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HGPflow: Physics-inspired full event particle reconstruction in collider experiments with HyperGraphs

Accurate particle reconstruction from detector data is a fundamental task in experimental particle physics. Traditional methods are becoming sub-optimal in the face of the increasing demands of the High Lumi phase of the LHC, making machine learning-based approaches more relevant.

Incorporating physics knowledge into machine learning-based reconstruction can enhance performance and provide interpretability.
In this study, we propose HGPflow [1], a physics-inspired HyperGraph learning approach for particle reconstruction. By mapping the problem's physical nature to a HyperGraph learning problem, we leverage non-machine learning expertise and seamlessly transfer it to the machine learning framework. HGPflow outperforms other machine learning approaches and offers transparent interpretability, making it a viable alternative to black-box methods.

Physics-inspired HyperGraph learning enhances the accuracy and interpretability of particle reconstruction in experimental particle physics. This approach holds promise for meeting the challenges of the High Lumi phase of the LHC and provides an effective and transparent solution for particle reconstruction.

1. F. A. Di Bello et al. **Reconstructing particles in jets using set transformer and hypergraph prediction networks**. *Eur. Phys. J. C, 83(7):596, 2023.*

Primary author: KAKATI, Nilotpal (Weizmann Institute of Science)

Co-authors: Ms IVINA, Anna (Weizmann Institute of Science); GROSS, Eilam (Weizmann Institute of Science); DREYER, Etienne (Weizmann Institute of Science); DI BELLO, Francesco Armando (University of Genoa); Prof. KADO, Marumi (Max Planck Institute for Physics, Munich)

Presenter: KAKATI, Nilotpal (Weizmann Institute of Science)