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## Efficient Point Transformer for Charge Particles Track Reconstruction

Charge particle track reconstruction is the foundation of the collider experiments. Yet, it's also the most computationally expensive part of the particle reconstruction. The innovation in tracking reconstruction with graph neural networks (GNNs) has shown the promising capability to cope with the computing challenges posed by the High-Luminosity LHC (HL-LHC) with Machine learning. However, GNNs face limitations involving irregular computations and random memory access, slowing down their speed. In this talk, we introduce a Locality-Sensitive Hashing-Based Efficient Point Transformer (HEPT) with advanced attention methods as a superior alternative with near-linear complexity, achieving milliseconds latency and memory consumption. We present a comprehensive evaluation of HEPT's computational efficiency and physics performance compared to other algorithms, such as GNN-based pipelines, highlighting its potential to revolutionize full track reconstruction.

## Significance

We expand on the ICML 2024 result to improve the attention algorithms and study the physics tracking performance compared with other existing methods.

## References

Previous results presented at ICML 2024 at https://arxiv.org/abs/2402.12535

## Experiment context, if any

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