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Improved Selective Background Monte Carlo Simulation at Belle II with Graph Attention Networks and Weighted Events

Monday, 24 October 2022 11:00 (30 minutes)

When measuring rare processes at Belle II, a huge luminosity is required, which means a large number of simulations are necessary to determine signal efficiencies and background contributions. However, this process demands high computation costs while most of the simulated data, in particular in case of background, are discarded by the event selection. Thus filters using graph neural networks are introduced at an early stage to save the resources for the detector simulation and reconstruction of events discarded at analysis level. In our work, we improved the performance of the filters using graph attention and invested statistical methods including sampling and reweighting to deal with biases introduced by the filtering.

Significance

Improved the accuracy of distinguishing between background and expected events while reduced bias. Provided a tool to speedup the generation + skimming process.

References

DPG Talk 2022:
https://www.dpg-verhandlungen.de/year/2022/conference/heidelberg/part/t/session/53/contribution/1
DPG Talk 2021:
https://www.dpg-verhandlungen.de/year/2021/conference/dortmund/part/t/session/38/contribution/10

Experiment context, if any

Belle II

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