Contribution ID: **19** Type: **Plenary**

End-to-end Particle-flow Reconstruction Algorithm for Highly Granular Calorimeters

Tuesday 10 October 2023 15:05 (25 minutes)

We present an end-to-end particle-flow reconstruction algorithm for highly granular calorimeters. Starting from calorimeter hits and reconstructed tracks the algorithm filters noise, separates showers, regresses their energy, provides an energy uncertainty estimate, and predicts the type of particle. The algorithm is trained on data from a simulated detector that matches the complexity of the CMS high-granularity calorimeter (HGCAL) for which it can be retrained in the future. Detector hits and reconstructed tracks are embedded in a dynamic graph. Information between graph nodes is then exchanged between neighbours weighted by their respective distance in a low dimensional latent space. The network is trained using the object condensation loss, a graph segmentation technique that allows to cluster an arbitrary number of showers in every event while simultaneously performing regression and classification tasks. We discuss the network's performance in terms of its shower reconstruction efficiency, its energy resolution and uncertainty estimate, as well as the accuracy of its particle identification. Additionally we discuss the model's jet reconstruction performance and evaluate the model's computational efficiency. To our knowledge this is the first implementation of an end-to-end particle-flow reconstruction algorithm aimed at highly granular calorimeters.

Primary authors: KIESELER, Jan (CERN); Mr ZEHETNER, Philipp (Ludwig Maximilians Universitat (DE)); QASIM, Shah Rukh (CERN)

Presenter: Mr ZEHETNER, Philipp (Ludwig Maximilians Universitat (DE))

Session Classification: Plenary