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Reconstructing Jet History with Machine Learning

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In this study, we investigate if machine learning can be used to reconstruct aspects of jet history. The space-time evolution of a jet shower is directly linked to local properties of the surrounding medium. Extracting the evolution poses a challenge, since experimentally we only have access to the final state hadron momenta. On the other hand, Monte Carlo simulations model the jet history in great detail. Here, we explore if the known history in simulations can be reconstructed by looking only at final state particles using machine learning. We consider jets in vacuum, generated by the JETSCAPE framework. We work with output data for both final state partons and final state hadrons. We use these datasets to train neural networks to predict the maximum opening angle θ_{max} and the jet splitting function z_G – related to transverse and longitudinal jet structure respectively – in the simulation. We compare the predictive powers of the parton data and the hadron data, to understand if and how information is lost during hadronization. Finally, we investigate ways to quantify and reduce information loss due to hadronization.

Category

Theory

Collaboration (if applicable)

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