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Improving Tracking Algorithms for ITk Detector at the HL-LHC

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In anticipation of the High-Luminosity phase of the Large Hadron Collider at CERN (HL-LHC), the ATLAS experiment is upgrading its innermost detector to the new Inner Tracker (ITk), characterized by its wider coverage and increased granularity. While this new detector promises enhanced spatial resolution for track measurements, its combination with the increased luminosity of the HL-LHC poses a computational challenge. The augmented number of space points and the combinatorial nature of track reconstruction would result in an unsustainable CPU usage for the existing tracking algorithms, therefore requiring significant improvements. This work focuses on improving the initial stages of the tracking chain, more specifically the seeding process. Within the ACTS framework, the existing method filters the seeds based on manually-defined scores, selecting the best candidates for subsequent tracking. This study introduces a novel approach to construct the seeds by bucketing the space points using machine learning algorithms, allowing to explore physics-inspired metrics and anticipating a future shift towards metric learning.

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