

**A NEW APPROACH FOR SOLVING LINEAR TIME FRACTIONAL
DIFFERENTIAL EQUATIONS USING SHEHU TRANSFORM
WITH ITERATIVE METHOD**

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Abstract: This paper presents an iterative method that combines the Shehu transform and fractional integration to obtain solutions of linear time-fractional partial differential equations involving the Caputo fractional derivative. By transforming the given differential equation into an equivalent Volterra-type integral equation, a recursive series solution is constructed. A convergence analysis is provided to establish the validity of the proposed iterative scheme and six examples are considered to demonstrate its applicability. Numerical results are obtained for different fractional orders and truncation levels, and the approximations are compared with available exact solutions or higher-order reference solutions. The corresponding absolute errors and three-dimensional representations further illustrate the convergence and solution behaviour. In addition, a comparison with the ADM and the VIM at an equal truncation order for a representative example demonstrates the consistency of the proposed formulation with these established approaches.

Keywords and Phrases: Fractional differential equation, Shehu transform, Caputo fractional derivative, Iterative method.