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New Fast Calorimeter Simulation in ATLAS

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The ATLAS physics program relies on very large samples of simulated events. Most of these samples are produced with GEANT4 which provides a detailed simulation of the ATLAS detector. However, this simulation is very time consuming. To solve this problem, fast simulation tools are used when detailed detector simulation is not needed. Until now, a fast calorimeter simulation (FastCaloSim) was used in ATLAS to replace the slowest part of the simulation. The detailed particle shower shapes and the correlations between the energy depositions in the various calorimeter layers are used to provide a parametrisation of the calorimeter response. FastCaloSim was tuned to data to improve its performance but had limitations in reproducing boosted objects and very forward regions of the detector. ATLAS is currently developing an improved version of FastCaloSim to overcome these problems by using machine learning techniques, such as principal component analysis and neural networks. A prototype is being tested and validated which shows significant improvements in the description of cluster level variables in electromagnetic and hadronic showers. To complement the new FastCaloSim, ATLAS is developing Fast Chain which provides fast tools for the digitisation and reconstruction of the events. By combining these tools ATLAS will have the capabilities to simulate the required numbers of events to achieve its physics goals. In this talk, we will describe the new FastCaloSim parametrisation and the performance as well as the status of the ATLAS Fast Chain.

Secondary topics

Applications

Primary topic

Simulation and algorithms

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