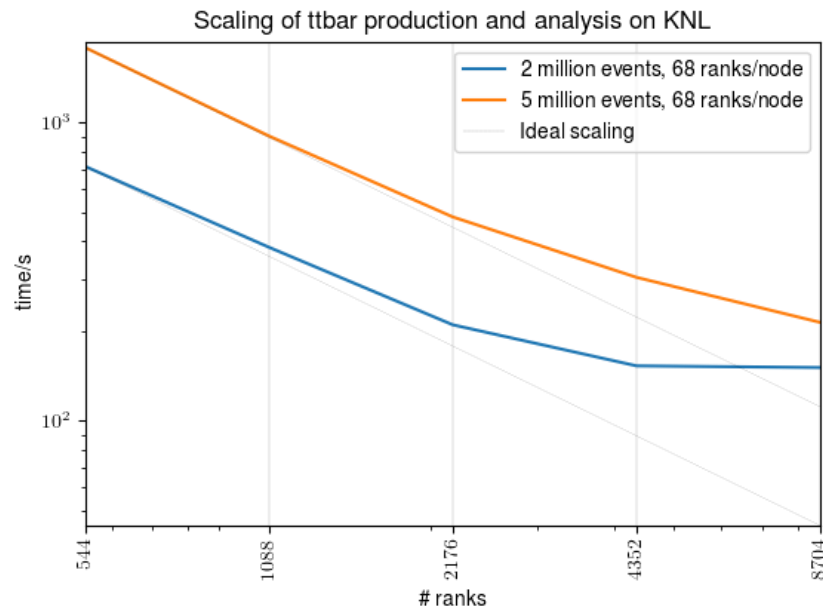


# Parallel event generation with DIY on HPC

## Scientific Achievement

Developed an application for generating and analyzing Monte-Carlo (MC) events on HPC architectures capable of running at a massively parallel scale.



Scaling behaviour when generating ttbar events with Pythia8 on HPC resources. The deviation from ideal scaling is due to the program overheads. With enough work assigned to each rank, we achieve perfect scaling. (Image Credit: Holger Schulz, U Cincinnati)

## Significance and Impact

HEP phenomenology and all experiment simulation workflows require vast numbers of MC generator events. This application efficiently utilizes HPC resources and HEP community tools to accumulate events in parallel.

## Research Details

- Data parallelism with ASCR DIY library encapsulates all MPI communications into a block-processing program application.
- Implements full chain of event generation with Pythia8 and analysis with Rivet.
- Allows for extremely short turn-around time of large parameter space explorations in e.g. the field of generator tuning.
- Paves the way for new and advanced optimization algorithms that do not rely on surrogate models, e.g. for limit setting through reinterpretation of LHC search analyses.
- Can also be used to accelerate laptop analyses.

Currently published on BitBucket at <https://bitbucket.org/iamholger/pythia8-diy/wiki/Home>.



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1