RooUnfold Tutorial

Lydia Brenner
Carsten Burgard
Vincent Croft

RooUnfold

- De-facto standard implementation for Unfolding in HEP
- contains a collection of relatively standard implementations using a common interface
- several exciting alternatives exist, make sure to check them out also!
- available publicly on CERN gitlab: gitlab.cern.ch/RooUnfold/RooUnfold
- can work standalone, but also has an interface to RooFit

Currently supported methods

- iterative d'Agostini (also "Bayesian")
- singular value decomposition (SVD, as proposed by Höcker and Kartvelishvili and implemented in TSVDUnfold)
- bin-by-bin (simple correction factors)
- an interface to the TUnfold method developed by Stefan Schmitt
- simple inversion of the response matrix without regularisation
- iterative dynamically stabilized (IDS) unfolding
- usage of gaussian processes (GP) for regularizing a kernel, as developed by Adam Bosson
- Poisson unfolding, a simple likelihood unfolding

The Tutorial

Open in SWAN

- If you have a CERN account, you can just click on the button on the top right
  - will clone a repository with the notebooks to your SWAN for you to work through online
- If you don't have a CERN account or prefer to work locally anyway, clone the repo
  - github.com/vincecr0ft/RooUnfoldTutorials

The tutorial has 4 notebooks:

1. Methods: A basic walk-through on unfolding, showing how to use different methods. Available in C++ and python.
2. Regularisation: A slightly more extensive look at regularized methods
3. Response: An example showing how to use the (relatively new) RooUnfoldSpec for improved error propagation
4. BiasVarianceCoverage: Showing how to use Bias, Variance and Coverage with RooUnfold

Bonus parts

- We have one additional notebooks prepared for you to play with
- This work-in-progress and not guaranteed to work in the same way the others are
- You might still find it interesting

- OmniFold comparison: A notebook that uses the OmniFold example and unfolds it using RooUnfold. If you want to compare OmniFold with other methods, this might be a good tool!
  - clone from here: github.com/vincecr0ft/BFTTutorial/

Teaser
We will add an implementation of Profile Likelihood Unfolding in the next weeks RooUnfold+RooFit.
We originally planned this to be available for the tutorial, but did not quite make it in time!
Stay tuned!