Contribution ID: **23**   Type: **Notebook talk**

Bridging RooFit and SymPy with applications in amplitude analysis

Tuesday 10 October 2023 17:00 (30 minutes)

RooFit is a C++ library for statistical modelling and analysis. It is part of the ROOT framework and also provides Python bindings. RooFit provides some basic building blocks to construct probability density functions for data modelling. However, in some application areas, the analytical physics-driven shapes for data modelling have become so complicated that they can't be covered by a relatively low-level tool like RooFit. One of these application areas is partial wave analysis (also known as amplitude analysis), where the model shapes are motivated by quantum field theory. These models are complicated enough to warrant separate frameworks for building them, like, for example, the Python packages maintained by the ComPWA organization. These tools often formulate the models with SymPy, a Python library for symbolic mathematics. Since SymPy is able to export formulae as C++ code, it is natural to use these formulae in the RooFit exosystem, especially for the well-established statistical analysis procedures implemented in ROOT.

This contribution highlights some recent developments in RooFit to support complex mathematical expressions formulated in SymPy. This includes the evaluation of the corresponding likelihood functions on the GPU, as well as the generation of analytic gradient code with automatic differentiation (AD) tools like Clad. This development is very relevant for RooFit users who want to also use modern amplitude analysis codes written in Python.

Authors: REMBSER, Jonas (CERN);   MONETA, Lorenzo (CERN)

Presenter: REMBSER, Jonas (CERN)

Session Classification: Plenary Session Tuesday