

# Automatic Differentiation in RooFit for fast and accurate likelihood fits

*Saturday 20 July 2024 14:47 (17 minutes)*

With the growing datasets of HEP experiments, statistical analysis becomes more computationally demanding, requiring improvements in existing statistical analysis software. One way forward is to use Automatic Differentiation (AD) in likelihood fitting, which is often done with RooFit (a toolkit that is part of ROOT.) As of recently, RooFit can generate the gradient code for a given likelihood function with Clad, a compiler-based AD tool. At the CHEP 2023 conference, we showed how using this analytical gradient significantly speeds up the minimization of simple likelihoods. This talk will present the current state of AD in RooFit. One highlight is that it now supports more complex models like template histogram stacks ("HistFactory"). It also uses a new version of Clad that contains several improvements tailored to the RooFit use case. This contribution will furthermore demo complete RooFit workflows that benefit from the improved performance with AD, such as ATLAS Higgs measurements.

## Alternate track

### I read the instructions above

Yes

**Primary authors:** LANGE, David (Princeton University (US)); REMBSER, Jonas (CERN); MONETA, Lorenzo (CERN); Mr ZARYTSKYI, Petro; THAKKAR, Vaibhav (Princeton University (US)); VASSILEV, Vassil (Princeton University (US))

**Presenter:** REMBSER, Jonas (CERN)

**Session Classification:** Computing and Data handling

**Track Classification:** 14. Computing, AI and Data Handling