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Development of ML FPGA filter for particle identification

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With the increase of luminosity for accelerator colliders as well as a granularity of detectors for particle physics, more challenges fall on the readout system and data transfer from detector front-end to computer farm and long term storage. Modern concepts of trigger-less readout and data streaming will produce large data volumes being read from the detectors.
From a resource standpoint, it appears strongly advantageous to perform both the pre-processing of data and data reduction at earlier stages of a data acquisition. Real-time data processing is a frontier field in experimental particle physics. Machine Learning methods are widely used and have proven to be very powerful in particle physics.
The growing computational power of modern FPGA boards allows us to add more sophisticated algorithms for real time data processing. Many tasks could be solved using modern Machine Learning (ML) algorithms which are naturally suited for FPGA architectures. The FPGA-based machine learning algorithm provides an extremely low, sub-microsecond, latency decision and makes information-rich data sets for event selection.
Work has started to develop an FPGA based ML algorithm for a real-time particle identification with Transition Radiation detector and E/M Calorimeter. This report describes the purpose of the work and progress in evaluating the ML-FPGA application.

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