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Fast simulation of backgrounds at LHCb - a generalised tool

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Background estimation is already a bottleneck in several analyses at LHCb, and with the upcoming larger datasets, the demand for efficient background simulation will continue to grow. While there are existing tools that can provide quick, rough estimates of background reconstructed distributions (e.g. RapidSim), these cannot account for the effects of common selection criteria. The tool presented here addresses this limitation by utilising Variational Autoencoders (VAEs) to model the reconstruction and vertexing algorithms of LHCb. For any given decay channel this tool will generate tuples containing the same high-level variables as produced by the full LHCb simulation software. Analysts can use these generated tuples as if they were indeed produced by the full simulation, for example, one can apply any bespoke selection criteria—such as event filtering and MVA classifiers—and directly assess how that selection affects any given background. The tool can be used to quickly generate reliable fit component templates that can be used in analyses without requiring the computationally intensive LHCb simulation software.

Track

Detector simulation & event generation

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