

NOVEL NUMERICAL APPROXIMATION FOR THE CAPUTO DERIVATIVE AND ITS APPLICATIONS

NIKHIL SRIVASTAVA*, VINEET KUMAR SINGH

ABSTRACT

In this talk, we will discuss about the development of novel numerical approximation for the Caputo fractional derivative of order $\alpha \in (1, 2)$. We have used the quadratic interpolating polynomial is applied on the first interval $[t_0, t_1]$ and cubic interpolating polynomial on uniform grid points for interval $[t_j, t_{j+1}]$ $2 \leq j \leq k - 1$. The novel approximation is second order accurate for all α . A difference scheme is proposed to solve the time-fractional wave equation (TFWE). The proposed numerical scheme is second order accurate in time and space for all α . A comparative study of the numerical results by the proposed scheme with some existing schemes is also provided to show the effectiveness and accuracy of our scheme.

REFERENCES

- [1] A. A. Alikhanov, C. Huang, *A high-order L_2 type difference scheme for the time-fractional diffusion equation*, Applied Mathematics and Computation 411 (2021) 126545.
- [2] R. Du, Y. Yan, Z. Liang, *A high-order scheme to approximate the Caputo fractional derivative and its application to solve the fractional diffusion wave equation*, Journal of Computational Physics 376(2019) 1312-1330.

* DEPARTMENT OF MATHEMATICAL SCIENCES, INDIAN INSTITUTE OF TECHNOLOGY, (BANARAS HINDU UNIVERSITY), VARANASI, INDIA., NIKHILSRIVASTAVA.RS.MAT18@IITBHU.AC.IN