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Graph Neural Networks for track reconstruction at HL-LHC

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The physics reach of the HL-LHC will be limited by how efficiently the experiments can use the available computing resources, i.e. affordable software and computing are essential. The development of novel methods for charged particle reconstruction at the HL-LHC incorporating machine learning techniques or based entirely on machine learning is a vibrant area of research. In the past years, algorithms for track pattern recognition based on graph neural networks (GNNs) have emerged as a particularly promising approach. We present new algorithms that can handle complex realistic detectors and achieve tracking efficiency and purity similar to production tracking algorithms based on Kalman filters. Crucially for HL-LHC and future collider applications, the pipeline benefits significantly from GPU acceleration, and its computational requirements scale close to linearly with the number of particles in the event.

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