ID de Contribution: **66** Type: **Non spécifié**

Overview of generator model for detector simulation

lundi 25 avril 2022 09:15 (1h 25m)

Detailed simulations of physics processes are a cornerstone of most physics measurements and searches at experiments such as those at the Large Hadron Collider (LHC) as well as in other scientific domains. However, the large volumes of data collected at the LHC precludes a requirement for even more simulated data in order to test various hypotheses to a high precision. As the LHC moves to the era of high luminosity, the large scale produciton of simulated particle physics collisions becomes even more important.
One of the bottlenecks in the generation of these data is the time required to simulate the response of the detector to particles created in collisions. This is in particular the case for calorimeter systems, which capture the energy of showers of particles.
The current state of the art simulations are performed using the Geant 4 toolkit, which provides a detailed simulation of the interaction of each individual particle with the detector material. This is a very time and CPU intensive process which requires a detailed description of the detector. For example, simulations of particle physics collision events in the ATLAS detector can take several minutes per event.
Fast simulation methods have been used by experiments for many years to reduce the required CPU time, with several non machine learning approaches actively used by the experiments at the LHC. Although these fast simulation methods often perform well, they are still far from the levels of the detailed simulation and efforts to improve them are ongoing. With the advent of deep generative modelling interest in bringing modern techniques to solve this challenge has grown, with the aim to improve upon the current fast simulation approaches. Deep generative modelling has shown great success in other domains, and the hope is to provide a simulation almost as accurate and varied as Geant 4, but without the required CPU time at inference.
In this talk an outline of the problem and its challenges will be presented, followed by an overview of several recent approaches and an outlook on future developments.

Orateur: RAINE, Johnny (Université de Genève)

Classification de Session: Generative Models workshop