

Improving the trilinear Higgs boson self-coupling measurement at the FCC-hh by exploiting **triangle/box** kinematical properties

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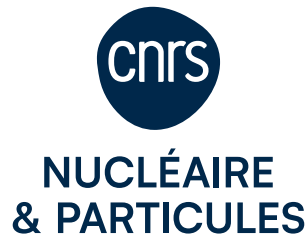
CERN, CH

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Université catholique de Louvain, BE

FCC-hh Physics & Performance meeting 3

2024-12-12

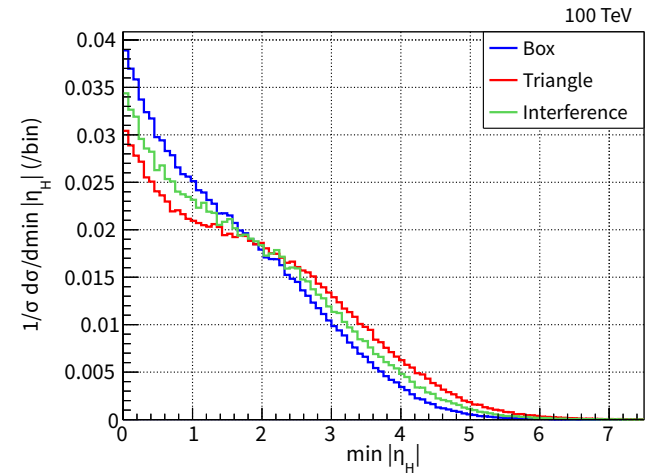
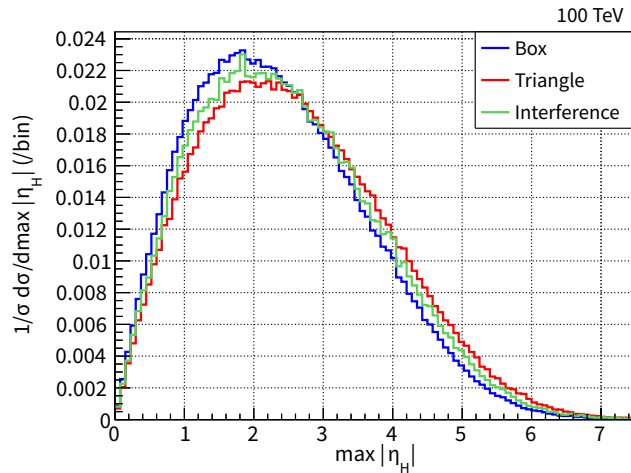
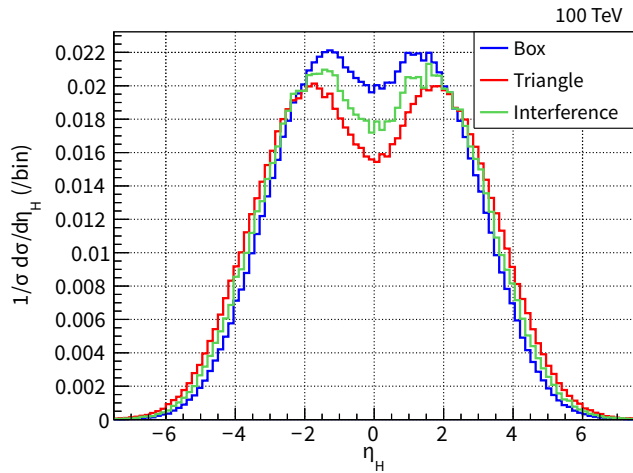
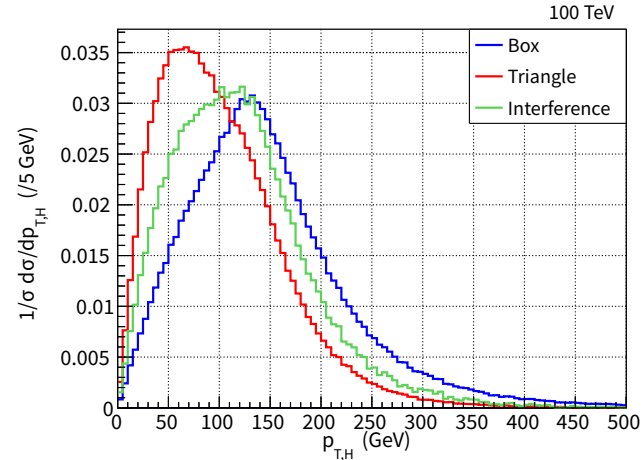
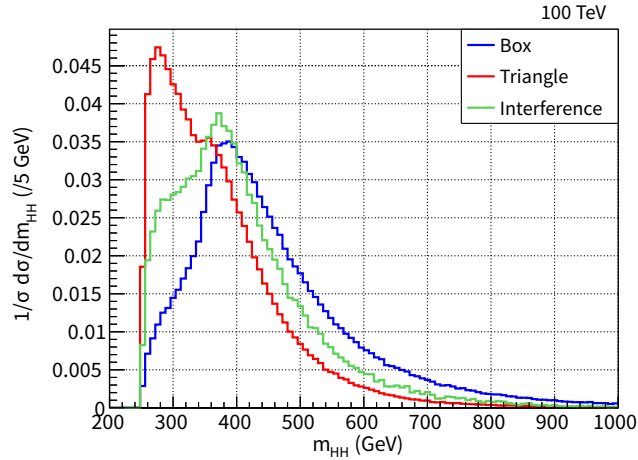


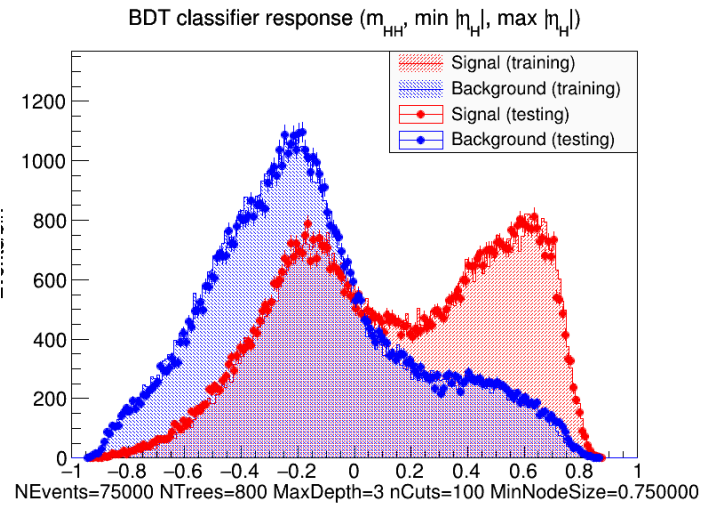
- Improving the sensitivity of the Higgs self-coupling measurement by exploiting the kinematical properties of the triangle vs. box contributions

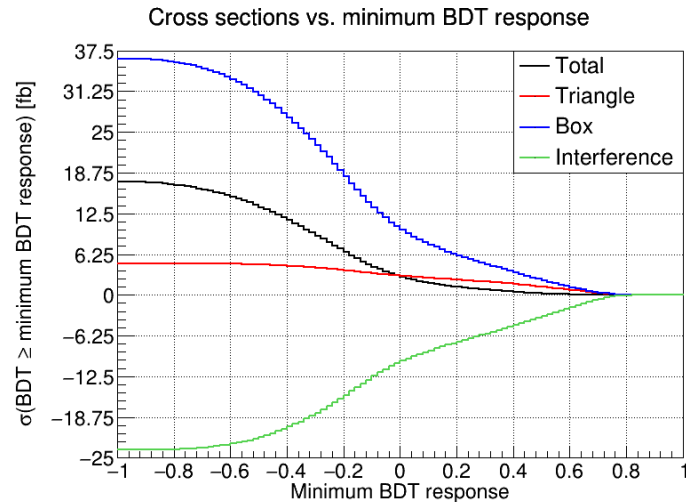
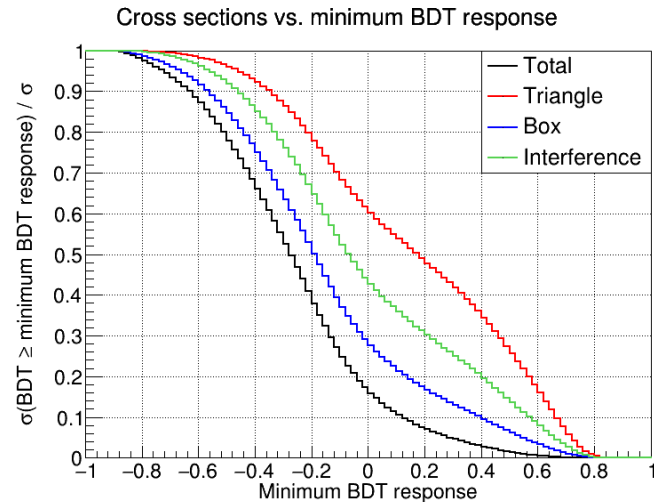
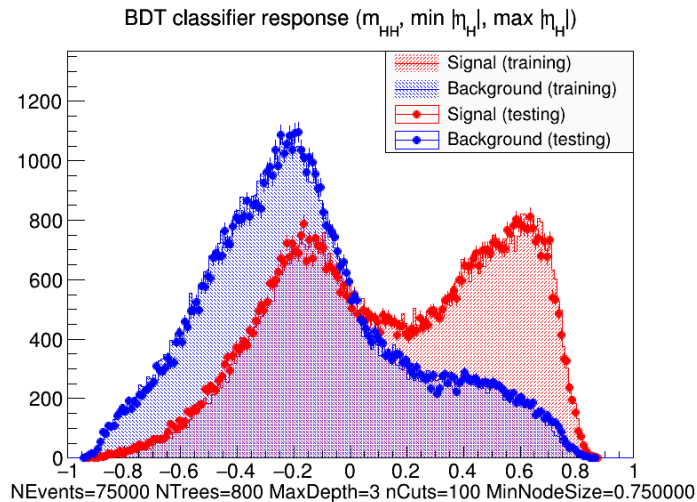
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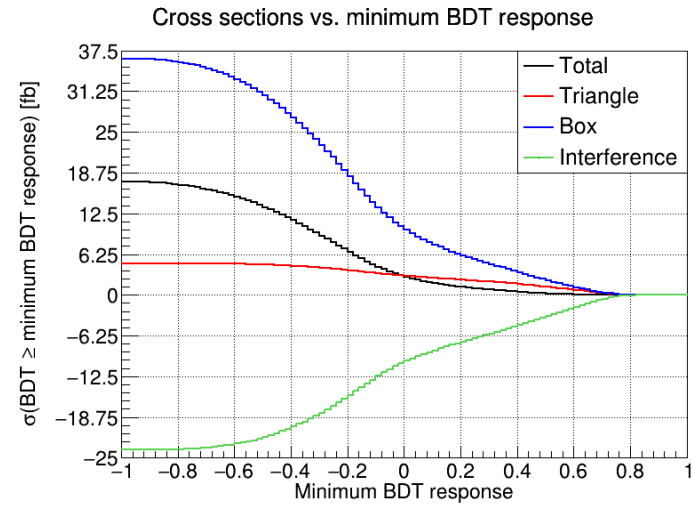
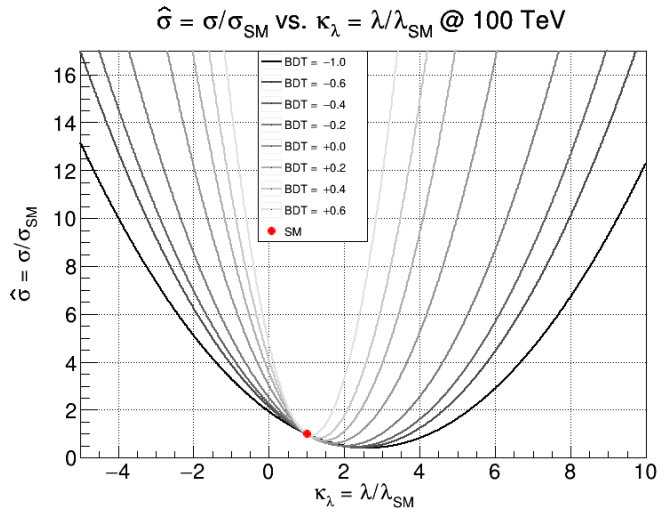
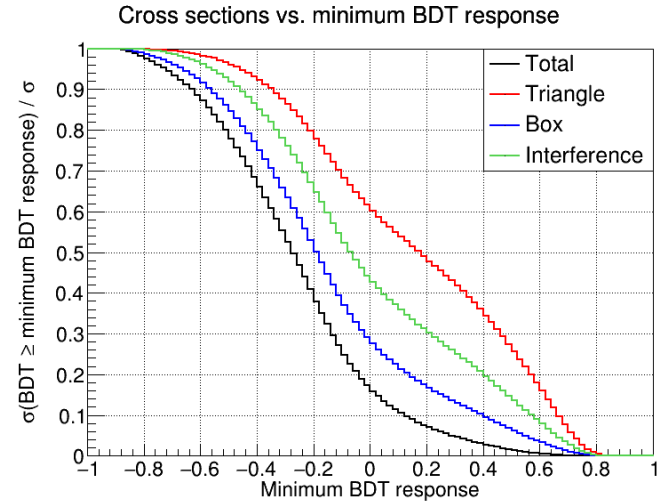
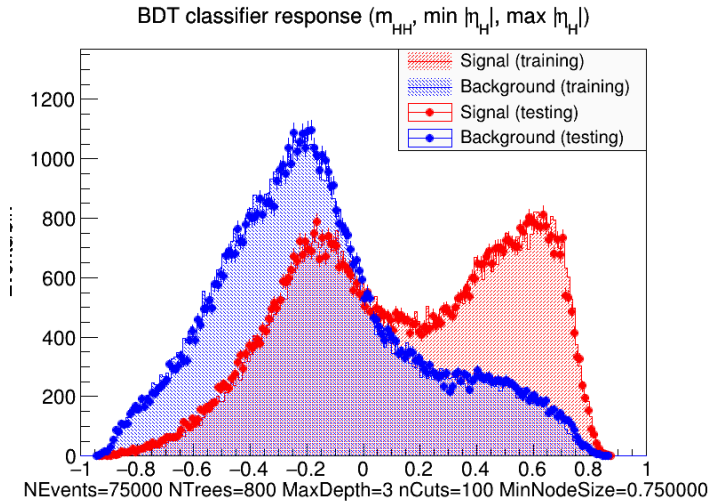
FCC-hh ESPP studies, meeting 3

<https://indico.cern.ch/event/1461211/#4-improving-the-sensitivity-of>









- Improving the sensitivity of the Higgs self-coupling measurement by exploiting the kinematical properties of the triangle vs. box contributions

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- **Take-away** — a BDT trained on LO **triangle** vs. **box** improves the sensitivity of $\sigma_{gg \rightarrow HH}^{\text{LO}}$ to κ_λ
- **Caveat** — only a proof of concept

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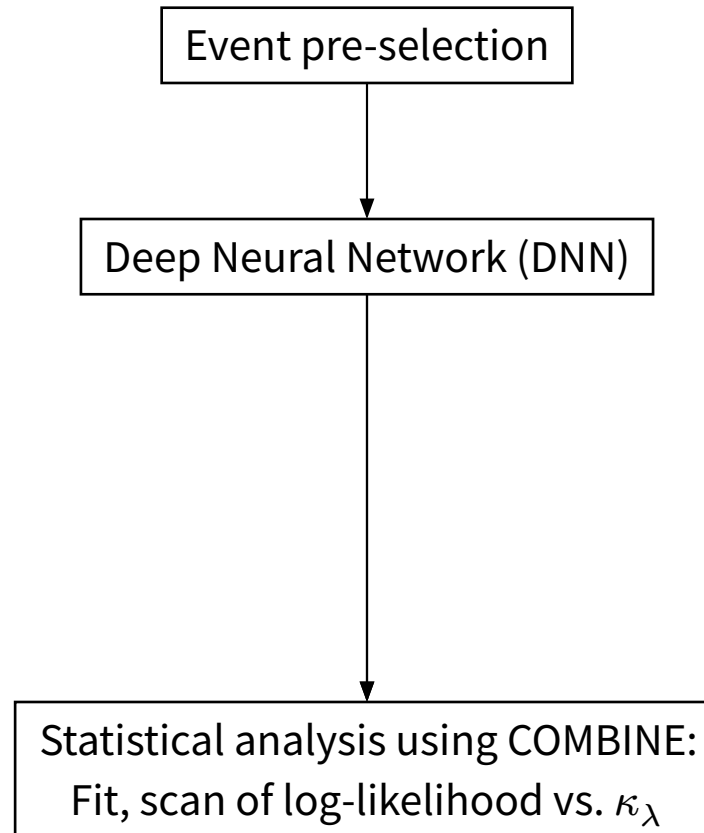
- **Take-away** — a BDT trained on LO **triangle** vs. **box** improves the sensitivity of $\sigma_{gg \rightarrow HH}^{\text{LO}}$ to κ_λ
 - **Caveat** — only a proof of concept
- Update on HH \rightarrow bby studies

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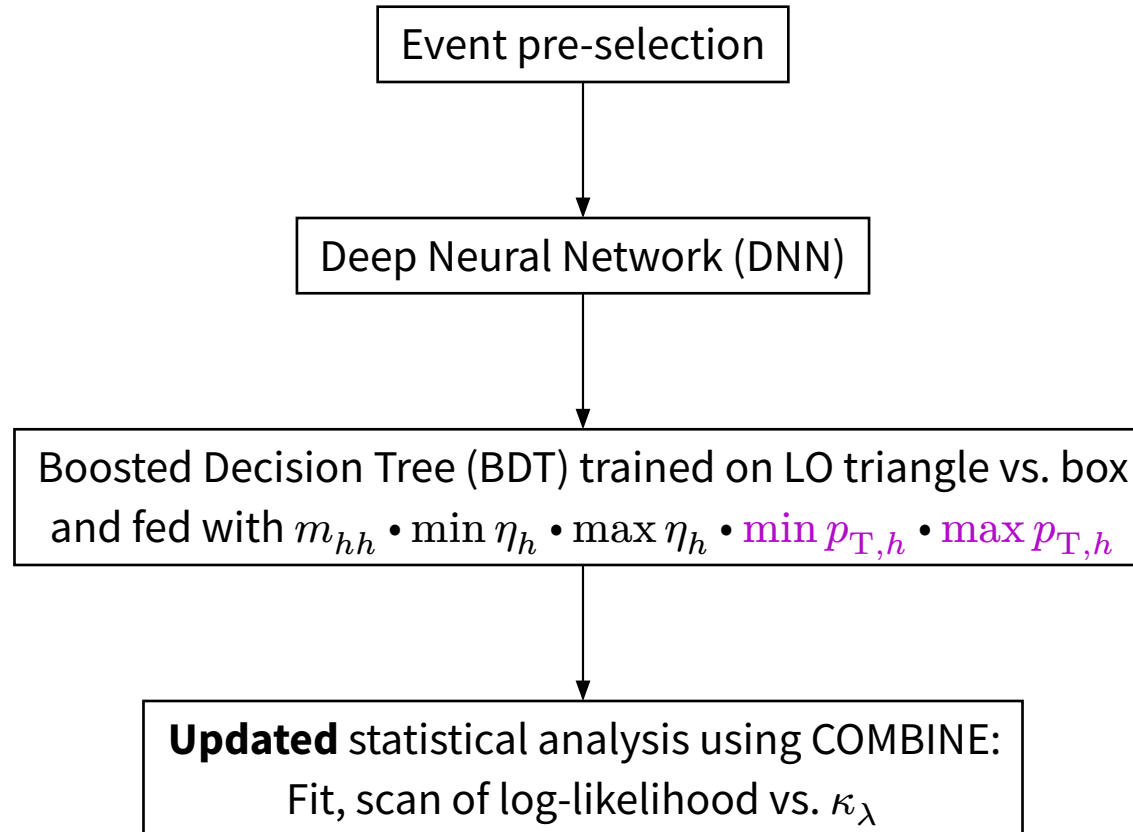
FCC-hh ESPP studies, meeting 2

<https://indico.cern.ch/event/1461208/#2-update-on-hh-bb-studies>

Current $b\bar{b}\gamma\gamma$ workflow (simplified)



Target bby workflow (simplified)



Steps

- Retrieve the LO samples for **triangle**, **box**, and total $gg \rightarrow HH \rightarrow b\bar{b}\gamma\gamma$
- Remake the BDT in Python using XGBoost
- Append the BDT application after the existing DNN
- Update the statistical analysis using COMBINE
- Compare the log-likelihood vs. κ_λ scan with and without the BDT

Schedule

- 2025-01-20
First draft for the FCC-hh studies for the 2025 update of the ESPP
- 2025-03-31
Absolute deadline for the FCC-hh studies for the 2025 update of the ESPP