Introduction to ROOT CERN Workshop

Welcome all to the ROOT-CERN workshop! In this workshop we will be figuring out how to work with the framework ROOT and using it to analyze different types of data in physics. The workshop will focused on physics analysis and therefore it will include basic concepts in some areas of physics. There is no need to be familiarized with these concepts beforehand, we will be talking about them during our sessions.

The workshop will be divided in for session as indicated in the table below:

1. Macros and files	• For, while loops. • Create Macros. • Open, close files, save root objets in files. • TTree class, declaration, branches, reading and writing a Ttree. • TRandom.
2. Histograms and graphs	• TH1 class, declaration, important comands: get number of bins, bin content, modify format of histograms. • TF1 class, declaration examples. • TgraphErrors, TCanvas, TPad, TLegend class.
3. Fitting	• Introduction to RooFit: model creation, importing data, fitting, parameters. • Lineshapes and fitting exercise (using the data from previous exercise) . • Composite models. • Lineshapes in RooFit and create new lineshapes, reparametrizing line shapes, convolution.
4. Final exercise	• Explanation of the physics background: the standard model of particle physics, interactions, QED, flavour physics, CP violation. • Analyze open data set of the LHCb.

Each session is two-hour long and they will be taught via zoom (link will be provided after registration is complete).

Before the online sessions, a pre-reading exercise will be given to you. In every session, there will be two exercises: one in the middle of the class that is intended to be a collaborative way to learn the basic commands used together with the instructor (these exercises count as participation). In this exercise the entire class will be asked to solve the question and the code will be submitted for participation point. The second exercise will be done individually or in groups and it should be submitted at the end of the day. The marking scheme for the coding exercises is shown below:

Macros and files	In class exercise	10%
	To-do exercise	10%
Histograms and graphs	In class exercise	10%
	To-do exercise	10%
Fitting	In class exercise	10%
	To-do exercise	10%
Open LHCb data exercise	In class, to-do	40%