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Energy Flow Polynomials for More Model-Agnostic Anomaly Detection

Weakly supervised anomaly detection has been shown to be a sensitive and robust tool for Large Hadron Collider (LHC) analysis. The effectiveness of these methods relies heavily on the input features of the classifier, influencing both model coverage and the detection of low signal cross sections. In this talk, we demonstrate that improvements in both areas can be achieved by using energy flow polynomials. To further highlight this, we introduce new benchmark signals for the LHCO RnD dataset, which is a widely used benchmark dataset in this field.

Significance

This talk presents the first comprehensive study of weakly supervised anomaly detection using energy flow polynomials (EFPs) on the LHCO R&D benchmark dataset. While EFPs are a well-established tool in jet substructure analysis, this is the first work to systematically apply them as input features for boosted decision tree (BDT) classifiers in a model-agnostic anomaly detection context. Our results demonstrate that EFP-based features outperform traditional N-subjettiness variables in both signal sensitivity and model coverage. Additionally, we contribute new benchmark signals to the LHCO R&D dataset, providing the community with a broader and more diverse test set for evaluating anomaly detection methods. These contributions represent both a methodological advancement and a valuable resource for future studies.

References

Experiment context, if any

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