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Using machine learning techniques to interface between experimental cross sections and QCD theory parameters ELENI TSITINIDI, RIDA SHAHID, Davidson College, YASIR ALANAZI, MANAL ALMAEEN, Old Dominion University, MICHELLE KUCHERA, Davidson College, YAOHANG LI, Old Dominion University, WALLY MELNITCHOUK, Jefferson Lab, RAGHU RAMANUJAN, Davidson College, NOBUO SATO, Jefferson Lab — We map experimental high-energy scattering data to quantum probability distributions that characterize nucleon structure and the emergence of hadrons in terms of the quark and gluon degrees of freedom of QCD. We train three network architectures, a mixture density network (MDN) an autoencoder (AE) and a combination of the two (AEMDN) to address the inverse problem of transforming observable space into theoretical parameter space. Gradually increasing the dimensionality of the parameter space and hyperbox size of possible cross sections, we test the limits of this approach. The mixture density component provides the possibility of multiple-parameter solutions being produced along with their probabilities. This approach has been used to accurately predict collinear parton distribution functions to within one standard deviation and with a chi^2 $1, comparable to the current fitting methods. This tool constitutes a new generation of QCD analysis and w energy experiments.$

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