Contribution ID: **251** Type: **Poster**

Point-clouds based generative models on hadronic showers

Simulating showers of particles in highly-granular detectors is a key frontier in the application of machine learning to particle physics. Achieving high accuracy and speed with generative machine learning models can enable them to augment traditional simulations and alleviate a major computing constraint.

Recent developments have shown how diffusion based generative shower simulation approach that do not rely on a fixed structure, but instead generates geometry-independent point clouds, are very efficient. We present two novel transformer-based architecture: a diffusion model and a conditional flow matching that were previously used for simulating only electromagnetic showers in the highly granular electromagnetic calorimeter of ILD. The attention mechanism allows to generate complex hadronic showers from pions with more pronounced substructure in the electromagnetic and hadronic calorimeter together. This is the first time that ml methods are used to generate hadronic showers in highly granular imaging calorimeters.

Significance

This is the first time that ml methods are used to generate hadronic showers in highly granular imaging calorimeters.

References

Experiment context, if any

The ILC International Development Team (IDT) was created by the Inter- national Committee for Future Accelerators (ICFA). The mandate of the Team is to prepare the ILC Pre-Lab as the first step of the preparation phase of the ILC to be constructed in Japan as an international project.

Authors: KOROL, Anatolii (Deutsches Elektronen-Synchrotron (DESY)); GAEDE, Frank-Dieter (Deutsches Elektronen-Synchrotron (DE)); KASIECZKA, Gregor (Hamburg University (DE)); KRUGER, Katja (Deutsches Elektronen-Synchrotron (DE)); MOZZANICA, Martina (university of hamburg); MCKEOWN, Peter (CERN); BUSS, Thorsten (University of Hamburg (DE))

Presenter: MOZZANICA, Martina (university of hamburg)

Session Classification: Poster session with coffee break

Track Classification: Track 1: Computing Technology for Physics Research