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Auto-tuning of the material mapping with the ACTS track reconstruction suite

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The reconstruction of particle trajectories is a key challenge of particle physics experiments as it directly impacts particle reconstruction and physics performances. To reconstruct these trajectories, different reconstruction algorithms are used sequentially. Each of these algorithms use many configuration parameters that need to be fine-tuned to properly account for the detector/experimental setup, the available CPU budget and the desired physics performance. Until now, these parameters had to be optimised by human experts which is inefficient and raises issues for the long term maintainability of such algorithms. Previous experiences with using machine learning for particle reconstruction (such as the TrackML challenge) have shown that they can be easily adapted to different experiments by learning directly from the data. We propose to bring the same approach to the classic track reconstruction algorithms by connecting them to an agent driven optimiser which will allow us to find the best set of input parameters using an iterative tuning approach. We demonstrated this approach on the generation of simplified material map used for trajectory reconstruction within A Common Tracking Software (ACTS) framework using the Open Data Detector (ODD).

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