

RooFit Tutorial Examples

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Outline

- RooFit (a very brief reminder)
- A very brief description of examples
- Practicum

ROOFIT

RooFit

What is RooFit?

It is a C++ toolkit, developed at BaBar by Wouter Verkerke and David Kirkby, for modeling probability density functions (pdf)

$$f(x | p, q)$$

and likelihoods

$$L(\theta) = f(D | p, q)$$

where D are the observed data, p are the parameters of interest, and q are all other parameters

RooFit

What is RooFit?

RooFit has an interface to Minuit, which makes it possible to perform maximum likelihood fits using the likelihoods defined using RooFit.

Points to note

- RooFit is really designed for continuous pdfs. It can handle discrete data, but as we shall see the mechanism is a bit awkward.
- RooFit really insists about normalizing pdfs for you!
- RooFit makes no distinction between D , p , and q

RooFit

What is RooFit?

Every mathematical concept associated with $f(x | p, q)$ is modeled with a C++ class, e.g., f , x , p , q .

Variables and collections of variables

RooRealVar	x, p, q
RooDataSet	D
RooArgSet	{RooRealVars} (unique entries)
RooArgList	[RooRealVars] (order preserved)

Functions of variables

RooFormulaVar

RooFit

What is RooFit?

A few of the available pdfs

RooGaussian

RooExponential

RooPolynomial

RooChebychev

RooCBShape

RooBreitWigner

: :

RooGenericPdf

1. RooFit provides tools to add, multiply, and convolve pdfs and to sample from them
2. Models can be stored in a Root file for later reuse

EXAMPLES

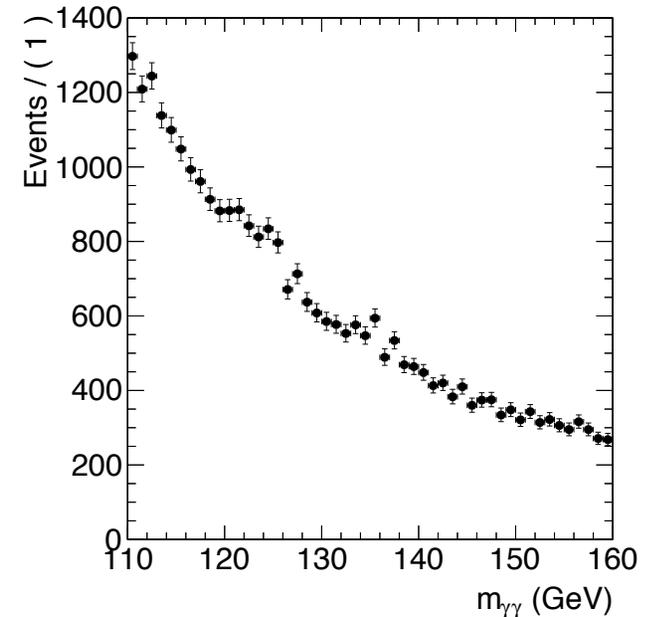
Tutorial Examples

Tutorial 1

signal + background model (Higgs to $\gamma\gamma$)

$$f(x \mid \text{params}) = \text{background} \times \text{Exponential}[-P_2(x / 100)] \\ + \text{signal} \times \text{Gaussian}(x, \text{mass}, \text{width})$$

1. Fit without signal (etype==0)
2. Try a pure exponential
3. Fit with signal 1 (etype==0||etype==1)
4. Fit with signal 2
5. Fit with both signals.
6. Fit fixing the width to 1.5 GeV



Tutorial Examples

Tutorial 2

standard model of cosmology fit to TypeIa data

1. Fit standard model
2. Fit phantom model ($\Omega_L=0 = \text{constant}$)
3. Invent your own model and try to fit it!