

EFFICIENT NUMERICAL METHODS FOR FRACTIONAL DIFFERENTIAL EQUATIONS

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ABSTRACT. Fractional differential equations (FDEs) play a pivotal role in modeling complex systems characterized by memory and hereditary properties. However, the numerical evaluation of fractional operators remains computationally challenging due to their non-local nature. In this study, we introduce an advanced and efficient numerical approach based on diffusive representations and the double exponential (DE) formula for numerical integration. The DE formula is adapted to efficiently compute fractional integrals by addressing the rapid decay of the integrand in diffusive representations. This method achieves high accuracy with reduced computational complexity, offering a significant improvement over conventional techniques. The proposed method provides a powerful tool for solving FDEs with enhanced accuracy and efficiency, making it suitable for a wide range of scientific and engineering applications.

The talk is based on joint work with Kai Diethelm, Renu Chaudhary and Fred Fuchs from Technische Hochschule Würzburg-Schweinfurt.

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