

Contribution submission to the conference Heidelberg 2022

Neural network based primary vertex reconstruction with FPGAs for the upgrade of the CMS level-1 trigger system

— •MATTHIAS KOMM — Desy, Hamburg

A major challenge of the high-luminosity upgrade of the CERN LHC is to single out the primary interaction vertex of the hard scattering process from the expected 200 pileup interactions that will occur each bunch crossing. To meet this challenge, the upgrade of the CMS experiment comprises a complete replacement of the silicon tracker that will allow for the first time to perform the reconstruction of charged particle tracks and the primary interaction vertex at the hardware-based first level of the event trigger system (L1). Knowledge of the primary interaction vertex is a central component for distinguishing tracks and calorimeter clusters belonging to the hard scattering process from pileup interactions, which subsequently improves the energy estimate and resolution of physics objects such as jets and the missing transverse momentum. This talk will focus on the reconstruction of the primary vertex from tracks at L1 within the stringent time requirements of $O(100\text{ns})$ while being additionally restricted by the FPGA resource usage and latency. To optimally exploit and pass-on the available information at each stage of the vertex reconstruction, an algorithm based on an neural network model has been developed that possesses simultaneous knowledge about all stages and hence enables end-to-end optimization. Future plans for operating and tuning the algorithm on real data during data-taking will also be outlined.

Part: T
Type: Vortrag;Talk
Topic: 3.08 DAQ und Trigger; 3.08 DAQ and Trigger
Email: mkomm@cern.ch