NOVEL VARIANTS OF DIFFUSIVE REPRESENTATION OF FRACTIONAL INTEGRALS: CONSTRUCTION AND NUMERICAL COMPUTATION

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Abstract. In this talk, we discuss novel variants of diffusive representations of Riemann-Liouville fractional integrals. These variants aim to offer highly efficient numerical algorithms for the approximate computation of fractional integrals with less computational complexity and memory footprint. For this, we have embarked on an exploration of innovative variations in diffusive representations tailored for fractional integrals. We have approximated the kernel function to the fractional integral by representing it as an exponential sum. This representation can be further optimized by leveraging Prony's method to curtail the number of terms involved. Subsequently, we have harnessed this refined approximation to compute an estimate for the fractional integral. This approach yields a notable reduction in both computational intricacy and memory usage, offering an enticing prospect for practical implementations. In addition to the exponential sum approximation, we have enriched our computational toolkit by developing the Gauss-Laguerre formula as an alternative method for approximating fractional integrals.

References

[1] Diethelm, K. (2023). Diffusive Representations for the Numerical Evaluation of Fractional Integrals. In 2023 International Conference on Fractional Differentiation and Its Applications (ICFDA) (pp. 1-6). IEEE.