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## End-to-end Deep Learning Fast Simulation Framework

*Tuesday, November 5, 2019 4:15 PM (15 minutes)*

To address the increase in computational costs and speed requirements for simulation related to the higher luminosity and energy of future accelerators, a number of Fast Simulation tools based on Deep Learning (DL) procedures have been developed. We discuss the features and implementation of an end-to-end framework which integrates DL simulation methods with an existing Full Simulations toolkit (Geant4). We give a description of the key concepts and challenges in developing a production environment level Simulation framework based on Deep Neural Network (DNN) models designed for High Energy Physics (HEP) problem domain and trained on HEP data. We discuss, data generation (simplified calorimeters simulations obtained with the Geant4 toolkit) and processing, DNN architecture evaluation procedures and API integration. We address the challenge of distributional shifts in the input data (dependent on calorimeter type) and evaluate the response of trained networks and propose a general framework for physics validation of DL models in HEP.

### Consider for promotion

No

**Primary authors:** IFRIM, Ioana (CERN); POKORSKI, Witold (CERN); ZABOROWSKA, Anna (CERN)

**Presenter:** IFRIM, Ioana (CERN)

**Session Classification:** Posters

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