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Reweighting via classsification for MC tuning(15'+5')

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Parton shower Monte Carlo programs are a key tool for all aspects of analysis using jet substructure. These programs have many tunable parameters that control aspects of both perturbative and non-perturbative models. Finding the best parameters is non-trivial, and parton showers are typically run both for some optimized parameters as well as variations for uncertainty estimates.

Traditionally, tuned parameters are found using a set of one-dimensional unfolded measurements and optimized using various approximate sampling methods. Simulations with new parameters can be costly and must be run for every new set of parameter values, except for some limited cases where analytic weights can be calculated.

We propose a new data-driven method which uses deep learning with jet constituents to calculate the weights relating any point in the parameter space to another. We show how this method can be trained to relate two discrete points or to interpolate continuously in parameter space. In the continuous case, it can be used to fit for the optimal Monte Carlo parameters by using gradient descent in a classification task between a MC sample with known parameter values and the "data".

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