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

Report of Contributions

https://indico.cern.ch/e/752376

Contribution ID: **1** Type: **not specified**

Introduction and news

Friday, 12 October 2018 15:00 (10 minutes)

Presenters: MONETA, Lorenzo (CERN); STOYE, Markus (Imperial College (GB)); SEYFERT, Paul (CERN); HAAKE, Rudiger (Yale University (US)); SCHRAMM, Steven (Universite de Geneve (CH))

Contribution ID: **4** Type: **not specified**

Guiding New Physics Searches with Unsupervised Learning

Friday, 12 October 2018 15:25 (30 minutes)

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.

Presenter: DE SIMONE, Andrea (SISSA)

Contribution ID: **5** Type: **not specified**

Machine learning as an instrument for data unfolding

Friday, 12 October 2018 16:35 (20 minutes)

Presenter: GLAZOV, Alexander (Deutsches Elektronen-Synchrotron (DE))

Contribution ID: **7** Type: **not specified**

Learning New Physics from a machine

Friday, 12 October 2018 16:00 (30 minutes)

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.

Presenter: WULZER, Andrea (CERN)

Contribution ID: **8** Type: **not specified**

ML community white paper path forward

Friday, 12 October 2018 15:10 (10 minutes)

Presenter: Dr GLEYZER, Sergei (University of Florida (US))