

RooRarFit

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What is RooRarFit

- An ML fitter based on ROOT/RooFit

Why RooRarFit

- Coding free for final users
- Driven by text configurations
- Flexible design, ‘programmable’ configs
- Fully documented, lots of examples already, in RooRarFit/doc and <http://www.slac.stanford.edu/~zhanglei/RooRarFit>

General Structure of RooRarFit Configuration File

1. Dataset Definition
2. Pdf Configuration
3. Fit Action

Implementation of RooRarFit

- Wrappers of RooFit PDF, RRV, etc. to define through ascii configs
- Dataset classes
- PDF classes
- Auxiliary classes, main program
- Detailed implementation documented through doxygen and in `RooRarFit/doc/RooRarFit.html`

Running RooRarFit

```
# in babar release version >=16.0.3-physics-1
addpkg RooRarFit
gmake RooRarFit.all
# run the application without any args to get short help page
rarFit
Usage:
rarFit [-options] <RooRarFit_Config_file>
    -h this help page
    -D <data input section> (default "Dataset Input")
    -C <mlFitter config section> (default "mlFitter Config")
    -A <fitter action section> (default "Fitter Action")
    -t <toy job id> (default 0)
    -n <toyNexp> (default 0, use config)
    -d <toy dir> (default .toyData)
```

Dataset Definition Section

```
[Dataset Definition]
```

```
Fields = mes de fisher
```

```
mes = RooRealVar "M_{es}" 5.19 5.29 B(50) "GeV"
```

```
de = RooRealVar "#Delta E" -0.01 0.08 B(45) "GeV"
```

```
fisher = RooRealVar "Fisher" -4 5 B(45)
```

Dataset Input Section

```
[Dataset Input]
```

```
dsdSec = Dataset Definition
```

```
Datasets = sigMC bbMC onData gsbData desbData
```

```
sigMC = ascii "sig MC" "mydats/mySIGMC.text" Q // quiet mode
```

```
bbMC = ascii "peaking BB MC" "mydats/myBBMC.text" Q
```

```
onData = ascii "onpeak Data" "mydats/myONPEAK.text" Q
```

```
gsbData = reduce "gsb Data" onData "mes<5.27"
```

```
desbData = reduce "de sb Data" onData "(de<-.1)||(de>.1)"
```

PDF Config Sections

```
[mlFitter Config]
Comps = myModel
fitData = onData
simultaneousFit = no
[myModel Config]
configStr = MLPdf "ml yield model"
Comps = Sig Chls Bkg
Coeffs = nSig nChls nBkg
nSig = nSig 100 L(-10 - 1000)
nChls = nChls 100 L(-10 - 1000)
nBkg = nBkg 2000 L(0 - 20000)
postPdfFloat = nSig nChls nBkg
[Sig Config]
configStr = ProdPdf
Comps = deSig mesSig fisSig
fitData = sigMC
[deSig Config]
configStr = TwoGauss
x = de
meanC = 0. L(-.1 - .1)
meanT = -0.04 L(-.1 - .1)
sigmaC = 0.025 L(0 - 0.15)
sigmaT = 0.09 L(0 - 0.3)
fracC = 0.75 L(0.5 - 1.0)
```

Fit Actions

Fit actions configurable through action sections. Current actions include:

- PDF parameter fit
To get PDF parameters for different components from different datasets/sources.
- Toy study
To validate the fitter with pure and/or embedded toys
- ML fit
Normal ML fit to get yields, BRs, etc.
- Scan plot
To scan NLL within interested param spaces
- Projection plot
To get projection plot for interested components and observables
- Contour plot
To get contour plots for two floating parameters
- sPlot
To get sPlot for interested components and observables

Toy Studies

Enhanced toy study features include:

- Floating parameter scanning
- Prototype datasets generation
- Embedded events re-parameterization

Summary

- Can be used in most *BABAR* B decay analyses
- Need feedback to improve it
- More features will be added
- Feel free to try and ask me question if interested