Contribution ID: **70** Type: **not specified**

Parnassus: An Automated Approach to Accurate, Precise, and Fast Detector Simulation and Reconstruction

Wednesday 6 November 2024 10:00 (20 minutes)

Simulating particle physics data is an essential yet computationally intensive process in analyzing data from the LHC. Traditional fast simulation techniques often use a surrogate calorimeter model followed by a reconstruction algorithm to produce reconstructed objects. In this work, we introduce Particle-flow Neural Assisted Simulations (Parnassus), a deep learning-based method for generating these reconstructed objects. Our model takes as input a point cloud representing particles interacting with the detector and outputs a point cloud of reconstructed particles. By integrating detector simulation and reconstruction into a single step, we aim to reduce resource consumption and create fast surrogate models that can be applied both within and beyond large collaborations. We demonstrate this approach using a publicly available dataset of jets processed through the full simulation and reconstruction pipeline of the CMS experiment. Our results show that the model accurately replicates the CMS particle flow algorithm on the same events used for training and generalizes well to different jet momenta and types outside the training distribution.

Track

Detector simulation & event generation

Authors: NACHMAN, Ben (Lawrence Berkeley National Lab. (US)); KOBYLIANSKII, Dmitrii (Weizmann Institute of Science (IL)); GROSS, Eilam (Weizmann Institute of Science (IL)); DREYER, Etienne (Weizmann Institute of Science (IL)); SOYBELMAN, Nathalie (Weizmann Institute of Science (IL)); MIKUNI, Vinicius Massami (Lawrence Berkeley National Lab. (US))

Presenter: KOBYLIANSKII, Dmitrii (Weizmann Institute of Science (IL))

Session Classification: Detector Simulation