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## **New features in the ROOT mathematical and statistical libraries**

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ROOT, a data analysis framework, provides advanced numerical and statistical methods via the ROOT Math work package.

Now that the LHC experiments have started to analyze their data and produce physics results, we have acquired experience in the way these numerical methods are used and the libraries have been consolidated taking into account also the received feedback. At the same time, new features have been introduced as required by the experiments. One of these new features is a better support for dealing with multi-dimensional data structure. A new class based on a binary kd-tree has been introduced for dealing with multi-dimensional data. We will show examples on how this class can be used for efficient binning of multidimensional data and for constructing non-parametric density estimation, which can be used for fitting or data classification.

We will show as well the improvements added in the mathematical libraries for analyzing and fitting weighted data sets. In particular we will show examples in fitting Poisson (histograms) and binomial data.

We will present as well some of the improvements in the core numerical algorithms and the optimization and performance studies which have been performed.

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