Contribution ID: **742** Contribution code: **contribution ID 742** Type: **Poster**

Efficient kernel methods for large scale problems in HEP

Kernel methods represent an elegant and mathematically sound approach to nonparametric learning, but so far could hardly be used in large scale problems, since naïve implementations scale poorly with data size. Recent improvements have shown the benefits of a number of algorithmic ideas, combining optimization, numerical linear algebra and random projections. These, combined with (multi-)GPU specific implementations, allow for great speedups on datasets up to billions of points while delivering state of the art results.
In this talk, after reviewing the main features of these techniques, we discuss their effectiveness on HEP specific problems such as signal-versus-background classification and anomaly detection. We also compare kernel methods with with similar neural network based models, showing significant gains in terms of training times and computational costs while maintaining comparable performances.

Significance

The aim of this presentation is to show how machine learning models based on kernel methods represent strong options for the HEP community. In particular, they provide algorithms that are mathematically sound and extremely efficient. We show that depending on the use case, there can be dramatic speedups in training times (from hours to minutes) compared to similar neural network based models.

References

https://proceedings.neurips.cc/paper/2020/file/a59afb1b7d82ec353921a55c579ee26d-Paper.pdf

Speaker time zone

Compatible with Europe

Primary authors: Mr LOSAPIO, Gianvito (MaLGa, University of Genoa); Prof. ROSASCO, Lorenzo (MaLGa, University of Genoa); Dr LETIZIA, Marco (MaLGa, University of Genoa and INFN - National Institute for Nuclear Physics); Mr RANDO, Marco (MaLGa, University of Genoa)

Presenter: Dr LETIZIA, Marco (MaLGa, University of Genoa and INFN - National Institute for Nuclear Physics)

Session Classification: Posters: Walnut

Track Classification: Track 2: Data Analysis - Algorithms and Tools