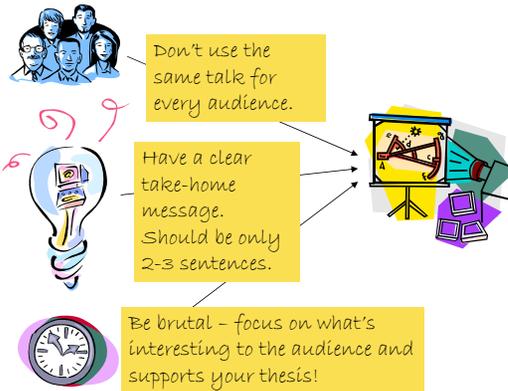


Make Your Material Fit into the Time Allotted

- Make sure the main message is highlighted in the time you have
 - Avoid the need to skip over important material by planning ahead
- Prioritize the details
 - E.g., maybe there is only time for numerical results or theory
- Check local customs on presentation times
 - Some places always start and finish 5 minutes late
- Respect the audience by finishing on time!



Mix & Stir Well for a Great Talk



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Components of a Talk



There are Typical Components to CS&E Talks

- Background & Motivation
- Algorithm Description
- Theoretical Results
- Numerical Results
- Conclusions
- Future Work



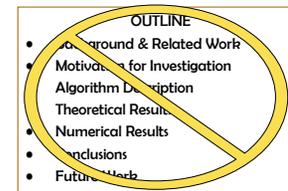
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Avoid Outline Slides (Generally)

- 99% of outline slides are identical, so they don't add anything to the presentation
- **Alternative:** Substitute "transition slides"
- The exception is outlines that don't fit the typical mode and support the thesis of the talk; see Kelly Dickson



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Outline Slides that support the thesis are Good!

Overview

- ▶ Background
 - ▶ numerical continuation and natural parameterization
 - ▶ pseudo-arclength continuation (ΨAC) for simple folds
- ▶ Results
 - ▶ **NEW THEOREM:** a condition estimate for ΨAC applied to paths containing simple folds
 - ▶ sketch of proof
- ▶ Summary

A good example of a useful outline slide.

From: Kelly Dickson, SIAM Annual Meeting, 2006

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Background & Motivation < 33%

- Only present what's need to support your thesis
- Dedicate the majority of the time to your contributions
- **But** avoid rehashing your own older work
- Be sure to cite related work
 - Papers, software, ideas
 - Cite the names of the people involved, not just the software packages
- **Trick:** Work in background in the middle of the talk



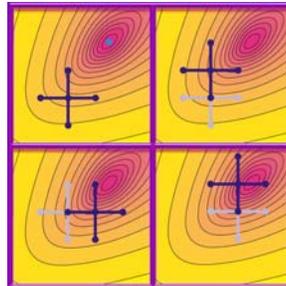
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Algorithmic Description: Highlight New Additions

- Present a simplified version of the algorithm
 - E.g., assume $x_0 = 0$ for an iterative method
- Keep mathematical notation simple and standard
- Focus on what's new in your version
- **Challenge:** Try to describe the algorithm in words in addition to (or rather than) math
- **Challenge:** Ditto for pictures



An illustration of four steps of generating set search (GSS) for nonlinear optimization

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Theoretical Results: Help Audience Untangle the Math

- Theoretical results can be tough to absorb from a talk
 - Especially for non-specialists
- Be sure to explain the impact of the results as well as the results themselves
- Only present proofs if they support the thesis
- **Idea:** Use color to highlight the key parts of interest

Tensor-matrix-products

Matricization and vectorization obscure the structure.

Basic rule: **Matricize and vectorize as late as possible!**

Lemma 1. Let B and C be 3-tensors of conforming dimensions.

$$\begin{aligned} \langle B(X_1)_{(11)}, C(X_2)_{(11)} \rangle &= \langle X_1, (B \otimes C(X_2)_{(11)})_{(2,3)} \rangle \\ &= \langle X_1, (B \otimes C)_{(2,3)}(X_2)_{(11)} \rangle \end{aligned}$$

Matrix factors can be "pulled out" of the inner product.

From: *Computing the best rank-(r_1, r_2, r_3) approximation of a tensor*, Lars Elden, Workshop on Algorithms for Modern Massive Data Sets, June 2006.

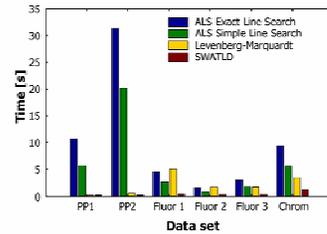
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Numerical Results: Make it Clear What's What

- Avoid showing tables of numbers
- **Idea:** Use bar charts and graphs
- Clearly label the axes & provide a legend
- Make sure it's clear which method is yours!



From: Computational Tools for PARAFAC models, G. Tomasi, Workshop on Algorithms for Modern Massive Data Sets, June 2006.



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Conclusions & Future Work: Tell 'Em What You Said

- Succinctly restate your thesis
- Remind the audience of the...
 - Motivation for the research
 - Supporting evidence
- Where to next?
 - Explain what you didn't figure out (enhances credibility)
 - Larger open issues
 - Cite related work
- Be sure to also include a slide at the end with your name, email, and URL



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Secret Weapons

- Prepare back-up slides with more details to answer questions
- Bring copies of your talk, poster, or paper as handouts
- **Reminder:** Cite related work throughout the talk
 - People love to hear their own names



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Creating Your Slides



Bye-Bye Latex

- I used to recommend LaTeX for slides
- Pros:
 - Good at math
 - Easy to create PDF
 - Works with Linux
- Cons:
 - Inserting images is hard
 - Animations are really tough

Creating Your Slides

Use LaTeX with the Beamer class
Handwritten talks are hard to do well
PowerPoint has trouble with equations
This talk uses (derives from)
Use LaTeX packages
Use the Beamer environment to draw pictures in LaTeX





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Use PowerPoint + TexPoint

TexPoint Edit Tex display

Format: 256 colors PNG Blend Block

Resolution: 1200 Transparent Work

Make bitmap Refresh later Cancel Export LaTeX

LaTeX source for bitmap display:

```
\documentclass[slides]{pagestyle{empty}}
\begin{document}
\begin{displaymath}
y = Ax + b
\end{displaymath}
\end{document}
```

$$y = Ax + b$$

- Pros
 - No compilation
 - Easy to add pictures
 - Easy to add animation
 - Easy to add equations (with TexPoint – do not use built-in equation editor)
- Cons
 - No Linux support
 - TexPoint costs \$25
 - Harder to make PDF
- Other
 - Ubiquitous
 - Management requirement



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Make Your Slides Readable

- **Do:** Make fonts large (use at least 14pt font)
- **Do:** Use lots of pictures, including general pictures
- **Do:** Use titles that say something (e.g., “Numerical results show new method is fastest”)
- **Do:** Put up the entire slide at once rather than using the “strip tease”
- **Don't:** Use yellow on a white background (or green text on blue, or blue on black, etc.)
- **Don't:** Forget to check grammar and spelling
- **Don't:** Overcrowd the slide





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Colors and Animations: Friend or Foe?

- Use color for emphasis and connections
- Avoid more than 4 colors
- Use animations for emphasis and clarity
- Avoid all gratuitous animation
 - Including page transitions, which PPT likes to sneak in
- Avoid the “strip tease”
 - Generally best to put all information up at the front

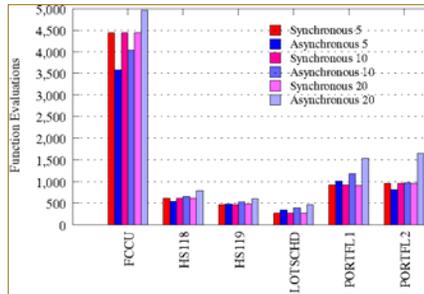


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Generating Pictures for Slides

Tools for generating pictures: MATLAB, Excel, bargraph.pl (*), LaTeX picture env.

- Be sure that the axes are labeled and the legend is clear
- Use thick lines and colors that show up well



(*) <http://www.burningcutlery.com/derek/bargraph/>

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Pictures can also be used to reinforce an idea



Why use derivative-free?

Answer: Sometimes you don't have choice

Derivative-based \mathcal{N}

- Function evaluations **quick**
- All points in Ω **fully defined**
- Constraints and search in Ω
- LHAs in an **atom**
- Looking for **nearest local min**

Derivative-free \mathcal{N}

- Function evaluations **slow**
- Points in Ω may be **undefined**
- Discontinuous, nonconvex, **cheap**
- **Not an atom**
- **Wanting something more global**

Should I take the



or this



?

Derivative-based methods place stronger restrictions on $f(x)$ and Ω but require fewer function evaluations to reach solution.

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July 17, 2006

From: Josh Griffin, July 2006.

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Presentation Tips

Three Rules: Practice, Tuning, & Timing

- Prepare your talk at least one week in advance
 - Stay focused on the thesis
- Practice! Practice! Practice!
 - Helps with nerves
 - Get feedback to improve the talk
- Perfect the timing
 - Allow 2-4 minutes per slide
 - Use practice runs to be sure you can finish on time



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On the day of the talk, be prepared

- Dress professionally to show respect
 - No jeans, no shorts, no t-shirts
 - Very important for interview talks
 - **Hint:** Every talk is an interview talk
 - **Good idea:** Outfit should accommodate a microphone
- Bring back-ups (your computer will die!)
 - USB stick
 - Mail a copy to your host/session chair in advance
- **Idea:** Bring handouts of your talk
- **Bonus:** Bring your own laser pointer



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Everyone has Nerves (I'm nervous right now!)

- Nerves are a natural part of public speaking
- The good news is that they enhance your energy
- To calm your nerves, take a slow, deep breath or take a drink of water
- **Recommendation:** Join a group such as Toastmasters to improve your speaking skills



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Speak to/towards the Audience

- Face the audience as you speak
 - **Trick:** Look at the laptop screen rather than at the projection
 - Make eye contact
- Speak slowly, clearly, and loudly
- **Avoid** reading the slide
 - Think of why you added that slide!
- **Don't** block the audience view
 - Try to stand next to the projection
- **Challenge:** Don't use any pointer!
 - Design the slides with this in mind



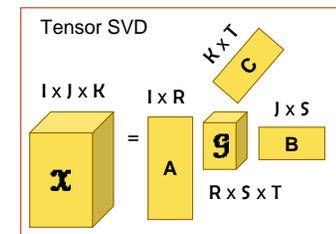
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Avoid pronouns

- Be explicit when referring to objects on the screen
- Try not to say
 - This
 - That
- Avoid just pointing



It would be much easier to just point for this equation, but instead say the names explicitly.



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Don't Run Over on Time

- Better 5 minutes too short than 5 minutes too long
- Be respectful of other people's schedules
 - Conferences are tightly scheduled
 - People may need to walk out due to other engagements
- If you're being slowed down by questions, defer them until the end of the talk
- **Hint:** Build in "flex slides" that can be used if there is extra time
- Leave adequate time for questions at the end
 - 5 minutes for short talks, 10 minutes for seminars



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Answer Questions with Confidence (even if you don't know the answer)

- Repeat the question before answering
- If you don't know how to answer, say
 - "Excellent question! I hadn't thought of that before, but I'd like to talk to you more offline."
- Take the questions seriously, even if they seem stupid
 - May not fully understand the true question
- Write down the questions you were asked so you are better prepared next time
 - Can even do this at the time of the question!
- Don't be surprised if you're told that your work has been done before – be enthusiastic rather than defensive
 - And ask for the reference!!



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Wrapping Up



You can give a great talk!

- Build your talk around a core message
- Plan for: Audience + Time
- Spend at least 2/3 of the talk on your new material
- Provide supporting evidence for your thesis, like theory and numerical results
- Prepare in advance
- Practice, practice, practice



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Please Contact Me With Questions

- Tammy Kolda, tgkolda@sandia.gov,
<http://csmr.ca.sandia.gov/~tgkolda/>
- Speakers who have really influenced me (with very different styles): Dianne O'Leary, Juan Meza, Margaret Wright, Nick Higham (see his Handbook of Writing) , Rosemary Chang, Ilse Ipsen, Pete Stewart, Philip Kegelmeyer, etc.

Thank You!



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