10 tips for academic talks

Nelson A. Uhan
Disclaimer

- I’m not a master public speaker

- I’ve collected some “dos and don’ts” through observation and experience

- This talk is heavily inspired by and borrowed from Matt Might (http://matt.might.net)
1. Know your audience

- Find out who you’re speaking to, and aim appropriately

- A talk for a general IE audience is different from a talk to experts in (insert specific subdomain here)

- Take your time with introductory material, even if it feels awkward or insulting (it’s not)

- It’s easy to gloss over concepts and details that took us years to learn
2. Practice, practice, practice

- Practice is the key to a natural delivery

- **Rehearse** the presentation, don’t memorize the talk
  - e.g. transitions between topics, intentional pauses

- Concentrate on your **opening**
  - First impressions are important
  - Good opening = comfort early on
2. Practice, practice, practice

- After rehearsing, ask yourself:
  - Was there a slide/topic I spent too much time on?
  - Was there a slide/topic I could have done without?

  ⇒ Expand or cut as necessary

- For conferences, I practice my full talk at least 3 times
  (When I was a graduate student... 10 times?)
3. A talk is about an idea, not a paper

- It takes hours of thoughtful reading to digest the average paper in detail

- A talk is typically 15-30 minutes

- The talk should present the same idea in the paper, but on its own terms
  - The ideal outline for a talk may be very different from how the paper is organized
  - The talk should concentrate on the key ideas
  - Examples are good
4. The 40/30/30 rule

- First 40% of your talk:
  - Introduce and motivate your problem
  - Why is this problem important?

- Second 30% of your talk:
  - Give an overview of your results
  - Why are these results interesting, important, etc.?

- Last 30% of your talk:
  - For the experts: methods, proofs, etc.
  - Blow the audience away with your technical prowess
5. Slides should not overwhelm the viewer

- Too much information on a slide $\Rightarrow$ brain shuts off

- Present information **piecemeal**
  e.g. bullet-by-bullet, node-by-node, equation-by-equation

- Highlight important parts
  (but use sparingly)

- Spread information amongst multiple slides if necessary

- **Do not** cut and paste from your paper
Don’t do this

Theorem
Computing the least core value of scheduling games is NP-hard.

Proof.
By the previous theorem, the least core value of scheduling games is

\[ z^* = \frac{1}{2} \max_{S \subseteq N, S \neq \emptyset, N} \{ v(N) - v(S) - v(N \setminus S) \} = \frac{1}{2} v(N) - \frac{1}{2} \min_{S \subseteq N, S \neq \emptyset, N} \{ v(S) + v(N \setminus S) \}. \]

Note that the minimization problem above is equivalent to the problem of minimizing the sum of weighted completion times of jobs in \( N \), with weight \( w_j \) and processing time \( p_j \) for each job \( j \in N \), on two identical parallel machines. Sahni (1976) showed that this two-machine problem is NP-hard, even when \( w_j = p_j \) for all jobs \( j \in N \). □
Theorem

Computing the least core value of scheduling games is NP-hard.

Proof.

\[ z^* = \frac{1}{2} \max_{S \subseteq N} \{v(N) - v(S) - v(N \setminus S)\} \]

\[ = \frac{1}{2} v(N) - \frac{1}{2} \min_{S \subseteq N} \{v(S) + v(N \setminus S)\} \]

\[ \implies \text{Problem is equivalent to } P2 \parallel \sum w_j C_j, \text{ which is } NP\text{-complete. [Sahni (1976)]} \]
6. A picture is worth a 1000 words

- Images and animations can convey or illustrate an idea better than text

- If you can use an image instead of text, do it
  - This takes thought and time

- Avoid unnecessary details on images
  e.g. scales, tick marks
Illustrating with animations and examples

- Job is completed when all its operations are completed

<table>
<thead>
<tr>
<th>Job 1</th>
<th>Job 2</th>
<th>Job 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation type 1</td>
<td>Operation type 2</td>
<td>Operation type 3</td>
</tr>
<tr>
<td>Machine 1</td>
<td>Machine 2</td>
<td>Machine 3</td>
</tr>
</tbody>
</table>

\[ C_1, C_2, C_3 \]
7. Use math carefully

- Math as a language is expressive and precise
- Talks are hand-wavy and should focus on intuition
- Reading lots of math disengages the reader from the speaker
- Be careful with how you use math
- Avoid unnecessary details
- Consider changing notation to make it easier to grasp
This is not a good way to present math

\[
\begin{align*}
\text{minimize} & \quad C_{\max} \\
\text{subject to} & \quad C_{\max} \geq C_{mn} \\
& \quad C_{00} \geq \sum_{j \in J} \sum_{s \in S} p_{0js} x_{0js} \\
& \quad C_{ik} \geq C_{i-1,k} + \sum_{j \in J} \sum_{s \in S} p_{ijs} x_{ijks} \\
& \quad C_{ik} \geq C_{i,k-1} + \sum_{j \in J} \sum_{s \in S} p_{ijs} x_{ijks} \\
& \quad S_{ij} - S_{hk} \leq M u_{hkij} - 1 \\
& \quad S_{hk} - S_{ij} + \sum_{l \in J} \sum_{s \in S} p_{hls} x_{hlks} \leq M v_{hkij} \\
& \quad C_{ij} = S_{ij} + \sum_{r \in J} \sum_{s \in S} x_{irjs} p_{irs} \\
& \quad u_{hkij} + v_{hkij} = 1 + y_{hkij} \\
& \quad x_{hlks} + y_{hkij} \leq 1 + z_{hlksij} \\
& \quad \sum_{k \in J} \sum_{s \in S} x_{ijks} = 1 \\
& \quad \sum_{j \in J} \sum_{s \in S} x_{ijks} = 1 \\
& \quad \sum_{s \in S} x_{ijks} = \sum_{s \in S} x_{hjks} \\
& \quad \sum_{r \in J} \sum_{s \in S} q_{irs} x_{irjs} + \sum_{h \in M, h \neq i} \sum_{l \in J} \sum_{k \in J} \sum_{s \in S} q_{hls} z_{hlksij} \leq Q_{\max} \\
& \quad x_{ijks}, u_{hkij}, v_{hkij}, y_{hkij}, z_{hlksij} \in \{0, 1\} \\
\end{align*}
\]

\(i = 1, \ldots, m; \ k \in J,\)

\(i \in M; \ k = 1, \ldots, n - 1,\)

\(i, h \in M; j, k \in J,\)

\(i, h \in M; j, k \in J,\)

\(i \in M; j \in J,\)

\(i, h \in M; j, k \in J,\)

\(i, h \in M; j, k \in J,\)

\(i \in M; k \in J,\)

\(i, h \in M; j, k \in J,\)

\(i \in M; j \in J,\)

\(i, h \in M; j, l, k \in J; s \in S.\)
Overall mathematical program

minimize \( C_{\text{max}} \)
subject to permutation flow shop constraints
concurrent job constraints
peak power consumption \( \leq Q_{\text{max}} \)
variable-type constraints (nonnegativity, binary)

Subsequent slides: one slide per constraint type
8. Style matters

- Your talk is primarily about what you say, but...

- Your slides should be visually appealing
  - Clean fonts
  - Lack of gratuitous adornments
  - Balance of whitespace
  - Imagery and animations that enhance intuition

- Learn to use your presentation software/package well (e.g. Beamer, PowerPoint, Keynote)
9. Questions are not random

- Anticipate questions your audience might ask

- Some answers belong in your talk

- Some don’t, but you can reserve a separate slide

- For unanticipated questions, buy time by reformulating the question in your own words

- If an exchange becomes long or hostile, thank the questioner and suggest taking the discussion offline
10. Speak slowly and use your body

- You are probably talking too fast
  - Rule of thumb: *at least* 1 minute per slide

- Be aware of your **body language**
  - Stand up straight
  - Gesture with your whole body

- Look at your projected slides, not the computer

- Step away from the podium, walk around

- Invest in a good presentation remote
To summarize...

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7. Use math sparingly
8. Style matters
9. Questions are not random
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