Contribution ID: **39** Type: **Regular talk**

Explaining machine-learned particle-flow reconstruction

Friday, 13 May 2022 15:35 (25 minutes)

The particle-flow (PF) algorithm is used in general-purpose particle detectors to reconstruct a comprehensive particle-level view of the collision by combining information from different subdetectors. A graph neural network (GNN) model, known as the machine-learned particle-flow (MLPF) algorithm, has been developed to substitute the rule-based PF algorithm (https://arxiv.org/abs/2101.08578), and shave shown comparable performance.

Understanding the model's decision making is not straightforward, especially given the complexity of the set-to-set prediction task, dynamic graph building, and message-passing steps. In this talk, we explore the application of an explainable AI technique, called the layerwise-relevance propagation, for GNNs and apply it to the MLPF algorithm to gauge the relevant nodes and features for its predictions. Through this process, we gain insight into the model's decision-making. Results can be found in our paper: https://arxiv.org/abs/2111.12840

A sneak peak of a public talk given about the topic can be found here: https://indico.cern.ch/event/1136420/contributions/4768351/attachm
Learned%20Particle%20Flow.pdf

Primary author: MOKHTAR, Farouk (Univ. of California San Diego (US))

Co-authors: KANSAL, Raghav (Univ. of California San Diego (US)); DIAZ, Daniel (Univ. of California San Diego (US)); DUARTE, Javier Mauricio (Univ. of California San Diego (US)); PATA, Joosep (National Institute of Chemical Physics and Biophysics (EE)); PIERINI, Maurizio (CERN); VLIMANT, Jean-Roch (California Institute of Technology (US))

Presenter: MOKHTAR, Farouk (Univ. of California San Diego (US))

Session Classification: Workshop