$B^0 \to \tau^+\tau^-$ with hadronic FEI

Hands on Result: Rationalization of BDT choices

Belle II

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Discussion! 2022.11.29. (TUE)

- *How many BDTs?*

- *How many samples are for each BDTs?*

- *BASF2 Internal MVA package vs. External package*

- *How many BDTs?*

- *How many samples are for each BDTs?*

- *BASF2 Internal MVA package vs. External package*

A Simple Test: "Single BDT" vs. "Two BDTs"
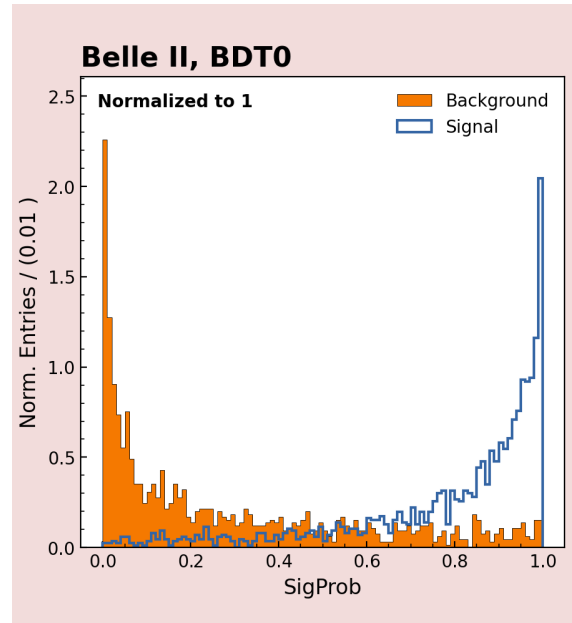
Purpose: To practice comparing BDT strategies

- Training
    - $BDT_{(cg,\,s)}$: Train BDT with "Cont. + Gen. vs. Sig." samples
    - $BDT_{(c,\,s)}$: Train BDT with "Cont. vs. Sig." samples
    - $BDT_{(g,\,s)}$: Train BDT with "Gen. vs. Sig." samples
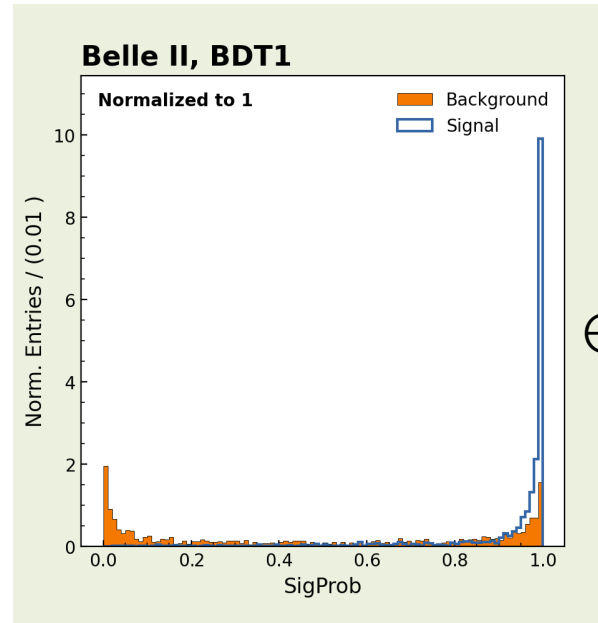
- Testing
    - Test with "Cont. + Gen. + Sig." sample
        - $BDT_{(cg,\,s)}(cgs) \equiv BDT_0$
        - $BDT_{(c,\,s)}(cgs) \equiv BDT_1$
        - $BDT_{(g,\,s)}(cgs) \equiv BDT_2$

- Compare BDTs
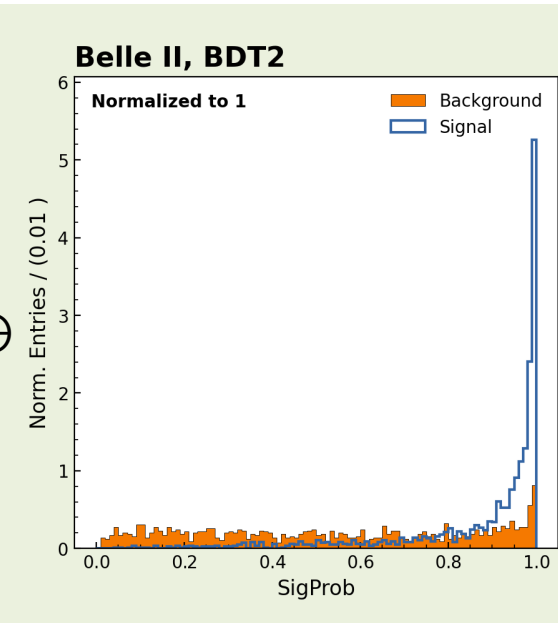   - "BDT_0" vs. "$BDT_1 \oplus BDT_2$"
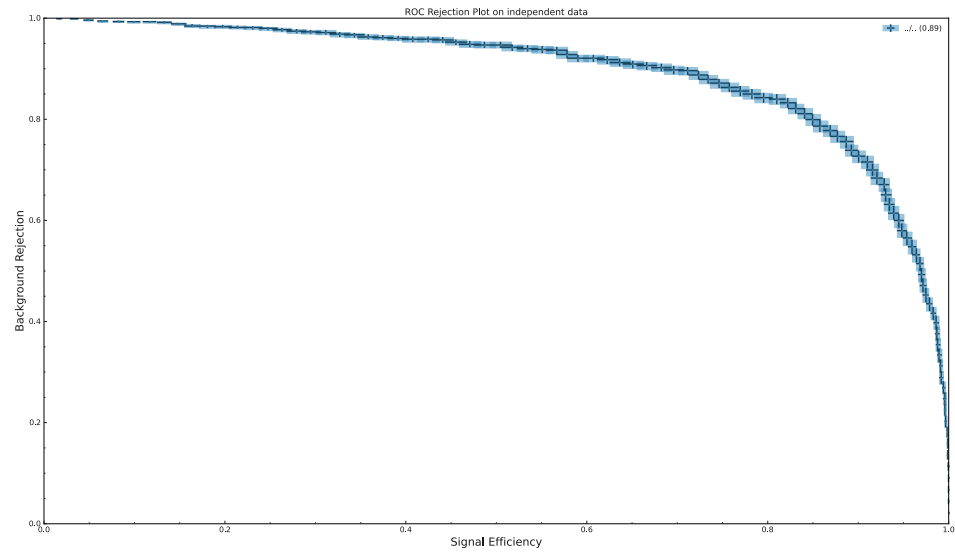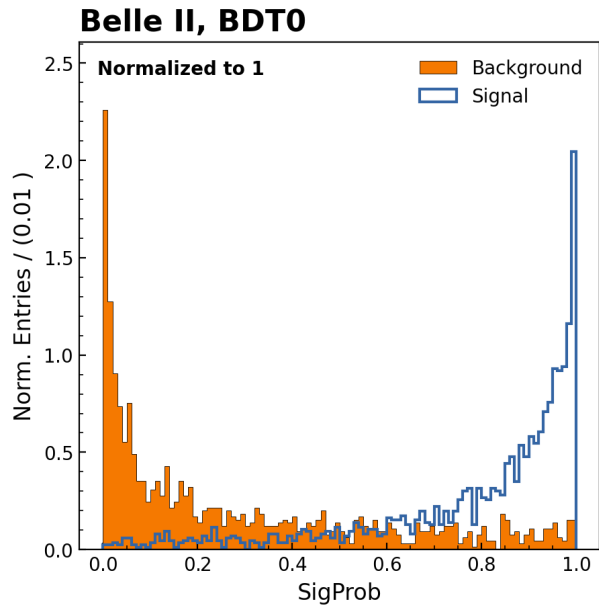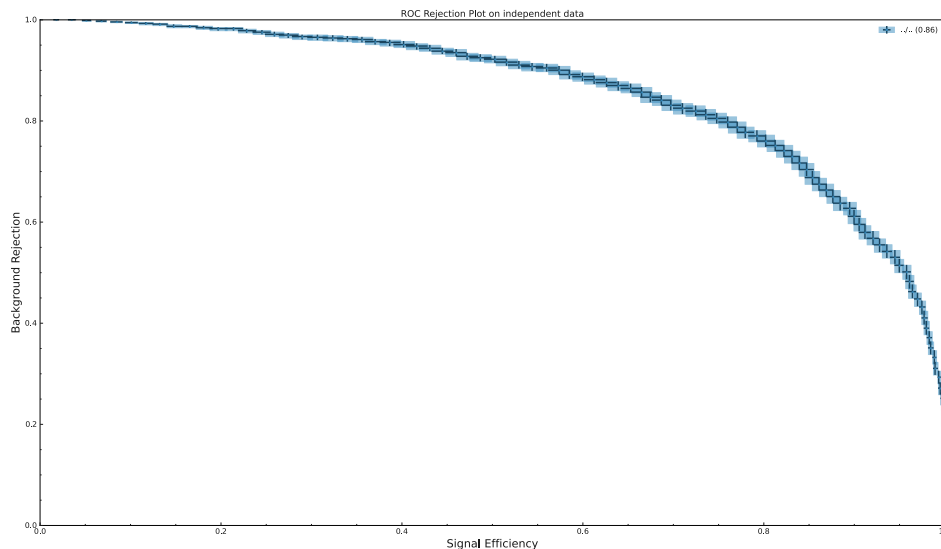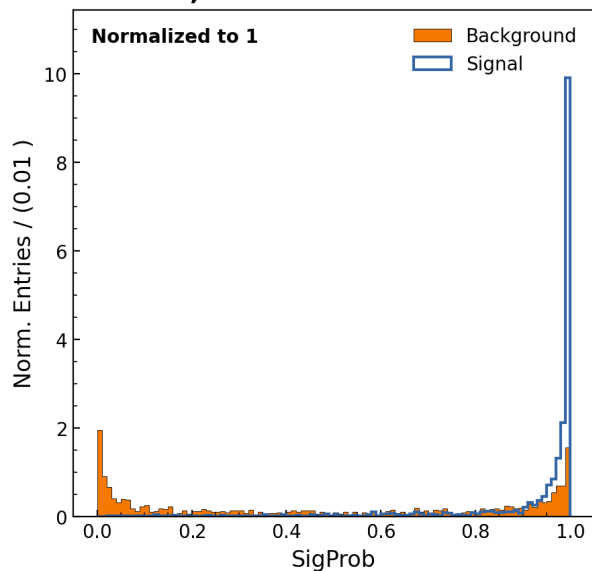
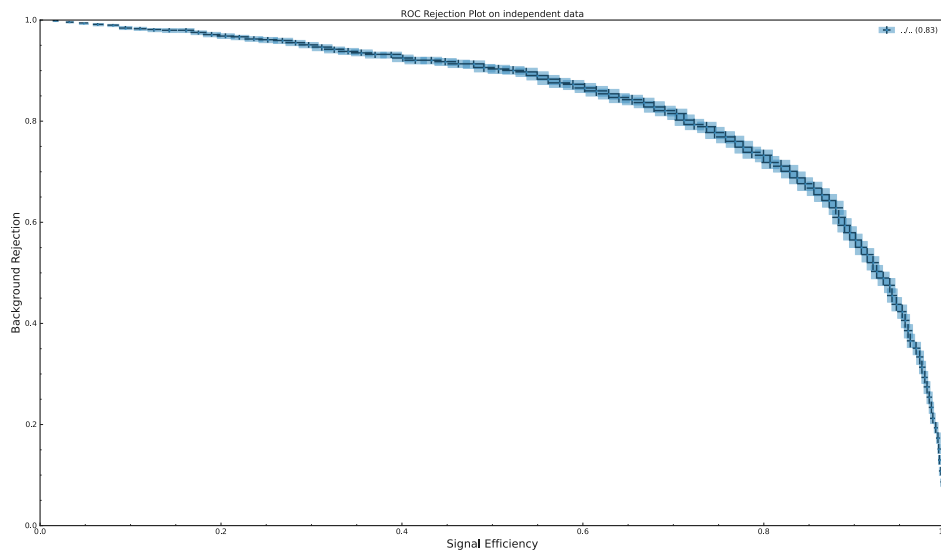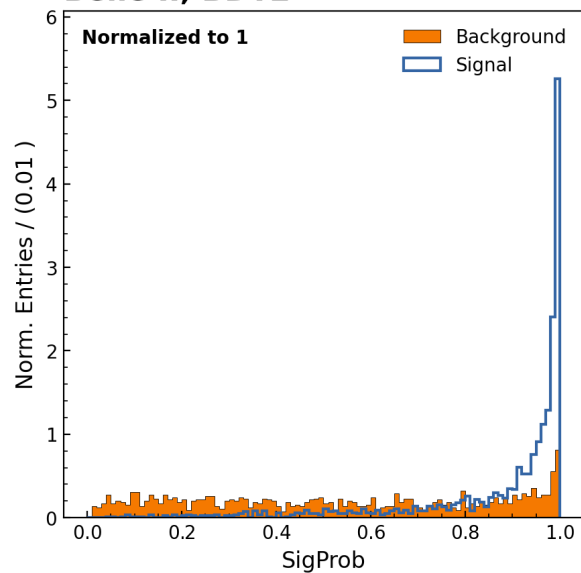**Belle II, BDT0**

- Conclusion
    - BDT comparison test is done with small samples
        - Plot BDT outputs
        - Plot ROC
            - Automatically generated by BASF2 internal MVA FBDT package

- Plan
    - Plot ROC manually
    - Choose cut for BDT output by using FoM
    - Calculate a number which shows "BDT_0" vs "$BDT_1 \oplus BDT_2$"

Backup

Backup

Alexandre Beaubien 도메인: uvic.onmicrosoft.com   오후 5:21 (7분 전)   ☆   ↩   ⋮
나, 나이정에게 ▾

文A 영어 ▾   >   한국어 ▾   메일 번역   영어 번역 안함   ✕

Interesting results. The BDT_c & BDT_g are both worse than the total BDT_cg. You tested both on a mixed sample of cgs right? The BDT1 + BDT2 combination may be a bit more technical than I thought.

Eventually you can try plotting the performance of BDT_c(c,s) & BDT_g(g,s) (instead of on cg,s both) to see how they perform on their intended classification task

Alex

- Giampiero Mancinelli (CPPM)
    - He is the author of the LHCb "$B_s \rightarrow \tau^+\tau^-$ and $B^0 \rightarrow \tau^+\tau^-$" paper
        - [PRL 118, 251802 (2017)]
        https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.118.251802
    - Use $\tau \rightarrow \pi\pi\pi$ sub-decay mode (LHCb's good vertexing ability)
    - Consider $\tau \rightarrow \mu\nu\nu$ sub-decay mode, too. Discard, finally.
    - $\tau \rightarrow e\nu\nu$ case, it is really hard to deal with LHCb due to the characteristic of pp collision.
    - Take his photo. He told his collogues that it is a good attitude.
    - BaBar => LHCb => Belle II
    - He has been to KEK 20 year ago.

- William William (University of Bonn)
    - He was the WG1 convener. It is first time for me to meet him. Before this physics week, I only know his voice.
    - He also told me that he knows my voice.
    - Recommendations
        - Test: Training and Testing BDT, locally. Copy (some fraction of) the sample from the Grid.
        - Add sample for validation (to avoid bias)
            - Train/Test => Train/Validation/Test

- Diego Tonelli
    - I checked the fact that his supervisor is really Punzi. Punzi Figure of Merit Punzi.
        - He said that every time people said Punzi FoM, he seemed a little bit shy (?)
    - Think also about the "impact" of your work. It is not physics, but it is also important.
        - LHCb showed the world's best results with preliminary data of them. My work will have more impact if I publish before version two of LHCb.
    - Too many optimizations, sometimes not that effective.

- Grid Experts (Stefano Lacaprara, Umberto Tamponi(?))
    - Interested in my Laptop Belle Logo. (Umberto Tamponi?)
    - I asked about the meaning of the DP Logo (turtle).
        - DP is slow. It is decided in a meeting.
        - The calibration group's logo is the rabbit because they are fast (?)
    - How to see the metadata of the FEI skimmed sample on the Grid.
        - Not yet. Too many Skims. Manpower.
    - Security: Can I access Grid or kekcc with shared Wifi like cafe or airport?
        - Yes, they are encrypted well.
        - Your attitude toward considering security is good.

- Peter Lewis (FEI lecturer)
  - Recommendation: BCS with FEI probability (tag=side) before signal => conservative
    - If this is not the case, signal dependence arises.
      - Efficiency increases, but dangerous.

- A guy from PISA (during the banquet)
  - Bread on the round table. Which one is my bread? Right-bread? Left-bread?
    - If you choose one, "collapse"
    - Spontaneous symmetry breaking.
      - The situation is like… It is a common textbook example.
    - etc.

- A German guy (during the banquet)
  - Physics vs. Mathematics?
    - Physics: Constraints => Logic, Reality
    - Mathematics: Constraints => Logic

- Another German guy (during the banquet)
  - Meaning of "Eigen (German word)"
    - "Intrinsic"

2021

- 2021.09.14. 25th EWP Meeting
  - https://indico.belle2.org/event/5190/#5-b0-tautau
- 2021.12.02. Leptonic Subgroup Meeting
  - https://indico.belle2.org/event/5728/#3-b0-to-tau-tau-analysis-statu

2022

- 2022.01.20. WG1 pre-session, 41st B2GM
  - https://indico.belle2.org/event/6017/#20-b0-to-tau-tau
- 2022.05.31. WG1 pre-session, 42nd B2GM
  - https://indico.belle2.org/event/6930/#sc-2-14-b-tau-tau
- 2022.Aug.04. Leptonic subgroup meeting
  - https://indico.belle2.org/event/7366/#7-b-to-tau-tau-preselection
- 2022.Oct.05. WG1 pre-session, 43rd B2GM
  - https://indico.belle2.org/event/7826/#sc-1-29-b-tau-tau
- 2022.Nov.29. Belle II Physics Week, Valencia, Spain
  - https://indico.belle2.org/event/7825/contributions/49707/