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Implementation of the likelihood-based ABCD method for background estimation and hypothesis testing with pyhf

The ABCD method is a common background estimation method used by many physics searches in particle collider experiments and involves defining four regions based on two uncorrelated observables. The regions are defined such that there is a search region, where most signal events are expected to be, and three control regions. A likelihood-based version of the ABCD method, also referred to as the "modified ABCD method", can be used even when there may be significant contamination of the control regions by signal events. Code for applying this method in an individual analysis has generally been developed using the RooFit and RooStats packages within the ROOT software framework. In this work, a standalone implementation of this method has been developed utilizing pyhf, a pure-Python package providing the functionality of the statistical analysis tools available in RooFit/RooStats. This implementation does not make any assumptions about the underlying analysis and can thus be used or adapted in any analysis using the ABCD method.

Significance

This work has not been presented publicly before, and I am not aware of any similar implementation being published or presented.

References

Speaker time zone

Compatible with Europe

Author: PROFFITT, Mason (University of Washington (US))

Presenter: PROFFITT, Mason (University of Washington (US))

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