How to Give a Good *Online* Scientific Talk

Computer Vision and Machine Learning
for Computer Graphics

Seminar – Summer Term 2021

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Graphics Vision & Video

max planck institut informatik

After you have read and understood the papers…

max planck institut
informatik

...

After you have read and understood the papers...

...you will have to present them online via Zoom.

Outline

* Structuring your story
* Preparing your data and information
* Preparing and giving the presentation
* Concluding your presentation
* Questions and answers

Presentation Structure :: Basic Rule

* Say what you are going to say (introduction)
* Say it (give the core talk)
* Say what you said (summarise and conclude)

Images: http://blogs.nature.com/naturejobs/2017/01/11/scientific-presentations-a-cheat-sheet/
https://www.barnesandnoble.com/blog/7-books-you-wont-believe-are-nonfiction/

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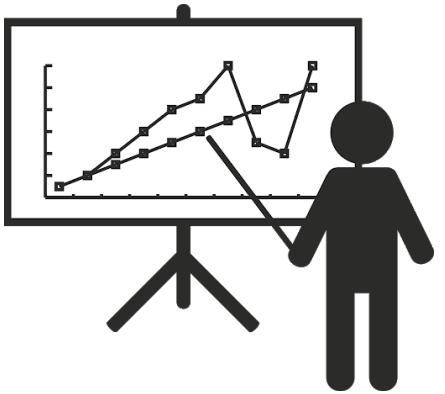

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vs

This is about scientific findings and implications:
Do not try building suspense and then unveiling a surprise ending.

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The Story

* Structure and tell the story logically
* Exemplary structure of the presentation:
  + Title page (title, date, authors, venue, acknowledgements)
  + Seminar specifics: recap of the previous topic
  + Introduction / Motivation (including an overview and related works)
  + Approach (technical details of the method, maths)
  + Experimental Results (including evaluation methodology, interpretation of the results and discussion)
  + Conclusion (summary and core implications)

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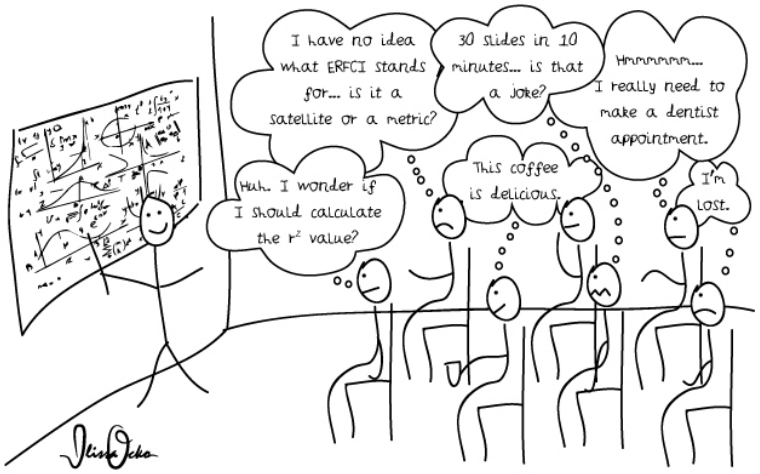
Audience

* Why are you giving this presentation?
* To whom are you giving this presentation?
* What are your expectations from that talk?
* What are the expectations of the audience?
* Is the presentation live or online?
* How much time do I have?



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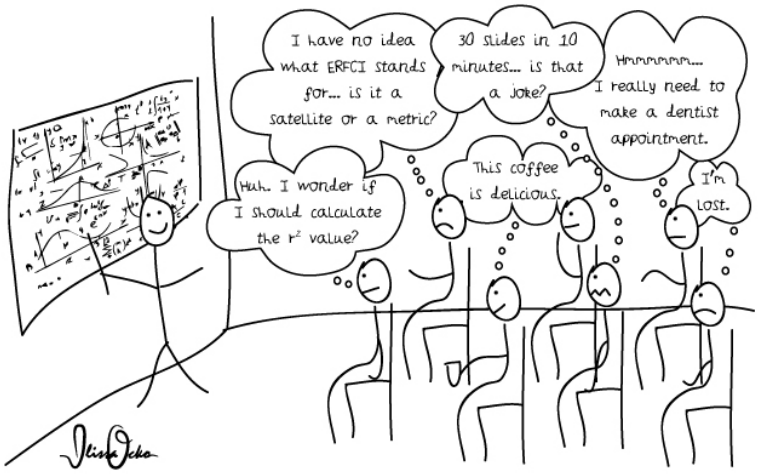
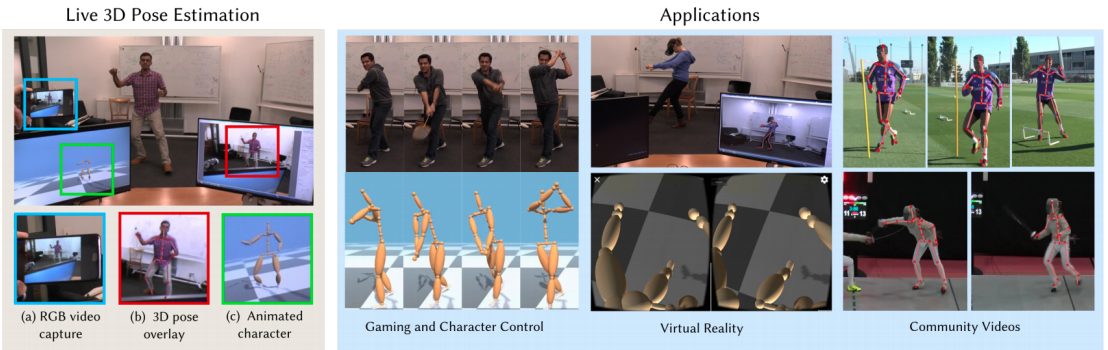


+ Keep that in mind while preparing the talk
+ Edit / adjust the slides

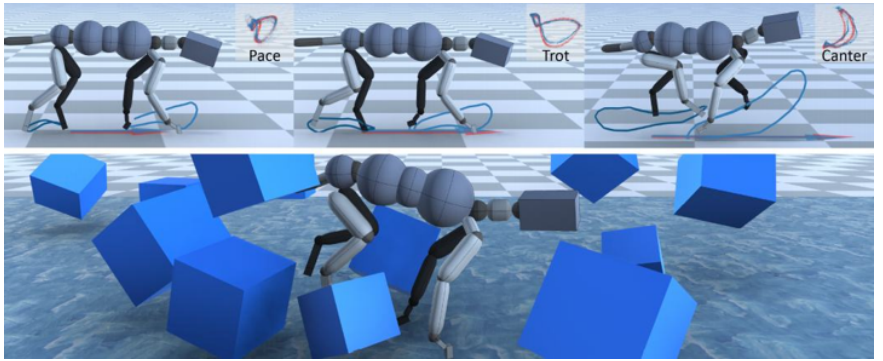
Audience :: University Seminar

* Audience with broad technical background
* Many topics: Provide an overview of state of the art
* Message:
    + Why the problem is important
    + Why the proposed solution is novel and impactful?
    + What are the main ideas and insights?
    + “Being a graduate student”: discussion, ideas for improvement
    + To include a slide or not: How important is it for the story? Will the audience understand and value the point?

Preparing the Talk :: Overview Figures



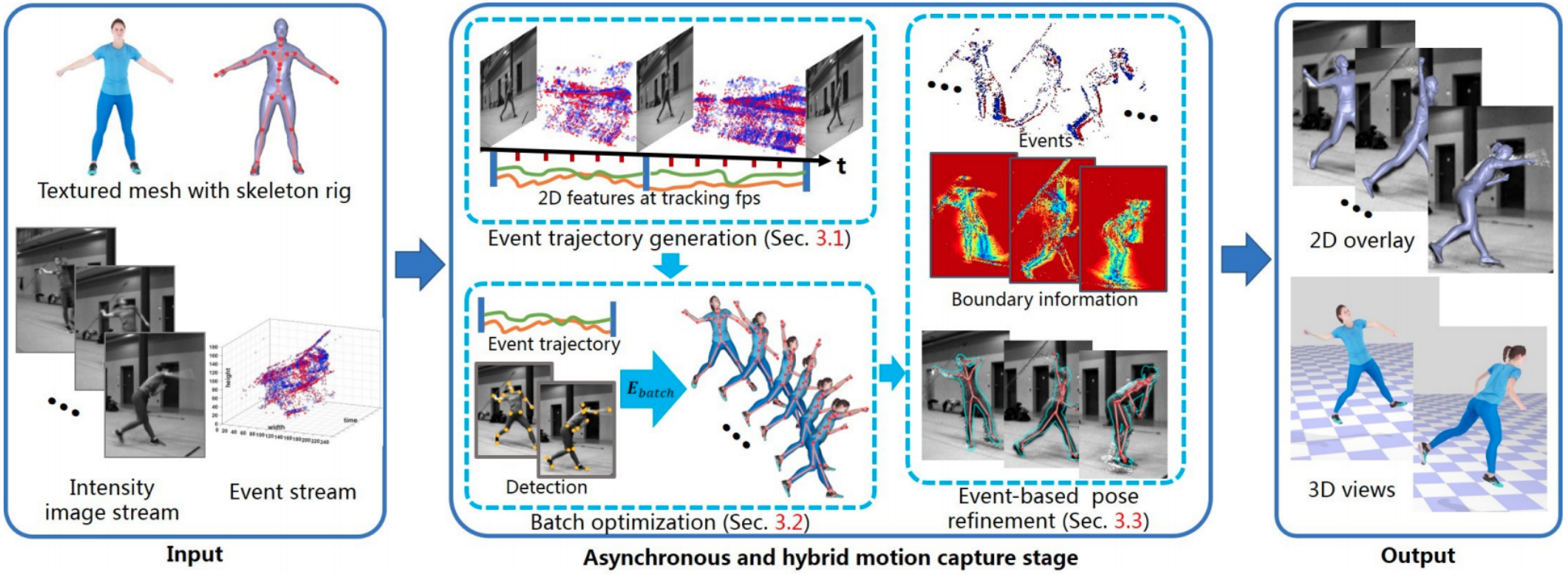
Mehta *et al.*, SIGGRAPH 2017.



Luo *et al.*, SIGGRAPH 2020.

* A figure with a summary of findings, overview of the method, problem or a core concept
* Helps to motivate why the problem is important
* If you use web sources, reference the source

Preparing the Talk :: Overview Figures



Xu *et al.*, CVPR 2020.

Example :: What is a Qubit?

Qubit. Quantum computing encompasses tasks which can be performed on quantum-mechanical systems [53]. Quantum *superposition* and *entanglement* are two forms of parallelism evidenced in quantum computers. A *qubit* is a quantum-mechanical equivalent of a classical bit. A qubit $|\phi\rangle$ — written in the *Dirac* notation — can be in the state $|0\rangle$, $|1\rangle$ or an arbitrary *superposition of both states* denoted by $|\phi\rangle = \alpha|0\rangle + \beta|1\rangle$, where α and β are the (generally, complex) probability amplitudes satisfying $|\alpha|^2 + |\beta|^2 = 1$. In quantum computing, the state $\frac{|0\rangle+|1\rangle}{\sqrt{2}}$ denoted by $|+\rangle$ is often used for initialisation of a qubit register. The state of a qubit remains hidden during the entire computation and reveals when measured. If qubits are *entangled*, measuring one of them influences the measurement outcome of the other one [59]. During the measurement, the qubit's state irreversibly collapses to one of the basis states $|0\rangle$ or $|1\rangle$. Efficient physical realisation of a qubit demand very low temperatures. Otherwise, thermal fluctuations will destroy it and lead to arbitrary changes of the measured qubit state.

HOW A QUANTUM COMPUTER WORKS

Principle of superposition allows parallelism in the calculations

Classical **Bit**

Binary system

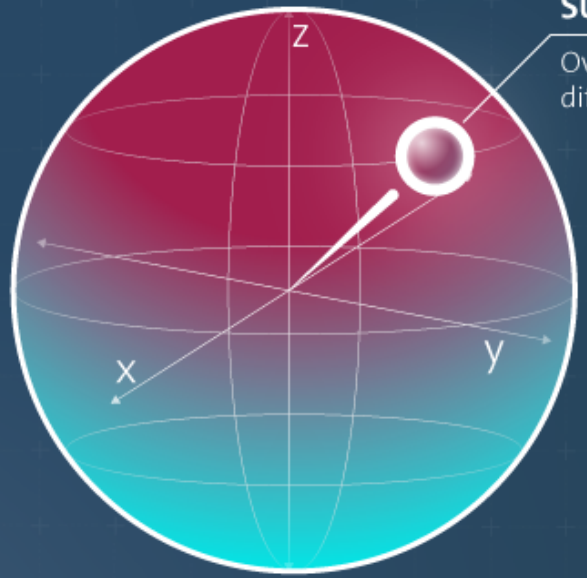
0

OR

1

quantum bit **"qubit"**

Arbitrarily manipulable two-state quantum system



SUPERPOSITION

Overlay of different states

0
1

MEASURING

Clear definition of the state

0

1

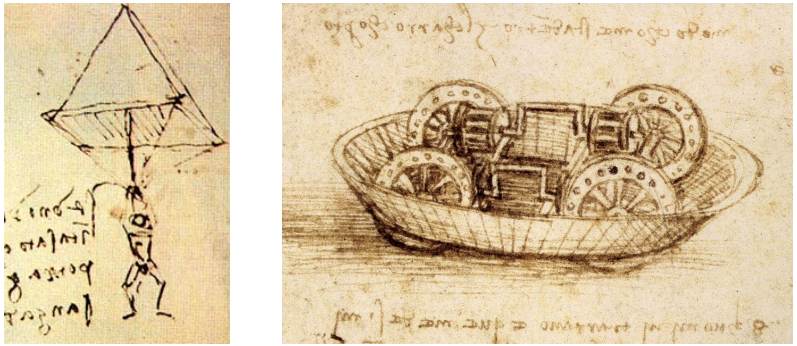
Parallel arithmetic operations possible

Exponential multiplication per qubit

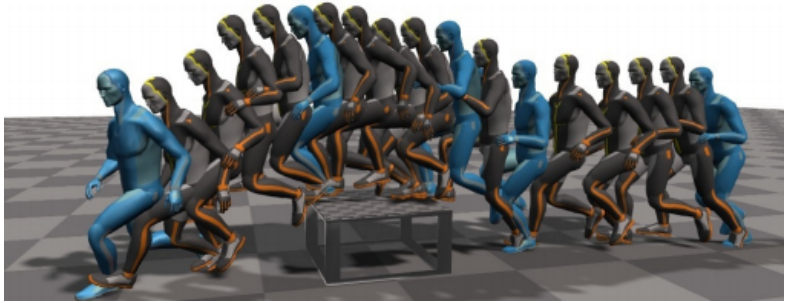
Massive amounts of data can be handled in plausible time

https://www.volkswagenag.com/en/news/stories/2019/11/where-is-the-electron-and-how-many-of-them.html

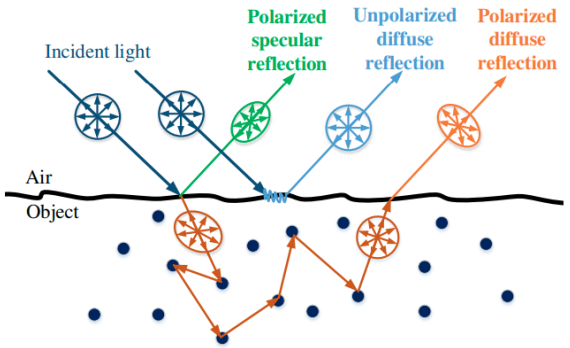
Example :: Overview Figures



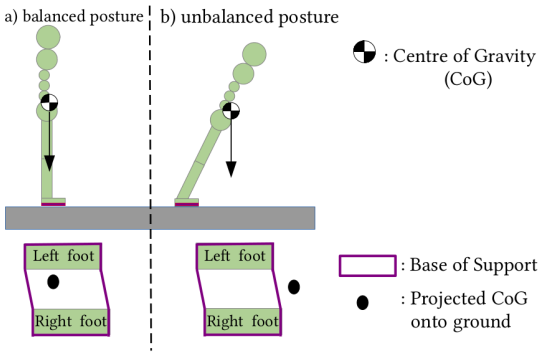
Technical Drawings of da Vinci.



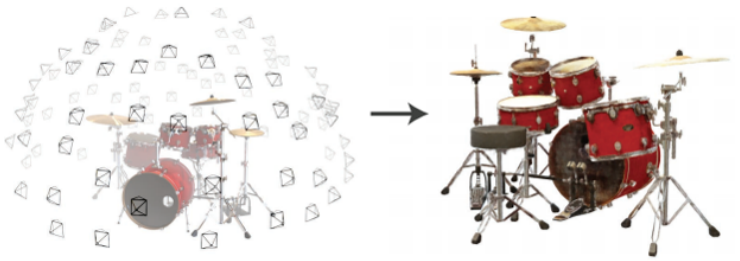
Harvey *et al.*, SIGGRAPH 2020.



Cui *et al.*, CVPR 2017.



Shimada *et al.*, SIG'ASIA, 2020.



Mildenhall *et al.*, ECCV, 2020.

Using Tables

date	discharge (cf/s)	precipitation (in/day)
1-Nov	631	0
2-Nov	808	0
3-Nov	794	0.08
4-Nov	826	0
5-Nov	1060	1.09
6-Nov	1080	0.48
7-Nov	1040	0.28
8-Nov	779	0
9-Nov	686	0
10-Nov	670	0
11-Nov	696	0.53
12-Nov	831	0.23
13-Nov	985	0.45
14-Nov	1080	0.14
15-Nov	1350	0.65
16-Nov	1430	0
17-Nov	2440	1.6
18-Nov	2280	0
19-Nov	2040	0
20-Nov	1830	0.55
21-Nov	1650	0
22-Nov	1560	0
23-Nov	1520	0.39
24-Nov	1410	0
25-Nov	1320	0
26-Nov	1310	0.11
27-Nov	1450	0.78
28-Nov	1560	0.22
29-Nov	1550	0.45
30-Nov	1480	0

date	discharge (cf/s)	precipitation (in/day)
1-Dec	1480	0.07
2-Dec	2920	0.96
3-Dec	2380	0
4-Dec	1990	0
5-Dec	1770	0
6-Dec	1620	0.1
7-Dec	1500	0
8-Dec	1420	0
9-Dec	1350	0
10-Dec	1290	0
11-Dec	1280	0.1
12-Dec	1330	0.47
13-Dec	1280	0
14-Dec	1250	0.57
15-Dec	1190	0.04
16-Dec	1180	0
17-Dec	1160	0.17
18-Dec	1120	0.01
19-Dec	1080	0
20-Dec	1070	0
21-Dec	1080	0
22-Dec	1060	0
23-Dec	1060	0.18
24-Dec	1050	0
25-Dec	1050	0.5
26-Dec	986	0
27-Dec	1010	0
28-Dec	1010	0.07
29-Dec	977	0
30-Dec	972	0
31-Dec	957	0

Discharge of the Esopus Creek (Coldbrook, NY) and precipitation at Slide Mountain, NY (source: USGS/NCDC)

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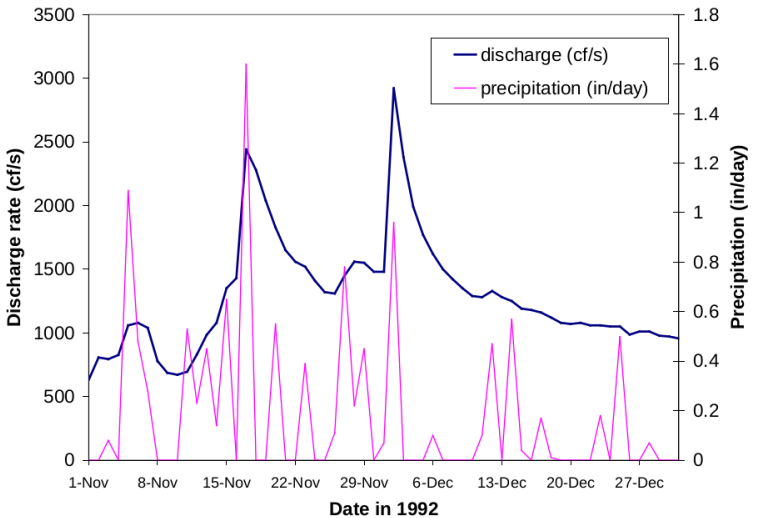

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Using Maths

$$\mathfrak{E}(\mathbf{T}^1, \mathbf{T}^2, \ldots, \mathbf{T}^{|Z|}, \mathbf{w}) = \sum_{\zeta \in Z} \alpha_\zeta \, \mathfrak{E}_{\text{data}}(\mathbf{T}^\zeta) +$$
$$+ \sum_{\zeta \in Z} \beta_\zeta \, \mathfrak{E}_{\text{pICP}}(\mathbf{T}^\zeta) \; + \gamma_\zeta \sum_{\zeta \in Z} \mathfrak{E}_{\text{l.reg.}}(\mathbf{T}^\zeta, \mathbf{w}) +$$
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vector of frame-to-frame segment transformations

segment-to-segment connectivity weights

brightness constancy

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projective ICP

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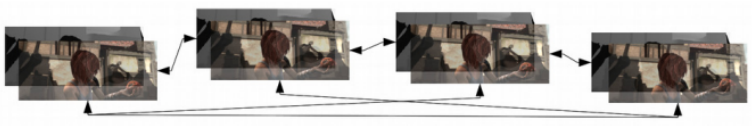
lifted segment pose regularizer

$$+ \eta \, \mathfrak{E}_{\text{r.opt.}}(\mathbf{w}) + \sum_{\zeta=3}^{|Z|} \lambda_\zeta \, \mathfrak{E}_{\text{c.}}(\mathbf{T}^\zeta).$$

robust weight optimizer

multiframe pose concatenation



optimization over multiple frames

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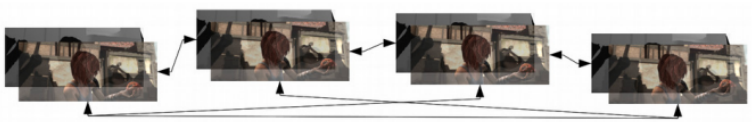
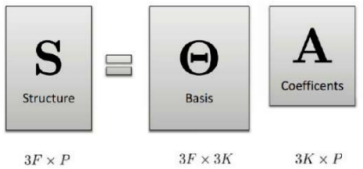


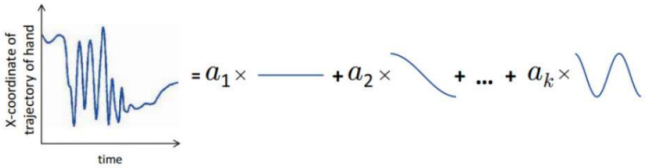
optimization over multiple frames

* use equations at little as possible and as much as needed

Using Maths

$$\mathbf{E}_{\text{traj}}(\boldsymbol{\theta}, \mathbf{z}) = \left\| (\mathbf{1}_T \otimes \bar{\mathbf{S}}) + f_{\boldsymbol{\theta}}(\mathbf{z}) - (\boldsymbol{\Phi} \otimes \mathbf{I}_3)\mathbf{A} \right\|_\epsilon, \quad \boldsymbol{\Phi} = \begin{pmatrix} \phi_{1,1} & \cdots & \phi_{1,K} \\ \vdots & \ddots & \vdots \\ \phi_{T,1} & \cdots & \phi_{T,K} \end{pmatrix}$$





Sidhu *et al.*, ECCV, 2020.

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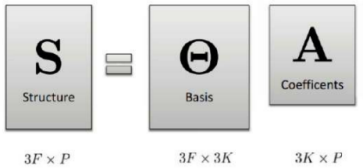
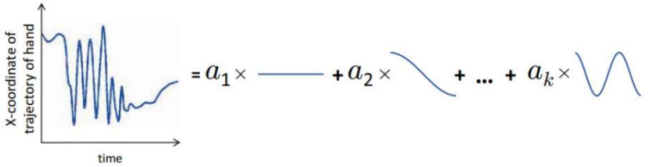
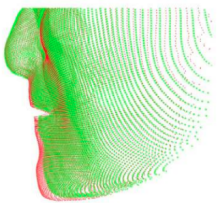




$$\mathbf{E}_{\text{spat}}(\boldsymbol{\theta}, \mathbf{z}) = \underbrace{\sum_{t=0}^{T-1} \sum_{\mathbf{p} \in \mathbf{S}_t} \left\| \mathbf{p} - \frac{1}{|\mathcal{N}(\mathbf{p})|} \sum_{\mathbf{q} \in \mathcal{N}(\mathbf{p})} \mathbf{q} \right\|_1}_{\text{Laplacian smoothing}} - \lambda \underbrace{\sum_{t=1}^{T} \|\mathcal{P}_z(\mathbf{G}_t \mathbf{S}_t)\|_2}_{\text{depth control}}$$



Sidhu *et al.*, ECCV, 2020.

General Rule :: Presenting Methodology

* A scientific talk is always about

HOW and WHY

* Explain what you do
* What is new and innovative
* **AND** motivate why this is the way to go

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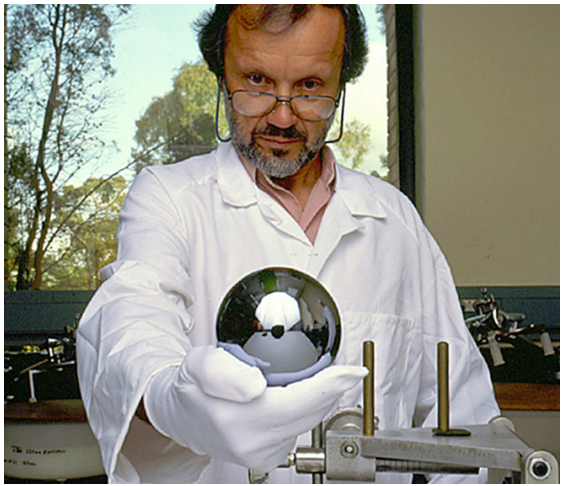
THIS INFLUENCES THE STORY

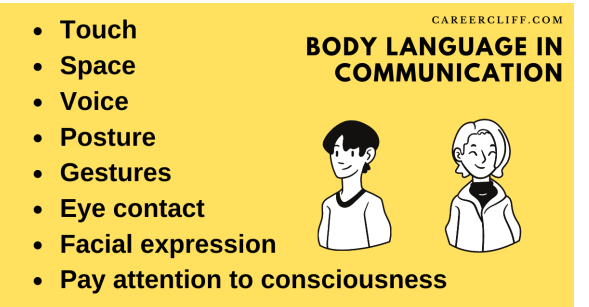
Preparing and Polishing Presentation

* Use 3-7 bullets per page
  + avoid writing out complete sentences
* No more than one minute per slide on average
* Check the slide appearance consistency
* No sound unless it is part of results
* Videos are often results in visual computing
* Spelling and writing style
  + Use the same font (or a few fonts)
  + Check the text for typos; check the grammar
  + Decide between British and American English, and use the chosen language consistently



https://www.wired.com/2010/10/platinum-silicon-kilogram-standard/

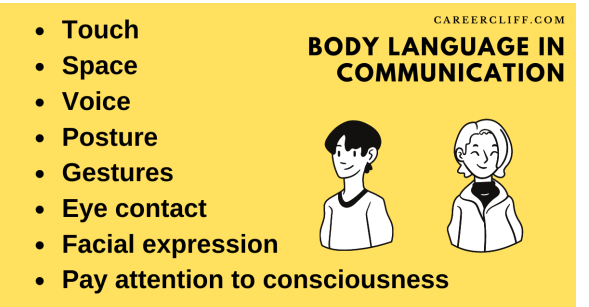
Preparing Yourself



* The way how you present yourself is as important as your slides
* Immerse yourself in what you are going to say
* Make sure that you are familiar with remote conference software (Zoom), check your equipment (microphone, *etc.*)

Image: https://medium.com/@indiayuvagi/body-language-in-daily-life-ac75ff6f2453

Preparing Yourself



* The way how you present yourself is as important as your slides
* Immerse yourself in what you are going to say
* Make sure that you are familiar with remote conference software (Zoom), check your equipment (microphone, *etc.*)
* Online format: perception of gestures and body language is limited; use other tools of expressiveness:
    + There is no eye contact with the audience, you do not see other participants
    + Use intonation in combination with the visual tools (*e.g.*, colours)
    + Rehearsing is very important! Be on time, know what you want to say, prepare transitions between the slides/papers

Image: https://medium.com/@indiayuvagi/body-language-in-daily-life-ac75ff6f2453

Rehearsing

* Practice – actually stand up and say the words out loud
    - discover what you do not understand and develop a natural flow
* Do not memorise the talk, do not over-rehearse
* Stay within the time limit
* The Feynman Technique: *a mental model and a breakdown of the thought process to convey information using concise thoughts and simple language [1].*

[1] https://medium.com/taking-note/learning-from-the-feynman-technique-5373014ad230

Rehearsing

* Practice – actually stand up and say the words out loud
  - discover what you do not understand and develop a natural flow
* Do not memorise the talk, do not over-rehearse
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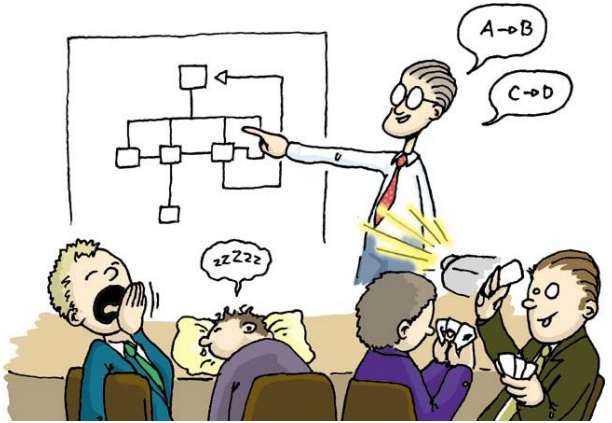
* The Feynman Technique: *a mental model and a breakdown of the thought process to convey information using concise thoughts and simple language [1].*

If you can't explain it simply, you don't understand it well enough.

A. Einstein.

[1] https://medium.com/taking-note/learning-from-the-feynman-technique-5373014ad230

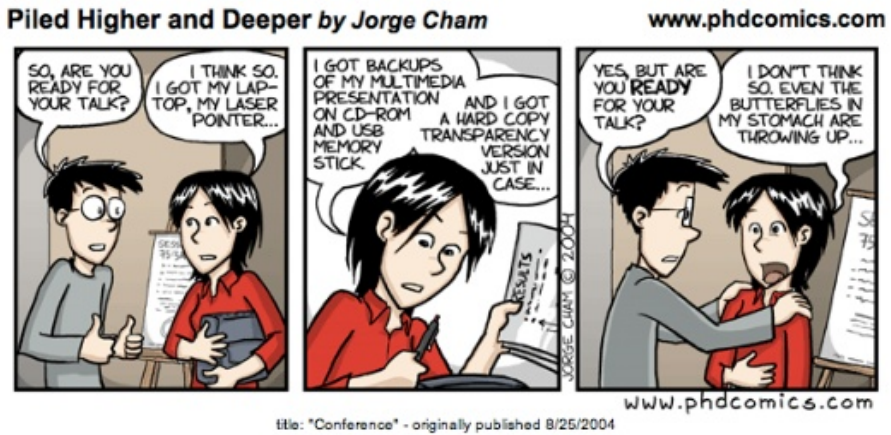
Presenting

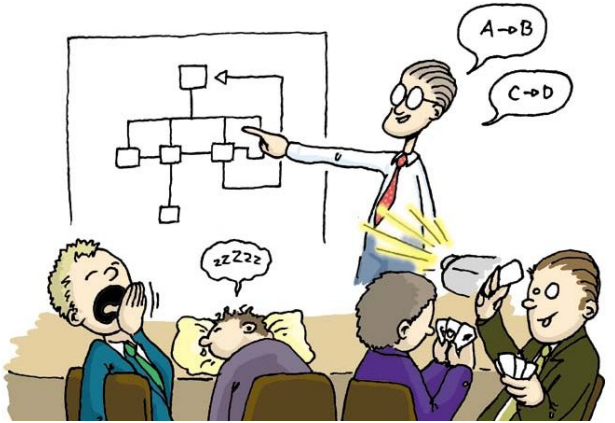


* Make yourself comfortable, speak freely, be enthusiastic but do not rush
* Ensure that people can hear you well and see your shared screen
* Seminar specifics : switch on your camera

https://mindthegraph.com/blog/scientific-presentation/
https://www.business2community.com/communications/z-mindful-presenting-high-impact-public-speaking-presentation-skills-b-brevity-01949085

Presenting





* Make yourself comfortable, speak freely, be enthusiastic but do not rush
* Ensure that people can hear you well and see your shared screen
* <u>Seminar specifics : switch on your camera</u>
* Starting is the most difficult part
  + memorise the first lines
* Nervousness is normal, don’t worry about stopping to think

https://mindthegraph.com/blog/scientific-presentation/
https://www.business2community.com/communications/z-mindful-presenting-high-impact-public-speaking-presentation-skills-b-brevity-01949085

Concluding the Presentation

* Announce the ending so that people are prepared
* Have only a few concluding statements (the core points)
* Come back to the big picture and summarise the significance of your work in that context
* Open up new perspective (could be another slide)
    + describe future work
    + raise questions and potential implications
* Think carefully about the final words (which people tend to memorise)

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    + describe future work
    + raise questions and potential implications
* Think carefully about the final words (which people tend to memorise)
* <u>Seminar specifics:</u>
    + compare two papers
    + common conclusion for both papers
    + present own ideas

Questions and Answers

* Difficult questions can help improving your skills, writing and research
  + Identifies parts the audience did not understand
  + Focuses and adds an additional dimension to your analysis
* You can repeat the question using your own words
  + This gives you time to think
  + Helps in understanding the question by more people
  + Presents an opportunity for clarification
* Be concise in your answers, do not drift away
* Anticipate questions, prepare backup slides if required
* Do not say that the question is bad or it has been already addressed
* Never demean the question or questioner

Moderating the Discussion

* You will be assigned as a moderator and get a set of questions one day before the appointment
* Most probably, some questions will be already addressed; all questions cannot be addressed due to time limits
    + 2-4 questions to each paper, up to 2 questions to both papers
    + you decide which questions are the most relevant and engaging
* Prepare a set of points to discuss
    + Weaknesses / Limitations of the methods
    + Comparisons between the papers
    + Ask other participants about their ideas
    + Build bridges to other talks in the seminar
    + Points you were unclear about while reading the papers

Conclusions

* Structure your content in a way that is comfortable for you and your audience
* Filter out core aspects and build convincing story
* Use figures, videos and maths appropriately
* Rehearse and present within the time limit
* Online format: Using body language in communication is difficult
* Be prepared for questions

12 Rules for a Bad Talk

* Cram as much onto each slide as you can
* Use tables with lots of data
* Make your plots really complex
* Use as many slides as possible
* Embrace obfuscation
* Over-run your time

  …

Best Presentation-Ever Bingo

Didn't pre-load the presentation	Over-ran time	Used as many bullet points as humanly possible	
	Apologized for unreadable slides	Acted as if had never used PowerPoint	Embraced Obfuscation
Used incredibly complex plots		Used as many slides as humanly possible	Crammed as much as possible onto each slide
Included a video fail	Didn't check the presentation worked beforehand		Used tables with more data than any sane person could read

Source: https://medium.com/edge-of-innovation/how-to-give-the-best-scientific-presentation-ever-c87e202718cf

Materials Used

This talk is a revised version of
How to Give a Good Scientific Talk by C. Theobalt, 2017.
Some ideas are from
How to Give a Good Talk by S. Pfirman (Cornell University) and
How to give Scientific Presentations by T. Williams (Texas A&M University).

Thank You!