7th Inter-Experimental LHC Machine Learning Workshop



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Type: Contributed talk

Challenges Deploying a Hybrid PVFinder Algorithm for Primary Vertex Reconstruction in LHCb's GPU-Resident HLT1

Thursday 22 May 2025 14:40 (20 minutes)

The PVFinder algorithm employs a hybrid deep neural network (DNN) approach to reconstruct primary vertices (PVs) in proton-proton collisions at the LHC, addressing the complexities of high pile-up environments in LHCb and ATLAS experiments. By integrating fully connected layers with a UNet architecture, PVFinder' s end-to-end tracks-to-hist DNN processes charged track parameters to predict PV positions, achieving efficiencies above 97% and false positive rates as low as 0.03 per event in LHCb, surpassing conventional heuristic methods. We present the current status of embedding PVFinder into LHCb's Allen framework, a fully software-based, GPU-optimized first-level trigger system for Run 3, handling 30 MHz of beam crossing data. Key challenges include optimizing computational efficiency and model integration within Allen's real-time constraints. For ATLAS, PVFinder matches the Adaptive Multi-Vertex Finder's efficiency while improving vertex-vertex resolution (0.23–0.37 mm vs. 0.76 mm). Future efforts target ATLAS ACTS integration and graph neural network enhancements.

Would you like to be considered for an oral presentation?

Yes

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