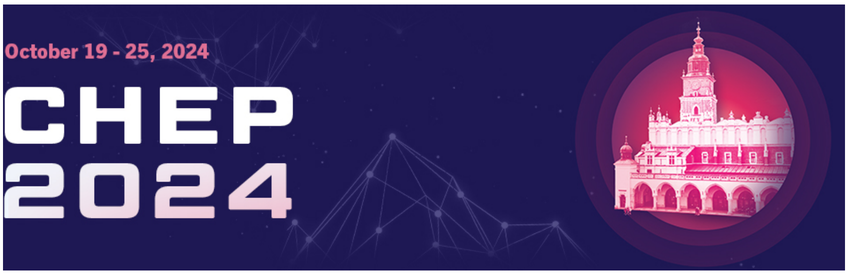

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New approaches for fast and efficient graph construction on CPU, GPU and heterogeneous architectures for the ATLAS event reconstruction

Monday 21 October 2024 16:00 (15 minutes)

Graph neural networks (GNN) have emerged as a cornerstone of ML-based reconstruction and analysis algorithms in particle physics. Many of the proposed algorithms are intended to be deployed close to the beginning of the data processing chain, e.g. in event reconstruction software of running and future collider-based experiments. For GNN to operate, the input data are represented as graphs. The creation of the graphs and the associated cost are often limiting factors in high-throughput production environments. We discuss the specific example of charged-particle track reconstruction in the ATLAS detector. The HL-LHC upgrade of the ATLAS detector brings an unprecedented track reconstruction challenge, both in terms of the large number of silicon hit cluster readouts, and the throughput required. The GNN4ITk project has designed GNN-based algorithms for tracking with a similar level of physics performance to traditional techniques, that scale sub-quadratically, provided that the large input graphs can be created efficiently. In this contribution, we present novel methods that are able to produce these graphs quickly and efficiently, and describe their computing performance.

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