Contribution ID: **18**   Type: **Poster**

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

A major challenge for the high-luminosity upgrade of the CERN LHC is to determine the interaction vertex of the hard scattering process from the 200 simultaneous interactions (pileup) that are expected to occur in each bunch crossing. To meet this challenge, the upgrade of the CMS experiment comprises of a complete replacement of the silicon tracker that will allow for the first time the reconstruction of charged particle tracks and the primary interaction vertex to be performed 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 missing transverse momentum.

This talk will focus on the reconstruction of the primary vertex from tracks at L1 within the stringent latency requirement of $O(100ns)$ and within FPGA resource usage constraints. 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 of all stages and hence enables end-to-end optimization. Future plans for operating and tuning the algorithm on real data during CMS data-taking will also be outlined.

Consider for young scientist forum (Student or postdoc speaker)

Yes

Second most appropriate track (if necessary)

Novel approaches and algorithms, and theoretical analysis

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