

CaloClouds3; Diffusion and normalising flows

Friday 4 July 2025 11:40 (25 minutes)

This contribution presents the final iteration of the CaloClouds series. Simulation of photon showers in the granularities expected in a future Higgs factory is computationally challenging. A viable simulation must capture the fine details exposed by such a detector, while also being fast enough to keep pace with the expected rate of observations. The Caloclouds model utilises point cloud diffusion and normalising flows to replicate MCMC simulation with exceptional accuracy. First we will make a lightning overview of the model's objectives and constraints. To describe the upgrades for the latest version, we detail the studies on the flow model and the optimisations made, and then summarise the steps taken to generalise CaloClouds 3 for using in the whole detector. Considering some of the underlying principles of model design, we look at the significance of the data format choice on model outcomes. Finally, we present the results of reconstructions performed on CaloClouds 3 output against the results from Geant4 simulation, thus demonstrating that this model provides reliable physics reproductions.

References

<https://arxiv.org/pdf/2309.05704>

Primary authors: KOROL, Anatolii (FTX (FTX Fachgruppe SFT)); GAEDE, Frank (FTX (FTX Fachgruppe SFT)); KASIECZKA, Gregor (UNI/EXP (Uni Hamburg, Institut für Experimentalphysik)); DAY-HALL, Henry (FTX (FTX Fachgruppe SFT)); VALENTE, Lorenzo (UNI/EXP (Uni Hamburg, Institut für Experimentalphysik)); MCKEOWN, Peter (CERN); BUSS, Thorsten (University of Hamburg)

Presenter: DAY-HALL, Henry (FTX (FTX Fachgruppe SFT))

Session Classification: Block 4 - Machine Learning Applications