

# Robust Signal Detection using a Classifier Decorrelated through Optimal Transport (CDOT)

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New physics searches are usually done by training a supervised classifier to separate a signal model from a background model. However, even when the signal model is correct, systematic errors in the background model can influence supervised classifiers and might adversely affect the signal detection procedure. To tackle this problem, one approach is to find a classifier constrained to be decorrelated with one or more protected variables, e.g. the invariant mass. We do this by considering an optimal transport map of the classifier output that makes it independent of the invariant mass for the background. We then fit a semi-parametric mixture model to the invariant mass for different cuts on the transformed classifier to detect the presence of signal. We compare and contrast this decorrelation method with previous approaches, show that the decorrelation procedure is robust to background misspecification, and analyze the power of the test that simultaneously fits multiple classifier output bins.

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