

Contribution ID: 218

Type: Parallel

## CMS FlashSim: how ML powers end-to-end simulation for HEP

The CMS Collaboration developed an end-to-end ML based simulation that can speed up the time for production of analysis samples of several orders of magnitude with a limited loss of accuracy. Detailed event simulation at the LHC is crucial for physics analyses and it is currently taking a large fraction of computing budget. Because the CMS experiment is adopting a common analysis level format (the NANOAOD) for a larger number of analyses, such an event representation is used as the target of this ultra fast simulation, which we call FlashSim. Generator level events, from PYTHIA or other generators, are directly translated into NANOAOD events at several hundred Hz rate with FlashSim. We show how training FlashSim on a limited number of full simulation events is sufficient to achieve very good accuracy on larger datasets for processes not seen at training time. With this work, we aim to update the community about recent and relevant developments behind the FlashSim framework.

## Secondary track

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Track Classification: T12 - Data Handling and Computing