Contribution ID: **335** Type: **Presentazione orale**

Machine Learning-based Fast Simulation in ATLAS for LHC Run 3 and Beyond

Monday, 26 May 2025 18:30 (15 minutes)

In view of the high luminosity campaign of the LHC (HL-LHC), the computational requirements of the ATLAS experiment are expected to increase remarkably in the coming years. In particular, simulation of Monte Carlo events is immensely demanding from the computational point of view and their limited availability is one of the major sources of uncertainty in many analyses. The main bottleneck in detector simulation is the detailed simulation of electromagnetic and hadronic showers in the ATLAS calorimeter system with the Geant4 software.

In order to increase Monte Carlo statistics and better employ available resources, the ATLAS Collaboration has put into production the AtlFast3 fast simulation system, which runs simulation of events in the ATLAS detector in reduced time with respect to Geant4, guaranteeing at the same time good accuracy. This tool also employs Machine Learning models, harnessing their power to achieve these goals; these models are also trained on the Leonardo supercomputer at CINECA.

This contribution presents the results obtained with the version of AtlFast3 currently in production for LHC Run 3, discussing the benefit it brings to ATLAS analyses in terms of computing resource usage and assessing its physics performance; the latest updates on the development of its future version are also presented, together with ideas and plans for the future of fast simulation in ATLAS also in view of HL-LHC.

Primary author: CORCHIA, Federico Andrea Guillaume (Istituto Nazionale di Fisica Nucleare)

Presenter: CORCHIA, Federico Andrea Guillaume (Istituto Nazionale di Fisica Nucleare)

Session Classification: Calcolo teorico e degli esperimenti

Track Classification: Calcolo teorico e degli esperimenti