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Measurement of lepton-jet correlation in deep-inelastic scattering with the H1 detector using machine learning for unfolding

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The first measurement of lepton-jet momentum imbalance and azimuthal correlation in lepton-proton scattering at high momentum transfer is presented. These data, taken with the H1 detector at HERA, are corrected for detector effects using an unbinned machine learning algorithm (OmniFold), which considers eight observables simultaneously in this first application. The unfolded cross sections are compared to calculations performed within the context of collinear or transverse-momentum-dependent (TMD) factorization in Quantum Chromodynamics (QCD) as well as Monte Carlo event generators. The measurement probes a wide range of QCD phenomena, including TMD parton distribution functions and their evolution with energy in so far unexplored kinematic regions.

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Primary authors: SCHMITT, Stefan (DESY); NACHMAN, Ben (LBNL)

Presenter: NACHMAN, Ben (LBNL)

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