ICHEP 2022 BOLOGNA
ICHEP 2022 XLI International Conference on High Energy Physics
Bologna (Italy)
6 13 07 2022

Contribution ID: **1349** Type: **Parallel Talk**

Sustainable Cyberinfrastructure for Matrix Element Analyses through Deep Learning

Saturday, 9 July 2022 12:15 (15 minutes)

Extracting scientific results from high-energy collider data involves the comparison of data collected from the experiments with "synthetic"data produced from computationally-intensive simulations. Comparisons of experimental data and predictions from simulations increasingly utilize machine learning (ML) methods to try to overcome these computational challenges and enhance the data analysis. There is increasing awareness about challenges surrounding interpretability of ML models applied to data to explain these models and validate scientific conclusions based upon them. The matrix element (ME) method is a powerful technique for analysis of particle collider data that utilizes an *ab initio* calculation of the approximate probability density function for a collision event to be due to a physics process of interest. The ME method has several unique and desirable features, including (1) not requiring training data since it is an *ab initio* calculation of event probabilities, (2) incorporating all available kinematic information of a hypothesized process, including correlations, without the need for "feature engineering"and (3) a clear physical interpretation in terms of transition probabilities within the framework of quantum field theory. In this talk, we present applications of machine learning that dramatically speeds-up ME method calculations and novel cyberinfrastructure developed to execute ME-based analyses on heterogeneous computing platforms.

In-person participation

Yes

Primary authors: ROY, Avik (University of Illinois at Urbana-Champaign); NEUBAUER, Mark (University of Illinois at Urbana-Champaign); FEICKERT, Matthew (University of Illinois at Urbana-Champaign)

Presenter: NEUBAUER, Mark (University of Illinois at Urbana-Champaign)

Session Classification: Computing and Data handling

Track Classification: Computing and Data handling