Exploring Linear Recursive Relations Through Python-Based Computation

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Linear recursive relations arise naturally across mathematics, computer science, and applied disciplines, including algorithm analysis, discrete dynamical systems, and financial modeling. While closed-form solutions provide theoretical insight, they are often challenging to derive, interpret, or apply in practical contexts. This study presents a Python-based computational framework for solving, analyzing, and visualizing linear recursive relations, emphasizing reproducibility, clarity, and accessibility for both research and pedagogy. Through computational experiments, the framework illustrates solution behavior, convergence patterns, and sensitivity to initial conditions, bridging the gap between analytical theory and practical application. By complementing traditional mathematical methods with accessible computational tools, this approach enhances conceptual understanding, facilitates applied experimentation, and provides a classroom-ready methodology for exploring linear recurrences. Applications to combinatorial sequences, algorithmic recurrences, and discrete-time modeling are discussed.