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Editorial

Special issue "Nonlinear differential equations: Oscillation theory, methods and applications"

Omar Bazighifan[1,2,*]

[1] Section of Mathematics, International Telematic University Uninettuno, Corso Vittorio Emanuele II, 39, 00186 Roma, Italy
[2] Department of Mathematics, Faculty of Education, Seiyun University, Hadhramout, Yemen

* **Correspondence:** Email: o.bazighifan@gmail.com.

The special issue, titled "Nonlinear Differential Equations: Oscillation Theory, Methods and Applications" published in AIMS Mathematics, focuses on the qualitative theory, mathematical modeling, and solution techniques for various forms of differential equations.

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 19 published papers.

Below is a general summary of each published paper, listed separately:

1. Oscillatory dynamics and recursive monotonicity of positive solutions to second-order neutral delay differential equations: Analytical framework and applications

This paper develops an analytical framework to study the oscillatory dynamics and recursive monotonicity of positive solutions for a class of second-order neutral delay differential equations, detailing its applications.

2. Multi-dimensional rational recurrence models: Local analysis with nonlinear effects

The research focuses on the local stability and behavior of multi-dimensional rational recurrence models, specifically analyzing the impact of nonlinear effects on the system's dynamics.

3. Asymptotic and oscillation properties of solutions of differential equations in the Canonical

case

This work investigates the asymptotic behavior and oscillatory characteristics of solutions to differential equations when they are in the Canonical case.

4. Modeling Monkeypox dynamics with human–rodent interactions and waning vaccination

The paper constructs a mathematical model to analyze the transmission dynamics of Monkeypox, incorporating key factors like human-rodent interactions and the effect of waning immunity from vaccination.

5. Oscillation for neutral differential equations of canonical form of even-order

This study provides new oscillation criteria and conditions for even-order neutral differential equations that are expressed in a canonical form.

6. Diversity of the soliton solutions and sensitivity analysis for a fractional stochastic dynamical system: Applications to certain ferromagnetic materials

The authors explore the various types of soliton solutions for a fractional stochastic dynamical system and perform a sensitivity analysis, with an application focus on specific ferromagnetic materials.

7. Oscillation conditions of nonlinear neutral differential equations with several delays

This research derives new sufficient conditions to guarantee the oscillation of solutions for a class of nonlinear neutral differential equations that involve multiple delays.

8. Dynamics of Lie symmetry, Paul-Painlevé approach, bifurcation analysis to the Ivancevic option pricing model via a optimal system of Lie subalgebra

This paper applies Lie symmetry analysis, the Paul-Painlevé approach, and bifurcation theory to investigate the dynamics of the Ivancevic option pricing model using an optimal system of Lie subalgebras.

9. Existence and asymptotic properties of global solution for hybrid neutral stochastic differential delay equations with colored noise

This work establishes the existence of a global solution and analyzes its asymptotic properties for hybrid neutral stochastic differential delay equations driven by colored noise.

10. Exact and numerical solutions of the generalized breaking soliton system: Insights into non-linear wave dynamics

The paper focuses on finding both exact and numerical solutions for the generalized breaking soliton system to provide deeper understanding into non-linear wave dynamics.

11. On nonlinear coupled differential equations for corrugated backward facing step (CBFS) with circular obstacle: AI-neural networking

This study uses AI-neural networking techniques to analyze and solve the system of nonlinear coupled differential equations describing flow over a corrugated backward-facing step with a circular obstacle.

12. Second-order advanced dynamic equations on time scales: Oscillation analysis via monotonicity properties

The research conducts an oscillation analysis for second-order advanced dynamic equations defined on time scales, utilizing monotonicity properties as the main methodology.

13. Existence and uniqueness of solutions for a class of fractional differential equation with lower-order derivative dependence

This paper establishes the conditions for the existence and uniqueness of solutions for a specific class of fractional differential equations where the solution depends on a lower-order derivative term.

14. Nonlinear neutral differential equations of second-order: Oscillatory properties

The paper investigates the oscillatory properties of solutions to a class of second-order nonlinear neutral differential equations.

15. Some new oscillation results for second-order differential equations with neutral term

This work presents new sufficient conditions and criteria for the oscillation of solutions to second-order differential equations that include a neutral term.

16. Nonlinear differential equations with neutral term: Asymptotic behavior of solutions

This research focuses on analyzing the asymptotic behavior and limit properties of solutions for a class of nonlinear differential equations that contain a neutral term.

17. On The oscillatory behavior of solutions to a class of second-order nonlinear differential equations

The study examines the oscillatory behavior of solutions for a general class of second-order nonlinear differential equations.

18. Improving diversification by a hybrid bat-Nelder-Mead algorithm and DDE for rapid convergence to solve global optimization

This paper introduces a hybrid optimization algorithm, combining the bat algorithm with the Nelder-Mead method and a differential drive evolution (DDE) strategy, to achieve rapid convergence for solving global optimization problems.

19. Optimal homotopy analysis method for (2+1) time-fractional nonlinear biological population model using J-transform

The authors utilize the optimal homotopy analysis method, combined with the J-transform, to find approximate analytical solutions for a (2+1) time-fractional nonlinear biological population model.

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.

Guest Editor:

Professor Omar Bazighifan
Section of Mathematics, International Telematic University Uninettuno, Corso Vittorio Emanuele II, 39, 00186 Roma, Italy
Department of Mathematics, Faculty of Education, Seiyun University, Hadhramout, Yemen
Email: o.bazighifan@gmail.com.

Conflict of interest

The author declares no conflict of interest.