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Reconstructing the Kinematics of Deep Inelastic Scattering with Deep Learning

In this talk we present a novel method to reconstruct the kinematics of neutral-current deep inelastic scattering (DIS) using a deep neural network (DNN). Unlike traditional methods, it exploits the full kinematic information of both the scattered electron and the hadronic-final state, and it accounts for QED radiation by identifying events with radiated photons and event-level momentum imbalance. The method is studied with simulated events at HERA and the future Electron-Ion Collider (EIC). We will show that the DNN method outperforms all the traditional methods over the full phase space, improving resolution and reducing bias. The DNN-base reconstruction has the potential to extend the kinematic reach of future experiments at the EIC, and thus their discovery potential in polarized and nuclear DIS.

Significance

The new DNN-based reconstruction of DIS kinematics will improve measurements in DIS at HERA and the EIC, and it will enlarge the kinematic reach of DIS experiments to higher x. The improvement is made possible, by combining detector- (acceptance&resolution) and physics specific issues (QED radiation) in a deep-learning approach, and the network indeed learns equations of the high-level quantities from lower-level input variables.

References

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Speaker time zone

No preference

Primary authors: NACHMAN, Ben (Lawrence Berkeley National Lab. (US)); BRITZGER, Daniel (Max-Planck--Institut für Physik München); ARRATIA MUNOZ, Miguel Ignacio (Lawrence Berkeley National Lab. (US)); LONG, Owen (University of California Riverside (US))

Presenters: NACHMAN, Ben (Lawrence Berkeley National Lab. (US)); BRITZGER, Daniel (Max-Planck-Institut für Physik München); ARRATIA MUNOZ, Miguel Ignacio (Lawrence Berkeley National Lab. (US)); LONG, Owen (University of California Riverside (US))

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