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Automate Monte Carlo simulation on hardware accelerators for Run4@LHC (recorded)

Friday 9 July 2021 01:20 (30 minutes)

We propose a new framework for automatic generation of simulated events for particle physics processes in high energy physics applications, for LHC and HL-LHC configurations, with automatic support for hardware accelerators, in particular, graphics processing units (GPU). The project focus on two specific problems: automate the generation of matrix elements and phase space terms for GPU and real-time inference for machine learning tools in order to reduce the computational effort required by the Monte Carlo integrator used by the simulation. From the computational point of view, we show how to extract matrix elements from MG5_aMC@NLO and convert the analytical expressions automatically to multi-threading CPU and GPU code, increasing drastically the number of generated events when compared to the original MC implementation. Furthermore, we investigate the performance of our approach on different clusters configurations, including setups with multi-GPU, and we estimate the efficiency gains when compared to current state of the art implementations.

Primary authors: CARRAZZA, Stefano (CERN); Dr CRUZ MARTÍNEZ, Juan M. (University of Milan); ZARO, Marco (Università degli Studi e INFN Milano (IT)); ROSSI, Marco (CERN)

Presenter: ROSSI, Marco (CERN)

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