Contribution ID: **633** Type: **Parallel**

New approaches using machine learning for fast shower simulation in ATLAS

Thursday 5 July 2018 15:45 (15 minutes)

Modeling the detector response to collisions is one of the most CPU expensive and time-consuming aspects in the LHC. The current ATLAS baseline, GEANT4, is highly CPU intensive. With the large collision dataset expected in the future, CPU usage becomes critical. During the LHC Run-1, a fast calorimeter simulation (FastCaloSim) was successfully used by ATLAS. FastCaloSim parametrizes the energy response of particles in the calorimeter cells, accounting for the lateral shower profile and the correlation of the energy deposition among various calorimeter layers. It significantly speeds up the calorimeter simulation. An improved version of FastCaloSim is currently under development to reduce CPU and memory requirements and to improve the physics description. The new FastCaloSim implements machine learning techniques, such as principal component analysis and neural networks. Other new ideas being investigated include using deep generative models such as Variational Auto-Encoders (VAEs) and Generative Adversarial Networks (GANs). These models take into account the complex geometry of the ATLAS calorimeter and reproduce the shower characteristics. They are enhanced to handle different particle types and energy level variations simultaneously. This talk will describe these fast simulation methods, quantify the performance and discuss physics applications.

Author: AHMED, Hasib (The University of Edinburgh (GB))

Presenter: AHMED, Hasib (The University of Edinburgh (GB))

Session Classification: Computing and Data Handling

Track Classification: Computing and Data Handling