# 10 tips for academic talks

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# 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?

  $\Rightarrow$ 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

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

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 $j \in N$. □

# Do this

## Theorem

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

## Proof.

$$z^* = \frac{1}{2} \max_{\substack{S \subseteq N \\ S \neq \emptyset, N}} \{v(N) - v(S) - v(N \setminus S)\}$$

$$= \frac{1}{2} v(N) - \frac{1}{2} \underbrace{\min_{\substack{S \subseteq N \\ S \neq \emptyset, N}} \{v(S) + v(N \setminus S)\}}_{\mathrm{P2}\,||\,\sum w_j C_j}$$

$\Rightarrow$ Problem is equivalent to $\mathrm{P2}\,||\,\sum w_j C_j$, which is NP-complete. [Sahni (1976)]

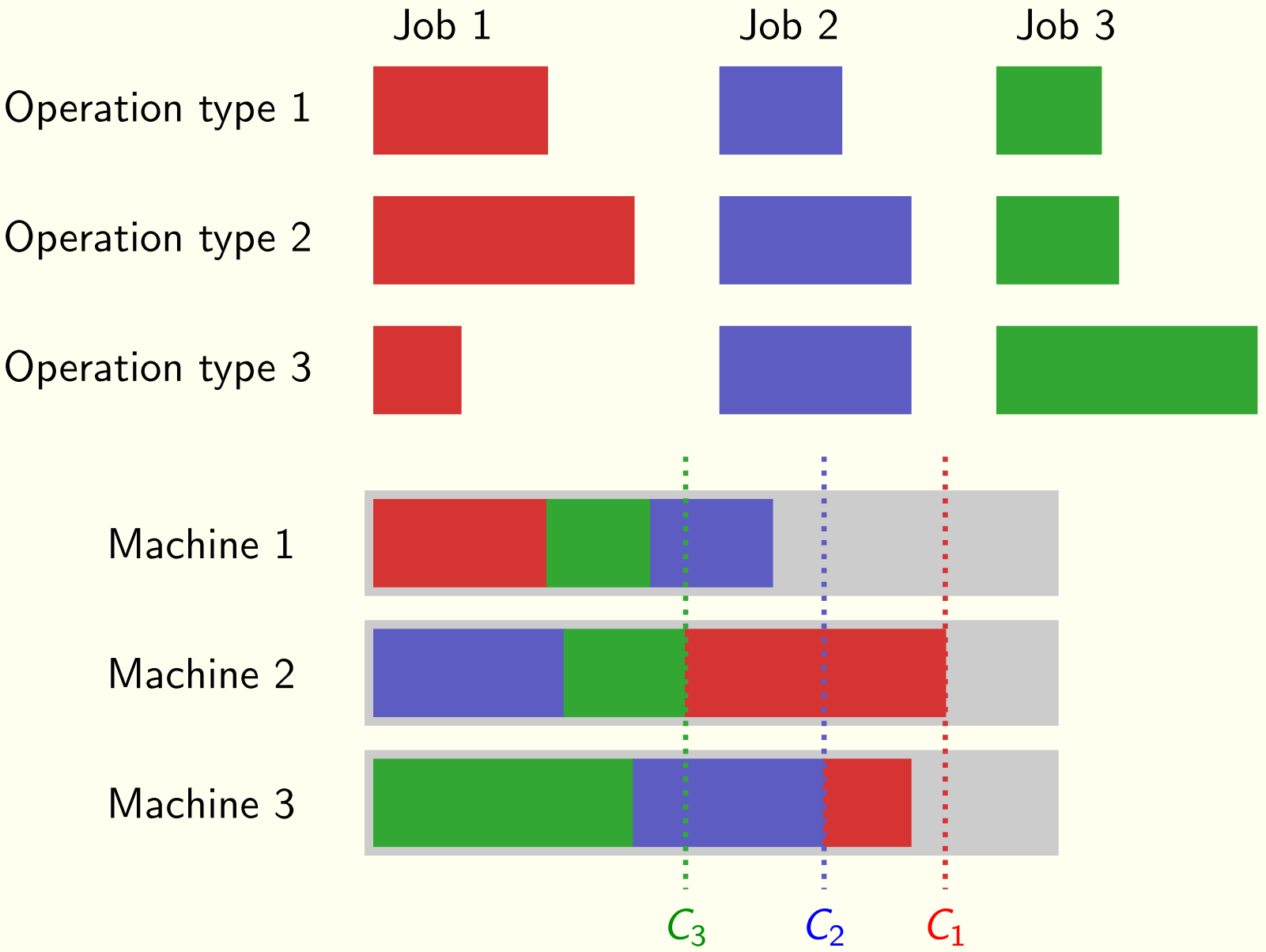
□

# 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



# 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

$$
\begin{aligned}
\text{minimize} \quad & C_{\max} \\
\text{subject to} \quad & C_{\max} \geq C_{mn} \\
& C_{00} \geq \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{0js} x_{0j0s} \\
& C_{ik} \geq C_{i-1,k} + \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{ijs} x_{ijks} && i = 1, \ldots, m;\ k \in \mathcal{J}, \\
& C_{ik} \geq C_{i,k-1} + \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{ijs} x_{ijks} && i \in \mathcal{M};\ k = 1, \ldots, n-1, \\
& S_{ij} - S_{hk} \leq M u_{hkij} - 1 && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& S_{hk} - S_{ij} + \sum_{l \in \mathcal{J}} \sum_{s \in \mathcal{S}} p_{hls} x_{hlks} \leq M v_{hkij} && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& C_{ij} = S_{ij} + \sum_{r \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{irjs} p_{irs} && i \in \mathcal{M}; j \in \mathcal{J}, \\
& u_{hkij} + v_{hkij} = 1 + y_{hkij} && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& x_{hlks} + y_{hkij} \leq 1 + z_{hlksij} && i, h \in \mathcal{M}; j, k, l \in \mathcal{J}; s \in \mathcal{S}, \\
& \sum_{k \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{ijks} = 1 && i \in \mathcal{M}; j \in \mathcal{J}, \\
& \sum_{j \in \mathcal{J}} \sum_{s \in \mathcal{S}} x_{ijks} = 1 && i \in \mathcal{M}; k \in \mathcal{J}, \\
& \sum_{s \in \mathcal{S}} x_{ijks} = \sum_{s \in \mathcal{S}} x_{hjks} && i, h \in \mathcal{M}; j, k \in \mathcal{J}, \\
& \sum_{r \in \mathcal{J}} \sum_{s \in \mathcal{S}} q_{irs} x_{irjs} + \sum_{h \in \mathcal{M}, h \neq i} \sum_{l \in \mathcal{J}} \sum_{k \in \mathcal{J}} \sum_{s \in \mathcal{S}} q_{hls} z_{hlksij} \leq Q_{\max} && i \in \mathcal{M}; j \in \mathcal{J}, \\
& x_{ijks}, u_{hkij}, v_{hkij}, y_{hkij}, z_{hlksij} \in \{0, 1\} && i, h \in \mathcal{M}; j, l, k \in \mathcal{J}; s \in \mathcal{S}.
\end{aligned}
$$

# This is a better way to present math

- Overall mathematical program

| | |
|---|---|
| minimize | $C_{\max}$ |
| subject to | permutation flow shop constraints |
| | concurrent job constraints |
| | peak power consumption $\leq Q_{\max}$ |
| | 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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2. Practice, practice, practice
3. A talk is about an idea, not a paper
4. The 40/30/30 rule
5. Slides should not overwhelm the viewer
6. A picture is worth a 1000 words
7. Use math sparingly
8. Style matters
9. Questions are not random
10. Speak slowly and use your body