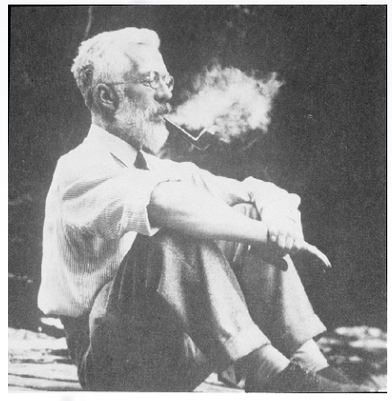
Applied Statistics

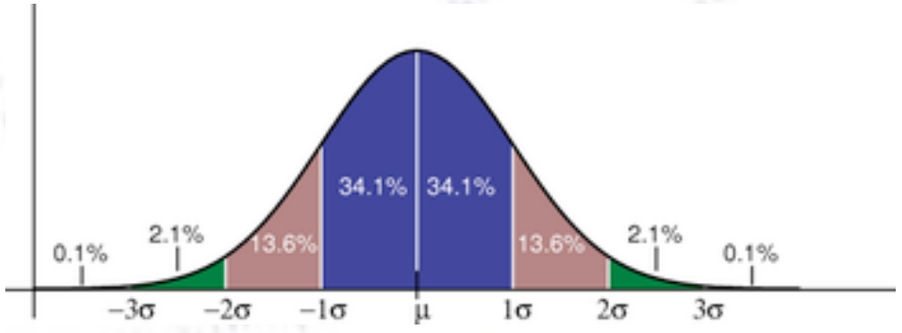
Minuit output explained








Troels C. Petersen (NBI)



"Statistics is merely a quantisation of common sense"

Minuit Output

Migrad				
FCN = 109.1			Nfcn = 98	
EDM = 5.22e-05 (Goal: 0.0002)				
Valid Minimum			No Parameters at limit	
Below EDM threshold (goal x 10)			Below call limit	
Covariance	Hesse ok	Accurate	Pos. def.	Not forced

	Name	Value	Hesse Error	Minos Error-	Minos Error+	Limit-	Limit+	Fixed
0	Nexp	4.82e3	0.08e3					
1	tau	2.58	0.05					
2	Ngauss	1.04e3	0.05e3					
3	mu	3.129	0.013					
4	sigma	0.269	0.012					

	Nexp	tau	Ngauss	mu	sigma
Nexp	6.14e+03	0.576 **(0.158)**	-1.1e+03 **(-0.307)**	0.0297	-0.221 **(-0.236)**
tau	0.576 **(0.158)**	0.00218	-0.236 **(-0.111)**	-2.35e-05 **(-0.039)**	-4.71e-05 **(-0.085)**
Ngauss	-1.1e+03 **(-0.307)**	-0.236 **(-0.111)**	2.08e+03	-0.0326 **(-0.056)**	0.209 **(0.385)**
mu	0.0297	-2.35e-05 **(-0.039)**	-0.0326 **(-0.056)**	0.000165	-5.58e-06 **(-0.036)**
sigma	-0.221 **(-0.236)**	-4.71e-05 **(-0.085)**	0.209 **(0.385)**	-5.58e-06 **(-0.036)**	0.000142

Migrad

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Number of calls (i.e. fitting steps)

Value of minimum (Chi2 or LLH value) access: minuit.fval

Estimated Distance to Minimum (numerical check)

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General cross checks of fit validity:

Is minimum valid?

Are any parameters at their limit?

Is result close enough to true minimum?

Are there fewer calls than maximum?

Is the Covariance matrix good?

Was Hesse algorithm satisfied?

Was the fit accurate?

Was the Covariance matrix Pos. Def?

Or had it to be forced Pos. Def?

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Fitting parameter result:

Parameter number, name, value, and uncertainty (assumed symmetric).

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Fitting parameter confidence intervals (if running Minos).

Fitting parameter status (in case you forgot your own!)

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Fitting parameter Covariance matrix:
The correlation matrix is in parenthesis, and colour scheme shows large entries.

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Fitting is an art…

It is important to check the Minuit output, as failed fits might still yield values, that your code would then go on to use subsequently!

The art of fitting lies in getting good convergence, and the best conditions for this are:

- **Good initial starting values!**
- Minimised correlation between fit parameters.
- Low number of fit parameters - at least to begin with.
- Good binning (if fitting histogram) and fit range.
- Using a ChiSquare fit (at least to begin with).

Even with these precautions, there is no guarantee that your fit will converge, but in this case, you might have to reconsider your data quality and quantity.