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Background Systematics in $HH \to b\bar{b}b\bar{b}$ gluon-gluon fusion

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The Standard Model (SM) predicts pair production of the Higgs boson, but it has not yet been observed. The physics involved in the creation of Higgs pairs can address numerous open questions in the SM.

There are several searches for Higgs pairs at the ATLAS detector, where they are formed primarily through gluon-gluon fusion (ggF), and the largest decay channel is to b-quark jets. Thus, analysis of $gg \to HH \to b\bar{b}b\bar{b}$ benefits from having the most data of any Higgs pair search. However, it also has the largest background, as there are many processes in the ATLAS detector with similar multijet signatures. The main goal of this analysis is to measure the Higgs self-coupling (κ_λ) and the observed signal strength (μ) relative to the SM expectations.

Monte Carlo simulation of this process is not sufficiently accurate, and the computing cost is very high, so the background must be derived through data-driven methods. Uncertainties in the background have been the largest in the analysis and have hindered its sensitivity. In this talk I will demonstrate a new approach to the background uncertainties, where the variance and bias systematics are measured using auxiliary datasets. This method allows for a more accurate determination of the uncertainty and could elevate the sensitivity of the analysis.

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