Juan Ricardo Muñoz

Universidad de Chile
Departamento de Ingenieria Matemática, FCFM
Av. Beauchef 851, Santiago, Chile

juan.munoz@dim.uchile.cl
Website

Academic Interests

My research interests include the Analysis of Partial Differential Equations, with emphasis on Control Theory and Stabilization of dispersive equations, analysis of the Lyapunov equation, reduced-order modeling for control problems, and machine learning techniques for control and PDE-constrained optimization.

Academic Positions

Universidad de Chile, UChile. Santiago de Chile, Chile.

Postdoctoral researcher at the Department of Mathematical Engineering (DIM), Faculty of Physical and Mathematical Sciences (FCFM), Universidad de Chile. Main researcher within the project *Control and Long-Time behavior for Dispersive equations*, funded by the **FONDECYT 2026** program

- Postdoctoral researcher (May 2026 - Present).
- Supervisor: Claudio Muñoz, Ph.D.
- Research project funded FONDECYT 2026.

University of Dubrovnik, UNIDU. Dubrovnik, Croatia

Postdoctoral researcher of Applied Mathematics within project CONDUCTION, at Faculty of Electrical Engineering and Applied Computing. Member of the cost action InterCoML (CA24136) - Interactions between Control Theory and Machine Learning, and collaborator at TRIUMPh, Institutional project at University of Dubrovnik funded by the NextgenerationEU.

- Postdoctoral researcher (March 2025 - April 2026).
- Supervisor: Martin Lazar, Ph.D.
- Research project funded by Croatian Science Foundation focused on **Optimal control and model reduction for evolution and data driven problems**

Education

Universidade Federal de Pernambuco, UFPE. Recife, PE, Brazil

- Ph.D., Mathematics (November 2021 - December 2024).
- Thesis: Control and Stabilization of KdV-KdV and KP type systems.
- Advisor: Roberto de A. Capistrano Filho, Ph.D.
- Co-Advisor: Fernando Gallego Restrepo, Ph.D.
- Co-Advisor: Victor Hugo Gonzalez Martinez, Ph.D.

[1] Updated July 28, 2026

Universidade Federal de Pernambuco, UFPE. Recife, PE, Brazil

- M.Sc., Mathematics (March 2020 - October 2021).
- Thesis: Boa colocação e controle para um modelo KdV-KdV.
- Advisor: Roberto de A. Capistrano Filho. , Ph. D.

Universidad Nacional de Colombia - Sede Manizales, UNAL. Manizales, Caldas, Colombia

- B.S., Mathematics, (June 2017 - April 2020).
- Thesis topic: On the dissipations of the Boussinesq system and their regularizing effects.
- Advisor: Fernando A. Gallego Restrepo, Ph.D.

Publications and Preprints

9. **Eigenvalue lower bounds for the Gramian in Anomalous diffusion process** (joint with M. Lazar). Within CONDUCTION research project. (In preparation)
8. **Rank aware adaptive approximations of Gramian operators** (joint with L. Grubišić and M. Lazar). Within CONDUCTION research project. (In preparation)
7. **Overcoming slow Kolmogorov width decay in parametric optimal control via neural network surrogates.** (joint with H. Kleikamp and M. Lazar). Within CONDUCTION and InterCoML research project. arXiv:2607.13226 [math.OC]. (Submitted)
6. **Exponential stabilization for the Hirota-Satsuma system by boundary time-delay input** (joint with V. H. Gonzalez Martinez). arXiv:2408.15705 [math.AP]. (Submitted)
5. **Critical lengths for the linear Kadomtsev-Petviashvili equation** (joint with R. A. Capistrano-Filho and F. A. Gallego Restrepo). arXiv:2409.03221 [math.AP]. . (Submitted)
4. **Schatten Norm Estimates for Lyapunov Gramians in Operators Scales** (joint with L. Grubišić and M. Lazar). Applied Mathematics Letters, 179, 109968 (2026). Within CONDUCTION research project. . (Article)
3. **Boundary Exponential Stabilization for the Linearl KP-II equation without Critical Size Restrictions.** (joint with F. A. Gallego Restrepo). Journal of Dynamical and Control Systems, 31, 14 (2025). (Article)
2. **On the boundary stabilization of the KdV-KdV system with time-dependent delay** (joint with R. A. Capistrano-Filho, B. Chentouf and V. H. Gonzalez Martinez). Nonlinear Analysis: Real World Applications, 79:104122 (2024). (Article)
1. **Stabilization of the Kawahara-Kadomtsev-Petviashvili equation with time-delayed feedback** (joint with R. A. Capistrano-Filho and V. H. Gonzalez Martinez). Proceedings of the Royal Society of Edinburgh Section A: Mathematics. (Article)

Short time courses

- **Research Workshop on Validated Methods in Scientific Machine Learning.** University of Zagreb, Faculty of Science, Department of Mathematics, Zagreb, Croatia. February 2026.
- **School on: Control and Machine Learning.** European Embedded Control Institute. July 2025.

- **Summer school "Control, Inverse Problems and Spectral Theory"** Institut de Mathématiques. Université Toulouse 3 Paul Sabatier. June 2025.
- **Control Theory and Partial Differential Equations.** Universidade Federal Fluminense. October 2022.
- **Differential Calculus in Banach spaces.** Pontificia Universidad Católica de Valparaíso. October 2020.
- **Control and Optimization in Dynamical Systems.** Pontificia Universidad Católica de Valparaíso.

Invited Talks

4. *Schatten Norm Estimates for Lyapunov Gramians in Operator Scales.* Research Seminar on Inverse Problems, Machine Learning and Optimization, IDeaLab and Department of Mathematics and Scientific Computing, University of Graz, 2026.
3. *Minicourse: The Gramian and application to anomalous diffusion problems.* Escuela de Análisis y EDPs - UNAL Sede Manizales, Facultad de Ciencias Exactas y Naturales - UNAL Sede Manizales, 2025.
2. *Two stabilization mechanisms for the KP-II equation on bounded domain.* Seminario de Análisis y EDPs - UNAL Sede Manizales, Facultad de Ciencias Exactas y Naturales - UNAL Sede Manizales, 2024.
1. *Wellposedness and control for a KdV-KdV model.* I Encuentro de Estudiantes y Egresados de Matemáticas, Facultad de Ciencias Exactas y Naturales - UNAL Sede Manizales, 2021.

Selected - Contributed Talks

5. *Reduced-Order Modeling for Parameter-Dependent Optimal Control: A map-parameter-to-latent approach.* NextGen Synergy: Control Theory & Machine Learning, Česká zemědělská univerzita v Praze, Prague, 2026.
4. *Decay of Gramian Eigenvalues in Fractional Heat Equation.* 8th Najman Conference on Spectral Theory and Differential equations, Centre for Advanced Academic Studies (CAAS), Dubrovnik, Croatia, 2025.
3. *Stabilization of the Kawahara-Kadomtsev-Petviashvili equation with time-delayed feedback (Poster).* 1st Colombian Workshop in Nonlinear Dispersive Equations, Facultad de Ciencias Exactas y Naturales - UNAL Sede Manizales, 2023.
2. *Stabilization of the Kawahara-Kadomtsev-Petviashvili equation with time-delayed feedback (Poster).* 34o. Colóquio Brasileiro de Matemática, Instituto de Matemática Pura e Aplicada, IMPA, 2023. .
1. *On the dissipations of the Boussinesq system and their regularizing effects (Poster).* XXII Congreso Colombiano de Matemáticas, Universidad del Cauca - Sociedad Colombiana de Matemáticas, 2019.

Awards and Honors

- Short-Term Scientific Mission:Reduced-Order Modeling for Parameter-Dependent Optimal Control: A map-parameter-to-latent approach. Funded by COST (European Cooperation in Science and Technology).
- Ph.D. Scholarship: Fundação de Amparo à Ciência e Tecnologia do Estado de Pernambuco (FACEPE) IBPG-0909-1.01/20. (11/2021 – 03/2025).
- M.Sc. Scholarship: Fundação de Amparo à Ciência e Tecnologia do Estado de Pernambuco (FACEPE) IBPG-0909-1.01/20. (03/2020 – 10/2021).

Working Experience

Universidad Nacional de Colombia - Sede Manizales

- Designing courses for the Faculty of Exact and Natural Sciences (2025): Financial education course design for non-financial proficients within the framework of the solidarity extension project towards integral education: course design in exact and natural sciences for secondary school students, teachers, and parents.
- Instructor, Fundamental mathematics (2021).
- Instructor, Fundamental mathematics (2020).
- Instructor, Preparatory mathematics for high school students (2019).
- Teaching Assistant, Differential Calculus, Linear Algebra, Numerical systems, Set Theory and Real Analysis (2019).
- Teaching Assistant, Differential Calculus, Linear Algebra, Numerical systems, Set Theory and Real Analysis (2018).
- Teaching Assistant, Differential Calculus, Linear Algebra, Numerical systems, Set Theory and Real Analysis (2017).
- Teaching Assistant, Differential Calculus, Linear Algebra, Numerical systems, Set Theory and Real Analysis (2016).

Technical Skills

Languages

Language	Proficiency	Details
Spanish	Native (mother tongue)	
English	Excellent	Reading, writing, and speaking (C1)
Portuguese	Excellent	Reading, writing, and speaking (C1/C2 level)

Software

Software	Proficiency	Details
Python	Excellent	Numerical computing, data analysis, visualization, machine learning
MATLAB	Good	Numerical analysis, numerical linear algebra, control systems
LaTeX	Excellent	Scientific writing, presentations, and academic publications

Outreach

- Mentor at *Pares Ordenados* a Directed Reading Program (Summer 2025). Supervising *Erick Altamirano Carpio* at *Universidad Yachay Tech* in the topic *Fourier transform and applications to the Korteweg-de Vries equation.*
- Instructor of the Mini course: *'Introduction to the Control Theory'* at Universidad Nacional de Colombia - Sede Manizales. December 2024.
- Coordinator and member of the organizing committee of the "Olimpiadas de Matemáticas", a proposal to promote and encourage mathematics through healthy competition aimed at secondary school students. (10/2023 - 11/2023).

- Monitor of the discipline: Fundamental Mathematics, within the framework of the leveling semester at the emerging of the Universidad Nacional de Colombia - Sede La Paz. (10/2019 - 11/2019).