How to give mathematics seminars

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Audience

A seminar (or video, thesis, paper, ...) is a piece of communication. You are talking to smart people, so if they don't understand, that's your problem!

- Who is the (expected) audience?
- What do they already know about the topic?
- What are you trying to convey (1 idea)?

You are telling a story: introduction, coherent arc, end with a punchline

Exercise

Exercise:

1. Pair up with someone who studies a very different area to you
2. Explain your thesis topic to them (3 min) — questions are encouraged!
3. They will then explain your topic to another pair (1 min per pair)
4. Repeat

What did/didn't work?

Theory

- Give proof details (otherwise hard to get a 'taste' of the topic) — but only showing key lines can be a good way to go
- Don't show full generality: simplest interesting case is ideal
  - Mention more complicated cases for the experts
  - "In this talk, I will work in L^2, but everything works for L^p $(1 \leq p \leq \infty)$ if you..."
  - "I will work in $\mathbb{C}$, but this works for any field..."
- Vary level of rigour/precision: some definitions & theorems in full details, some as heuristics
- Examples & pictures are always useful
- Notation: consistent, clear, minimal
- Cite yourself with initials only [P. P. & L. R., 2021]
- What are you trying to *ultimately* convey?

Board Talks

- Common in pure maths, unusual in applied maths
- Slows you down — makes it easier to follow
- Prepare detailed & clear notes
- Do everything from memory, or with minimal checking of notes (slows you down, stops you skipping ahead)
- Handwriting: neat & large

Slides

- Beamer allows you to generate slides in LaTeX (but some use Keynote or Powerpoint)
- Pick a template that you like: not crowded, but some repeated information can be useful (e.g. name, title)
  - These slides use a modified version of metropolis
  - Slide numbers are very helpful for Q&A
- Don't overcrowd information: nobody reads walls of text
- Avoid cross-references (I don't remember what "Lemma 2" or equation (3) was)
- Including citations is good
  - Formatting: [Jones & Smith, 1998] or [Jones & Smith, *Invent. Math.*, 1998] is better than [1], since audience can write down immediately (e.g. apalike in Bibtex)
- 1–2 minutes per slide *including* 'padding' slides (title, outline, etc.).
  - Pierre is more conservative (5 minutes per slide)

Figures

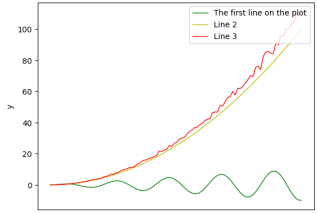
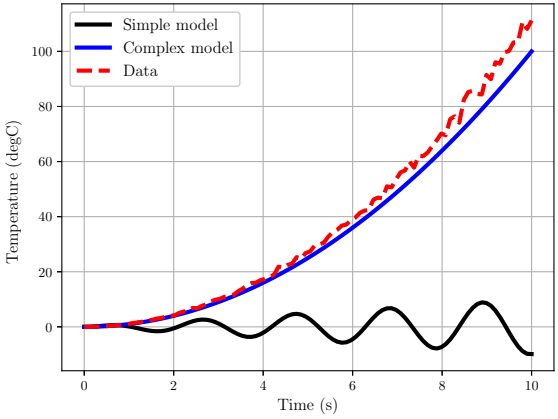


Figure 1



Comparison to data

Figures

- Keep it minimal: drop unnecessary lines, use short labels, few figures per slide
- Size matters (figure size, line width ≥ 2, font size)
- Many plotting packages allow you to write LaTeX in labels
- Plots should be readable in black & white (vary linestyle and/or markers)
  - Yellow usually invisible, 1 in 12 men are colourblind (red/green most common)
- Obvious stuff: legend (not blocking important things), axis labels & values sensible, helpful captions
- Talk! Explain what you are plotting, which line is which, give us time to understand (and hints are good: "higher curves are better")

Tables? Almost never a good idea (use bold/colours/etc. to direct attention)

Public speaking

- Talk to the back of the room (unless using a microphone)
- Look at the whole audience while speaking (especially for board talks)
- Don't rush
- Vary pitch — make us *want* to listen to you
- Don't read every word on a slide (or every term of an equation)
  - Talk around each point
  - Slide text shouldn't be full sentences
- Observe others: what do you like/dislike?
- Q&A session:
  - Actually answer the question! Don't lie ("I'm not sure, but..." is fine)
  - Ask good questions: ≤ 2 sentences, last sentence ends with a question mark

Practicalities

- Always mention co-authors, acknowledge funding bodies, thank organisers (if relevant)
- Practice
- Double-check your notes/slides (mistakes, hard to read, **??**, embedded videos, etc.)
- Check the room beforehand: layout, IT equipment
  - Projector works
  - Using laptop or from USB (is there a desktop?)
  - Have all required cables
  - Chalk/markers/erasers available? Which markers work? What colour(s) will you use?
- Start with an empty board, even if using slides
- Stick to time
- Arrive early, meet the chair, don't leave immediately afterwards (if possible)

Other views

These are my views (with input from Pierre) — you may disagree. Ask yourself:

- What one thing do I want my audience to remember?
- Would I enjoy listening to my talk?
- What talks/lectures have I enjoyed/disliked & why?

Other views

- `http://www.math.wisc.edu/~ellenber/mntcg/TalkTipSheet.pdf`
- `https://people.bath.ac.uk/eas25/pgaway_2015_annotated.pdf`
- `https://faculty.washington.edu/heagerty/Courses/b572/public/HalmosHowToTalk.pdf`

Questions?