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High Fidelity Simulation of High GranularityCalorimeters with High Speed

The Monte Carlo simulation of calorimeter showers is a vital part of particle physics. However, individually modeling the paths and interactions of each particle in a shower is a very time consuming process. This computation time requirement becomes even more problematic as we move to higher luminosities. Therefore we aim to speed up shower simulations through the use of Generative Machine Learning methods. Specifically we apply a new architecture, the so called Bounded Information Bottleneck AutoEncoder. We are able to show that this architecture, in combination with a novel Neural Network based Post Processing step, is capable of modeling calorimeter showers with a higher precision than other generative setups, while providing a significant speed up over the state of the art simulation tool GEANT4.

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