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Acceleration of the ML based fast simulation in high energy physics

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The diffusion model has demonstrated promising results in image generation, recently becoming mainstream and representing a notable advancement for many generative modeling tasks. Prior applications of the diffusion model for both fast event and detector simulation in high energy physics have shown exceptional performance, providing a viable solution to generate sufficient statistics within a constrained computational budget in preparation for the High Luminosity LHC. However, many of these applications suffer from slow generation with large sampling steps and face challenges in finding the optimal balance between sample quality and speed. The study focuses on the latest benchmark developments in efficient ODE/SDE-based samplers, schedulers, and fast convergence training techniques. We test on the public CaloChallenge and JetNet datasets with the designs implemented on the existing architecture, the performance of the generated classes surpass previous models, achieving significant speedup via various evaluation metrics.

Significance

References

Experiment context, if any

Primary author: JIANG, Cheng (The University of Edinburgh (GB))

Co-authors: QU, Huilin (CERN); QIAN, Sitian (Peking University (CN))

Presenter: QIAN, Sitian (Peking University (CN))

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