ESCAPE WP3 – LAPP contributions

Thomas Vuillaume, on behalf of all ESCAPE-LAPP members

30-11-2022, ESCAPE OSSR workshop, Erlangen

- The OSSR – see yesterday

- ESCAPE Data Science schools

- GammaLearn

- HiPeRTA

- lstMCpipe

The ESCAPE Data Science schools

The aim of the school is to provide theoretical and hands-on training on Data Science and Python development (coding environment and good code practices, version control and collaborative development, Python packaging, scientific libraries for data science and analysis and machine learning).

Teaching the community researchers to provide FAIR software

- https://escape2020.github.io/school2021/
- https://escape2020.github.io/school2022/

Online edition 2021: recorded lectures available online with all the content and material
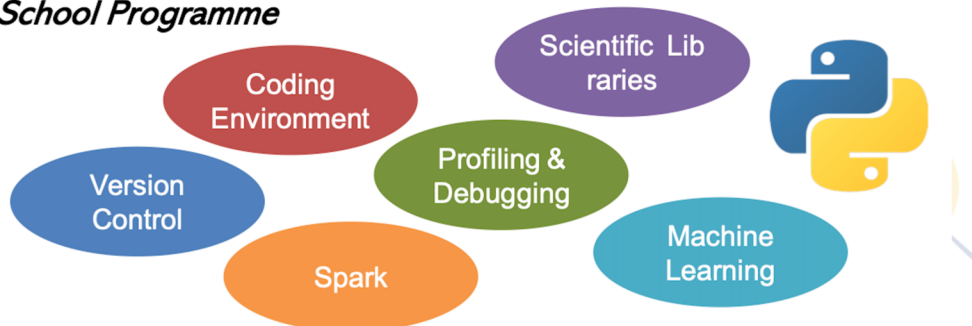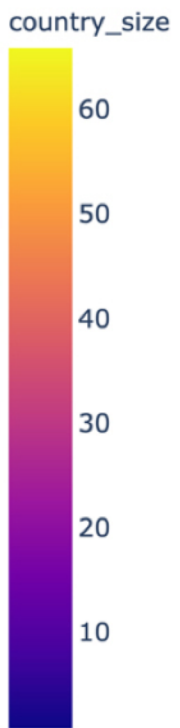
2021 (online edition)

Experiments and projects with more than 10 members participating

Virgo/LIGO 10.5%, SKA 10.2%, ATLAS 9.0%, LSST 7.8%, ESO 7.8%, None 7.5%, CTA 7.3%, CMS 6.3%, LHCb 6.1%, ALICE 4.1%, KM3NeT 3.9%

Positions

Undergrad 17.6%, Master student 27.2%, PhD student 34.2%, Postdoc 10.8%, Senior researcher 2.7%, Academia Engineer 1.4%, Other 6.0%
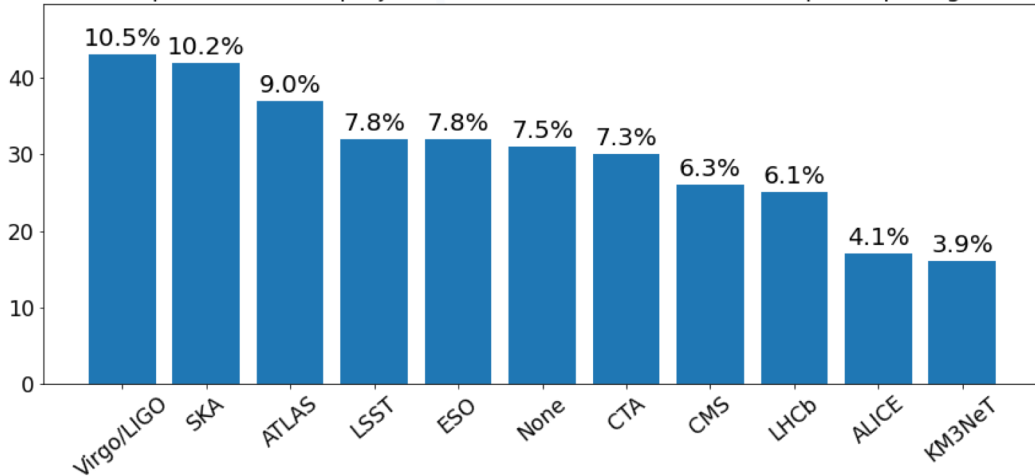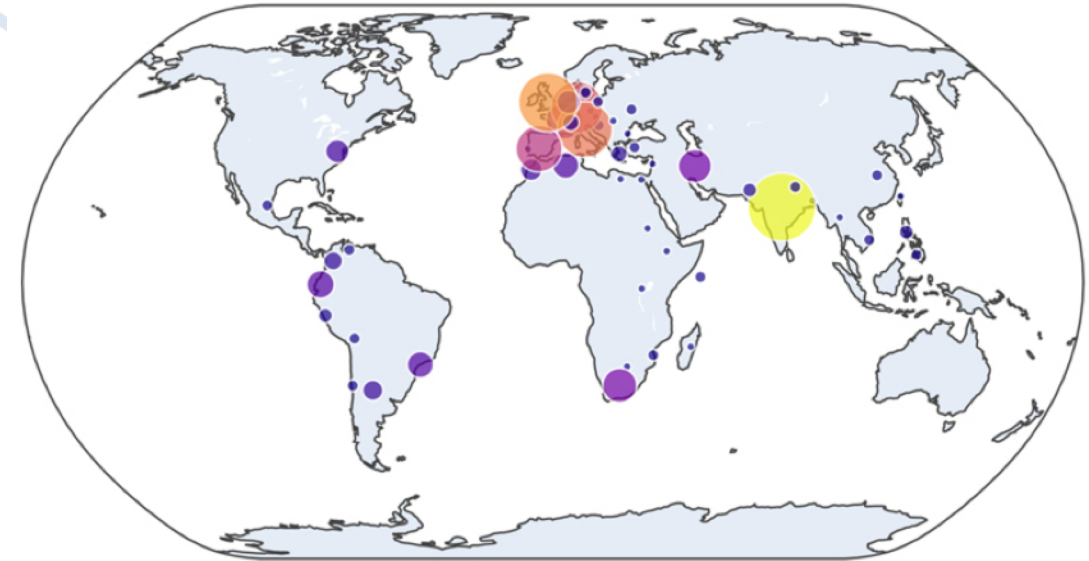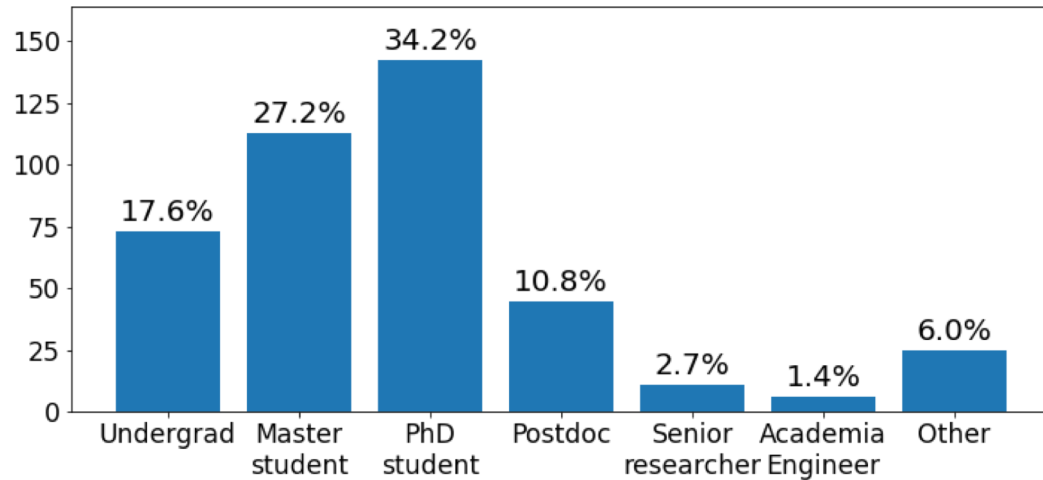
Did the school meet your expectations?

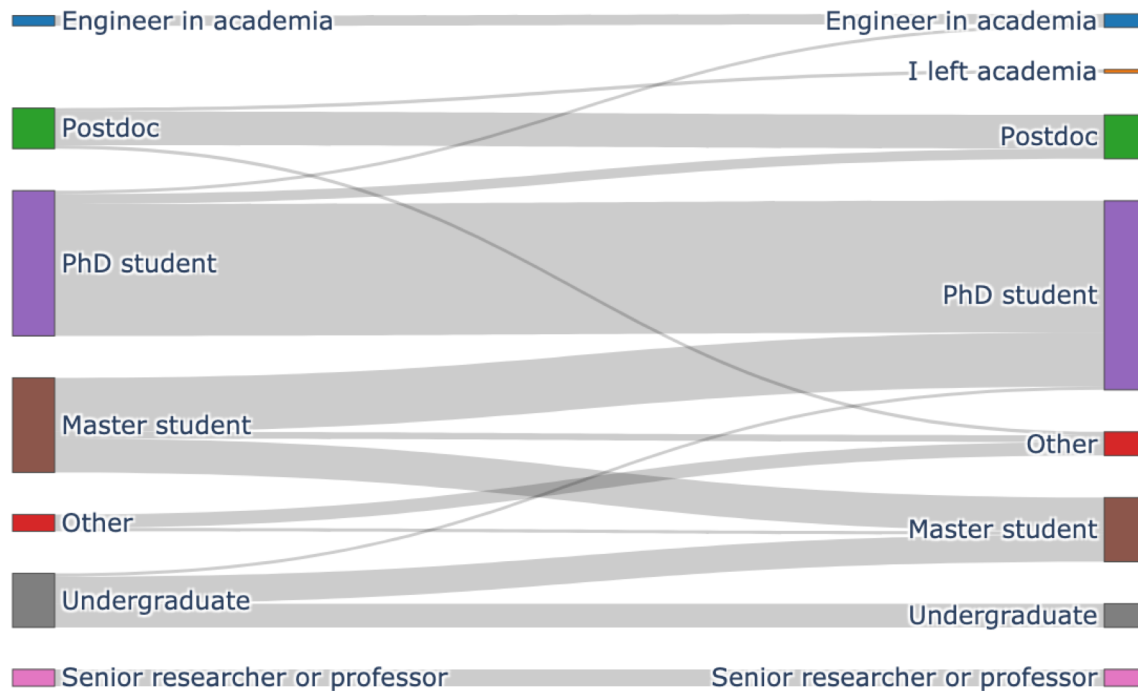1: 1.0%, 2: 1.0%, 3: 8.9%, 4: 29.7%, 5: 59.4%
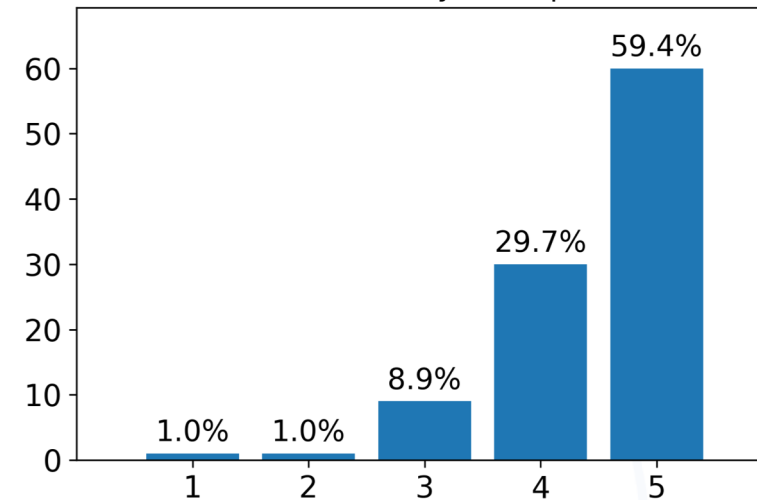
2021 – **one year later** survey

Survey sent one year after the 2021 edition to the participants to know if the school has actually been useful: **152 answers**
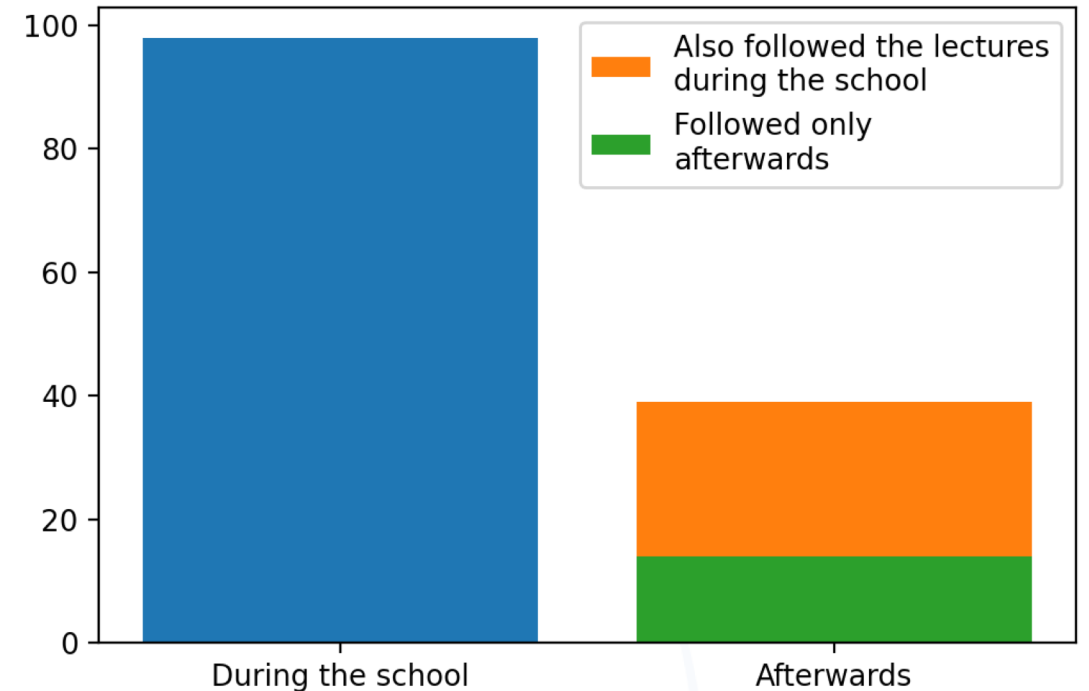

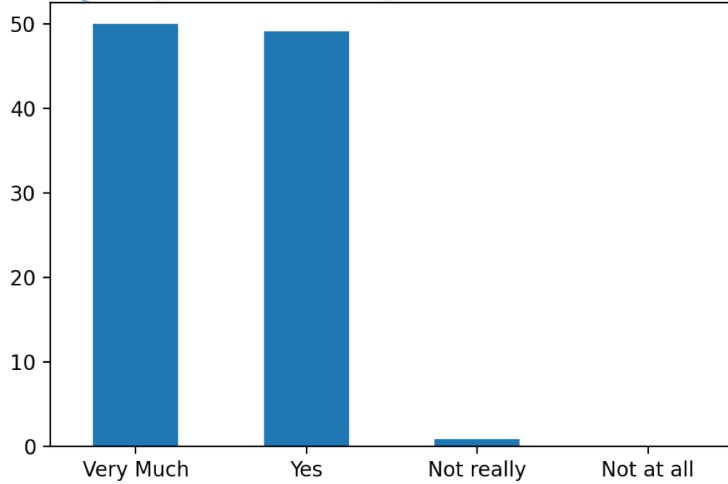School participants positions

During the school — 1 year later

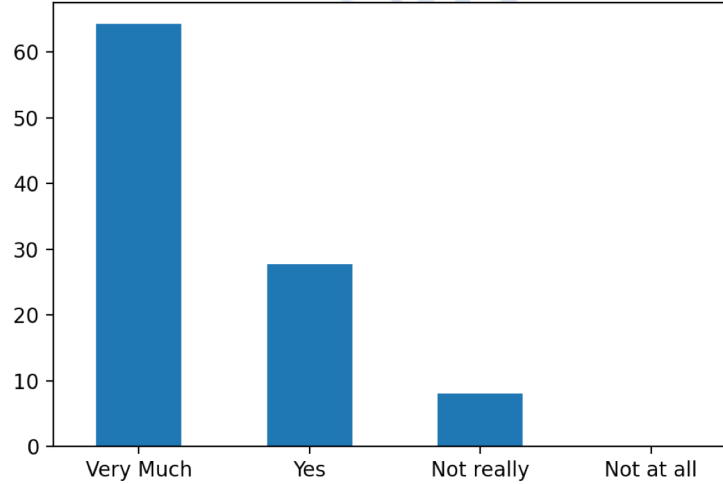

When did you follow the lectures?

2021 – one year later survey

2022 survey
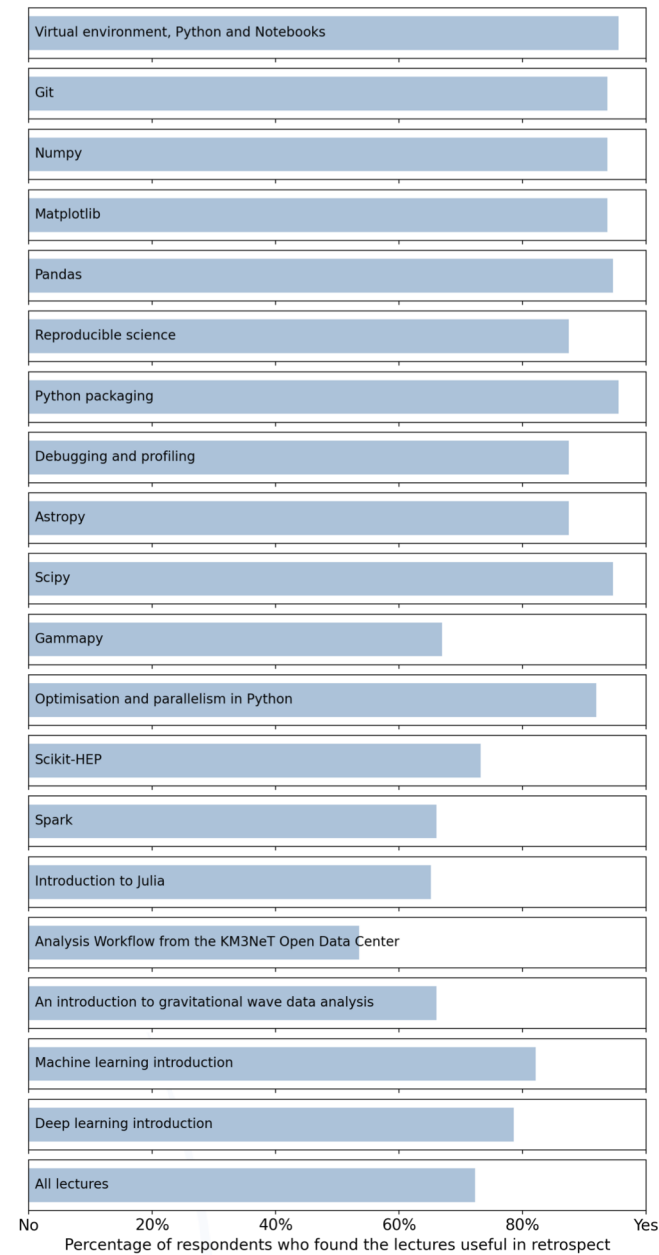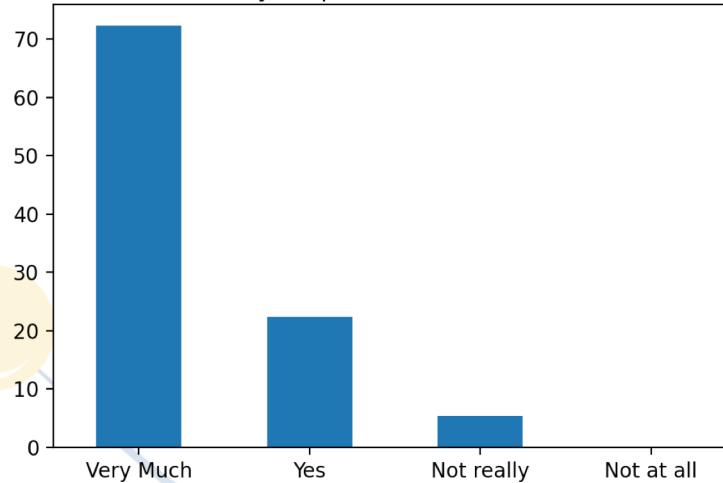
Positions

- Engineer in academia: 5.3%
- PhD student: 68.4%
- Master student: 10.5%
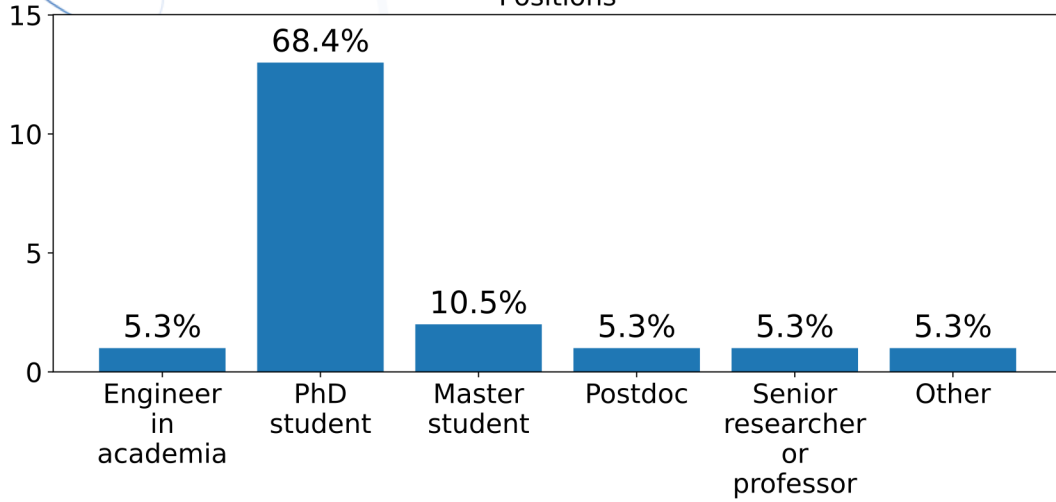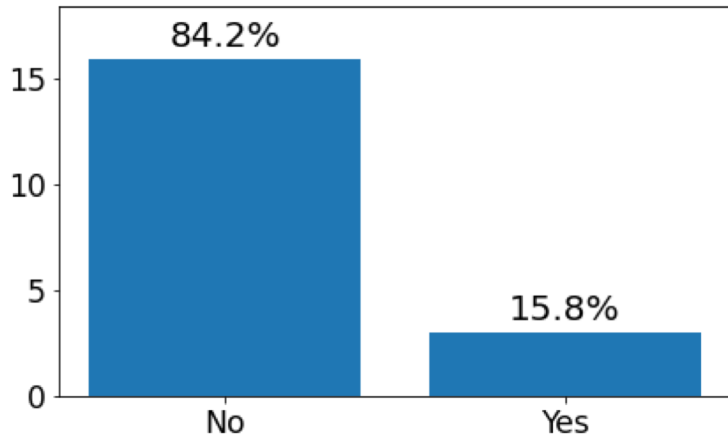- Postdoc: 5.3%
- Senior researcher or professor: 5.3%
- Other: 5.3%

country
- France
- Germany
- Italy
- Netherlands
- United Kingdom
- Croatia
- South Africa
- United States

ESCAPE members
- No: 84.2%
- Yes: 15.8%

Global satisfaction
- 26.7%
- 73.3%
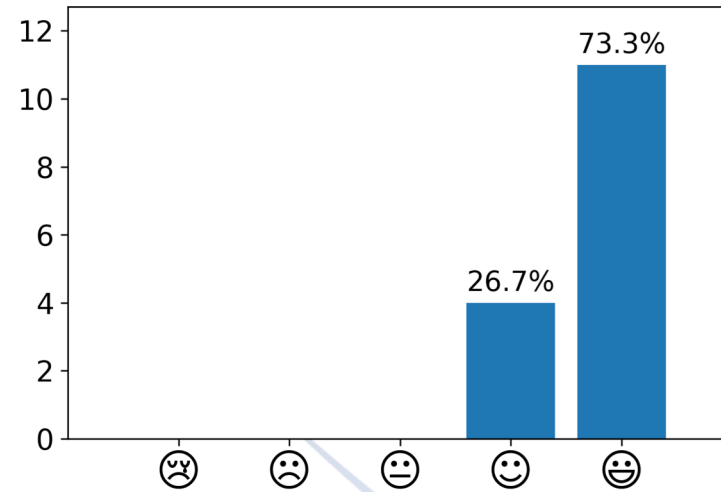
For future editions, should we have
- a physical event: 80.0%
- an hybrid event: 20.0%

GammaLearn
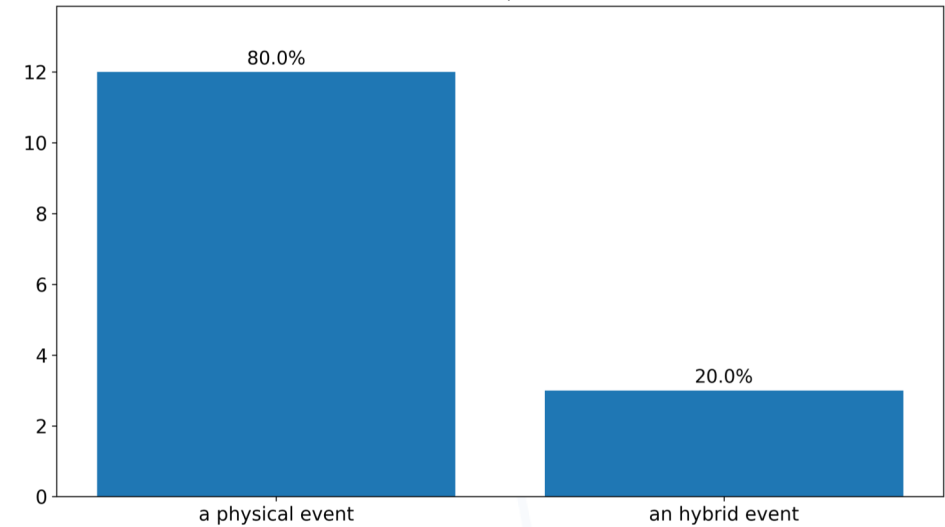
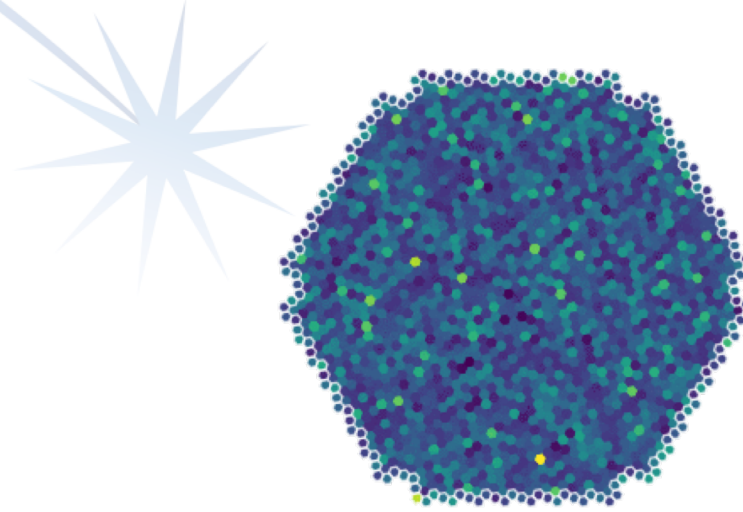- Deep learning for CTA event reconstruction

- A complete framework to:
  - ease developments and experiments running
  - load datasets
  - pre-process data (filter, augment, transform)
  - train, validate and test networks
  - monitor the training process
  - visualize training results

- Fully onboarded: https://zenodo.org/record/6522736

- Recent publications:
 - M. Jacquemont, T. Vuillaume, A. Benoit, G. Maurin, P. Lambert and G. Lamanna, **First Full-Event Reconstruction from Imaging Atmospheric Cherenkov Telescope Real Data with Deep Learning**, 2021
  - Jacquemont, M.; Vuillaume, T.; Benoit, A.; Maurin, G. and Lambert, P. (2021). **Multi-Task Architecture with Attention for Imaging Atmospheric Cherenkov Telescope Data Analysis**.
  - Jacquemont M., Vuillaume T., Benoit A., Maurin G., Lambert P. (2021) **Deep Learning for Astrophysics, Understanding the Impact of Attention on Variability Induced by Parameter Initialization**.
  - *Vuillaume T., Jacquemont M., de Bony de Lavergne M., Sanchez D.~A., Poireau V., Maurin G., Benoit A., et al.*, **Analysis of the Cherenkov Telescope Array first Large-Sized Telescope real data using convolutional neural networks**, arXiv e-prints, 2021.
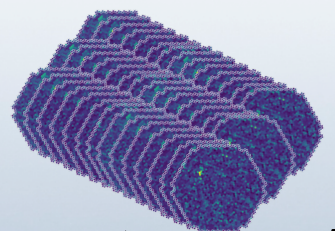
GammaLearn

– deep learning for the Cherenkov Telescope Array –

- Cosmic rays produce atmospheric showers
- Showers are imaged by an array of optical telescopes
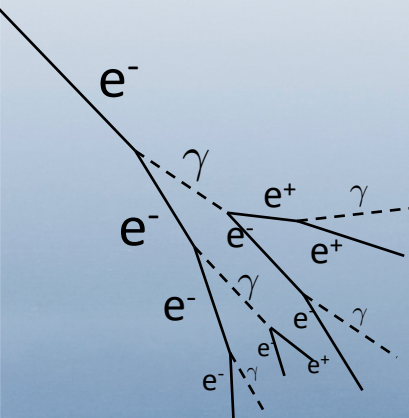
PetaBytes
of Data !

- Deep Convolutionnal Neural Networks reconstruct the physical parameters of the primary particle from the telescopes images

e⁻

γ

e⁺   γ

e⁻   e⁻   e⁺

e⁻   γ   e⁺   γ

e⁻   e⁺   γ   e⁺

learn

class

distance

direction

energy

Contact: https://gammalearn.pages.in2p3.fr/pages/ - thomas.vuillaume@lapp.in2p3.fr
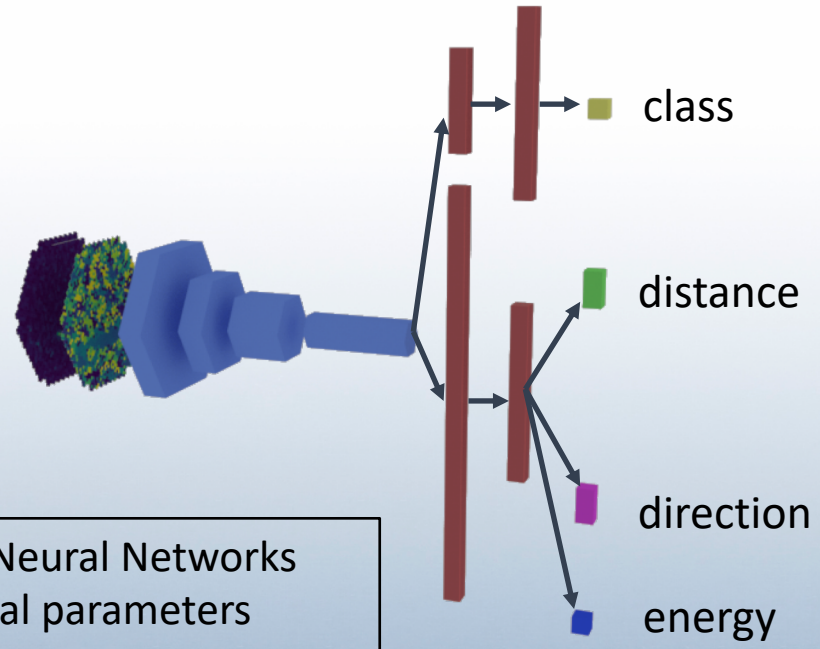
HiPeRTA

- High Performance pipeline for CTA online event reconstruction

- C++ library with highly optimized code

- Accepted as in-kind contribution for CTAO during ESCAPE

- Under use for LST-1 (first telescope on-site in La Palma under commissioning)
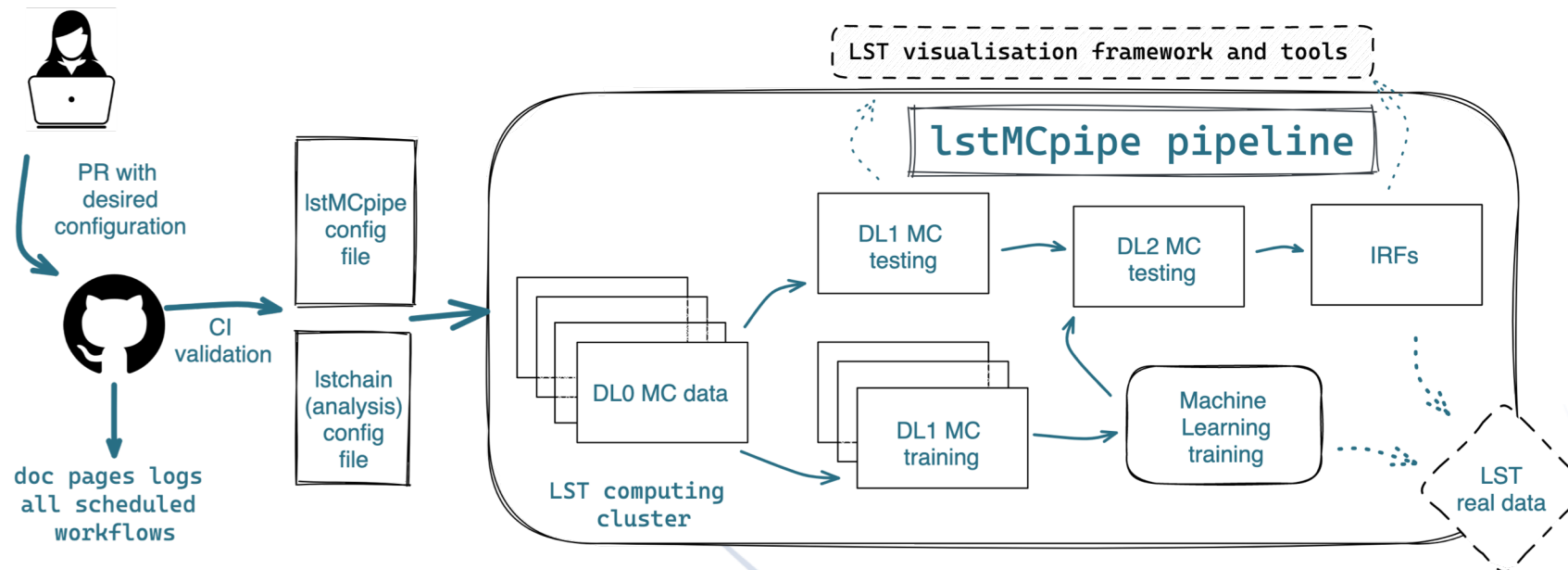
HiPeRTA
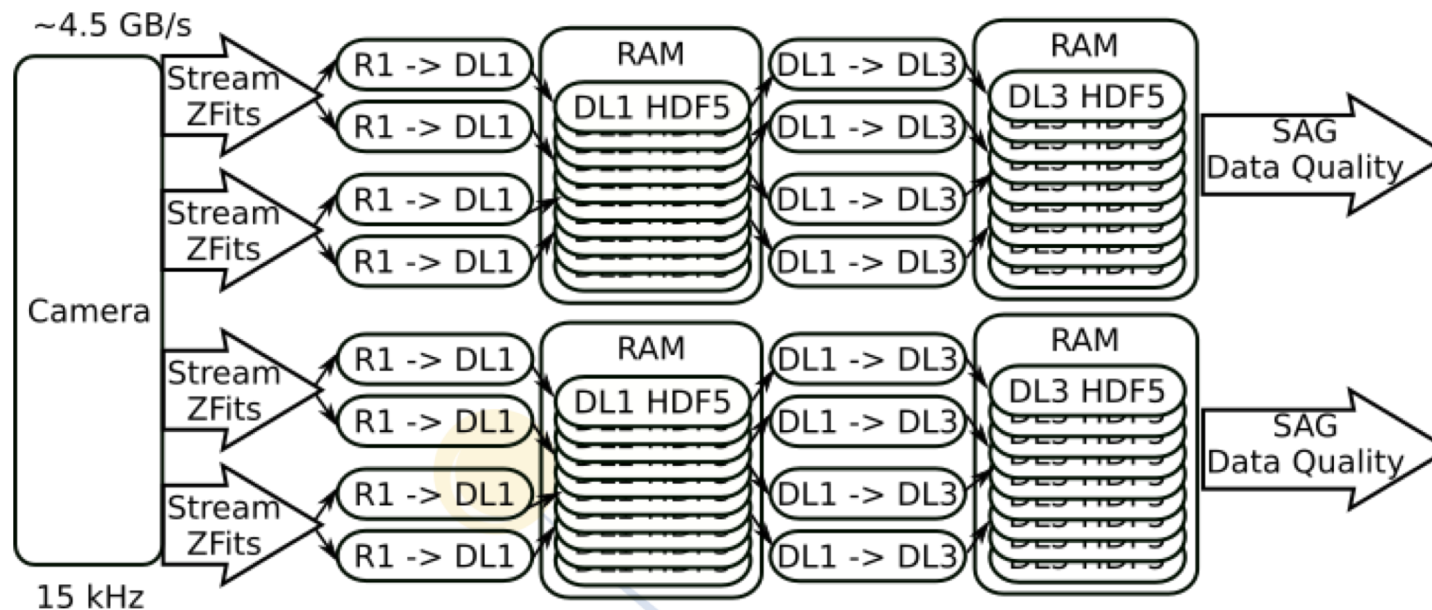
- Repository: https://gitlab.in2p3.fr/CTA-LAPP/HiPeRTA
  - License: CeCILL Free Software License Agreement v1.0
  - Unit tests and CI
  - Continuous integration and comparison with offline pipeline

- Doc: https://cta-lapp.pages.in2p3.fr/HiPeRTA/

- Onboarding on-going: https://gitlab.in2p3.fr/escape2020/wp3/ossr-curation/-/merge_requests/48

lstMCpipe

- Python package to orchestrate the different stages of the analysis of the CTA LST-1 telescope Monte-Carlo files on a computing facility

- MC productions as a service for LST members through GitHub pull requests

lstMCpipe

- Code: https://github.com/cta-observatory/lstmcpipe
  - License: MIT
  - Unit tests and CI

- Doc: https://cta-observatory.github.io/lstmcpipe/

- Zen: https://doi.org/10.5281/zenodo.6460727

- Onboarding to do