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Preserving physically important variables in optimal event selections

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Analyses of collider data, often assisted by modern Machine Learning methods, condense a number of observables into a few powerful discriminants for the separation of the targeted signal process from the contributing backgrounds. These discriminants are highly correlated with important physical observables; using them in the event selection thus leads to the distortion of physically relevant distributions.
Focusing on the 0-lepton channel of the process VH -> bb, we present an alternative event selection strategy, based on adversarially trained classifiers. Our procedure exploits the discriminating power contained in many event variables, but *preserves* the distribution of the di-b-jet invariant mass and thus allows the Higgs signal strength to be extracted through a fit to this physically important variable. Compared to a cut-based approach pursued by ATLAS, this method consequently leads to a significant improvement in analysis sensitivity.

(Ref: https://arxiv.org/abs/1907.02098)

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