



# Update on ROOT Documentation

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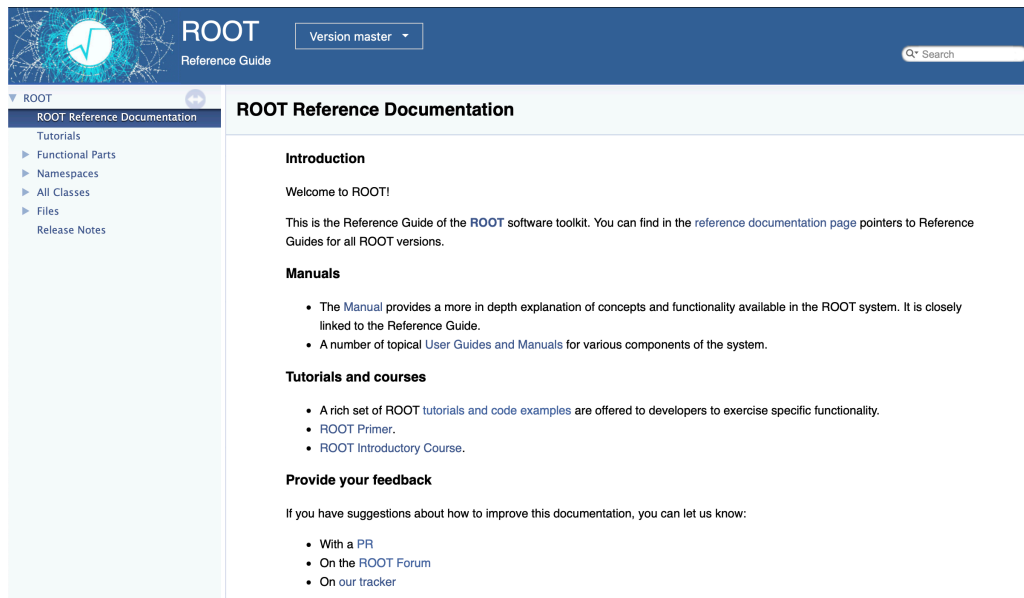
# Overview

Overview of the ROOT main sources of documentation.

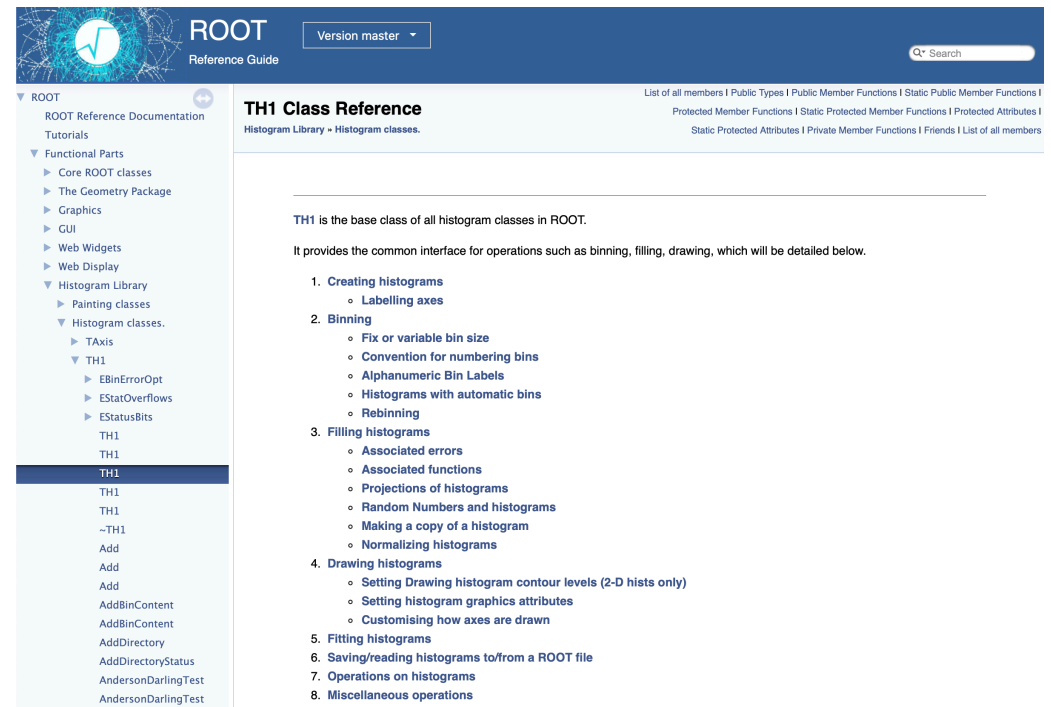
- Reference Guide
- Tutorials
- The "Manual" on web site
- Further information (Primer, Topical manuals ...)

# Reference Guide

The Reference Guide is the main source of documentation.  
It provides detailed information about each ROOT class or function.



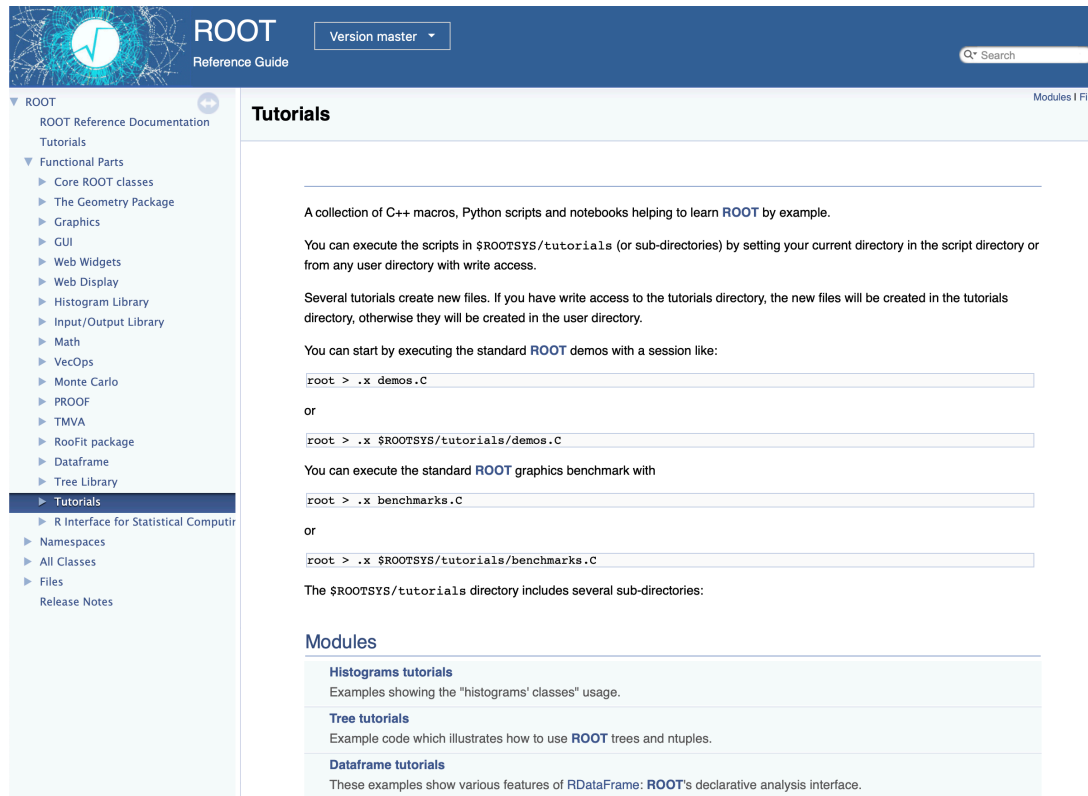
The screenshot shows the ROOT Reference Guide homepage. The header includes the ROOT logo, the text "ROOT Reference Guide", a "Version master" dropdown, and a search bar. The left sidebar contains a navigation menu with "ROOT Reference Documentation" selected, and sub-items: Tutorials, Functional Parts, Namespaces, All Classes, Files, and Release Notes. The main content area is titled "ROOT Reference Documentation" and contains sections: "Introduction" (Welcome to ROOT!, This is the Reference Guide of the ROOT software toolkit...), "Manuals" (The Manual provides a more in depth explanation...), "Tutorials and courses" (A rich set of ROOT tutorials and code examples...), and "Provide your feedback" (If you have suggestions about how to improve this documentation...).



The screenshot shows the ROOT TH1 Class Reference page. The header is identical to the homepage. The left sidebar shows the navigation menu with "TH1" selected under "Histogram classes". The main content area is titled "TH1 Class Reference" and contains a list of members. The "Histogram Library" section lists "Histogram classes". The "TH1" class is highlighted. The "TH1" class is described as the base class of all histogram classes in ROOT. It provides the common interface for operations such as binning, filling, drawing, which will be detailed below. The page lists 8 sections: 1. Creating histograms, 2. Binning, 3. Filling histograms, 4. Drawing histograms, 5. Fitting histograms, 6. Saving/reading histograms to/from a ROOT file, 7. Operations on histograms, and 8. Miscellaneous operations.

# Tutorials

The ROOT tutorials are part of the Reference Guide.  
It is a collection of C++ macros, Python scripts and notebooks helping to learn ROOT by example.



The screenshot shows the ROOT Reference Guide website. The header includes the ROOT logo, the text "ROOT Reference Guide", a "Version master" dropdown, and a search bar. The left sidebar contains a navigation menu with categories like "ROOT Reference Documentation", "Tutorials", "Functional Parts", "Core ROOT classes", "The Geometry Package", "Graphics", "GUI", "Web Widgets", "Web Display", "Histogram Library", "Input/Output Library", "Math", "VecOps", "Monte Carlo", "PROOF", "TMVA", "RooFit package", "Dataframe", "Tree Library", "Tutorials", "R Interface for Statistical Computing", "Namespaces", "All Classes", "Files", and "Release Notes". The "Tutorials" section is selected and highlighted. The main content area is titled "Tutorials" and contains the following text:

A collection of C++ macros, Python scripts and notebooks helping to learn **ROOT** by example.

You can execute the scripts in `$ROOTSYS/tutorials` (or sub-directories) by setting your current directory in the script directory or from any user directory with write access.

Several tutorials create new files. If you have write access to the tutorials directory, the new files will be created in the tutorials directory, otherwise they will be created in the user directory.

You can start by executing the standard **ROOT** demos with a session like:

```
root > .x demos.C
```

or

```
root > .x $ROOTSYS/tutorials/demos.C
```

You can execute the standard **ROOT** graphics benchmark with

```
root > .x benchmarks.C
```

or

```
root > .x $ROOTSYS/tutorials/benchmarks.C
```

The `$ROOTSYS/tutorials` directory includes several sub-directories:

### Modules


<b>Histograms tutorials</b>
Examples showing the "histograms" classes' usage.
<b>Tree tutorials</b>
Example code which illustrates how to use <b>ROOT</b> trees and ntuples.
<b>Dataframe tutorials</b>
These examples show various features of <b>RDataFrame</b> : <b>ROOT</b> 's declarative analysis interface.



# Manual

The ROOT Manual provides detailed information about the use and applications of ROOT.

The manual contains many, often interactive examples, so that you can immediately start interacting with ROOT.



ROOT  
Data Analysis Framework

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ROOT Manual - Basics

First steps with ROOT

ROOT architecture and components

ROOT macros and shared libraries

ROOT files

Creating a user application with ROOT

Integrating ROOT into CMake projects

ROOT collections

Object ownership

Multi-threading

ROOT Manual - Functional parts

Histograms

Graphs

Graphics

Fitting

Dataframes

Trees

Roofit

Machine learning with ROOT

Python interface: PyROOT

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Physics vectors

Geometry

I/O Concepts

I/O of custom classes

Signal/Slot communication

JSROOT

How to embed ROOT in a GUI

The C++ interpreter Cling

Further information

Tutorials

Primer

All Reference Guides

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First steps with ROOT

Note

Before you can use ROOT, you must have a working ROOT installation. → See [Installation Guide](#).

Working with an interactive ROOT session

Starting and quitting ROOT [↗](#)

ROOT can be started at the system prompt. To that end, you can type:

```
$ root
```

bash

and the ROOT prompt is displayed:

```
-----
| Welcome to ROOT 6.22/02                               https://root.cern |
| (c) 1995-2020, The ROOT Team; conception: R. Brun, F. Rademakers |
| Built for macosx64 on Aug 17 2020, 12:46:52 |
| From tags/v6-22-02@v6-22-02 |
| Try '.help', '.demo', '.license', '.credits', '.quit'/'.' |
-----

root [0]
```

To display a list of ROOT commands, type `.help` (or `.?`):

```
root [0] .help
```

To quit the ROOT prompt, type `.q` (or `.quit` or `.exit`):

```
root [0] .q
```

Command line options

These are some command line options you can use when starting ROOT:

```
-h - ROOT session runs in hatch mode without graphics display. This mode is useful in case you do not want to eat the
```

→ On this page

Working with an interactive ROOT session

Starting and quitting ROOT

Command line options

Running C++ code

Simple commands

Multi-line commands

Special interpreter commands

ROOT command line tools

Using ROOT from Python

ROOT tutorials

Starting with a simple tutorial

Browsing through the rest of tutorials



# Further information

Further source of documentation are available.  
Among them:

- Topical Manuals
- Primer

## ROOT Primer

### Abstract

ROOT is a software framework for data analysis and I/O: a powerful tool to cope with the demanding tasks typical of state of the art scientific data analysis. Among its prominent features are an advanced graphical user interface, ideal for interactive analysis, an interpreter for the C++ programming language, for rapid and efficient prototyping and a persistence mechanism for C++ objects, used also to write every year petabytes of data recorded by the Large Hadron Collider experiments. This introductory guide illustrates the main features of ROOT which are relevant for the typical problems of data analysis: input and plotting of data from measurements and fitting of analytical functions.

Original Authors: D. Piparo, G. Quast, M. Zeise

## Motivation and Introduction

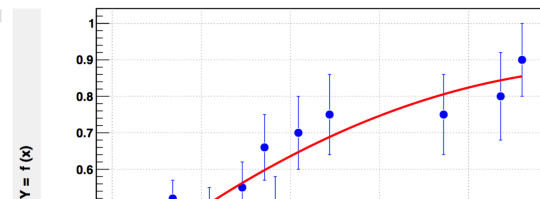
### Welcome to data analysis!

Comparison of measurements to theoretical models is one of the standard tasks in experimental physics. In the most simple case, a "model" is just a function providing predictions of measured data. Very often, the model depends on parameters. Such a model may simply state "the current  $I$  is proportional to the voltage  $U$ ", and the task of the experimentalist consists of determining the resistance,  $R$ , from a set of measurements.


As a first step, a visualisation of the data is needed. Next, some manipulations typically have to be applied, e.g. corrections or parameter transformations. Quite often, these manipulations are complex ones, and a powerful library of mathematical functions and procedures should be provided - think for example of an integral or peak-search or a Fourier transformation applied to an input spectrum to obtain the actual measurement described by the model.

One specialty of experimental physics are the inevitable uncertainties affecting each measurement, and visualisation tools have to include these. In subsequent analysis, the statistical nature of the errors must be handled properly.

As the last step, measurements are compared to models, and free model parameters need to be determined in this process. See Figure 1.1 for an example of a function (model) fit to data points. Several standard methods are available, and a data analysis tool should provide easy access to more than one of them. Means to quantify the level of agreement between measurements and model must also be available.



→ On this page
Motivation and Introduction
ROOT Basics
ROOT as calculator
Learn C++ at the ROOT prompt
ROOT as function plotter
Controlling ROOT
Plotting Measurements
Histograms in ROOT
Interactive ROOT
ROOT Beginners' FAQ
ROOT Macros
General Remarks on ROOT macros
A more complete example
Summary of Visual effects
Interpretation and Compilation
Graphs
Read Graph Points from File
Polar Graphs
2D Graphs
Multiple graphs
Histograms
Your First Histogram
Add and Divide Histograms
Two-dimensional Histograms
Multiple histograms
Functions and Parameter Estimation
Fitting Functions to Pseudo Data
Toy Monte Carlo Experiments
File I/O and Parallel Analysis
Storing ROOT Objects
N-tuples in ROOT
ROOT in Python
PyROOT
Custom code: from C++ to Python
Concluding Remarks
Downloadable versions
References



ROOT  
Data Analysis Framework

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### ROOT Manual - Basics

First steps with ROOT  
ROOT architecture and components  
ROOT macros and shared libraries  
ROOT files  
Creating a user application with ROOT  
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Object ownership  
Multi-threading

### ROOT Manual - Functional parts

Histograms  
Graphs  
Graphics  
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Machine learning with ROOT  
Python interface: PyROOT  
Mathematical libraries  
Physics vectors  
Geometry  
I/O Concepts  
I/O of custom classes  
Signal/Slot communication  
JSROOT  
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The C++ interpreter Cling

### Further information

Tutorials  
Primer  
All Reference Guides  
**Topical Manuals**  
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How-tos  
Cling

## Topical Manuals

This page lists all the manuals related to packages used by or close to the ROOT framework.

### RooFit

The RooFit library provides a toolkit for modeling the expected distribution of events in a physics analysis.

- [RooFit Manual \(PDF A4 format\)](#)
- [RooFit Quick Start Guide \(PDF A4 format\)](#)
- [Here is a link to a 200 slide presentation on RooFit presented in the French School of Statistics 2008 \(slides are in English\)](#)

### HTTP Server

The idea of THttpServer is to provide remote http access to running ROOT application and enable HTML/JavaScript user interface. Download it [here](#).

### HttpServer manual: 6 Release Cycle

- [HttpServer manual \(PDF A4 format\)](#)
- [HttpServer manual \(PDF Letter format\)](#)
- [HttpServer manual \(HTML version\)](#)
- [HttpServer manual \(epub version for iPad and iPhone\)](#)

### HttpServer manual (5.34)

- [HttpServer manual \(PDF A4 format\)](#)
- [HttpServer manual \(PDF Letter format\)](#)
- [HttpServer manual \(HTML version\)](#)
- [HttpServer manual \(epub version for iPad and iPhone\)](#)

### JSROOT

The JSROOT project intends to implement ROOT graphics for web browsers. Reading of binary ROOT files is supported.

[➔ Go to JSROOT](#)

### → Topical Manuals

RootFit
HTTP Server
HttpServer manual: 6 Release Cycle
HttpServer manual (5.34)
JSROOT
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Minuit
Minuit 2
Minuit2 manual: 6 Release Series
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TSpectrum manual (5.34)
TMVA
PROOF

O.Couet- ROOT User's Workshop 9 -13 May 2022



# Live demonstration

Lets see how it looks like !