Contribution ID: **135** Type: **Oral Presentations**

Machine learning based reconstruction techniques for CMS HGCAL

Monday, 4 September 2023 17:30 (20 minutes)

Nearly all physics analyses at CMS rely on precise reconstruction of particles from their signatures in the experiment's calorimeters. This requires both assignment of energy deposits to particles and recovery of various properties across the detector. These tasks have traditionally been performed by classical algorithms and BDT regressions, both of which rely on human-engineered high level quantities. However, bypassing human feature engineering and instead training deep learning algorithms on low-level signals has the potential to further recover lost information and improve the overall reconstruction. We have therefore developed novel algorithms for particle reconstruction based on graph neural networks, which allow us to represent the energy deposits recorded in the calorimeter directly in our models. In this presentation we will show the performance of our GNN architecture applied to energy reconstruction in test beam data for the CMS High-Granularity Calorimeter (HGCAL), planned for operation in the HL-LHC, which have shown an unprecedented improvement in the energy resolution of single hadrons compared to traditional rules based methods. Furthermore, we will discuss the new particle flow algorithm designed for HGCAL to do end-to-end particle reconstruction which uses graph architectures to build 3D particle showers.

Primary author: Ms ALPANA, Alpana

Presenter: Dr CHATTERJEE, Rajdeep (Tata Institue of Fundamental Research)

Session Classification: A4