Contribution ID: **203** Type: **Flashtalk with Poster**

Advances in developing deep neural networks for finding primary vertices in proton-proton collisions at the LHC

Tuesday, 30 April 2024 14:53 (3 minutes)

We have been studying the use of deep neural networks (DNNs) to identify and locate primary vertices (PVs) in proton-proton collisions at the LHC. Previously reported results demonstrate that a hybrid architecture, using a fully connected network (FCN) as the first stage and a convolutional neural network (CNN) as the second stage provides better efficiency than the default heuristic algorithm for the same low false positive rate. The input features are individual track parameters and the output is a list of PV positions in the beam direction.

More recently, we have studied how replacing the hybrid architecture with a Graph Neural Network (GNN) can improve the predictions of PV positions directly from tracks parameters, and also enable tracks-to-vertex associations. The latter opens the way to additional predictions of the positions of secondary vertex position (SV), and SV-to-PV association. For the first time, we report the results of these preliminary studies, and discuss the advantages and disadvantages of using GNNs compared to our hybrid FC+CNN architecture.

Primary author: AKAR, Simon (University of Cincinnati)

Co-authors: KAUFFMAN, Elise (Princeton University (US)); SCHREINER, Henry (Princeton University (US)); TOMPKINS, Lauren (Stanford University (US)); SOKOLOFF, Michael (University of Cincinnati (US)); ELASHRI, Mohamed (University of Cincinnati (US)); GARG, Rocky (Stanford University (US)); SHINDE, Sara (University of Cincinnati (US))

Presenter: AKAR, Simon (University of Cincinnati)

Session Classification: 2.1 Pattern recognition & Image analysis

Track Classification: Session A