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Computational, Experimental, and Theoretical Aspect of Fractional Order Operators

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Message from the Guest Editors

Fractional calculus has attracted considerable interest because of its ability to model complex phenomena such as continuum and statistical mechanics, viscoelastic materials, high-frequency price dynamics in financial markets, and biological systems such as population genetics. While the fractional integral has been used to describe the fractal structure of materials, which leads to new thermodynamic relations, the fractional derivative could be used to describe viscoelasticity, thermal and chemical diffusion, and light–matter interactions in materials. On the other hand, time-fractional generalizations of the Poisson process, which are based on the fractional Kolmogorov–Feller equation, not only provide a good phenomenological model for high-frequency price dynamics in financial markets but also play a critical role in deriving the fractional coalescent in population genetics. The strong role of fractional calculus in modeling complex fractal structure–fractional property relations opens up many opportunities to advance our understanding and design of novel materials, advanced structures, and intelligent systems.

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Message from the Editor-in-Chief

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