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Generative Models for Fast Simulation of Electromagnetic and Hadronic Showers in Highly Granular Calorimeters

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Simulation is a key component of modern high energy physics experiments. However, producing simulated data with sufficient detail and in sufficient quantities places a significant strain on the available computing resources. With the increased simulation demands of the upcoming high luminosity phase of the LHC and future colliders expected to contribute to a major bottleneck, computationally efficient solutions are urgently needed.

This contribution presents significant progress in the development of deep generative models for fast shower simulation in highly granular calorimeters. Approaches to simulating both electromagnetic and hadronic showers will be reported, with a focus on the high degree of physical fidelity and computational performance achieved. Additionally, steps taken to overcome the challenges faced when broadening the scope of these simulators, such as those posed by multi-parameter conditioning, will also be presented.

Authors: KOROL, Anatolii (Deutsches Elektronen-Synchrotron (DE)); EREN, Engin (Deutsches Elektronen-Synchrotron (DE)); BUHMANN, Erik (Hamburg University (DE)); GAEDE, Frank-Dieter (Deutsches Elektronen-Synchrotron (DE)); MCKEOWN, Peter (Deutsches Elektronen-Synchrotron (DE)); KASIECZKA, Gregor (Hamburg University (DE)); SHEKHZADEH, Imahn (Hamburg University (DE)); KRUGER, Katja (Deutsches Elektronen-Synchrotron (DE)); RUSTIGE, Lennart (CDCS / DESY); DIEFENBACHER, Sascha Daniel (Hamburg University (DE)); BIERINGER, Sebastian Guido (Hamburg University (DE)); KORCARI, William (Hamburg University (DE))

Presenter: EREN, Engin (Deutsches Elektronen-Synchrotron (DE))

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