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Application of deep neural networks to the reconstruction of DIS kinematics

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We study the use of machine learning (ML) for deep inelastic scattering (DIS) measurements. In particular, we train deep neural networks to reconstruct the scaling variables x and Q^2 from the lepton and the hadronic system in ep scattering at the ZEUS experiment at HERA. These models are trained by a careful selection of Monte Carlo events. The results from the deep neural networks (DNN) are compared to those of classical reconstruction methods, including the electron method, the Jacquet-Blondel Method, and the double-angle method. We demonstrate that, with the appropriate selection of a training set, the DNN approach outperforms all classical reconstruction methods for most of the kinematic phase space. Finally, we present an analysis of event shapes in DIS and discuss the improvements of the precision of the measurement due to the DNN approach.

Primary authors: FARHAT, Abdullah; DIEFENTHALER, Markus (Jefferson Lab); VERBYTSKYI, Andrii (MPP); Dr XU, Yuesheng (Old Dominion University)

Presenter: FARHAT, Abdullah

Session Classification: Future Experiments

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