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# MINUIT Package Parallelization and applications using the RooFit Package

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MINUIT is the most common package used in high energy physics for numerical minimization of multi-dimensional functions. The major algorithm of this package, MIGRAD, searches for the minimum
by using the function gradient. For each minimization iteration, MIGRAD requires the calculation of the first derivatives for each parameter of the function to be minimized.
In this presentation we will show how the algorithm can be easily parallelized using MPI techniques to scale over multiple nodes or multi-threads for multi-cores in a single node.
We will present the speed-up improvements obtained in typical physics applications such as complex maximum likelihood fits using the RooFit package. Furthermore, we will also show results of hybrid parallelization between MPI and multi-threads, to take full advantage of multi-core architectures.

**Primary author:**   Dr LAZZARO, Alfio (Universita' degli Studi and INFN, Milano)

**Co-author:**   Dr MONETA, Lorenzo (CERN)

**Presenter:**   Dr LAZZARO, Alfio (Universita' degli Studi and INFN, Milano)

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