



Contribution ID: 249

Type: Oral

Unweighted event generation for multi-jet production processes based on matrix element emulation

Wednesday, 26 October 2022 14:55 (20 minutes)

The generation of unit-weight events for complex scattering processes presents a severe challenge to modern Monte Carlo event generators. Even when using sophisticated phase-space sampling techniques adapted to the underlying transition matrix elements, the efficiency for generating unit-weight events from weighted samples can become a limiting factor in practical applications. Here we present the combination of a two-staged unweighting procedure with a factorisation-aware matrix element emulator using neural networks which we make accessible in the Sherpa event generation framework. The algorithm can significantly accelerate the unweighting process, while it still guarantees unbiased sampling from the correct target distribution. We apply, validate and benchmark the approach in high-multiplicity LHC production processes, including $Z/W+4$ jets and $t\bar{t}+3$ jets, where we find speed-up factors up to 60.

Significance

References

Experiment context, if any

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Session Classification: Track 3: Computations in Theoretical Physics: Techniques and Methods

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