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Automating Boosted Decision Tree Analyses with MInOS

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A new software tool MInOS (Machine Intelligent Optimization of Significance) is introduced for the automation of machine learning on collider event statistics, with back-end functionality provided by the XGBoost package. A simple, compact, and powerful meta-language syntax facilitates the generation of sophisticated Boosted Decision Tree analyses based upon instructions supplied in a reusable card file. MInOS integrates transparently with MadGraph/Pythia/Delphes and handles the weighted recombination and over-sampling of simulated data. All event statistics computable by the companion package AEACuS (and arbitrary user-supplied functions thereof) may be leveraged as learning keys, or as criteria for manual event selection. Ensemble training against distinct background components may be combined to generate composite classifications with enhanced discrimination, and trained models may be stored or converted into standalone executable code for reapplication. ROC curves as well as score distribution, feature importance, and significance threshold plots are generated on the fly.

Summary

Author: Prof. WALKER, Joel (Sam Houston State University)

Presenter: Prof. WALKER, Joel (Sam Houston State University)

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