

Harnessing ultrafast ML for new algorithms at the CMS L1 trigger

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In the high luminosity LHC (HL-LHC) era, the CMS detector will be subject to an unprecedented level of simultaneous proton-proton interactions (pile-up) that complicate the reconstruction process. Mitigation of the effects of pile-up is of prime importance. In preparation for this, the detector will be upgraded, providing more granularity and more information than we have had before. In addition to the pile-up mitigation, we can use these upgrades to enable and improve the physics strategy at the Level-1 (L1) trigger. With the inclusion of FPGA boards with greater resources in the L1 upgrade, and new codesign tools like hls4ml for easily converting neural networks into FPGA firmware, we now have the ability to deploy ultrafast machine learning algorithms at L1. This talk will describe plans to use machine learning techniques at L1 to perform anomaly detection, long-lived particle detection, and better estimate the missing transverse momentum.

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