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Flavour tagging with the ATLAS detector at the HL-LHC

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The High-Luminosity LHC (HL-LHC) era will herald significant increases in both the instantaneous luminosity and the number of interactions per bunch crossing. To cope with these significantly more complex conditions, detector upgrades are planned to maintain and surpass the current physics performance. The replacement of the current Inner Detector with a new all-silicon Inner Tracker (ITk) is one of the key upgrades planned for the ATLAS detector. The ITk upgrade provides excellent tracking performance, which will enhance other reconstruction algorithms dependent upon tracking, and ultimately the physics reach of the experiment. In particular, the identification of jets originating from heavy flavour hadrons, known as flavour tagging, is heavily reliant upon tracking and is ideally placed to benefit from the detector upgrade. The performance of recent stateof-the-art flavour tagging algorithms applied to the upgraded ATLAS detector was previously presented, which achieved significant performance enhancements to the benefit of several physics analyses. However, new algorithmic developments could further benefit from the HL-LHC detector upgrades to provide additional enhancements in the performance. This talk will survey recent algorithmic developments in the ATLAS flavour tagging community, including algorithms based on deep sets and graph neural networks, and compare their performance with the previous algorithms in the context of HL-LHC upgrades such as the ITk.

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