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Gaussian processes versus parametric background modeling

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The signal to background ratio for Higgs decaying to 2 photons is small, therefore, a powerful estimation of the background is needed to accurately measure the signal. Since the underlying physical function is unknown, various functional parameterizations are considered for background estimation. When the number of events increases, the relative uncertainty decreases. This might give rise to some previously hidden features of the distribution, leading to the need for re-estimation of the background to avoid creating a spurious signal.
The current process is lengthy and awkward, and therefore, this study has focused on investigating Gaussian Processes (GP) as a new method for estimating the background and signal distributions. GP is a machine learning method that does not depend on a specific parametric function and could, therefore, be employed in numerous scientific areas. Although GP proved to be a challenging method to work with, the results obtained indicate that GP is a promising candidate for background estimation of the Higgs to 2 photons channel.

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