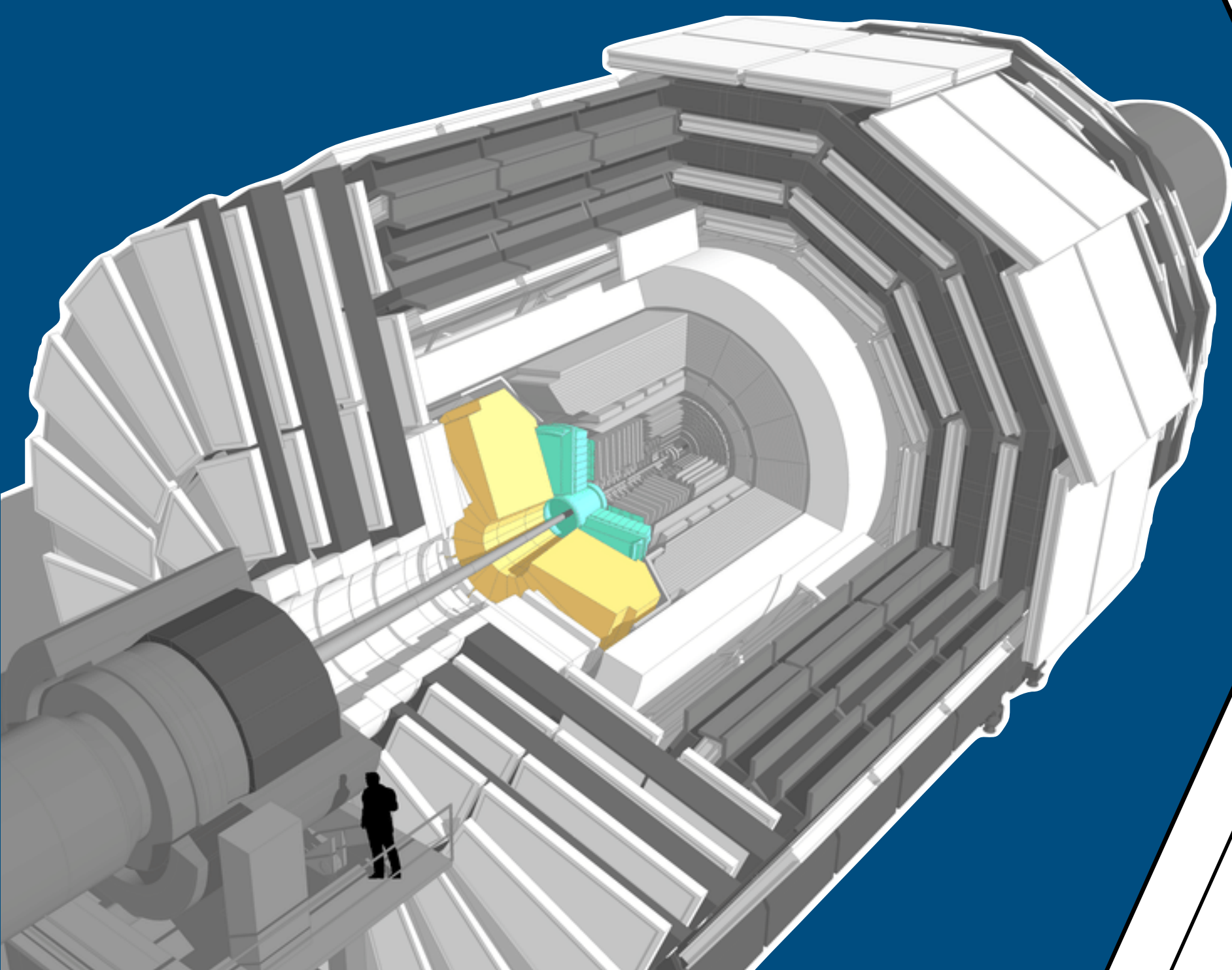


Machine Learning reconstruction in the CMS Phase-2 endcap calorimeter

Théo Cuisset, on behalf of the CMS Collaboration

EuCALFCOn 2025, Cagliari

June 18th, 2025

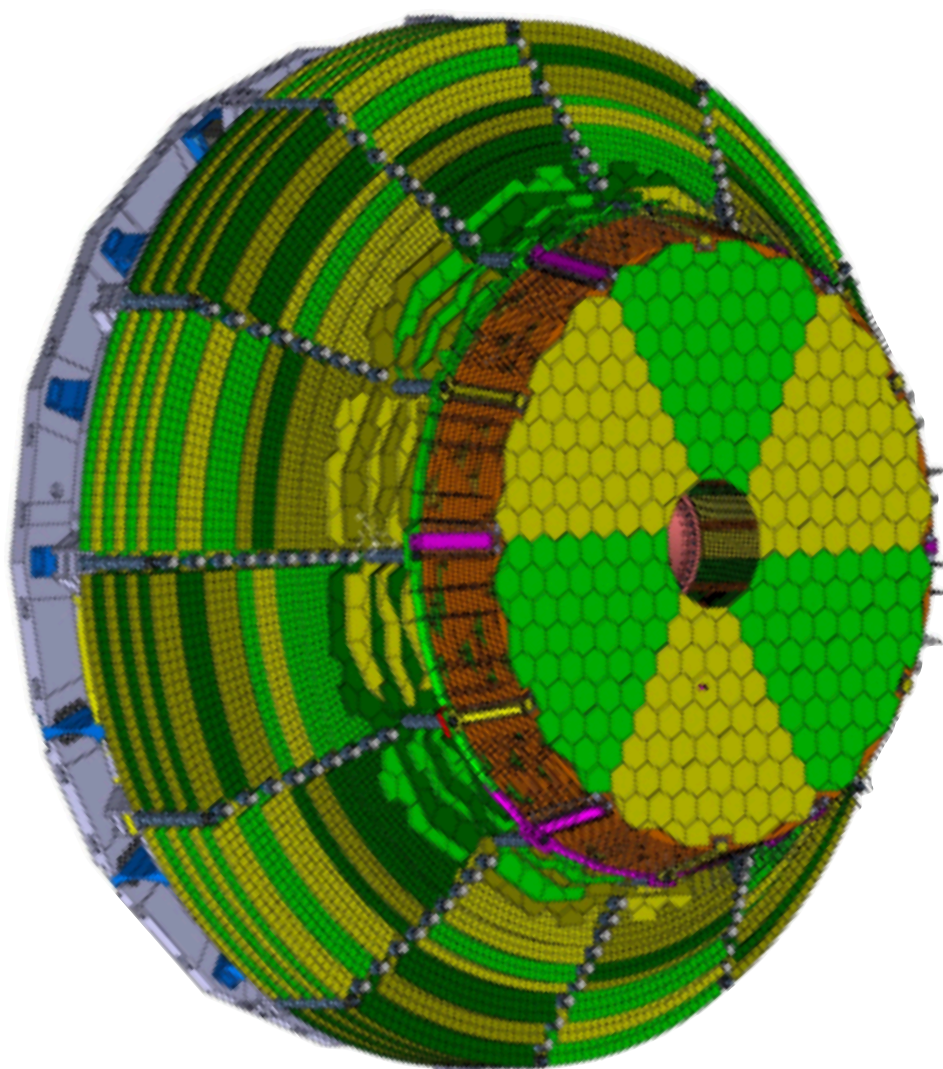


The High Granularity Calorimeter (HGCAL)

Phase-2 of the LHC

- By 2029, the LHC will be **upgraded** to deliver 5-7 times more instantaneous luminosity.
- The current end-cap calorimeters of the CMS detector will be fully replaced

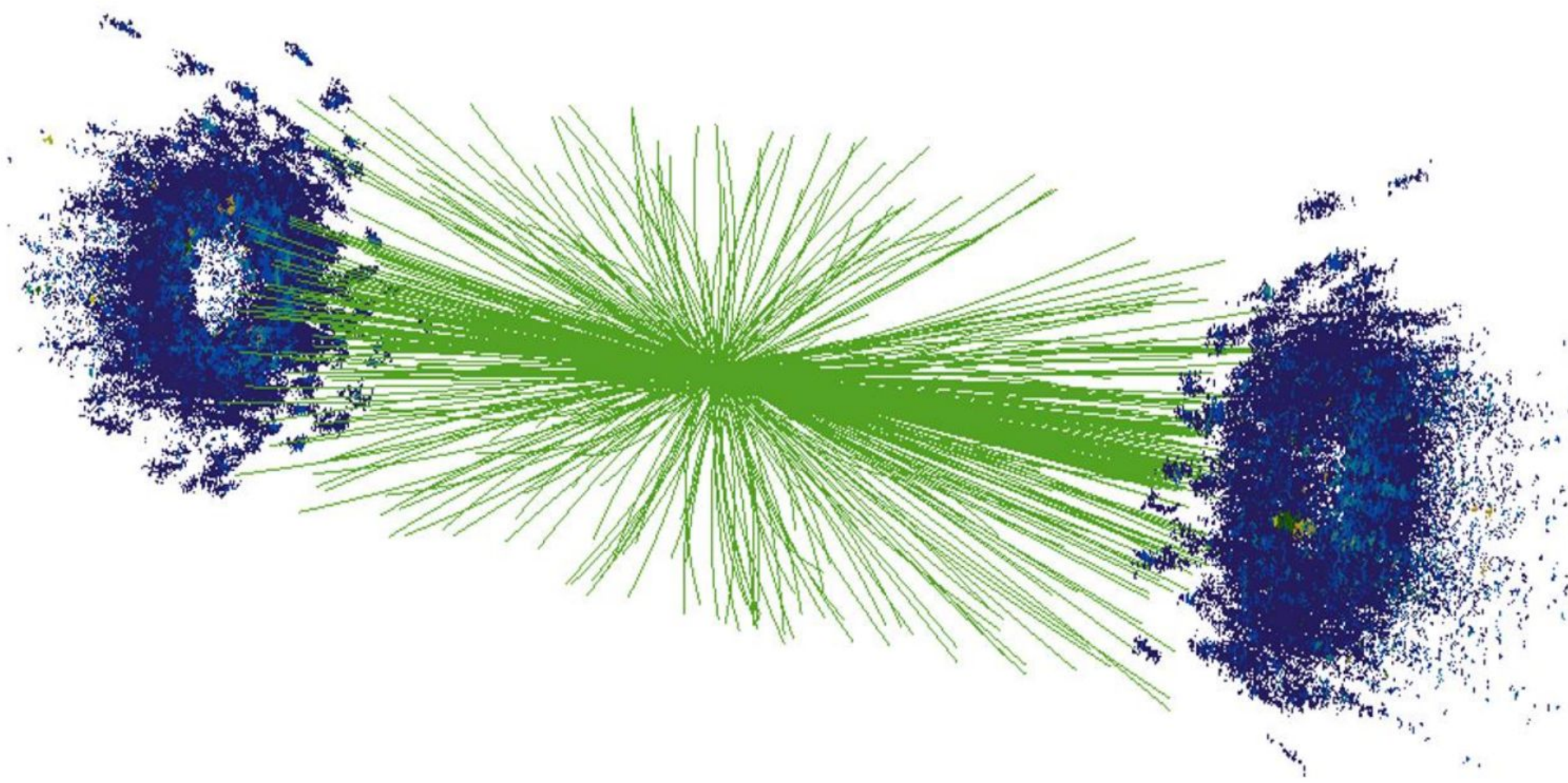
The High Granularity Calorimeter



- **Sampling calorimeter** with a mix of silicon sensors & scintillators
- Designed for **Particle Flow** (combining tracker and calorimeter information)
- **6 million** readout channels
- **5D information** : Position, Energy and **Time**.

Machine Learning in HGCAL

A simulated event display of HGCAL at 200 pileup.



6 million channels and 5D information from all of them

+

Very large background from overlapping proton-proton collisions

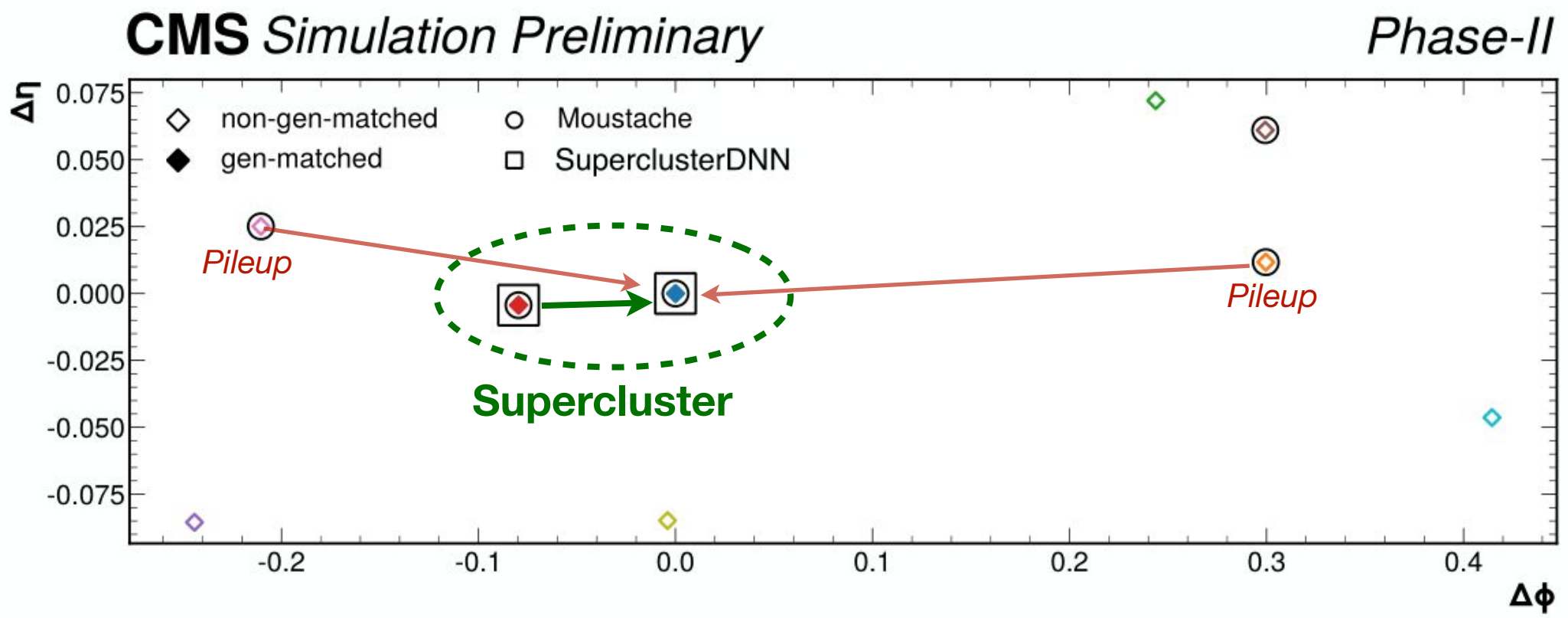
↓
Novel machine-learning based algorithms to tackle these challenges!

Reconstruction in HGCAL : TICL framework

GPU-accelerated clustering algorithms



DNN-assisted electron reconstruction



And many more uses of Machine Learning in HGCAL :

CNN and GNN for Particle Identification

GNN energy regression