



Contribution ID: 16

Type: **Plenary**

## 40 MHz Scouting with Deep Learning in CMS

*Wednesday, April 22, 2020 1:30 PM (15 minutes)*

A 40 MHz scouting system at CMS would provide fast and virtually unlimited statistics for detector diagnostics, alternative luminosity measurements and, in some cases, calibrations, and it has the potential to enable the study of otherwise inaccessible signatures, either too common to fit in the L1 accept budget, or with requirements which are orthogonal to “mainstream” physics, such as long-lived particles.

Deep learning is a class of machine learning algorithms that uses multiple layers to progressively extract higher-level features from the raw inputs. A series of studies on different aspects of LHC data processing have demonstrated the potential of deep learning for CERN applications. The usage of deep learning aims at improving physics performance and reducing execution time.

This talk will present a deep learning approach to muon scouting in the Level-1 Trigger of the CMS detector. The idea is to utilize multilayered perceptrons to ‘re-fit’ the Level-1 muon tracks, using fully reconstructed offline tracking parameters as the ground truth for neural network training. The network produces corrected helix parameters (transverse momentum, eta and phi), with a precision that is greatly improved over the standard Level 1 reconstruction. The network is executed on an FPGA-based PCIe board produced by Micron Technology, the SB-852. It is implemented using the Micron Deep Learning Accelerator inference engine. The methodology for developing deep learning models will be presented, alongside the process of compiling the models for fast inference hardware. The metrics for evaluating performance and the achieved results will be discussed.

### **Consider for young scientist forum (Student or postdoc speaker)**

Yes

### **Second most appropriate track (if necessary)**

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**Session Classification:** Recording sessions