

Bayesian and Frequentist Methodologies in Collider Physics with pyhf

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Collider physics analyses have historically favored frequentist statistical methodologies, with some exceptions of Bayesian inference in LHC analyses through use of the Bayesian Analysis Toolkit (BAT). In an effort to allow for advanced Bayesian methodologies for binned statistical models based on the HistFactory framework, which is often used in High-Energy physics, we developed the Python package Bayesian_pyhf. It allows for the evaluation of models built using pyhf, a pure Python implementation of the HistFactory framework, with the Python library PyMC. Based on Monte Carlo Chain Methods, PyMC enables Bayesian modeling and together with the arviz library offers a wide range of Bayesian analysis tools. Utilizing the frequentist analysis methodologies already present with pyhf, we demonstrate how Bayesian_pyhf can be used for the parallel Bayesian and frequentist evaluation of binned statistical models within the same framework.

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