

Meirin Oan Evans, on behalf of the ATLAS Collaboration

ATLAS Open Data: co-creation of educational resources

a genuinely collaborative approach for the creation of educational resources

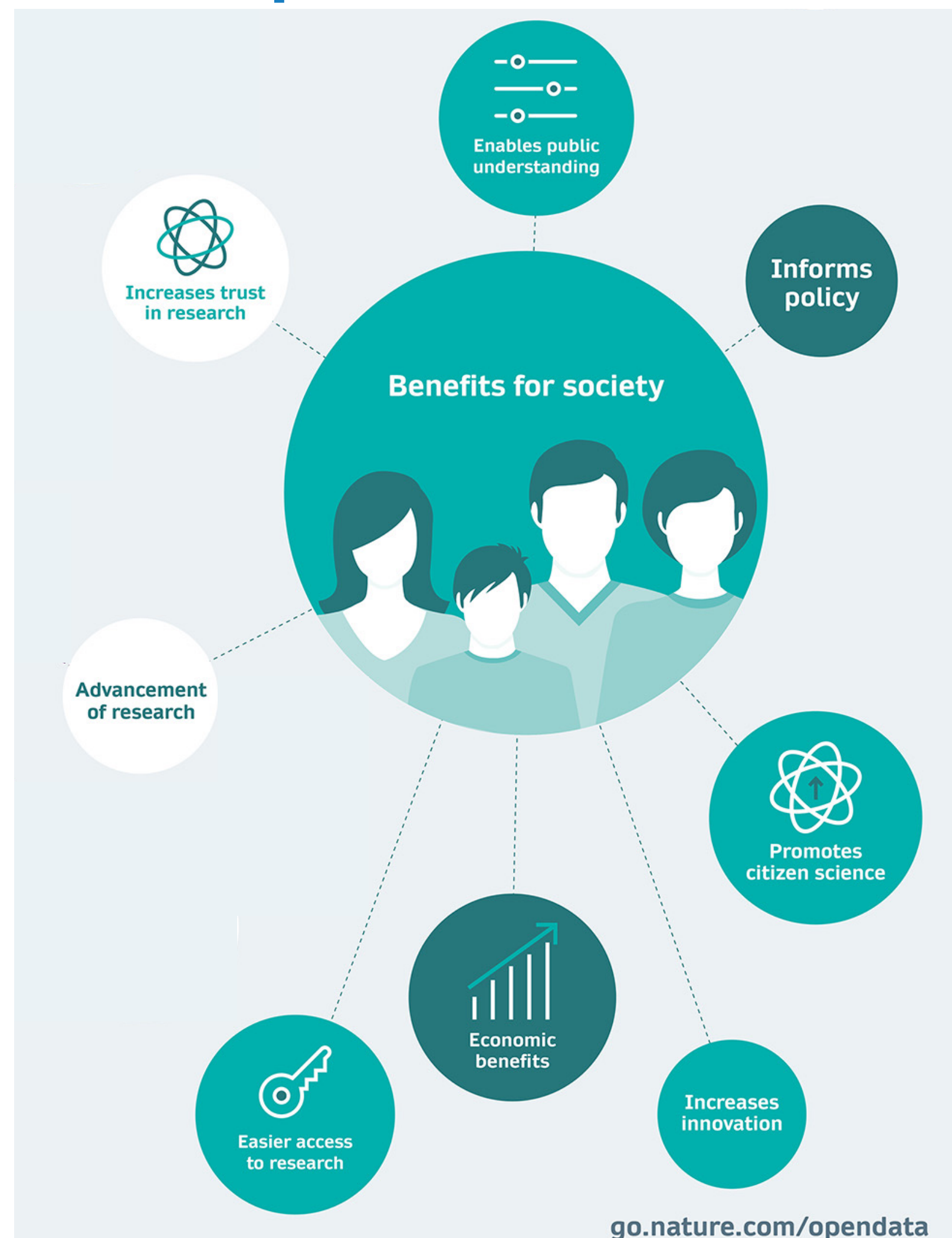
STUDENTS

**ATLAS
OPEN DATA**

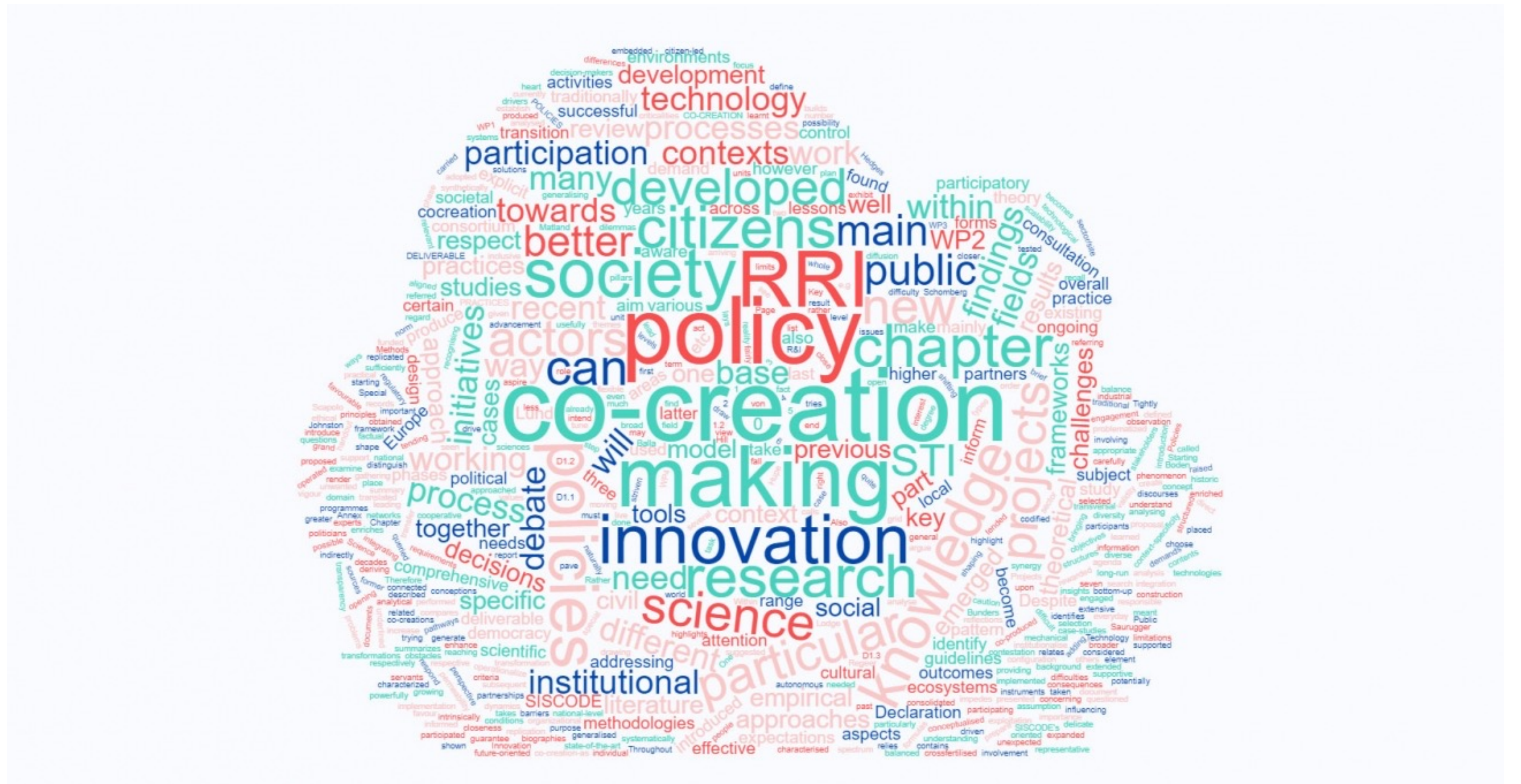


**EDUCATIONAL
RESOURCES**

ATLAS Open Data: co-creation of educational resources



- ▶ Enables public understanding
- ▶ Promotes citizen science
- ▶ Easier access to research
- ▶ Increases trust in scientists



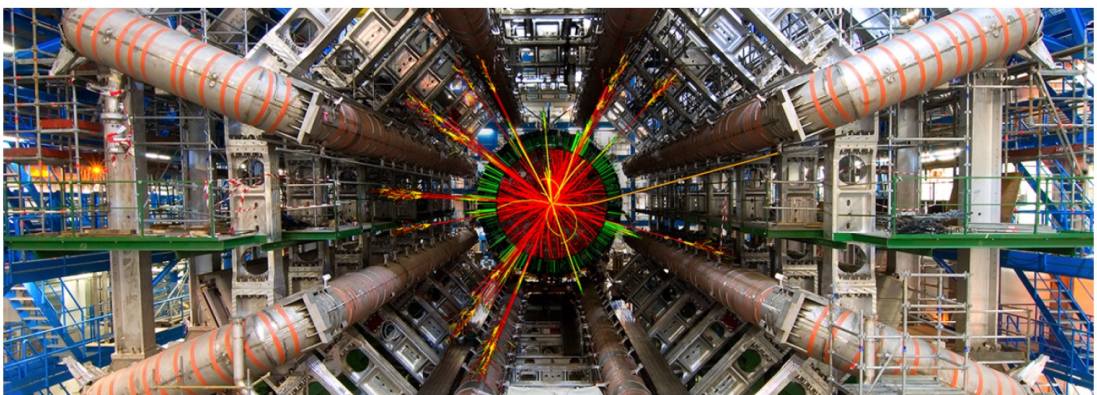
ATLAS Open Data: co-creation of educational resources

ATLAS Open Data

An Educational project in High Energy Physics



[documentation](#)
[website](#)



The ATLAS Open Data 13 TeV docs

The aim of the 13 TeV ATLAS Open Data is to **provide data and tools** to high school, undergraduate and graduate students, as well as teachers and lecturers, to help educate and train them in analysis techniques used in experimental particle physics. Sharing data collected by the ATLAS experiment aims to generate excitement and enthusiasm for fundamental research, inspiring physicists of the future.

GitLab

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atlas-outreach-data-tools

atlas-outreach-data-tools

Group ID: 5082 Request Access

ATLAS outreach-data-tools for public releases

Subgroups and projects

Shared projects

Archived projects

Search by name

Last updated

A

aod-website-hugo-framework

Developer

ATLAS Open Data website hugo framework (2020)

★ 1

6 months ago

1

13TeVATLASOpenDataGuide2020

Maintainer

13 TeV ATLAS Open Data online introductory material and documentation

★ 1

7 months ago

A

atlas-opendata-subtitles-videos

Repo to save the subtitles of the ATLAS Open Data subtitles videos

★ 0

5 months ago

H

hackathon-docs

★ 0

7 months ago

L

lhcp-proceeding-2019

LHCP outreach proceeding 2019 <https://indico.cern.ch/event/687651/contributions/33...>

★ 0

7 months ago

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Packages

ATLAS PERIMETER

ATLAS Outreach data and tools

atlas-outreach-data-tools

Popular repositories

atlas-outreach-data-tools-framework

Python software framework for the ATLAS OpenData project

Python★ 10🔗 15

atlas-outreach-cpp-framework-13tev

C++★ 8🔗 23

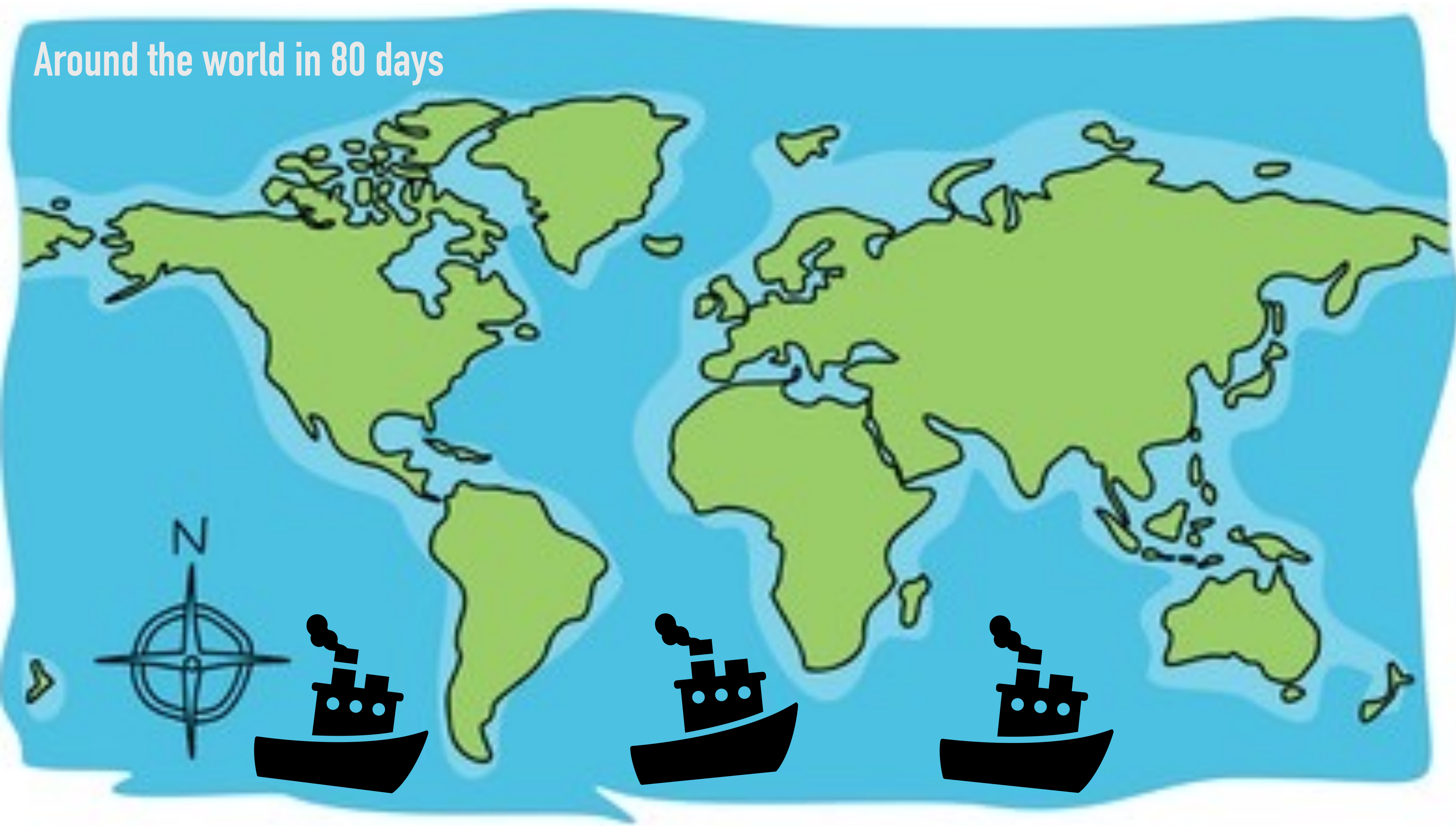
notebooks-collection-opendata

A set of simple notebooks using 8 TeV and 13 TeV ATLAS Open Data datasets

notebooks

This is the ATLAS outreach data and tools official repository for notebooks under ROOT

Around the world in 80 days



Around the world in 80 days 15 minutes

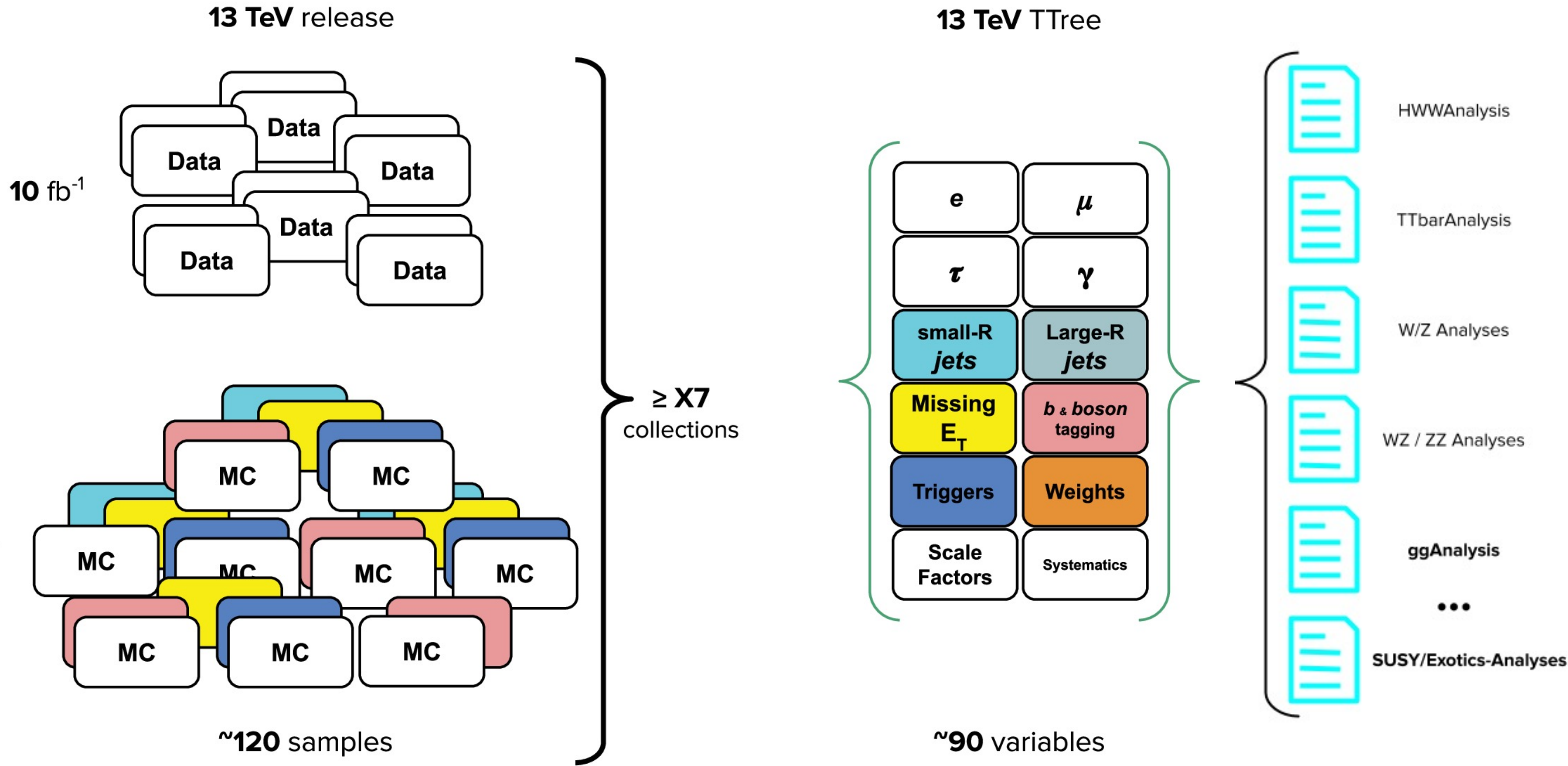


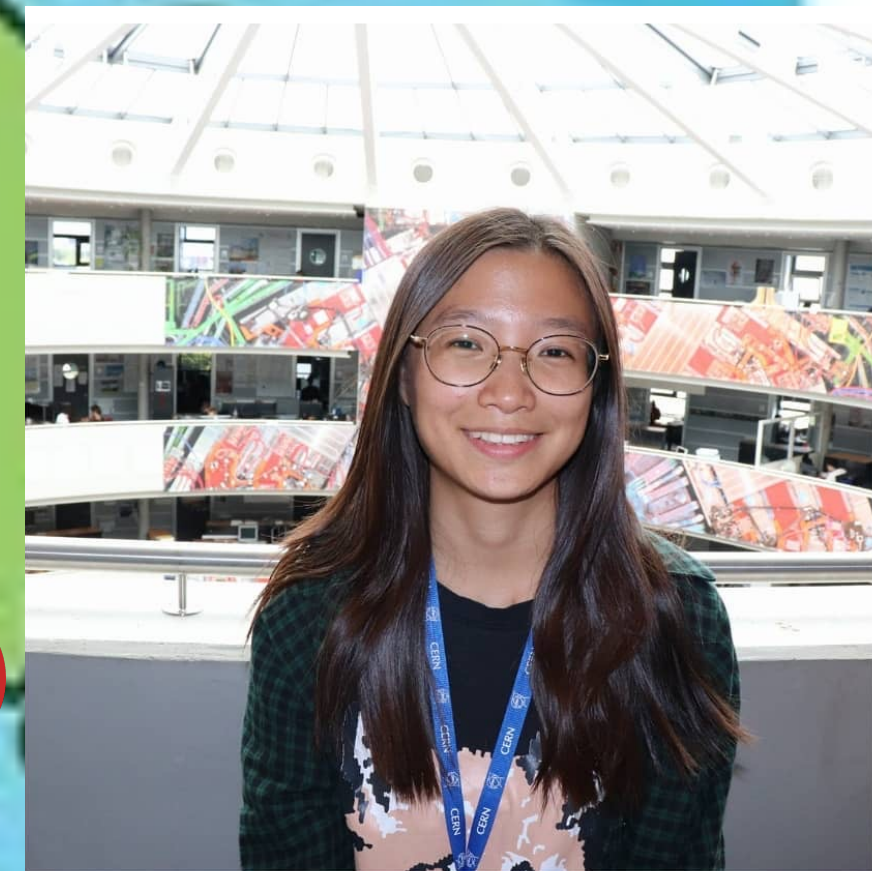


Meirin

Even

Dataset creation



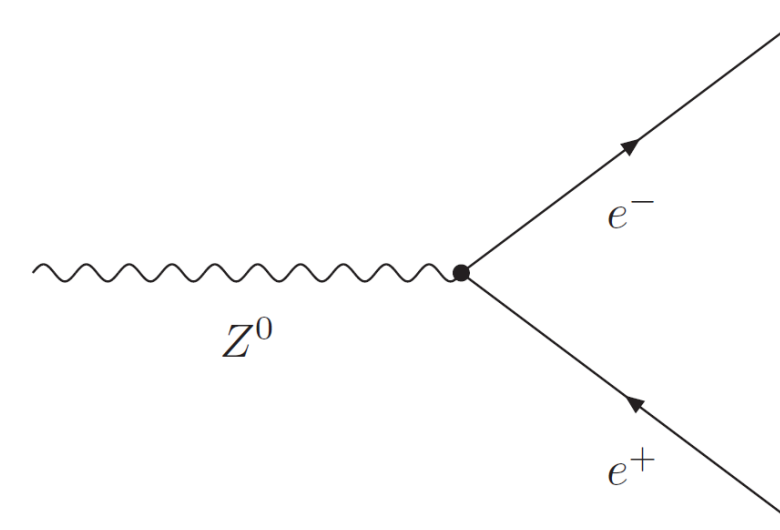


Ya-Feng

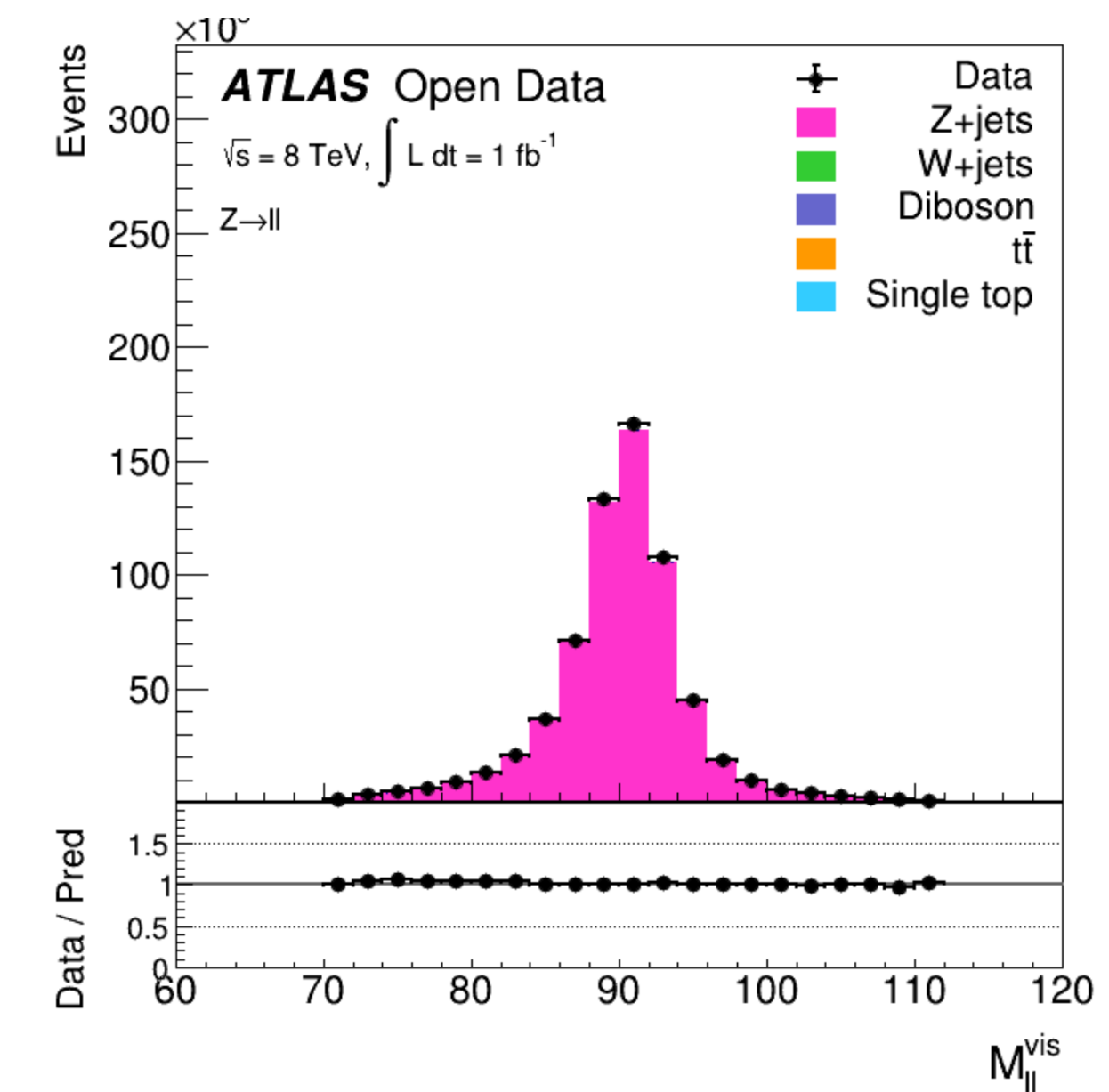
C++ software for visualisation and physics analysis

- ▶ 7 ROOT analysis examples to accompany open data release
- ▶ To educate and train others

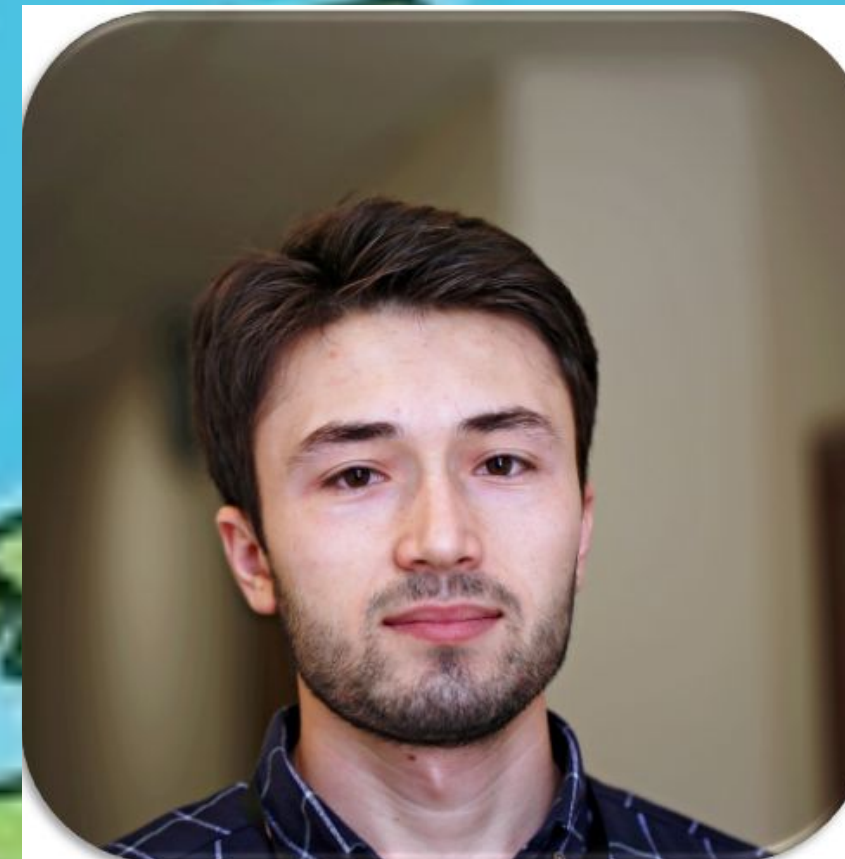
Z analysis



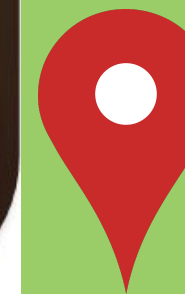
- Exactly two good leptons with $p_T > 25$ GeV;
- Leptons have opposite charge;
- Leptons have same flavour;
- $|m_{\ell\ell} - m_Z| < 20$ GeV with $m_Z = 91.18$ GeV.



Shodruz

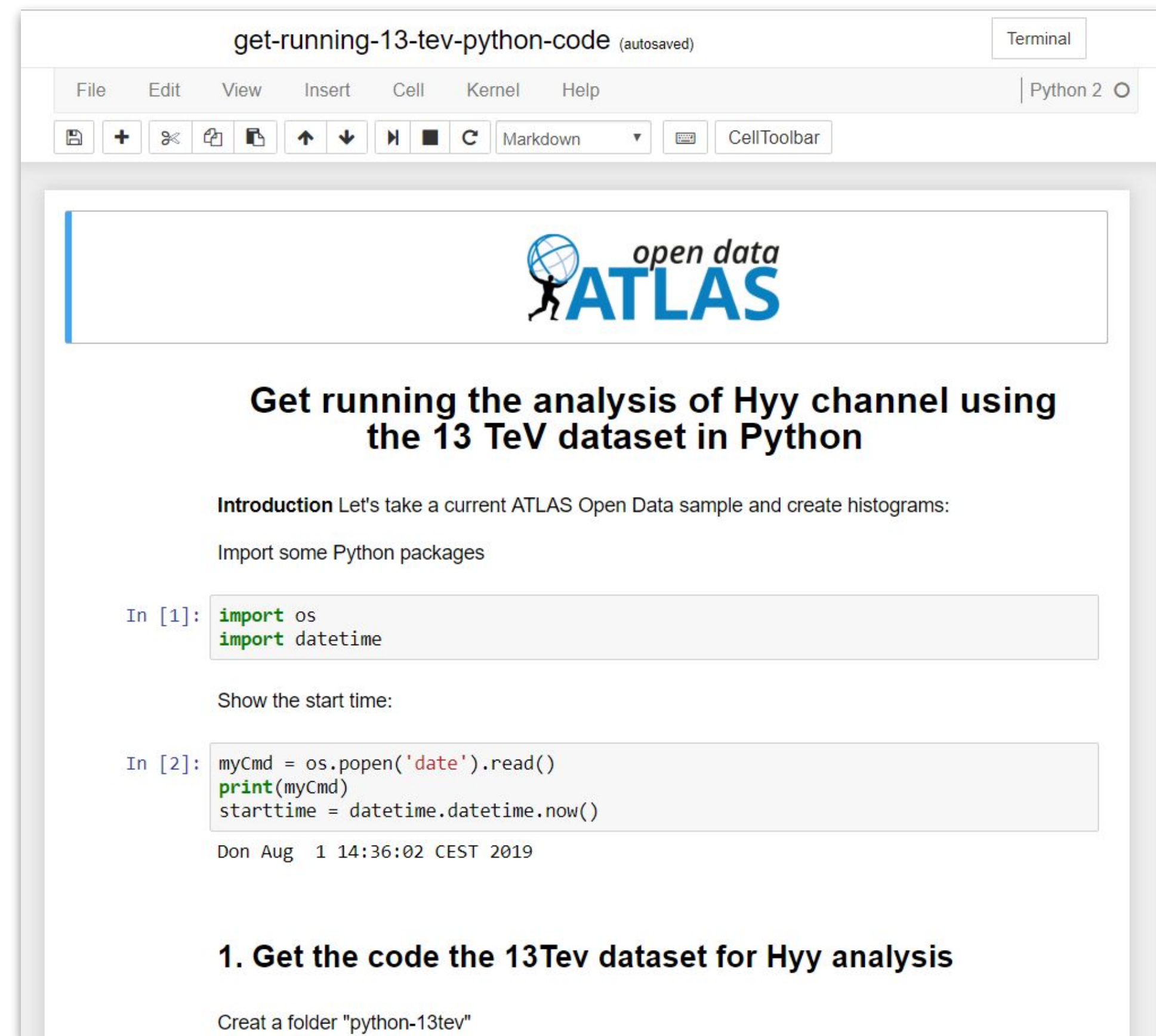


Yixin



Data & Tools release

- ▶ Developed Jupyter interface with ROOT
- ▶ Histogram plotting, analysis methods, code explanation
- ...



get-running-13-tev-python-code (autosaved) Terminal

File Edit View Insert Cell Kernel Help Python 2

open data
ATLAS

Get running the analysis of Hyy channel using the 13 TeV dataset in Python

Introduction Let's take a current ATLAS Open Data sample and create histograms:

Import some Python packages

```
In [1]: import os
import datetime
```

Show the start time:

```
In [2]: myCmd = os.popen('date').read()
print(myCmd)
starttime = datetime.datetime.now()

Don Aug  1 14:36:02 CEST 2019
```

1. Get the code the 13TeV dataset for Hyy analysis

Creat a folder "python-13tev"



Student voice in documentation

Student voice

Being negatively charged the particle (electron) is repelled by the negative plate, and goes towards the positive plate in the opposite direction of the electric field. This suggests the electron here will experience a constant electrostatic force due to the uniform electric field between the plates, so it has an acceleration.

Why do we want to accelerate them ?|

* The ability to accelerate particles to the point where they annihilate each other means when releasing energy and mass from the collision you could then observe with a series of special monitors.

Curriculum links

The reconstruction of vertices is important for many physics studies. This includes searches for new particles, identifying jets containing b-quarks or taus, and reconstruction of exclusive b-quark decays.
[Reference to OCR A Kerboodle textbook for the basics on Standard Model Particles: Pages 478-479]

Peer review

Reconstructed Dilepton Mass < 75 GeV: The Z events (Z boson events) are the major background in this analysis. The Z boson has a mass of 91 GeV



Link to definition

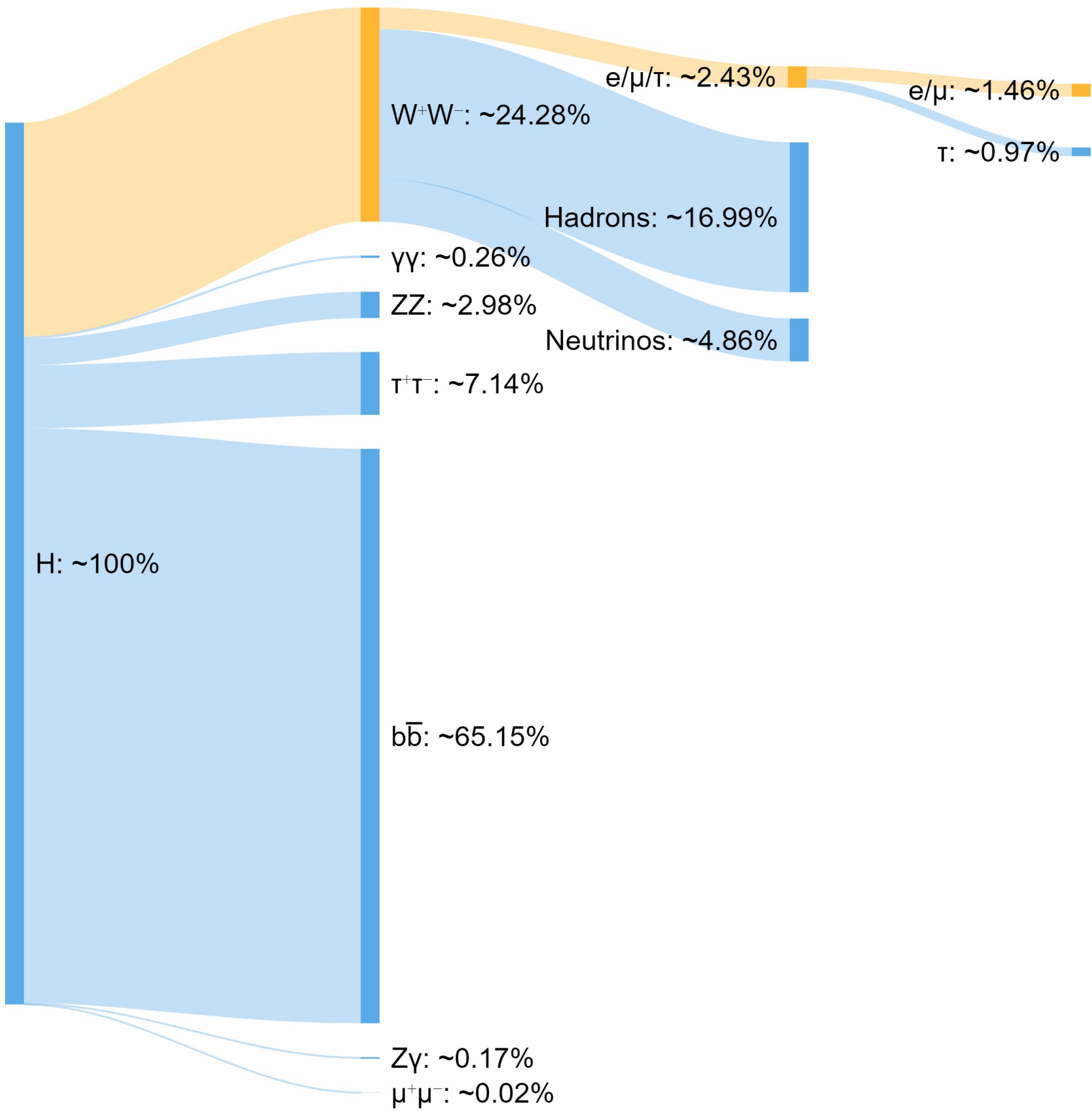


lago

New explanations

Decay channel	Branching ratio	Rel. uncertainty
$H \rightarrow \gamma\gamma$	2.28×10^{-3}	+5.0% -4.9%
$H \rightarrow ZZ$	2.64×10^{-2}	+4.3% -4.1%
$H \rightarrow W^+W^-$	2.15×10^{-1}	+4.3% -4.2%
$H \rightarrow \tau^+\tau^-$	6.32×10^{-2}	+5.7% -5.7%
$H \rightarrow b\bar{b}$	5.77×10^{-1}	+3.2% -3.3%
$H \rightarrow Z\gamma$	1.54×10^{-3}	+9.0% -8.9%
$H \rightarrow \mu^+\mu^-$	2.19×10^{-4}	+6.0% -5.9%

► 🤔 That could be visualised



Ander, William, Kip, Brieuc, Maud



Documentation enhancement & translation

☰ Mots clés Accueil Informations Application Data Logiciel Nouvelles/Blog FR

ATLAS Open Data

Français

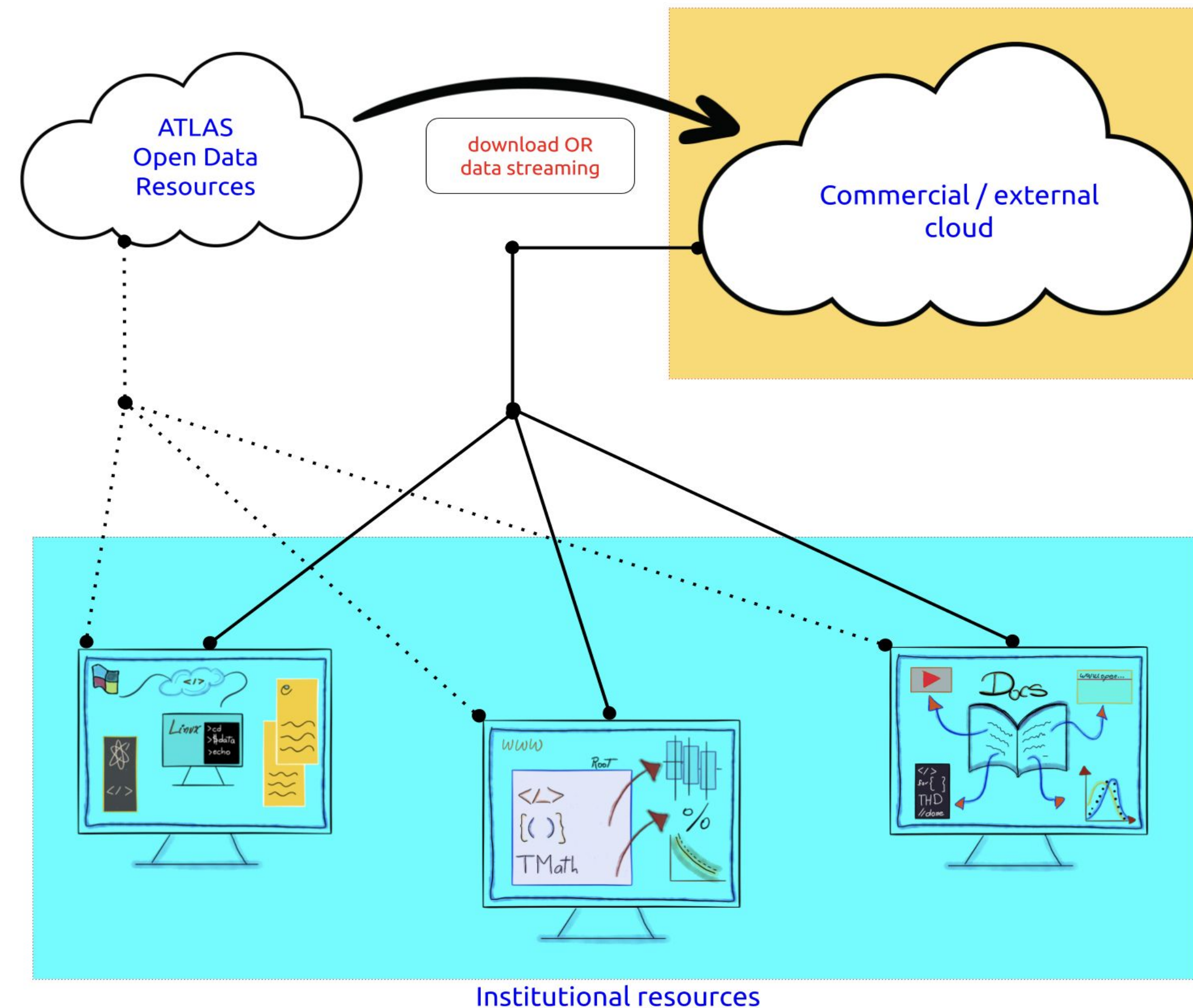




Giovanni

Multi-user deployment

- ▶ Developing infrastructure to deploy reproducible educational data-analysis platforms at small/medium projects & institutions



Too many students to name!



Testing, testing, testing

- ▶ Resource stress-testing many times in Latin America



Future challenges

- ▶ How to ensure our learning resources are **accessible** without guidance from physicists?
- ▶ How to incorporate our resources into more schools?
- ▶ How can we emphasise the teaching of more than just particle physics – skills in computing, programming, coding, analysis, data science, machine learning...?
- ▶ How can we empower students with additional skills – presenting, poster design, teamwork, research...?
- ▶ How can we reach more students that need it?

Conclusions

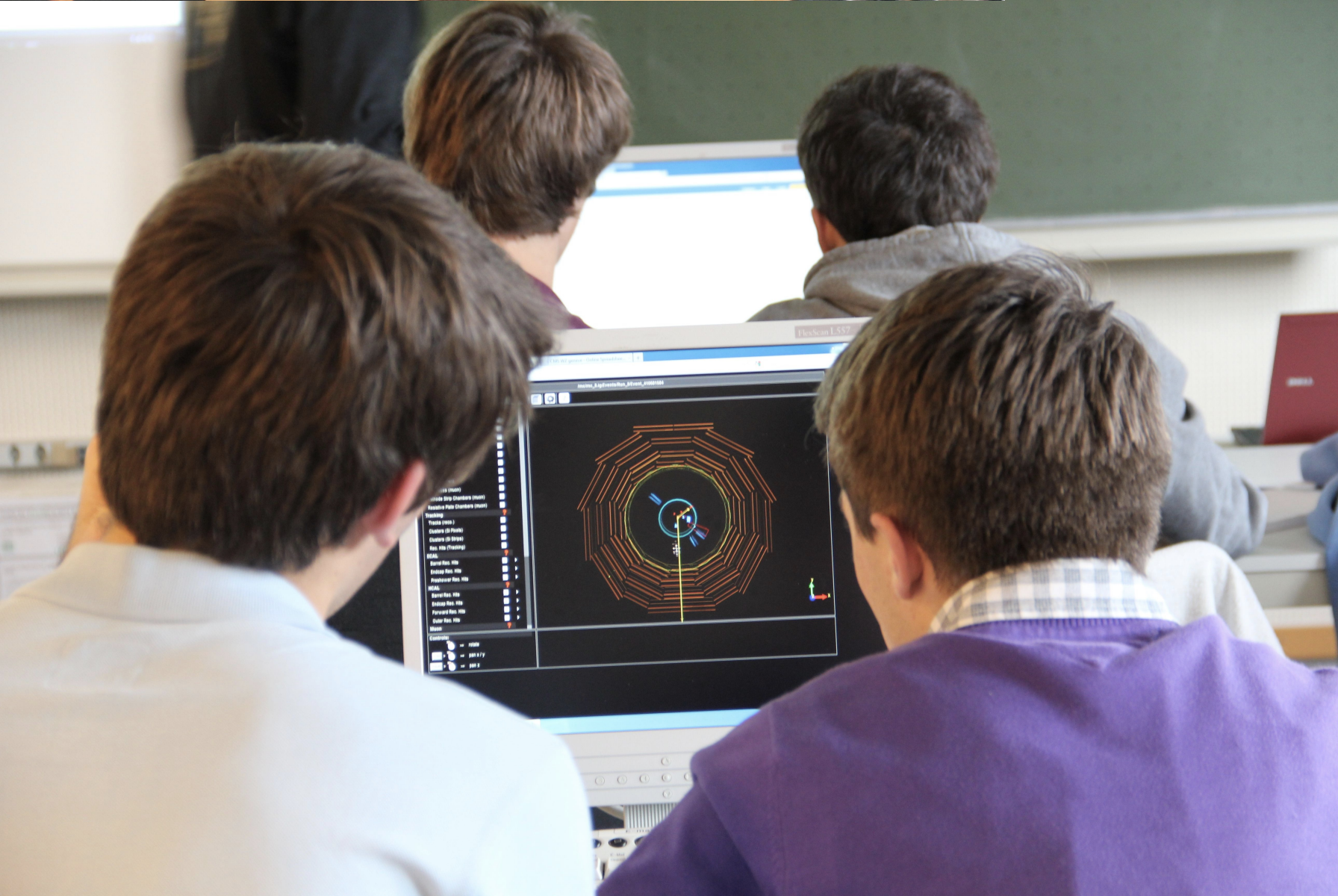
- ▶ ATLAS Open Data give access to research data for education
- ▶ Along with educational resources to analyse the data
- ▶ Co-creation of these resources leads to:
 - Better resources
 - Better experience for students
 - A fun experience for all involved
- ▶ Are you interested in co-creating resources with students?





Thanks!

Diolch!



*also to every single student co-creating with us