Contribution ID: **36** Type: **Lightning Talk**

B-tagging and Tau reconstruction in the Level-1 Trigger with real-time Machine Learning

Monday 25 September 2023 17:25 (5 minutes)

The future LHC High-Luminosity upgrade amplifies the proton collision rate by a factor of about 5-7, posing challenges for physics object reconstruction and identification including tau and b-jet tagging. Detecting both the taus and bottom quarks at the CMS Level-1 (L1) trigger enhances many important physics analyses in the experiment. The challenge of the L1 trigger system requires identification at a throughput of 40 million collisions per second, while only having a latency of 12.5-microsecond window for each event. This study presents the integration of two machine learning algorithms for b-tagging and tau reconstruction into the CMS L1 trigger. Our algorithm utilizes the HLS4ML software to generate the neural network allowing us to achieve the desired latency and throughput within the constrained resources of the system. We present how the particle inputs are prepared, how the synchronization between different jet algorithms is performed, and board-testing of the whole system in Xilinx VU9P FPGAs.

Primary author: HOANG, Duc Minh (MIT)

Presenter: HOANG, Duc Minh (MIT)

Session Classification: Contributed Talks

Track Classification: Contributed Talks