

OmniFold: Simultaneously Unfolding All Observables

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Unfolding is the procedure by which the “recorded” detector-level distribution of an observable is corrected for detector effects and other sources of noise to obtain the “true” particle-level distribution. In high-energy particle physics, unfolding is a ubiquitous part of measurements at the LHC. The current state-of-the-art procedure, Iterated Bayesian Unfolding (IBU), is typically applied to only a one-dimensional recorded distribution to obtain a one-dimensional true distribution, ignorant of other correlations present and requiring a separate unfolding for each observable. In this talk, I will exhibit a method, called Omniscient Unfolding (OmniFold), that takes advantage of the full phase-space information at both detector and truth levels to solve the unfolding problem. OmniFold learns a universal weighting of truth events such that the distribution of any observable can be calculated. The method is demonstrated and compared to IBU using the Herwig and Pythia event generators, the Delphes simulation package, and a variety of jet substructure observables, showing equal or improved robustness in all cases.

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