

## IML meeting – NEWS

Lorenzo Moneta (CERN)   Markus Stoye (Imperial College, DSI)  
Paul Seyfert (CERN)   Rüdiger Haake (Yale University)  
Steven Schramm (Université de Genève)



- Editing meeting on Friday
- Thanks to all contributors and commentators
  - Comment deadline extended until 1st November



**IML Machine Learning Working Group: unsupervised searches and unfolding with ML**

Friday 12 Oct 2018, 15:00 → 18:00 Europe/Zurich  
40-S2-AB1 - Salle Anderson (CERN)

Videoconference Rooms IML\_MachineLearning-WG

- 15:00 → 15:10 Introduction and news** (10m)  
Speakers: Lorenzo Moneta (CERN), Markus Stoffe (Imperial College), Paul Seyfert (CERN), Rutiger Haake (Fakultät für Physik der Universität Bonn), Steven Schwenn (Università di Torino)  
StevenSchwenn...
- 15:10 → 15:20 ML community white paper path forward** (10m)  
Speaker: Dr Sergei Gleizer (University of Florida)  
arXiv link, Authorship details, HEPML\_CWP\_Serg., Hypothesis (comm...)
- 15:25 → 15:55 Guiding New Physics Searches with Unsupervised Learning** (30m)  
I will describe an approach to search for new phenomena in data, by detecting discrepancies between two datasets. These could be, for example, a simulated standard model background, and an observed dataset containing a potential hidden signal of New Physics.  
I will propose a new statistical test, built upon a test statistic which measures deviations between two samples, using a Nearest Neighbors approach to estimate the local ratio of the density of points.  
The test is model-independent and non-parametric, requiring no knowledge of the shape of the underlying distributions, and it does not bin the data, thus retaining full information from the multidimensional feature space.  
As a by-product, the technique is also a useful tool to identify regions of interest for further study.  
As a proof-of-concept, I will show the power of the method when applied to synthetic Gaussian data, and to a simulated dark matter signal at the LHC.  
Speaker: Andrea De Simone (CERN)  
arXiv:1807.04038, DeSimone.pdf, Recording
- 16:30 → 16:30 Learning New Physics from a machine** (30m)  
We propose using neural networks to detect data departures from a given reference model, with no prior bias on the nature of the new physics responsible for the discrepancy. The model-independent nature of our approach, and its ability to deal with rare signals such as those expected at the LHC, is quantitatively assessed in toy examples.  
Speaker: Andrea Wulzer (CERN)  
arXiv:1806.02350, Recording, talk\_wulzer.pdf
- 16:35 → 16:55 Machine learning as an instrument for data unfolding** (20m)  
Speaker: Alexander Glazov (Deutsches Elektronen-Synchrotron DESY)  
arXiv:1712.01814, IML\_181012.pdf, Recording

- Instead of written minutes we now organise recordings for talks
- (with approval by the speaker, not automatically)
- e.g. last meeting's talks accessible on the indicog agenda
- Big thanks to the recording service



# Upcoming events

2018-10-31 Data science seminar: Full Event Interpretation at Belle 2

2018-11-30 Next IML meeting (Filtration plant 222/R-001)

open topic: anything ML related that you're working on that didn't fit topical meetings



## Upcoming conferences/workshops

- 2018-11-14 – 2018-11-16 [ML4Jets](#) abstract deadline tomorrow  
ML as applied to jet physics
- 2019-01-22 – 2019-01-25 [PHYSTAT-nu](#) abstract deadline tomorrow  
statistics, including ML, for neutrino physics
- 2019-03-11 – 2019-03-15 [ACAT](#) abstract deadline 2018-11-20  
Empowering the Revolution: Bringing ML to HPC
- 2019-04-02 – 2019-04-05 [Connecting the Dots](#) abstract deadline Sunday  
track reconstruction, pattern recognition, and ML with tracks



# Today's meeting

## IML Machine Learning Working Group: unsupervised searches, part 2

Tuesday 30 Oct 2018, 15:00 → 18:00 Europe/Zurich

500-1-001 - Main Auditorium (CERN)

Videoconference  
Rooms

IML-MachineLearning-WG

Join

15:00 → 15:10

### Introduction and news

10m

**Speakers:** Lorenzo Moneta (CERN), Markus Stoye (Imperial College (GB)), Paul Seyfert (CERN), Rudiger Haake (Yale University (US)), Steven Schramm (Universite de Geneve (CH))

15:15 → 15:35

### Searching for new physics without knowing the signal model

20m

**Speakers:** Jeroen Schouwenberg (Nikhef National Institute for subatomic physics (NL)), Sascha Caron (Nikhef National Institute for subatomic physics (NL)), Simone Amoroso (Deutsches Elektronen-Synchrotron (DE))

15:40 → 16:00

### CWoLa hunting

20m

**Speakers:** Ben Nachman (Lawrence Berkeley National Lab. (US)), Jack Collins (University of Maryland and Johns Hopkins University)

16:05 → 16:25

### QCD or What?

20m

arXiv:1808.08979

**Speaker:** Jennifer Thompson (TP Heidelberg)

16:30 → 16:50

### The Unsupervised Collider Searches DarkMachines Project

20m

**Speaker:** Amir Farbin (University of Texas at Arlington (US))

16:55 → 17:15

### Searching for New Physics with Deep Autoencoders

20m

<https://arxiv.org/abs/1808.08992>

**Speaker:** David Shih (Rutgers University)



Run: 34818  
Timestamp: 2015-11-25 12:21:51  
System: Physics  
Energy: 0.88 TeV



CMS Experiment at LHC, CERN  
Data recorded: Wed Nov 25 12:21:51 2015 CET  
Run/Event: 262548 / 14562169  
Lumi section: 309



SFT

Event: 2598326  
Run: 168486  
Wed, 25 Nov 2015 12:51:53

CEST

first, stable beams heavy-ion collisions

Run: 34918  
Timestamp: 2015-11-03 11:03:36(UTC)  
System: Pb-Pb  
Energy: 0.8 TeVCMS Experiment at LHC, CERN  
Data recorded: Wed Nov 25 12:21:51 2015 CET  
Run/Event: 262548 / 14502169  
Lumi section: 309

SFT

CEST

first, stable beams heavy-ion collisions

sources for slides will appear on  
(excl. cern logo and monospace font)

<https://gitlab.cern.ch/pseyfert/slides-implnews-2018-10-30>

