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AtlFast3: Fast Simulation in ATLAS for LHC Run 3 and beyond

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As we are approaching the high-luminosity era of the LHC, the computational requirements of the ATLAS experiment are expected to increase significantly in the coming years. In particular, the simulation of MC events is immensely computationally demanding, and their limited availability is one of the major sources of systematic uncertainties in many physics analyses. The main bottleneck in the detector simulation is the detailed simulation of electromagnetic and hadronic showers in the ATLAS calorimeter system using Geant4. In order to increase the MC statistics and to leverage the available CPU resources for LHC Run 3, the ATLAS collaboration has recently put into production a refined and significantly improved version of its state-of-the-art fast simulation tool AtlFast3. AtlFast3 uses classical parametric and machine learning based approaches such as Generative Adversarial Networks (GANs) for the fast simulation of LHC events in the ATLAS detector.

This talk will present the newly improved version of AtlFast3 that is currently in production for the simulation of Run 3 samples. In addition, ideas and plans for the future of fast simulation in ATLAS will also be discussed.

Significance

The talk will give an overview of the completely revised configuration of the Run 3 fast simulation used in ATLAS, which is currently in production for the simulation of physics samples. ATLAS aims to use >90% of fast simulation samples in the coming years, such that improvements in fast simulation accuracy are crucial for the success of the ATLAS physics programme.

References

Experiment context, if any

ATLAS

Primary author: BEIRER, Joshua Falco (CERN)**Presenter:** BEIRER, Joshua Falco (CERN)**Session Classification:** Poster session with coffee break**Track Classification:** Track 1: Computing Technology for Physics Research