Contribution ID: **127** Type: **Oral presentation**

FPGA Tracking with oneAPI

Wednesday 24 April 2024 11:55 (20 minutes)

The next era of LHC experiments will provide an unprecedented volume of data, aiming to achieve a tenfold increase in integrated luminosity. Processing these data presents formidable computing challenges. In the case of the LHCb detector, a fully software based trigger has been employed in its current design, which processes events at ˜30MHz. Currently, GPU-based compute acceleration is harnessed to manage the high track densities within the detector. The computing challenge intensifies with HL-LHC hit multiplicities, leading to extremely large combinatorics in forming particle tracks from hits. To tackle this challenge, a novel tracking algorithm, employing machine learning, has been devised to generate track stubs for early particle track reconstruction. This algorithm is tailored for deployment on an FPGA, leveraging parallel streams of pipelined neural nets to optimize bandwidth and resource utilization. Central to this approach is the integration of Intel's oneAPI framework. OneAPI enables algorithm development through high-level C++ coding whilst allowing integration with conventional RTL designs. Early profiling tools identify resource estimates and bottlenecks in minutes rather than the hours typical of traditional FPGA development cycles. The machine learning algorithm and oneAPI development cycle will be presented, sharing some early performance measurements using LHCb Vertex Locator data.

Minioral

No

IEEE Member

No

Are you a student?

No

Authors: HENNESSY, Karol (University of Liverpool (GB)); RINNERT, Kurt (University of Liverpool (GB))

Presenter: HENNESSY, Karol (University of Liverpool (GB))

Session Classification: Invited Talk, Oral presentations, Mini-Orals

Track Classification: AI, Machine Learning, Real Time Simulation, Intelligent Signal Processing