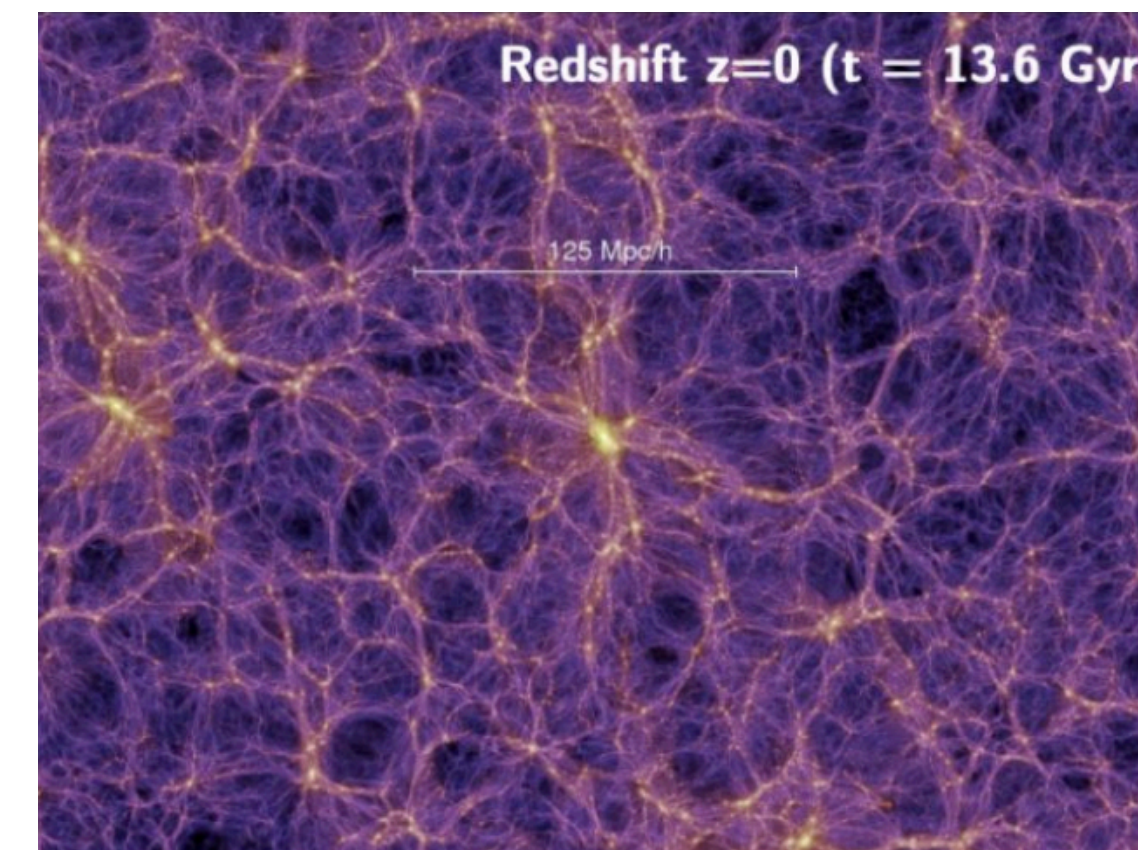
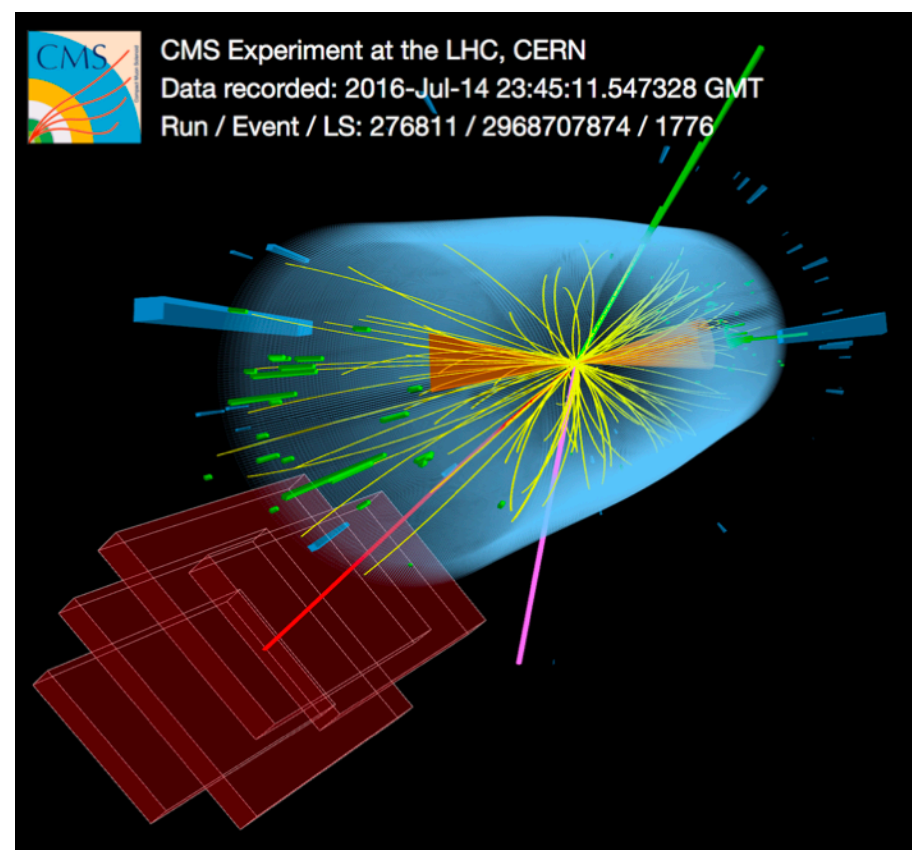
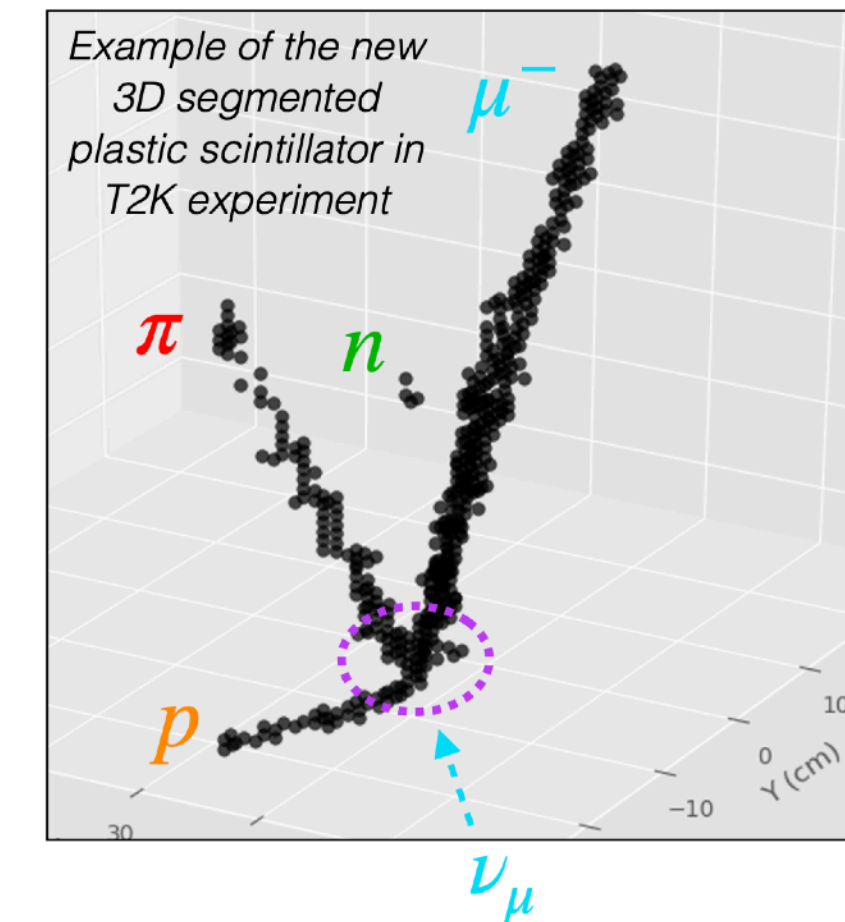


IPA ML Workshop Closing

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Idea behind this workshop:

- Connect the IPA groups.
- Encourage possible collaborations, and knowledge sharing, around deep learning applications.
- Possibly create connections also within the DPHYS
- Introduce more people (including students) to the field of machine learning



What was achieved:

- **More awareness of what is going on in the different domains: neutrino, particle physics and astrophysics**
- **Exchange on different solutions applied in the specific field**
- **Found commonalities on problems modelling, reconstruction, background mitigation, data selection, and more) and ML-based solutions (GANs, CNN, GNN, AEs, ...)**
- **Possibly found inspiration from colleagues developments**

	Methods	Tutorials
10:00	Welcome <i>Prof. Davide Sgalaberna</i> HIT E 51, ETH Zurich 10:00 - 10:30	
11:00	Physics and machine learning: an overview <i>Dr Saul Alonso Monsalve</i> HIT E 51, ETH Zurich 10:30 - 12:00	
12:00	Lunch HIT E 51, ETH Zurich 12:00 - 13:30	
13:00	Machine learning lecture <i>Dr Mauro Donega</i> HIT E 51, ETH Zurich 13:30 - 14:45	
14:00	Break HIT E 51, ETH Zurich 14:45 - 15:15	
15:00	Machine learning (BDT) tutorial <i>Massimiliano Galli et al.</i> HIT E 51, ETH Zurich 15:15 - 16:15	
16:00	Deep learning tutorial <i>Dr Saul Alonso Monsalve</i> HIT E 51, ETH Zurich 16:15 - 17:00	
17:00		

First day:

- Introduction to ML for beginners
- Thanks to **Saul, Mauro and Simone** for the huge work and the excellent lectures/tutorials

Applications			Applications Methods		
09:00	Introduction on neutrino experiments workflow with emphasis on challenges HIT E 51, ETH Zurich	Prof. Davide Sgalaberna 09:00 - 09:20	09:00	Data-MC matching HIT E 51, ETH Zurich	Massimiliano Galli 09:00 - 09:20
	Image reconstruction in a 3D plastic scintillator detector using deep learning HIT E 51, ETH Zurich	Dr Saul Alonso Monsalve 09:20 - 09:40		Analysis techniques HIT E 51, ETH Zurich	Florian Eble 09:20 - 10:00
	Neutrino interaction classification and transfer learning HIT E 51, ETH Zurich	Dr Leigh Whitehead 09:40 - 10:00	10:00	Quantum machine learning HIT E 51, ETH Zurich	Vasilis Belis 10:00 - 10:20
10:00	Event filtering and mitigation of simulation biases HIT E 51, ETH Zurich	Dr Marta Babicz 10:00 - 10:20		Break HIT E 51, ETH Zurich	10:20 - 10:50
	Break HIT E 51, ETH Zurich	10:20 - 10:50		Machine learning applications HIT E 51, ETH Zurich	Dr Mauro Verzetti 10:50 - 11:30
11:00	Event reweighting and generative models in neutrino experiments HIT E 51, ETH Zurich	Dr Cristovao Vilela 10:50 - 11:10	11:00	Robotics, event-based imaging HIT E 51, ETH Zurich	Prof. Davide Scaramuzza 11:30 - 12:00
	Multi-task data reconstruction chain for imaging detectors in neutrino experiments HIT E 51, ETH Zurich	Prof. Kazuhiro Terao 11:10 - 11:30		Knowledge distillation HIT E 51, ETH Zurich	Patrick Odagiu 12:00 - 12:30
	Large Scale Structure Cosmology with Artificial Intelligence HIT E 51, ETH Zurich	Dr Tomasz Kacprzak 11:30 - 11:50	12:00	Lunch HIT E 51, ETH Zurich	12:30 - 13:30
	Cosmological constraints from combined probes of large scale structure with deep learning HIT E 51, ETH Zurich	Arne Thomsen 11:50 - 12:10		Round table HIT E 51, ETH Zurich	13:30 - 14:45
12:00	Lunch HIT E 51, ETH Zurich	12:10 - 13:20		Closing HIT E 51, ETH Zurich	Prof. Anna Paola de Cosa 14:45 - 15:00
	Background rejection in Cherenkov Telescopes HIT E 51, ETH Zurich	Prof. Adrian Biland 13:20 - 13:40	13:00		
	New generative AI models HIT E 51, ETH Zurich	Luca Biggio 13:40 - 14:00	14:00		
14:00	Geometric Learning/ Physics-informed AI for cosmology HIT E 51, ETH Zurich	Dr Tilman Troester 14:00 - 14:20			
	PointNets for galaxy redshift surveys HIT E 51, ETH Zurich	Sotirios Anagnostidis 14:20 - 14:40			
	Break HIT E 51, ETH Zurich	14:40 - 15:10	15:00		
15:00	Introduction on LHC experiments workflow with emphasis on challenges HIT E 51, ETH Zurich	Prof. Anna Paola de Cosa 15:10 - 15:30			
	Object identification and reconstruction HIT E 51, ETH Zurich	Dr Alessandro Calandri 15:30 - 15:50			
	Ultrafast ML inference for triggering HIT E 51, ETH Zurich	Dr Thea Aarrestad 15:50 - 16:10			
16:00	Machine learning for data quality monitoring HIT E 51, ETH Zurich	Roberto Seidita 16:10 - 16:30			
	Probabilistic models in ML for HEP HIT E 51, ETH Zurich	Davide Valsecchi 16:30 - 16:50			

Second and third day:

- 20 highly interesting talks from IPA colleagues showing a variety of ML applications in the 3 different domains
- 2 fascinating talks on ML applications outside physics from external guests
- Thanks to **the speakers** for such inspiring presentations and to **the participants** for contributing to the exchange

Thanks to

The IPA executive board

- That supported the organization of the workshop
- And all the colleagues that helped with the organization, especially
 - **Prof. Rubbia** who first had the idea to initiate such an exchange
 - **Prof. Refregier** and **Prof. Harra** for their useful input

The IPA Administration

- For all the organisational and technical support we received