Contribution ID: **662** Contribution code: **contribution ID 662**   Type: **Poster**

Symmetry aware generation of two-staged particle decays in high-energy physics

We present a specialised layer for generative modeling of LHC events with generative adversarial networks. We use Lorentz boosts, rotations, momentum and energy conservation to build a network cell generating a 2-body particle decay. This cell is stacked consecutively in order to model two staged decays, respecting the symmetries across the decay chain. We allow for modifications of the resulting four-vectors in order to model higher order and detector effects.
We give an evaluation of the generator quality in a higgs decay into two
Z bosons, further decaying into a muonpair each.

Significance

In the High-Luminosity LHC era, the requirement for Monte-Carlo simulation will outscale the available resources. Generative adversarial networks show a promising way to generate events at very low computational cost. First efforts have been done in this field but there are very few specialised architectures that incorporate the needed physisc symmetries.

References

Speaker time zone

Compatible with Europe

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Session Classification: Posters: Orange

Track Classification: Track 2: Data Analysis - Algorithms and Tools