

Advanced event reweighting for MVA training.

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Title: Advanced event reweighting for MVA training.

Multivariate discrimination techniques, such as Neural Networks, are key ingredients to modern data analysis and play an important role in high energy physics. They are usually trained on simulated Monte Carlo (MC) samples to discriminate signal from background and are then applied to data. This has in general some side effects which we address in this talk.

One is that the discriminator behaviour on real data depends on the agreement between the MC training sample and data. We present ways of re-weighting MC samples on a per event basis to make them more look like data.

In some cases it is even possible to become completely independent from MC simulations by using the sPlot technique, which also makes extensive use of weights during the training and is a sort of advanced background subtraction procedure.

Another issue is that a cut on the discriminator can change the distribution of variables which discriminate signal from background themselves. This becomes an issue if one wants to see and fit a clear signal peak in this distribution on data as a final result, e.g. in the invariant mass of decay particles. Our approach uses a neural network which is trained to discriminate between signal and background while explicitly disallowing any influence on the distribution the variable of interest to be used for template fits in the end.

We will give examples of the application of these three techniques performed with the NeuroBayes package in different physics analysis.

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