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Jet tagging algorithm respecting Lorentz group symmetry

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Deep learning has transformed jet tagging, in bringing a leap to tagging performance and hence substantially improving the sensitivity of physics searches at the LHC. In seek of further enhancement, recent interests fall in experimenting with more advanced neural network architectures, or injecting physics knowledge into the design of the network. This talk focuses on the latter, with a discussion on how intrinsic physics symmetries play a vital role. We introduce and investigate the LorentzNet, an efficient model with a graph neural network (GNN) backbone that respects the Lorentz group symmetry of a jet. We show how the model improves the tagging performance over the previous state-of-the-art algorithms including ParticleNet, especially when trained only on a few thousand jets. We study how symmetry preservation serves as a strong inductive bias of the jet tagging learning algorithm and hint at its potential role in future tagger development.

This talk is based on https://arxiv.org/abs/2201.08187 and includes new relevant studies on LorentzNet.

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