# On the computation of the Mittag–Leffler function

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The computation of special functions is often difficult and time–consuming. This is the case, for instance, of the Mittag–Leffler function which plays a key role in the analysis and solution of differential equations of fractional (i.e., non integer) order.

The importance of the Mittag–Leffler function in fractional calculus is comparable to that of the exponential function for classical derivatives of integer order; however the computation of the Mittag–Leffler function is more challenging than the exponential and several programming languages do not provide built-in routines for this function.

We present a method for the fast and accurate computation of the Mittag–Leffler function which is based on the numerical inversion of the Laplace transform and generalizes an approach previously proposed by Weideman and Trefethen [Math. Comp. 76, 2007]; the application to the Mittag–Leffler function, whose Laplace transform has a possibly large number of singularities scattered in the whole complex plane, demands however for substantial changes and a more involved error analysis.

The proposed method not only allows the evaluation of the classical Mittag–Leffler function with one and two parameters but also applies to the three parameters extension (also known as the Prabhakar function) which has important applications in the description of polarization processes in anomalous dielectrics.