

Flavour Tagging with Graph Neural Networks with the ATLAS experiment

Walteri Leinonen on behalf of the ATLAS Collaboration



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Physics-informed GNN

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GN1 and GN2 are ATLAS's state-of-the-art low-level ***b*-tagging** and **boosted Higgs tagging** architectures.

- Physics inspired tagging with **auxiliary tasks** : $L_{total} = L_{jet} + \alpha L_{vertex} + \beta L_{track}$
 - Interpretable model outputs through **vertexing** and **track tagging**
- Massive performance upgrade
 - Many-fold higher background rejection → **Higher tagging efficiency**
- Flexible architecture, suitable for general tagging tasks
 - **Boosted Higgs** → **$b\bar{b}/c\bar{c}$ tagging** used in **precision measurements**
 - Top tagging folded into the same architecture
 - Unique challenges in producing mass-decorrelated tagger

