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Jet tagging with Lorentz-Equivariant Geometric Algebra Transformers

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Extracting scientific understanding from particle-physics experiments requires solving diverse learning problems with high precision and good data efficiency. We present the Lorentz Geometric Algebra Transformer (L-GATr), a new multi-purpose architecture for high-energy physics. L-GATr represents high-energy data in a geometric algebra over four-dimensional space-time and is equivariant under Lorentz transformations. At the same time, the architecture is a Transformer, which makes it versatile and scalable to large systems. In this talk we will focus on the application of L-GATr to the task of jet classification. We find that L-GATr is able to either match or outperform other baselines in the top tagginng, quark-gluon and JetClass benchmarks. In addition, we further improve the accuracy of L-GATr in the top-tagging task by pretraining the model on the JetClass dataset and then fine-tuning on top tagging data. This strategy boosts the classification performance of L-GATr across every metric, establishing a new state of the art result.

Track

Tagging (Classification)

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Session Classification: Tagging