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Boost-Invariant Polynomials: an efficient and interpretable approach to jet tagging

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Besides modern architectures designed via geometric deep learning achieving high accuracies via Lorentz group invariance, this process involves high amounts of computation. Moreover, the framework is restricted to a particular classification scheme and lacks interpretability.
To tackle this issue, we present BIP, an efficient and computationally cheap framework to build rotational, permutation, and boost in the jet mean axis invariances. Moreover, we show the versatility of our approach to obtaining state-of-the-art range accuracies in both supervised and unsupervised jet tagging by using several out-of-the-box classifiers.

Significance

We show that a mathematically inspired multi-body representation of jets can generate a fast, accurate, and interpretable classification of jets at Hadron Colliders via sub-group invariances. Thus obtaining state-of.the-art results within a fraction of the computational cost and speed-ups of orders of magnitude in both training and inference.

References

Experiment context, if any

We benchmark our method in both of the following datasets: https://zenodo.org/record/2603256 and https://zenodo.org/record/3164691

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