Efficient Numerical Methods for Fractional Differential Equations

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The approximate evaluation of fractional Riemann-Liouville integrals in their traditional representation leads to complex computations that require a relatively high memory and large amount of time when they are implemented on a computer. In this talk, our aim is to introduce the concept of a so-called diffusive representation (or infinite state representations). This is an approach on which we can construct very efficient numerical algorithms with respect to both the run time and the memory issues for computing fractional integrals. Indeed such representations can lead to numerical methods with small run time and low memory requirements. We additionally show how one can apply such diffusive-representation-based algorithms to solve fractional ordinary differential equations in a fast and highly accurate way.

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[link to pdf] [back to Numdiff-17]