Contribution ID: **61** Type: **Poster and Flash talk**

FlashSim: Towards a Digital Twin of the CMS Experiment using Normalizing Flows and Flow Matching

Monday 23 September 2024 16:30 (3 minutes)

The simulation of high-energy physics collision events is a key element for data analysis at present and future particle accelerators. The comparison of simulation predictions to data allows us to look for rare deviations that can be due to new phenomena not previously observed. The CMS Collaboration is investigating how novel machine learning algorithms, specifically Normalizing Flows and Flow Matching, can be used to perform accurate simulations with several orders of magnitude of speed-up compared to traditional approaches, contributing to the development of a "Digital Twin" of the CMS Experiment, a simulation framework named FlashSim. The classical simulation chain computes energy deposits, electronics response, and reconstruction from a physics process. We propose an end-to-end approach, directly simulating the final high-level format from physical inputs, skipping intermediate steps. The speed and accuracy of the proposed approach make it a compelling tool for the present and future needs of CMS Collaboration.

What of the following keywords match your abstract best?

GPUs

Please tick if you are a PhD student and wish to take part to the poster prize competition!

I am a PhD student

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Session Classification: Flash talks / poster session