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High-statistics and GPU-accelerated data analysis in IceCube

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The IceCube neutrino observatory is a cubic-kilometer scale ice Cherenkov detector located at the South Pole. The low energy analyses, that are for example used to measure neutrino oscillations, exploit shape differences in very high-statistics datasets. We present newly-developed tools to estimate reliable event rate distributions from limited statistics simulation and very fast algorithms to produce these. We also ported several features to run on GPUs (CUDA) to considerably speed up data analyses and render it possible to run a more sophisticated treatment of statistical and systematic uncertainties. Advancements are also being made in the reconstruction of low energy events, which are intrinsically difficult to deal with due to the weak signals they produce in the detector.

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