Introduction to Monte Carlo Tools for High Energy Physicists

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June 27, 2015

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Preface

This will help you get started.

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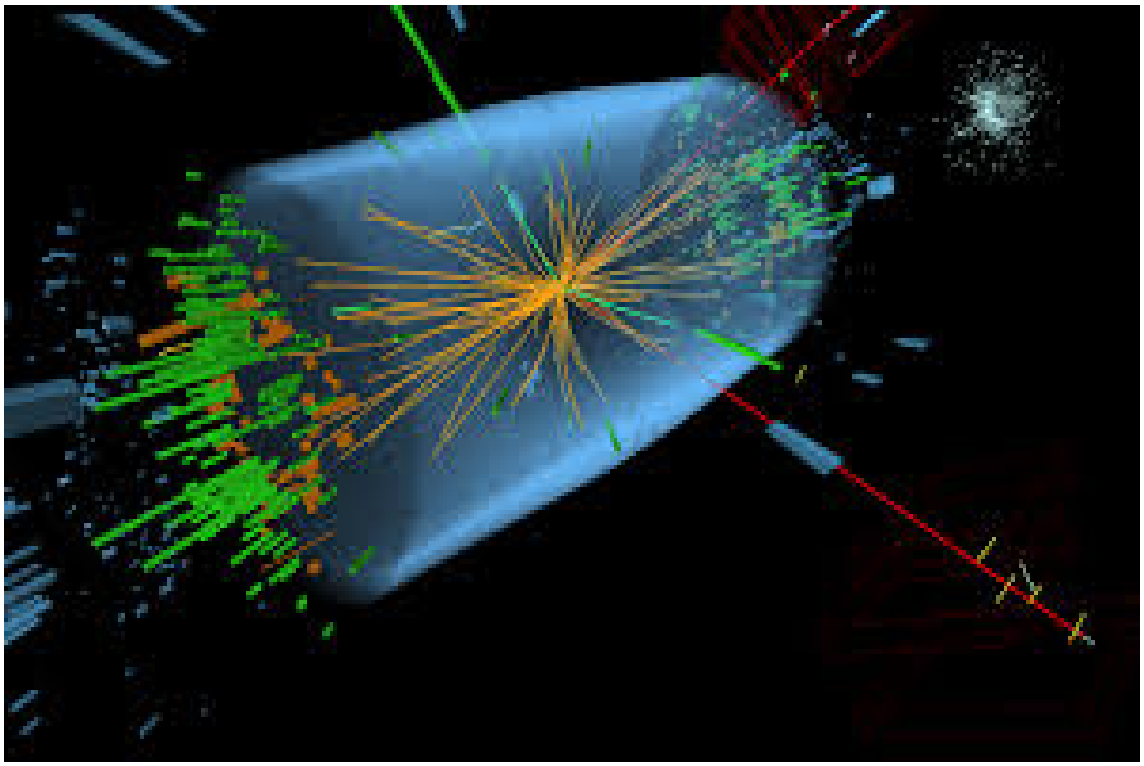

Introduction

At this point in the course, you should be comfortable with Linux, C++, and root, and you should be beginning to understand why continuing to learn more about programming is essential for most careers in science.

In this part of the course, we are going to learn two very sophsticated computational tools that are used extensively by the experimental high energy physics community, PYTHIA8 and GEANT4. These tools, written initially in FORTRAN but now in C++, were developed over the course of decades, and involved input from hundreds of physicists (albeit often with one lead author).

PYTHIA8 is used almost exclusively by high energy physicists. GEANT4, however, has wide applications, in high energy physics, cosmology, particle astrophysics, health physics, plasma physics, and medical physics. Both, however, will serve to introduce you to the type of large code systems used in many fields of physics and engineering.

Of course, during this semester, we will only be able to touch on the wide range of options and applications of these programs. To really know them well, most people need a few years of constant use.

The web sites for these programs can be found at

- GEANT 4: http://geant4.cern.ch/
- PYTHIA 8: http://home.thep.lu.se/ torbjorn/Pythia.html and

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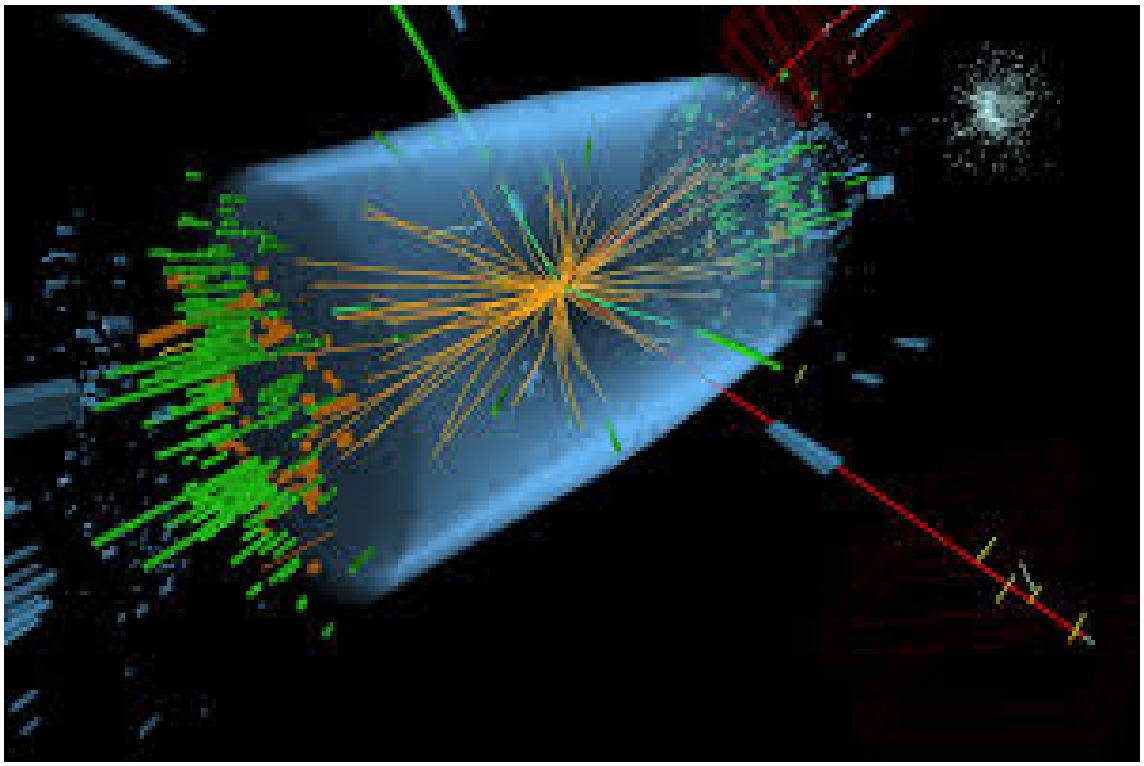

Pythia

2.1 Introduction

PYTHIA was developed by Torbjorn Sjostrand, a professor of the University of Lund, in Sweden, in the 1978.

2.2 Learning Projects

2.3 Readings

- A brief introduction to PYTHIA 8.1 http://arxiv.org/abs/0710.3820

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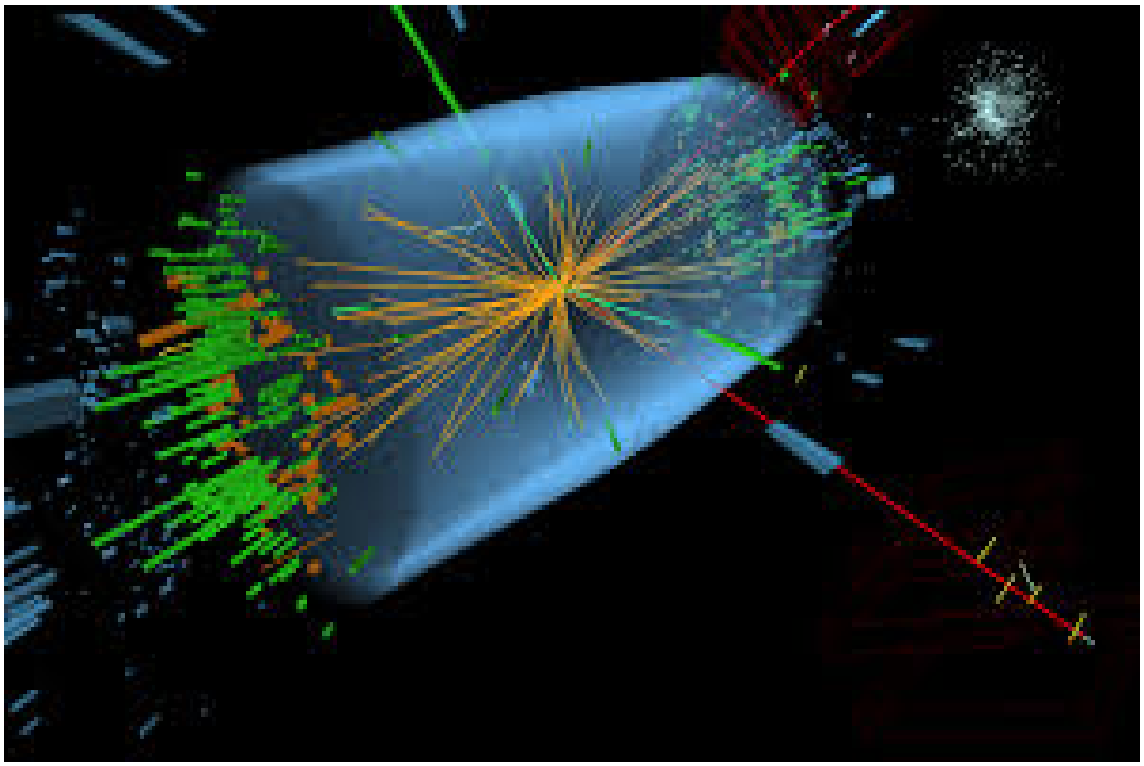

GEANT

3.1 Introduction

GEANT was developed by Rene Brun of CERN in the 1974 as well (it was a good time for programming).

3.2 Learning Projects

3.3 Readings

- http://geant4.web.cern.ch/geant4/UserDocumentation/UsersGuides/IntroductionToGeant4/html/index.html