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Machine Learning-Assisted Measurement of Lepton-Jet Azimuthal Angular Asymmetries and of the complete final state in Deep-Inelastic Scattering at HERA

Deep-inelastic positron-proton scattering at high momentum transfer Q^2 is an ideal place to study QCD effects. The H1 collaboration presents two such studies based on data collected in ep collisions at $Q^2 > 150$ GeV^2. The data are unfolded (corrected for detector effects) using advanced machine learning methods. This results in parallel and unbinned measurements of several observables, hence it is possible to measure quantities such as moments or variables with poor resolution. One such example are moments of the lepton-jet azimuthal angular asymmetry, sensitive to subtle gluon radiation effects which have to be pinned down accurately in order to be able measure TMDs from similar observables. The moments are presented as a function of the total transverse momentum of the lepton-jet system,
$lvert\vec{q}_\perp$
$rvert$. Another analysis is targeting a simultaneous measurement of all final state particles in these high Q^2 events, such that complex studies such as comparisons of different jet algorithms, or jet substructure measurements can be performed on the unfolded data, free of restrictions on the choice of observables or other technicalities such as bin boundaries. The unfolded dataset is projected for validation purposes onto a few example observables which have been measured earlier. New measurements such as comparisons of jet algorithms or energy-energy corelators are also presented.

Secondary track

Author: H1 COLLABORATION

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