## Contribution submission to the conference SMuK 2023

Generative Modeling with Diffusion Neural Networks for Fast Simulation of Electromagnetic Showers in the International Large Detector — •ANATOLII KOROL — Deutsches Elektronen-Synchrotron DESY, Hamburg, Germany

In high energy physics, detailed and time-consuming simulations are used for particle interactions with detectors. For future experiments and the upcoming High-Luminosity phase of the Large Hadron Collider (HL-LHC), the computational costs of conventional simulation tools are expected to exceed the projected computational resources.

Generative neural networks (GNNs) have the potential to provide a fast and accurate alternative. So far most of the studies of GNNs for fast simulations have used data represented in the form of a regular grid since it is possible to apply modern machine learning algorithms from image processing that are well optimized and developed.

In fast simulations with GNNs, it is crucial to be able to place GNNs into the simulation pipeline, and since many of today\*s detector systems are not regular in terms of the positions of the active cells, it\*s very hard to represent the data in a form suitable for training the GNN.

This work focuses on the development of a GNN for speeding up the simulation of electromagnetic showers in the electromagnetic calorimeter of the International Large Detector (ILD). In particular, a Diffusion Model is trained on Geant4 steps, where the electromagnetic shower is presented as a 3D point cloud to avoid the irregularities of the detector geometry and thereby generate showers anywhere in the calorimeter.

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Туре:	Vortrag;Talk
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