

Fitting functions to data in 10 Julia ways

There are two main kinds of “fitting” in HEP – fitting function to data, and template fitting for statistical analysis. The two are linked, but each has enough depth to warrant a dedicated tutorial.

This tutorial connects familiar concept in HEP to best practices in Julia ecosystem. We go through the following topics:

- Simple curve fitting by minimizing χ^2 , we use this as an opportunity to show `Optimization.jl`, which allows switching and combine numerical backend easily, as well as `Minuit2.jl`, which HEP audience are familiar with.
- Binned and Unbinned maximal likelihood fit of a well-defined PDF function
- Binned maximal likelihood fit for “extended PDF” and “sums” of PDFs – we introduce the math and also uses `AlgebraPDF.jl` developed by LHCb Julia users.
- Finally, we show some “future” tech such as `SymbolicRegression.jl` and evaluating Unbinned likelihood on GPUs to show users what is possible in the future for analysis.

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