High Performance Computer Architectures Practical Course
- Exercise 6 -

Tutorium 1

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Section FittingDemoSimple_0

The 'fitFunction' function has the purpose to define the funtional form of the background model. This model will then be fitted to the histogram data. Root framework will attempt to find the best fit of the parameters so that the difference between the histogram data and the model is minimized. In the 'FittingDemoSimple0' function we create the canvas to display the ROOT objects, we fill it with 1 000 000 random numbers we generate. We create a TF1, which represents the quadratic function defined earlier. The histogram is then fitted with the Fit method of the histogram. So the program has in effect created a histogram filled with random numbers from a triangular distribution, which is then fitted with a quadratic function. The graph it creates shows this fitted quadratic function overlaid over the histogram, in order to show how well the function fits the data.

Below we can see the output graphs:

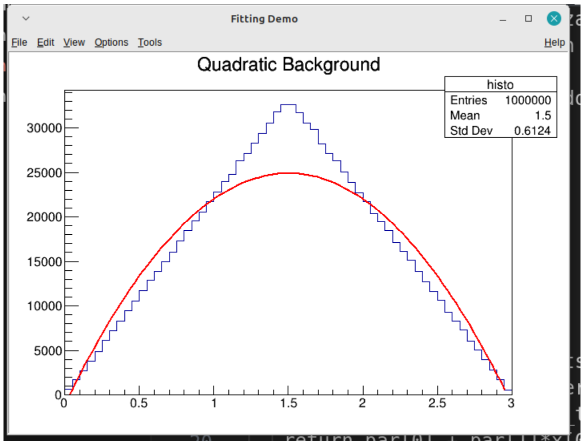
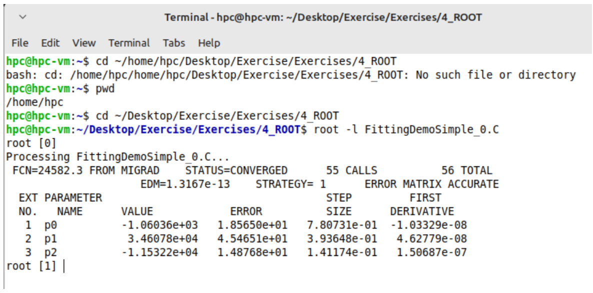


Figure 1: Histogram

And the output metrics:


Terminal - hpc@hpc-vm: ~/Desktop/Exercise/Exercises/4_ROOT
File Edit View Terminal Tabs Help

```
hpc@hpc-vm:~$ cd ~/home/hpc/Desktop/Exercise/Exercises/4_ROOT
bash: cd: /home/hpc/home/hpc/Desktop/Exercise/Exercises/4_ROOT: No such file or directory
hpc@hpc-vm:~$ pwd
/home/hpc
hpc@hpc-vm:~$ cd ~/Desktop/Exercise/Exercises/4_ROOT
hpc@hpc-vm:~/Desktop/Exercise/Exercises/4_ROOT$ root -l FittingDemoSimple_0.C
root [0]
Processing FittingDemoSimple_0.C...
 FCN=24582.3 FROM MIGRAD    STATUS=CONVERGED      55 CALLS          56 TOTAL
                     EDM=1.3167e-13    STRATEGY= 1      ERROR MATRIX ACCURATE
  EXT PARAMETER                                   STEP         FIRST
  NO.   NAME      VALUE            ERROR          SIZE      DERIVATIVE
   1  p0          -1.06036e+03   1.85650e+01   7.80731e-01  -1.03329e-08
   2  p1           3.46078e+04   4.54651e+01   3.93648e-01   4.62779e-08
   3  p2          -1.15322e+04   1.48768e+01   1.41174e-01   1.50687e-07
root [1] |
```

Figure 2: Histogram

FittingDemo_1

To accomplish this task we need to adjust the polynomial order of our background function to the order of three, four and six. We do this with the following code snippets, located in the file "FittingDemo_1.C":

```
    Double_t background(Double_t *x, Double_t *par) {
   return par[0] + par[1]*x[0] + par[2]*x[0]*x[0] +
      par[3]*x[0]*x[0]*x[0];
}
```

File 1: Order 3

```
    Double_t background(Double_t *x, Double_t *par) {
        return par[0] + par[1]*x[0] + par[2]*x[0]*x[0]
             + par[3]*x[0]*x[0]*x[0] + par[4]*x[0]*x
            [0]*x[0]*x[0];
     }
```

File 2: Order 4

```
    Double_t background(Double_t *x, Double_t *par) {
        return par[0] + par[1]*x[0] + par[2]*x[0]*x[0]
             + par[3]*x[0]*x[0]*x[0] + par[4]*x[0]*x
            [0]*x[0]*x[0] + par[5]*x[0]*x[0]*x[0]*x[0]*
            x[0] + par[6]*x[0]*x[0]*x[0]*x[0]*x[0]*x
            [0];
     }
```

File 3: Order 6

In the code snippets above the function 'background' takes two parameters x and the value par, which denotes an array of parameters (six in total). Below you can see the resulting plots.

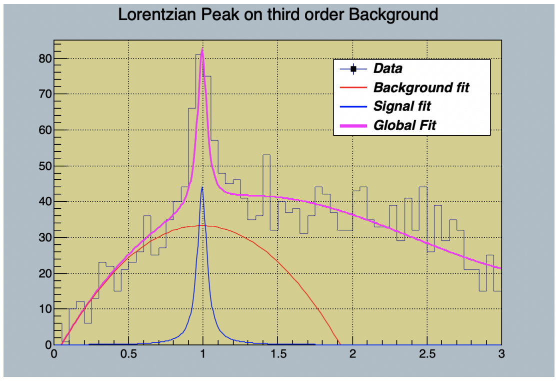


Figure 3: 3-order

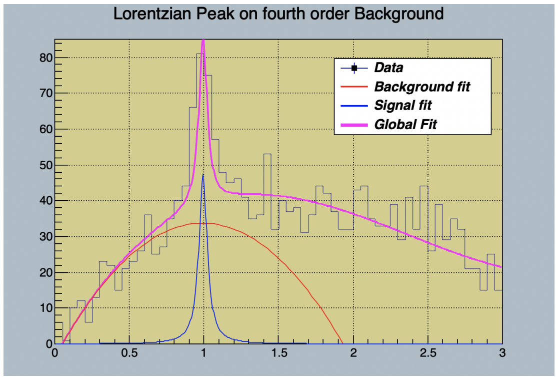


Figure 4: 4-order

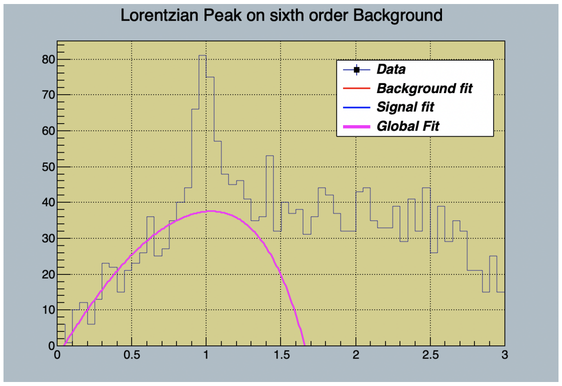


Figure 5: 6-order