Designing technical presentations

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Today you will learn how to design scientific presentations

Good and bad examples of technical presentations

Structural design of presentations

Slide design

These slides don't teach you how to *deliver* a presentation

Delivery is more important, but good design can help a lot

Finding the Higgs Boson was the most important goal of particle physics for decades

The Higgs Boson validates the Standard Model of Physics

The Higgs Boson is what gives mass to particles

https://en.wikipedia.org/wiki/Standard_Model

Finding the Higgs Boson was the most important goal of particle physics for decades

It was proposed by Peter Higgs and other physicists in 1964!

Because of its significance some media called it "God Particle"

https://en.wikipedia.org/wiki/Higgs_boson

When CERN discovered a new boson, it lead to extreme media hype and ultimately to a Nobel Prize for Higgs

The LHC costed 13,500,000,000 EUR

https://arxiv.org/abs/1603.00886

Let's look at how CERN announced its monumental discovery

Opening slide from the announcement

http://cms.web.cern.ch/news/observation-new-particle-mass-125-gev

Slide 3 from the announcement

We present updated results on SM Higgs searches based on the data recorded in 2011 at $\sqrt{s}$=7 TeV (~4.9 fb^{-1}) and 2012 at $\sqrt{s}$=8 TeV (~5.9 fb^{-1})

Results are preliminary:
- ❑ 2012 data recorded until 2 weeks ago
- ❑ harsher conditions in 2012 due to ~ x2 larger event pile-up
- ❑ new, improved analyses deployed for the first time

$H \rightarrow \gamma\gamma$ and $H \rightarrow 4l$: high-sensitivity at low-m_H; high mass-resolution; pile-up robust
- ❑ analyses improved to increase sensitivity → new results from 2011 data
- ❑ all the data recorded so far in 2012 have been analyzed

→ results are presented here for the first time

Other low-mass channels: $H \rightarrow WW^{(*)} \rightarrow l\nu l\nu$, $H \rightarrow \tau\tau$, $W/ZH \rightarrow W/Z\ bb$:
- ❑ E_T^{miss} in final state → less robust to pile-up
- ❑ worse mass resolution, no signal "peak" in some cases
- ❑ complex mixture of backgrounds

→ understanding of the detector performance and backgrounds in 2012 well advanced, but results not yet mature enough to be presented today

→ 2011 results used here for these channels for the overall combination

ATLAS: Status of SM Higgs searches, 4/7/2012 3

http://cms.web.cern.ch/news/observation-new-particle-mass-125-gev

Slide 11 from the announcement

http://cms.web.cern.ch/news/observation-new-particle-mass-125-gev

After 32 more slides
with similar details...

The big result is presented on slide 44

http://cms.web.cern.ch/news/observation-new-particle-mass-125-gev

The big result is "summarized" on slide 51

We have presented preliminary results on searches for a SM Higgs boson using the full data sample recorded so far for $H \rightarrow \gamma\gamma$ and $H \rightarrow 4l$ ($\sqrt{s}$=7, 8 TeV, ~10.7 fb^{-1}) and the 2011 data ($\sqrt{s}$=7 TeV, ~ 4.9 fb^{-1}) for the other channels

Impressive accomplishment of the experiment in all its components: first results with full 2012 dataset were available less than one week from "end of data-taking", with a fraction of good-quality data used for physics of ~ 90% of the delivered luminosity

We have looked for a SM Higgs over the mass region 110-600 GeV in 12 channels

We have excluded at 99% CL the full region up to 523 GeV except $121.8 < m_H < 130.7$ GeV

We observe an excess of events at m_H ~ 126.5 GeV with local significance 5.0 σ

- The excess is driven by the two high mass resolution channels: $H \rightarrow \gamma\gamma$ (4.5 σ) and $H \rightarrow ZZ^* \rightarrow 4l$ (3.4 σ)
- Expected significance from a SM Higgs: 4.6 σ
- Fitted signal strength: 1.2 ± 0.3 of the SM expectation

If it is the SM Higgs, it's very kind of it to be at that mass → accessible at LHC in $\gamma\gamma$, $ZZ^* \rightarrow 4l$, $WW^* \rightarrow l\nu l\nu$, bb, ττ

ATLAS: Status of SM Higgs searches, 4/7/2012 51

http://cms.web.cern.ch/news/observation-new-particle-mass-125-gev

EXERCISE: What is wrong with this presentation?

Form groups of 4.

5 min: Discuss in group:

1) What are the biggest issues?

2) What is the reason for these issues?

5 min: Discuss with whole class

EXERCISE: What is wrong with this presentation?

What went wrong in the communication situation?

3 min: Fill in the table.

Discussion: What happened?

	WHO	WHAT	WHOM	WHY	HOW
How it was imagined					
What happened					

Discussion: What is wrong with this presentation?

Main mistake: The audience is ignored!

Who is the audience?

Experts (scientists) and non-experts (science journalists + public)

Ignoring the audience leads to a chain of problems

	WHO	WHAT	WHOM	WHY	HOW
How it was imagined				To inform colleagues	Technical presentation
What happened				To inform colleagues	Technical presentation
How should it have happened?					

Ignoring the audience leads to a chain of problems

	WHO	WHAT	WHOM	WHY	HOW
How it was imagined				To inform colleagues	Technical presentation
What happened				To inform colleagues	Technical presentation
How should it have happened?				To inform the public	Non-technical presentation

Structural design of presentations

To excel in your presentations, you need content, passion, and a good sense of your audience

[www.psyclops.com]

[ted.com]

[www.wildchimpanzees.org]

Both content and passion are necessary

Passion but no content

Content but no passion

Both content and passion are necessary

Carl Sagan effect:
Mistaking passionate communication with lack of content

When presenting, you must seize upon the advantages of presentations and downplay the disadvantages

Advantages?

Disadvantages?

When presenting, you must seize upon the advantages of presentations and downplay the disadvantages

Advantages

- Chance to answer questions
- Chance to read expressions
- Chance to emphasize key points
- Ability to use visual aids
- Assurance that audience has witnessed the content

Disadvantages

- One chance to talk, one chance to hear
- Difficult for audience to look up background information
- Audience restricted by pace of speaker
- Success dependent on delivery
- Difficult assembling speaker and audience

When preparing a presentation, what are the important questions to ask about the audience?

Audience

When preparing a presentation, what are the important questions to ask about the audience?

Audience

What do they know?

When preparing a presentation, what are the important questions to ask about the audience?

Audience

What do they know?

Why will they be interested?

When preparing a presentation, what are the important questions to ask about the audience?

Audience

What do they know?

Why will they be interested?

What do I want to achieve?
Inform, persuade, inspire?

DISCUSSION: Why are these slides not persuasive?

Temperature Concern on SRM Joints

27 Jan 1986

HISTORY OF O-RING DAMAGE ON SRM FIELD JOINTS

		Cross Sectional View			Top View		
	SRM No.	Erosion Depth (in.)	Perimeter Affected (deg)	Nominal Dia. (in.)	Length Of Max Erosion (in.)	Total Heat Affected Length (in.)	Clocking Location (deg)
61A LH Center Field**	22A	None	None	0.280	None	None	36° - 66°
61A LH CENTER FIELD**	22A	NONE	NONE	0.280	NONE	NONE	338° - 18°
51C LH Forward Field**	15A	0.010	154.0	0.280	4.25	5.25	163
51C RH Center Field (prim)***	15B	0.038	130.0	0.280	12.50	58.75	354
51C RH Center Field (sec)***	15B	None	45.0	0.280	None	29.50	354
41D RH Forward Field	13B	0.028	110.0	0.280	3.00	None	275
41C LH Aft Field*	11A	None	None	0.280	None	None	--
41D LH Forward Field	10A	0.040	217.0	0.280	3.00	14.50	351
STS-2 RH Aft Field	2B	0.053	116.0	0.280	--	--	50

*Hot gas path detected in putty. Indication of heat on O-ring, but no damage.
**Soot behind primary O-ring.
***Soot behind primary O-ring, heat affected secondary O-ring.

Clocking rotation of leak check port - 0 deg.

OTHER SRM-15 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY AND NO SOOT HEAR OR BEYOND THE PRIMARY O-RING

SRM-22 FORWARD FIELD JOINT HAD PUTTY PATH TO PRIMARY O-RING, BUT NO O-RING EROSION AND NO SOOT BLOWBY. OTHER SRM-22 FIELD JOINTS HAD NO BLOWHOLES IN PUTTY.

There is a culture of ineffective technical presentations. Why?

We imitate and follow social norms

What if the norm is bad?

Slides are an aid, NOT the main content

Not everything in a presentation needs slides

Slides are for the audience, NOT for the presenter

≠

Slides are for the audience, NOT for the presenter

Literature Review

Hefner developed a dynamic electro-thermal model for IGBT, from of the temperature-dependent IGBT silicon chip, packages and heat sinks. The temperature-dependent IGBT electrical model describes the instantaneous electrical behavior in terms of the instantaneous temperature of the IGBT silicon chip surface. The instantaneous power dissipated in the IGBT is calculated using the electrical model and determines the instantaneous heat rate that is applied to the surface of the silicon chip thermal model. Hefner incorporated this methodology into the *SABER* circuit simulator.

Adams, Joshi and Blackburn considered thermal interactions between the heat sources, substrate, and encloses walls as affected by the thermal conductance of the walls and substrate with the intent of determining which physical effects and level of detail are necessary to accurately predict thermal behavior of discretely heated enclosures.

Chen, Wu and Borojevich are modeling of thermal and electrical behavior using several commercial softwares (I-DEAS, Maxwell, Flotherm and Saber) and 3-D, transient approaches.

If you want a detailed takeaway, prepare a handout

Our research question is whether the dunlins of Iceland and the Baltic Sea are different subspecies

[commons.wikimedia.org]

≠

Our research question is whether the dunlins of Iceland and the Baltic Sea are different subspecies

Our research question is whether the dunlins of Iceland and the dunlins of the Baltic Sea are different subspecies. At present, the Dunlins *Calidris alpina* in Northern Europe are considered one subspecies. However, if the dunlins of Iceland and the dunlins of the Baltic Sea are in fact different subspecies, then the subspecies of the Baltic sea might be a threatened species because their numbers are declining.

Collaborators: Jan T. Lifield and Liv Wennerberg of the University of Oslo "Population Differentiation in Dunlins *Calidris alpina* in Northern Europe" (Oslo, Norway: Zoological Museum, University of Oslo, 6 June 2004).

References:

Photo of Baltic dunlin by Lars Erik Joannessen ©

Map of Norwegian Sea from Wikipedia Commons: http://commons.wikimedia.org/wiki/File:Norwegian_Sea

Principal Researcher: Gunnhild Marthinsen, University of Oslo

Presentation software defaults are bad

1987

2003

2007

I need you to:

To excel in your scientific presentation, you guide your audience up the mountain of your work

Many good presentations have an hourglass structure

Big picture | Details | Big picture

You must define a fitting scope and depth

The area is determined by the speaking time

What are the common mistakes with scope and depth?

What are the common mistakes with scope and depth?

What are the common mistakes with scope and depth?

Problem 1: Trying to cover too much
Problem 2: Talking too much about your struggles

The success of a presentation is measured by how well you have communicated new insights.

What are the common mistakes with scope and depth?

Problem 1: Too many details
Problem 2: Laundry lists, lack of guidance

Many good presentations have an hourglass structure

Accompany your facts with guidance

"This could sound obvious to you, but is an important concept to build on:"
[Easy fact]

"This is the IMPORTANT INSIGHT of this work:"
[Important insight]
"Look how beautiful it is. Nobody knew before."

"This is a minor detail but interesting for the mathematicians:"
[Detail]

Where do you need transitions?

You need transitions between sections

When you end, reconnect to the beginning

Good speakers make a transition between each slide

Example presentation

To prepare my presentation I analyzed the situation

WHO	WHAT	WHOM	WHY	HOW
	Data visualization project on transport justice	3rd year DS BSc students	Teach good presentations Inspire you about the topic	7 min presentation (non-technical)

Revealing wasted urban space through data visualization

Michael Szell
Computer Science Dept

Sep 3, 2019

IT UNIVERSITY OF COPENHAGEN

Space is not distributed in a fair way between different modes of transport

Copenhagenize

Most space is for cars, but most people use bikes

Copenhagenize

Can we use data science and visualization to learn more?

MANHATTAN
UPPER EAST SIDE
MIDTOWN
East River
COLLEGE POINT
678
25A
Grand Central Pkwy
JACKSON HEIGHTS
278
495
FOREST HILLS
New York
278
BUSHWICK
478
BROOKLYN
PARK SLOPE
EAST NEW YORK
27
278
Belt Pkwy
RIDGE
Belt Pkwy
BRIGHTON BEACH

Phyllis & Turing and RPH
Beach Channel Dr
Rockaway Beach Blvd
Beach 149th St
Beach 138th St
Marine Pkwy Bridge
Rockaway Beach Blvd
Riis Park Golf Course
Rockaway Beach
Riis Park Beach Bazaar
Wise Clock (aka Riis Park Memorial Clock)
The People's Beach at Jacob Riis Park

What a lovely ~~green~~..

What a ~~lovely~~ ~~green~~.. MONSTER

800m x 500m

MANHATTAN
UPPER EAST SIDE
MIDTOWN
East River
COLLEGE POINT
678
25A
Grand Central Pkwy
JACKSON HEIGHTS
278
495
FOREST HILLS
New York
278
BUSHWICK
478
BROOKLYN
PARK SLOPE
EAST NEW YORK
27
278
Belt Pkwy

Phyllis A. Turrigiano, RPH
Beach Channel Dr
Rockaway Beach Blvd
Beach 149th St
Beach 138th St
Marine Pkwy Bridge
Rockaway Beach Blvd
Wheel Fun Rentals
Hiss Park Golf Course
Rockaway Beach

Phyllis A. Turrigiano, RPH
Beach Channel Dr
Rockaway Beach Blvd
Wheel Fun Rentals
Park Gateway National Recreation...
The People's Beach at Jacob Riis Park
Rockaway Beach
Beach Bazaar
Wise Clock (aka Riis Park Memorial Clock)

We visualized ALL parking spaces with polygon packing

There are huge differences between car and bike parking

There are huge differences bety d bike parking

Our project What the Street!? covers 23 world cities

Open-sourced at https://github.com/moovel/lab-what-the-street

Why is there so much car parking?

Is it necessary?

Cars are used 36 minutes per day
Cars are not used 1404 minutes per day

Civity (2016)

Cars are used 36 minutes per day
Cars are not used 1404 minutes per day

A typical snapshot of Copenhagen

5,500 cars moving

250,000 cars parked

We are wasting space worth 6,000 playgrounds!

A typical snapshot of Copenhagen

5,500 cars moving

250,000 cars parked

6,000
Playgrounds

=

2.5 ×

=

whatthestreet.com

moovellab

How can we get back all the space?

10% of self-driving cars can deliver same mobility

OECD, International Transport Forum (2015)

Self-driving, shared cars sound nice but are NOT the ultimate solution

You can't beat math:
Simple geometry tells us cars will ALWAYS be inefficient

Harms and Kansen, Netherlands Institute for Transport Policy Analysis (2017)
Szell, Urban Planning 3, 1-20 (2018)

Pioneering cities have started to remove parking.
Let us push for more to save our cities and the planet!

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EXERCISE: Analyze the talk's structure

Form groups of 4.

10 min: Analyze in group

1) Content, passion, audience
2) Hourglass, sections and transitions
3) Scope and depth
4) Purpose fulfilled?

5 min: Discuss with whole class

Slide design

DISCUSSION: Analyze the talk's slides

How are the slides different than in a "typical" research talk?

Can we use data science and visualization to learn more?

Why is there so much car parking?

Is it necessary?

How can we get back all the space?

Beginning
Middle
Ending

The beginning should answer what the presentation is about without leaving the audience behind

The beginning should answer what the presentation is about without leaving the audience behind

Determining Whether Atmospheric Mercury Goes into Surface Snow after a Depletion Event

Katrine Aspmo
Torunn Berg
Norwegian Institute for Air Research

Grethe Wibetoe
University of Oslo, Dept. of Chemistry

June 16, 2004

A common error in the mapping of technical talks is to show a list that is not memorable

A common error in the mapping of technical talks is to show a list that is not memorable

This talk traces what happens to mercury after it depletes from the atmosphere in arctic regions

Theory for mercury cycling

Measurements from Station

Environmental implications

Beginning
Middle
Ending

The assertion-evidence structure consists of a message headline supported by visual evidence

The way a dog sniffs does not contaminate the vapor stream from the scent source

[Settles et al., 2002]

The assertion-evidence structure consists of a message headline supported by visual evidence

Xenon headlights illuminate signs better than halogen headlights do

Halogen Headlight

Xenon Headlight

The assertion-evidence structure consists of a message headline supported by visual evidence

Space is not distributed in a fair way between different modes of transport

Copenhagenize

Change defaults: Bulleted lists lack logical connections

Change defaults: Bulleted lists lack logical connections

Change defaults: Set up master slides

Change defaults: Use readable font consistently

Change defaults: Use readable font consistently

PRIMARY CONCERNS -

FIELD JOINT - HIGHEST CONCERN

- EROSION PENETRATION OF PRIMARY SEAL REQUIRES RELIABLE SECONDARY SEAL FOR PRESSURE INTEGRITY
  - IGNITION TRANSIENT - (0-600 MS)
    - (0-170 MS) HIGH PROBABILITY OF RELIABLE SECONDARY SEAL
    - (170-330 MS) REDUCED PROBABILITY OF RELIABLE SECONDARY SEAL
    - (330-600 MS) HIGH PROBABILITY OF NO SECONDARY SEAL CAPABILITY
- STEADY STATE - (600 MS - 2 MINUTES)
  - IF EROSION PENETRATES PRIMARY O-RING SEAL - HIGH PROBABILITY OF NO SECONDARY SEAL CAPABILITY
    - BENCH TESTING SHOWED O-RING NOT CAPABLE OF MAINTAINING CONTACT WITH METAL PARTS GAP OPERATING TO MEOP
    - BENCH TESTING SHOWED CAPABILITY TO MAINTAIN O-RING CONTACT DURING INITIAL PHASE (0 - 170 MS) OF TRANSIENT

Maximize signal-to-noise and slow down with graphs

We developed the mobility triangle
It shows the arrogance of space with 2 data points

Change defaults: Cut all noise

Gravitation and hydrostatic pressure

$$m = \rho V = \rho \delta^2 h$$

- $F_g = mg \sin \psi$
- $F_{ph} = mg \sin \psi_s$

- $F_{g,ph} = mg(\sin \psi + \sin \psi_s)$

Change defaults: Cut all noise

Change defaults: Cut all noise

How could you improve these slides?

Tsunamis cause devastating destruction, especially to sparsely vegetated areas.

2004 Indian Ocean Tsunami: Gleebruk Village, Sri Lanka

Before:

After:

Leave enough space, align, group

Beginning
Middle
Ending

Final slides should emphasize the main takeaway

Final slides should emphasize the main takeaway

In summary, high concentrations of acetic acid help protect steel from corrosion

Adsorbed HOAc allows the growth of siderite

A thick siderite layer protects the steel from corrosion

PENNSTATE

Final slides can give a call for action

Pioneering cities have started to remove parking.
Let us push for more to save our cities and the planet!

Michael Szell
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https://www.assertion-evidence.com/internship-resistance.html

Presentations for different purposes

When informing, be logical and straightforward

Tell them what you are
going to tell them,

tell them,

and tell them
what you told them.

https://en.wikipedia.org/wiki/Aristotle

When persuading, audience bias has to be considered

With an antagonistic audience, building credibility is most important

When inspiring or entertaining, passion & delivery is key

When teaching, present first evidence, then assertion

How could you improve these slides?

Tsunamis cause devastating destruction, especially to sparsely vegetated areas.

2004 Indian Ocean Tsunami: Gleebruk Village, Sri Lanka

Before:

After:

Preparing presentations

Before opening your computer, decide the story of your talk

Preparing today's 3.5-hour lecture took me 20+ hours

... and I did not practice much

EXERCISE: Improve your own presentation

10 min: Start improving your slides following the checklist

Form groups of 2.
5 min: Apply checklist to your partner's slides
5+5 min: Get+give feedback

Open: Continue improving until the whole checklist is satisfied

Mandatory assignment 1: Slides

Consider your own research topic (for example, first or second year project). Using this topic, create and hand in a deck of 5-12 slides in pdf format for a 6 minute presentation targeted towards *informing* a *general audience*. It should follow the assertion-evidence format and include images. Use the checklist to ensure quality slides.

Suggested starting point: the slides from an existing previous presentation like the ones you gave during your first/second year project exams. In a later class you will be expected to present.

Hand-in of this assignment is required for taking the final exam. Hand-in after the due date is not possible.

checklistslides.xlsx

Due date	Friday, 20 September 2019, 23:59

Today you learned

Presentations are much more than a list of facts

Slide design is important to not lose your audience

Know your audience!

Sources and further materials for today's class

https://www.craftofscientificpresentations.com