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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

arXiv:2110.05505

Speaker time zone

No preference

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