T 77: Invited Topical Talks 3

Time: Thursday 11:00–12:30 Location: Geb. 30.21: Gerthsen-HS

Invited Topical Talk T 77.1 Thu 11:00 Geb. 30.21: Gerthsen-HS

Track reconstruction for the ATLAS Phase-II Event Filter using GNNs on FPGAs — •Sebastian Dittmeier — Physikalisches Institut, Universität Heidelberg, Heidelberg, Germany

The High-Luminosity LHC poses new challenges for the trigger and data acquisition system of the ATLAS experiment. The reconstruction of charged particle tracks is already now the computationally most intensive task of the trigger. It becomes even more expensive once the new tracking detector, called the Inner Tracker, is installed and the luminosity reaches HL-LHC target levels. To keep the computing resources within their given power, space and cost constraints, a heterogeneous server farm is proposed for the Event Filter, and novel algorithms are investigated.

Over the last years, it has been shown that Graph Neural Networks have great potential to efficiently solve the combinatorial challenge of finding track candidates in dense environments with hundreds of thousands of hits per event. Recent studies conducted for the ATLAS experiment come close to the physics performance of current tracking methods, while offering potential speed-ups. GNNs are well-suited to be implemented on FPGAs because of their intrinsic message passing algorithms, which lead to highly irregular computations and memory access patterns. This talk summarizes the development of the ATLAS Event Filter for HL-LHC, the most recent results of tracking with GNNs for ATLAS, and the translation of these models to FPGAs.

Invited Topical Talk T 77.2 Thu 11:30 Geb. 30.21: Gerthsen-HS

Searches for Long-Lived Particles at LHC — •Lisa Benato — Hamburg University

An overview of the most recent results in searches for long-lived particles at the LHC experiments is presented, with an emphasis on very long lifetimes, producing peculiar signatures in the outer layers of the detectors (calorimeters and muon systems). Future perspectives, along with new ideas for algorithmic developments, are briefly discussed.

Invited Topical Talk T 77.3 Thu 12:00 Geb. 30.21: Gerthsen-HS

Searches for long-lived particles at accelerators — •Maksym Ovchynnikov for the SHiP-Collaboration — Karlsruhe Institute of Technology, Karlsruhe, Germany

The scientific community's interest in discovering long-lived new physics particles has intensified in recent years. These particles, elusive due to their tiny interactions, represent a significant area of inquiry in particle physics. This talk will focus on recent progress in this field, highlighted by two case studies: the Downstream algorithm at LHCb and the SHiP experiment, representing searches at the LHC and utilizing extracted beamlines. The discussion will cover the capacity of these experiments to exclude a range of particle signatures, a vital step in the search process. Furthermore, in the event of a positive detection, the talk will address the methodologies employed by these experiments to determine the properties of these long-lived particles. Such discoveries could provide essential insights into phenomena that extend beyond the standard model of particle physics.