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## **Combining Neural Network predictions with Hypothesis Testing for discovery in the LHC**

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As the use of Machine Learning techniques become more widespread within High Energy Physics it is important to consider how the results from Neural Networks can be applied within hypothesis testing. We show how a Log-Likelihood Ratio test can be performed using the the output of Neural Network classifiers trained on different physical datasets to yield a detection significance between two simple hypotheses, which we find to be superior to a common naive result. We also show how a generalised Log-Likelihood Ratio test can be performed using the output of a Variational Autoencoder when one hypothesis is not fully known beforehand, thereby providing a discovery significance that is useful in anomaly detection scenarios, which we showcase in the example of a Heavy Higgs EFT search.

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