Jet flavour algorithms

Problem

(soft) gluons splitting into large-angle $q\bar{q}$ pairs makes it difficult to assign a flavour to a jet (typically IRC unsafe at some order)

Several recent proposals

- F. Caola, R. Grabarczyk, L. Hutt, G.P. Salam, L. Scyboz, J. Thaler, arXiv:2306.07314
- R. Gauld, A. Huss, G. Stagnitto, arXiv:2208.11138
- S. Caletti, A.J. Larkoski, S. Marzani, D. Reichelt, arXiv:2205.01109, arXiv:2205.01117
- M. Czakon, A. Mitov, R. Poncelet, arXiv:2205.11879

Jet substructure

- depending on the energy scale, the Higgs(es) will be boosted or not.
- Tagging techniques and backgrounds would be quite different in the two cases.
- In jet substructure boosted $H \to b\bar{b}$ has received lots of attention (many tools available).
- It would be interesting to look into options to bridge between the boosted and non-boosted cases [ideas can be thought of, e.g. based on the Lund-Net Machine Learning tool this is largely untested]

Simulations/Monte-Carlo samples

- Backgrounds are delicate to simulate but one should aim for a good control (especially when they are used for pheno studies)
- for example, a "better" agreement with Pythia8 alone compared to MadGraph+Pythia is worrysome and should be understood.
- (vague) question: what fraction of 6-b events have an extra jet (passing the cuts)?