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Multi-differential Jet Substructure Measurement in electron-proton Collisions

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Jet angularities provide a detailed representation of the radiation pattern within high energy quark and gluon jets. While there has been major advances in jet substructure studies at hadron colliders, the precision achievable by collisions involving electrons is superior, since several of the complications from hadron colliders are absent.

In this contribution jets are analyzed which were produced in deep-inelastic electron-proton scattering and recorded by the H1 experiment at HERA (DESY). The measurement is unbinned and multi-dimensional, making use of machine learning to correct for detector effects. Results are presented after unfolding the data to particle level for events in the fiducial volume of momentum transfer Q^2>150 GeV^2 and jet transverse momentum $p_{\mathrm{T}}^{\mathrm{jet}} > 10\,\mathrm{GeV}$. All of the available object information in the events is used to achieve the best precision through the novel use of graph neural networks (GNN). The networks were trained at the new Perlmutter supercomputer at Berkeley Lab with a large number of Graphical Processing Units (GPUs).

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