

ETH zürich

Welcome to the 1st workshop
on Machine Learning at the
Institute of Particle physics
and Astrophysics

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- Deep learning is finding more and more applications in many different fields
- We wanted to improve the communication and encourage possible collaborations between the different research groups at the Institute of Particle physics and Astrophysics (IPA) and possibly create connections within the Department of Physics (D-PHYS)
- Starting from an idea of Prof. Rubbia and with the full support of the IPA Executive Board we wanted to bring people together with the goal of
 - ✓ Introducing more people to the field of machine learning
 - ✓ Bringing the different research groups together and share their most recent developments in the field
 - ✓ Discussing about the state of the art within IPA as well as outside the field
 - ✓ Finding contact points and synergies between applications in Astrophysics, Neutrino and Collider physics

We have 3-days workshop with ~100 participants and many different talks !

Day 1

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

*The whole workshop
will be in HIT E 51*

*If you are joining the
tutorial please bring your
laptop and make sure you
have a Google account*

Day 2

Neutrino

Astrophysics

LHC

09:00	Introduction on neutrino experiments workflow with emphasis on challenges <i>HIT E 51, ETH Zurich</i>	<i>Prof. Davide Sgalaberna</i> 09:00 - 09:20
	Vertex activity and fitting of particle trajectories <i>HIT E 51, ETH Zurich</i>	<i>Dr Saul Alonso Monsalve</i> 09:20 - 09:40
	Neutrino interaction classification and transfer learning <i>HIT E 51, ETH Zurich</i>	<i>Dr Leigh Whitehead</i> 09:40 - 10:00
10:00	Event filtering and mitigation of simulation biases <i>HIT E 51, ETH Zurich</i>	<i>Dr Marta Babicz</i> 10:00 - 10:20
	Break <i>HIT E 51, ETH Zurich</i>	10:20 - 10:50
11:00	Event reweighting and generative models in neutrino experiments <i>HIT E 51, ETH Zurich</i>	<i>Dr Cristovao Vilela</i> 10:50 - 11:10
	Semantic segmentation in neutrino interactions <i>HIT E 51, ETH Zurich</i>	<i>Prof. Kazuhiro Terao</i> 11:10 - 11:30

	Large Scale Structure Cosmology with Artificial Intelligence <i>HIT E 51, ETH Zurich</i>	<i>Dr Tomasz Kacprzak</i> 11:30 - 11:50
12:00	Cosmological constraints from combined probes of large scale structure with deep learning <i>HIT E 51, ETH Zurich</i>	<i>Arne Thomsen</i> 11:50 - 12:10
	Lunch <i>HIT E 51, ETH Zurich</i>	12:10 - 13:20
13:00	Background rejection in Cherenkov Telescopes <i>HIT E 51, ETH Zurich</i>	<i>Prof. Adrian Biland</i> 13:20 - 13:40
	New generative AI models <i>HIT E 51, ETH Zurich</i>	<i>Luca Biggio</i> 13:40 - 14:00
14:00	Geometric Learning/ Physics-informed AI for cosmology <i>HIT E 51, ETH Zurich</i>	<i>Dr Tilman Troester</i> 14:00 - 14:20
	PointNets for galaxy redshift surveys <i>HIT E 51, ETH Zurich</i>	<i>Sotirios Anagnostidis</i> 14:20 - 14:40

15:00	Break <i>HIT E 51, ETH Zurich</i>	14:40 - 15:10
	Introduction on LHC experiments workflow with emphasis on challenges <i>HIT E 51, ETH Zurich</i>	<i>Prof. Anna Paola de Cosa</i> 15:10 - 15:30
	Ultrafast ML inference for triggering <i>HIT E 51, ETH Zurich</i>	<i>Dr Thea Aarrestad</i> 15:30 - 15:50
16:00	Machine learning for data quality monitoring <i>HIT E 51, ETH Zurich</i>	<i>Roberto Seidita</i> 15:50 - 16:10
	Object identification and reconstruction <i>HIT E 51, ETH Zurich</i>	<i>Dr Alessandro Calandri</i> 16:10 - 16:30
	Probabilistic models in ML for HEP <i>HIT E 51, ETH Zurich</i>	<i>Davide Valsecchi</i> 16:30 - 16:50

Day 3

LHC

Other Applications

09:00	Data-MC matching <i>HIT E 51, ETH Zurich</i>	<i>Massimiliano Galli</i> 09:00 - 09:20
	Analysis techniques <i>HIT E 51, ETH Zurich</i>	<i>Florian Eble</i> 09:20 - 10:00
10:00	Quantum machine learning <i>HIT E 51, ETH Zurich</i>	<i>Vasilis Belis</i> 10:00 - 10:20
	Break <i>HIT E 51, ETH Zurich</i>	10:20 - 10:50
11:00	Machine learning applications: generative models <i>HIT E 51, ETH Zurich</i>	<i>Dr Mauro Verzetti</i> 10:50 - 11:30
	Robotics, event-based imaging <i>HIT E 51, ETH Zurich</i>	<i>Prof. Davide Scaramuzza</i> 11:30 - 12:00
12:00	Knowledge distillation <i>HIT E 51, ETH Zurich</i>	<i>Patrick Odagiu</i> 12:00 - 12:30

*Round table
+ Closing*

13:00	Lunch <i>HIT E 51, ETH Zurich</i>	12:30 - 13:30
14:00	Round table <i>HIT E 51, ETH Zurich</i>	13:30 - 14:45
15:00	Closing <i>HIT E 51, ETH Zurich</i>	<i>Prof. Annapaola de Cosa</i> 14:45 - 15:00

Let's get started !