

# Generative models and seq2seq techniques for the flash-simulation of the LHCb experiment

*Saturday 20 July 2024 11:02 (17 minutes)*

Simulating detector and reconstruction effects on physics quantities is of paramount importance for data analysis, but unsustainably costly for the upcoming HEP experiments.

The most radical approach to speed-up detector simulation is a Flash Simulation, as proposed by the LHCb collaboration in Lamarr, a software package implementing a novel simulation paradigm relying on deep generative models and seq2seq attention-driven techniques to deliver simulated samples. Thanks to its modular layout, Lamarr provides analysis-level quantities by applying a pipeline of machine-learning-based modules that properly transforms the information resulting from physics generators.

Good agreement is observed by comparing key reconstructed quantities obtained with Lamarr against those from the existing detailed Geant4-based simulation. Integrated within the general LHCb Simulation software framework, we show that a two-order magnitude cost reduction can be achieved by adopting Lamarr.

## Alternate track

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Yes

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**Session Classification:** Computing and Data handling

**Track Classification:** 14. Computing, AI and Data Handling