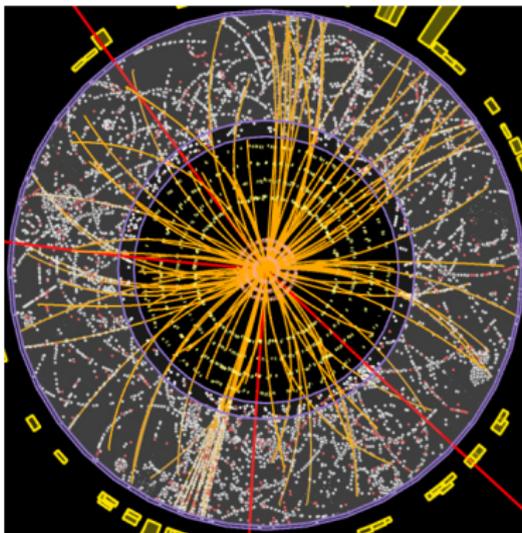


ACTS: CPU Race for Particle Hunting

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Example from ATLAS



ACTS

ACTS is an experiment independent open source scientific computing library for track reconstruction.

A charged particle will travel in an approximately helical path through the detector, and such trajectories are parametrised in a five dimensional space.

Small matrix linear algebra

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Cross-platform compatibility is important for an experiment independent library.

ACTS currently uses the `eigen` library. A student working with the ACTS team last summer showed that there was an overhead factor of **four** relative to the platform specific code that he wrote on inversion of 5×5 matrices.

My goal was to provide equally efficient implementations using a portable data container library called `xtensor`.

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Three merged pull requests to `xtensor`.

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`xtensor` is a C++ library that relies heavily on template metaprogramming.

Essentially, in a style that's particular to C++, we can build a rich type system and compile time utilities for putting together exactly the optimal assembly code for any requested computation.

What remains

I am currently finishing the implementation of a system vector length padded data container in `xtensor`. With this, multiplication will run optimally with zero runtime overhead, and we will be able to reproduce the inversion algorithm that outperforms `eigen` by a factor of four. This will provide the ACTS team with an algebra utility meeting all of their needs, and primed for integration into their code base.