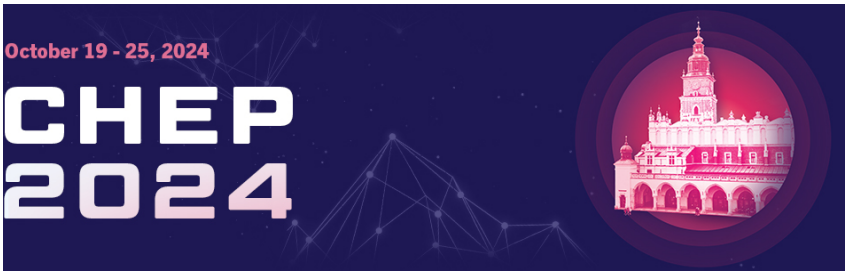

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Recent Advances in the GAN-based Fast Calorimeter Simulation of the ATLAS Experiment

Monday 21 October 2024 16:00 (15 minutes)

Simulation of the detector response is a major computational challenge in modern High-Energy Physics experiments, accounting for about 40% of the total computational resources used in ATLAS. The simulation of the calorimeter response is particularly demanding, consuming about 80% of the total simulation time.
In order to make the best use of the available computational resources, fast simulation tools based on Machine Learning techniques have been developed to simulate the calorimeter response faster than Geant4 while maintaining a high level of accuracy. One such tool, developed by the ATLAS Collaboration and currently in production for LHC Run 3, is FastCaloGAN, which uses Generative Adversarial Networks (GANs) to generate electromagnetic and hadronic showers.
To facilitate the training and optimisation of the GANs, and to enable a more efficient use of computational resources, a container-based system, FastCaloGANtainer, facilitates the deployment of the FastCaloGAN training on complementary high-performance resources such as High Performance Computing (HPC) farms and ensures its operational independence from the underlying system.
This talk presents the latest developments in FastCaloGAN and FastCaloGANtainer, discussing their technical details and recent improvements in terms of Physics and computational performance. For FastCaloGAN, these improvements include an improved voxelisation and extension to further use cases (e.g. particle types not yet covered), while for FastCaloGANtainer they concern its deployment on a wider variety of resources with multi-CPU/GPU nodes and different architectures (including cutting-edge HPC clusters such as Leonardo at CINECA in Bologna, Italy).

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