

TrackML

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At HL-LHC, the seven-fold increase of multiplicity wrt 2018 conditions poses a severe challenge to ATLAS and CMS tracking experiments. Both experiment are revamping their tracking detector, and are optimizing their software. But are there not new algorithms developed outside HEP which could be invoked: for example MCTS, LSTM, clustering, CNN, geometric deep learning and more?

We organize a data science competition to stimulate both the ML and HEP communities to renew core tracking algorithms in preparation of the next generation of particle detectors at the LHC.

In a nutshell : one event has 100.000 3D points; how to associate the points onto 10.000 unknown approximately helicoidal trajectories? avoiding combinatorial explosion? you have a few seconds. But we do give you 100.000 events to train on.

ttbar events with 200 minimum bias event superimposed have been simulated with ACTS a simplified (yet accurate) simulation of a generic LHC silicon detectors, and wrote out the reconstructed hits, with matching truth. An accuracy metric which capture with one number the quality of an algorithm (high efficiency/low fake rate) has been defined. The challenge is running in two phases: the first on accuracy (no stringent limit on CPU time), has just started on Kaggle 1st May and will run till mid-August and the second (starting in the summer 2018) on the throughput, for a similar accuracy.