Contribution ID: **19** Type: **not specified**

Towards a foundational jet model: Enhancing generalization with contrastive "gen-reco" pre-training

Friday, 22 August 2025 15:20 (20 minutes)

A foundation jet model aims to achieve optimal performance across all jet analysis tasks while ensuring strong generalization. Building on *Sophon*, a pre-trained jet classification model, we develop *Sophon++*, which employs contrastive learning to connect initial, parton-level, and reconstruction-level particles, enabling continuous encoding of generator-level particle configurations into the model's latent space. While matching *Sophon* in classification performance, *Sophon++* demonstrates stronger generalization through several fine-tuning tasks. This work provides a promising pathway towards a foundation jet model for analysis.

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Session Classification: Session