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Turning noise into data: using pileup for physics

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Pileup, or the presence of multiple independent proton-proton collisions within the same bunch-crossing, has been critical to the success of the LHC, allowing for the production of enormous proton-proton collision datasets. However, the typical LHC physics analysis only considers a single proton-proton collision in each bunch crossing; the remaining pileup collisions are viewed as an annoyance, adding noise to the physics process under study. By independently reconstructing these pileup collisions, it is possible to access an enormous dataset of lower-energy hadronic physics processes, which we demonstrate using data recorded by the ATLAS Detector during Run 2 of the LHC. Comparisons to triggered alternatives confirm the ability to use pileup as an unbiased dataset. The potential benefits of using pileup for physics are shown through the evaluation of the jet energy resolution, derived from dijet asymmetry measurements, comparing single-jet-trigger-based and pileup-based datasets.

Alternate track

I read the instructions above

Yes

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