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## GPT-like transformer model for silicon tracking detector simulation

Simulating physics processes and detector responses is essential in high energy physics but accounts for significant computing costs. Generative machine learning has been demonstrated to be potentially powerful in accelerating simulations, outperforming traditional fast simulation methods. While efforts have focused primarily on calorimeters initial studies have also been performed on silicon detectors.

This work employs the use of GPT-like transformer architecture in a fully generative way ensuring full correlations between individual hits. Taking parallels from text generation hits are represented as a flat sequence of feature values. The resulting tracking performance, evaluated on the Open Data Detector, is comparable with the full simulation.

## Significance

While this contribution builds on an existing work this result presents the first time a comparable physics performance was achieved between silicon detectors simulated using Geant4 and using machine learning.

## References

CHEP 2024 (pending conference paper publication): https://indico.cern.ch/event/1338689/contributions/6016184/

## Experiment context, if any

Work is done in an experiment-agnostic way and uses Open Data Detector with the goal that it may eventually be applied to ATLAS.

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