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Implementation and performance of the ATLAS pixel clustering neural networks

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The high particle densities produced by the Large Hadron Collider (LHC) mean that in the ATLAS pixel detector the clusters of deposited charge start to merge. A neural network-based approach is used to estimate the number of particles contributing to each cluster, and to accurately estimate the hit positions even in the presence of multiple particles. This talk or poster will thoroughly describe the algorithm and its implementation as well as present a set of benchmark performance measurements. The problem is most acute in the core of high-momentum jets where the average separation between particles becomes comparable to the detector granularity. This is further complicated by the high number of interactions per bunch crossing. Both these issues will become worse as the Run 3 and HL-LHC programme require analysis of higher and higher p_T jets, while the interaction multiplicity rises. Future prospects in the context of LHC Run 3 and the upcoming ATLAS inner detector upgrade will also be discussed.

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