

Fixed-Time Tensor Gradient Neural Network for Online Sylvester Tensor Equation Solving

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This presentation introduces a fixed-time convergent Tensor Gradient-based Neural Network (TGNN) model for real-time resolution of the generalized Sylvester tensor equation:

$$\sum_{n=1}^N \mathcal{X}(t) \times_n A_n = \mathcal{B}$$

in real-time applications. The key innovation lies in a newly designed activation function that guarantees fixed-time convergence, rigorously proven through theoretical analysis. We systematically compare this activation function with four existing nonlinear alternatives under the TGNN framework, providing tight upper bounds for their convergence times. Numerical experiments on two benchmark problems demonstrate the superior convergence speed and computational robustness of our method.