

Preface

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We are delighted to present this special issue in *Matemática Contemporânea*. This volume compiles the research presented at the ICMC Summer Meeting on Differential Equations 2024 Chapter, held from January 29 to January 31 at the Institute of Mathematical and Computer Sciences (ICMC), University of São Paulo (USP) in São Carlos, Brazil.

The call for papers was made by the ICMC Summer Meeting scientific committee, at the invitation of Professor Jaqueline Mesquita, editor-in-chief of *Matemática Contemporânea*.

This special issue contains seven articles in Differential Equations and Nonlinear Analysis. More precisely, one article is in the area of Domain Perturbation for PDEs and Applications, two articles are in the area of Free Boundaries Problems and Related Topics, one article is in the area of Integral and Functional Differential Equations, one article is in the area of Linear Partial Differential Equations, and two articles are in the area of Nonlinear Dynamical Systems.

The article in the area of Domain Perturbation for PDEs and Applications, by Diana C. S. Bello and Alessandra A. Verri, investigates the spectrum of the Dirichlet Laplacian in a broken waveguide, exploring both its essential and discrete spectrum. Specifically, the study reveals how the

number of discrete eigenvalues is influenced by localized deformations in the waveguide's structure.

Concerning the papers in the area of Free Boundaries Problems and Related Topics, in the survey presented by Mariana. S. V. Garcia, the author highlights the celebrated Almgren monotonicity formula, showcasing its significant applications through various examples. Building upon this, the survey applies some techniques to prove how a parabolic Almgren monotonicity formula can be derived as a high-dimensional limit of its elliptic counterparts. In the survey presented by Juan P. Cabeza, the author establishes Hölder regularity results for viscosity solutions of fully nonlinear nonlocal uniformly elliptic second-order differential equations with local gradient terms. This work extends a nonlocal result to fully nonlinear extremal nonlocal operators.

The article in Integral and Functional Differential Equations, by Suzete M. Afonso, Everaldo M. Bonotto, and Marcia Federson, focuses on the exponential stability of the trivial solution of a Volterra-Stieltjes integral equation involving Perron-Stieltjes integrable functions. The authors make use of Lyapunov-type functionals to obtain conditions for weak and strong exponential stability.

The article in Linear Partial Differential Equations, by Marcello D'Abicco and Antonio Lagioia, examines a two by two system of evolution equations featuring non-effective damping and semilinear coupling of derivative type. It establishes sufficient conditions on the nonlinearities in the coupling term to ensure the existence of global-in-time small data solutions.

Concerning the papers in the area of Nonlinear Dynamical Systems, the author Jacson Simsen exhibits a survey on the existence of global attractors for four types of autonomous evolution problems under homogenous Dirichlet boundary conditions with a variable exponent and a bounded smooth domain. In the article by Alexandre N. Carvalho, Heraclio López-Lázaro, and Jackeline Huaccha-Neyra, it is proved the smoothing property of an evolution process associated with the semilinear heat equation with

delay, which is defined on a one-dimensional moving boundary domain. As a consequence, the authors estimate the fractal dimension of the pullback attractor associated with this parabolic problem.

Editorial Board

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Contributed papers

- A note on broken waveguides,
Diana C. S. Bello and Alessandra A. Verri.
- Almgren-type monotonicity formulas,
Mariana S. V. Garcia.
- Hölder regularity for fully nonlinear nonlocal equations with gradient terms,
Juan P. Cabeza.
- Exponential stability for Volterra–Stieltjes–type integral equations via generalized ODEs,
Suzete M. Afonso, Everaldo M. Bonotto, and Marcia Federson.
- A system of two σ -evolution equations with non-effective damping and coupling derivative-type semilinear terms,
Marcello D’Abbicco and Antonio Lagioia.
- Four types of problems with variable exponents: Existence of global attractors,
Jacson Simsen.
- Smoothing property of an evolution process associated with semilinear heat equation with delay on an interval with moving ends,
Alexandre N. Carvalho, Heraclio López-Lázaro, and Jackeline Huaccha-Neyra.