fractal and fractional

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Editorial

Editorial for Special Issue "Recent Advances in Fractional Differential Equations, Delay Differential Equations and Their Applications"

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Differential equations, both fractional and ordinary, give key tools in understanding the mechanisms of physical systems and solving various problems of nonlinear phenomena. In particular, we mention diffusive processes as problems in elasticity theory and in the study of porous media.

Differential equations enable mathematics to be associated with other disciplines such as science, medicine, and engineering, since real-life problems in these fields give rise to differential equations that can only be solved using mathematics. Topics related to the theoretical and numerical aspects of differential equations have been undergoing tremendous development for decades.

This Special Issue contains 17 published papers. In [1], the authors use the concept of quantum calculus (Jackson's calculus) in a recent note to develop an extended class of multivalent functions on the open unit disk. Convexity and star-likeness properties are obtained by establishing conditions for this class. The most common inequalities of the proposed functions are geometrically investigated.

Viscoelasticity and variable mass are common phenomena in Micro-Electro-Mechanical Systems (MEMS) and could be described by a fractional derivative damping and a stochastic process, respectively.

To study the dynamic influence cased, damping is investigated in [2]. Firstly, an approximately equivalent system of the studied nonlinear stochastic system is presented according to the Taylor expansion technique. Next, the corresponding Fokker–Plank–Kolmogorov (FPK) equation is deduced. Finally, a nonlinear oscillator with variable mass and fractional derivative damping is proposed in numerical simulations.

In [3], milstein and approximate coupling approaches are compared for the pathwise numerical solutions to stochastic differential equations (SDE) driven by Brownian motion.

In [4], the authors use the Hadamard fractional integral operator via Mellin integral transform to establish the generalization of some fractional-order kinetic equations, including extended (k,τ)-Gauss hypergeometric matrix functions.

In the paper [5], numerical solutions of the variable-coefficient Korteweg-De Vries (vcKdV) equation with space described by the Caputo fractional derivative operator is developed.

The paper [6] aims to investigate the Hadamard type inequalities for a generalized class of functions namely strongly (α,h−m)-p-convex functions by using Riemann–Liouville fractional integrals.

In [7], the authors investigate a fractional p(·)-Kirchhoff type problem involving variable exponent logarithmic nonlinearity. With the help of the Nehari manifold approach, the existence and multiplicity of nontrivial weak solutions for the above problem are obtained.

The paper [8] investigates the asymptotic properties of the class of even-order differential equations with several delays. The authors main concern revolves around how to

Citation: Bazighifan, O. Editorial for Special Issue "Recent Advances in Fractional Differential Equations, Delay Differential Equations and Their Applications". *Fractal Fract.* **2022**, *6*, 503. https://doi.org/10.3390/fractalfract6090503

Received: 25 August 2022
Accepted: 30 August 2022
Published: 8 September 2022

simplify and improve the oscillation parameters of the studied equation. For this, they use an improved approach to obtain new properties of the positive solutions of these equations.

In [9], the authors handle a novel investigation that depends on the Hermite–Hadamard-type inequalities concerning a monotonic increasing function. The proposed methodology deals with a new class of convexity and related integral and fractional inequalities.

In this research work [10], the aim is to use the fast algorithm to solve the Rayleigh–Stokes problem for heated generalized second-grade fluid (RSP-HGSGF) involving Riemann–Liouville time fractional derivative. The authors suggest the modified implicit scheme formulated in the Riemann–Liouville integral sense and the scheme can be applied to the fractional RSP-HGSGF.

Under a new generalized definition of exact controllability, the author in [11] introduced and with an appropriately constructed time delay term in a special complete space to overcome the delay-induced-difficulty, they establish the sufficient conditions of the exact controllability for a class of impulsive fractional nonlinear evolution equations with delay by using the resolvent operator theory and the theory of nonlinear functional analysis.

The study acts in [12] on the notion of quantum calculus together with a symmetric differential operator joining a special class of meromorphic multivalent functions in the puncher unit disk. The authors formulate a quantum symmetric differential operator and employ it to investigate the geometric properties of a class of meromorphic multivalent functions.

In paper [13], by utilizing the fractional $\mathfrak{F}$-Caputo operator, a simple fractional order discrete-time neural network with three neurons is introduced. The dynamic of this model is experimentally investigated via the maximum Lyapunov exponent, phase portraits, and bifurcation diagrams.

In research paper [14], the authors dedicate the interest to an investigation of the sufficient conditions for the existence of solutions of two new types of a coupled systems of hybrid fractional differential equations involving ϕ-Hilfer fractional derivatives.

The focus of the present study [15] is to present a stochastic numerical computing framework based on Gudermannian neural networks (GNNs) together with the global and local search genetic algorithm (GA) and active-set approach (ASA), i.e., GNNs-GA-ASA.

The paper [16] proposes a deep learning time-series prediction model to forecast the confirmed, recovered, and death cases by COVID-19.

In paper [17], the authors propose the solutions of nonhomogeneous fractional integral equations, by using the Laplace transform technique. They obtain solutions in the form of Mellin–Ross function and of the exponential function.

There is a large and very active community of scientists working on topics such as analytic inequalities, fractional equations and differential equations, as well as focusing on their applications to dynamical programming, biology, information theory, statistics, physics, and engineering processes. We hope this Special Issue together with the ideas and publications therein will be of interest to readers, and will inspire new studies on the theories and applications of analytic inequalities, functional equations and differential equations.

Funding: This research received no external funding.

Acknowledgments: As Guest Editor, I want to express my gratitude to all the authors of this Special Issue on the contribution. I also want to thank all reviewers for their help and efforts in improving the quality of the papers, as well as the Editorial Office for their kind cooperation and preparation toward this special collection.

Conflicts of Interest: The author declares no conflict of interest.

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