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Machine Learning Based Jet p_T Reconstruction in ALICE

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Reconstructing the jet transverse momentum (p_{T}) is a challenging task, particularly in heavy-ion collisions due to the large fluctuating background from the underlying event. While ALICE's standard area-based method effectively corrects for the average background, it does not account for region-to-region fluctuations. These residual fluctuations are handled in an unfolding procedure following the background subtraction, which is made easier when these fluctuations are reduced.

A novel method to correct the jet p_{T} on a jet-by-jet basis using machine learning techniques to reduce these fluctuations will be presented. This approach uses jet properties, including the constituents of the jet to create a mapping between the corrected and uncorrected jet p_{T}. The performance of this approach is evaluated using jets from PYTHIA simulations embedded into ALICE Pb–Pb data. Various machine learning techniques are compared including shallow neural network, random forest, and linear regression algorithms. This method introduces some dependence on the fragmentation of the jet and investigations into the extent and impact of this bias will be shown. In comparison to the area-based method, these machine learning based estimators show a significantly improved performance, which enables measurements of jets to lower transverse momenta and larger jet radii.

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