

# Nicolás Carreño

## Assistant Professor

Universidad Técnica Federico Santa María  
Campus Vitacura, Santiago, Chile

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Universidad Técnica Federico Santa María (UTFSM)  
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Avda. Santa María 6400, Vitacura, Santiago  
Oficina A-256

## PERSONAL DETAILS

Date of birth: August 15th, 1983.

Citizenship: Chilean.

Marital status: Married.

ORCID identifier: <https://orcid.org/0000-0003-3833-6442>

## PROFESSIONAL EMPLOYMENT

- 2017- Universidad Técnica Federico Santa María, Departamento de Matemática, **Assistant Professor**, Santiago - Chile
- 2014-2017 Universidad Técnica Federico Santa María, Departamento de Matemática, **Postdoctoral Researcher**, Santiago - Chile  
Funded by FONDECYT Project No. 3150089.

## EDUCATION

- 2014 **PhD in Mathematics**, Université Pierre et Marie Curie, Paris - France  
Thesis: On the controllability of some systems of the parabolic kind with a reduced number of controls and of a KdV equation in the vanishing dispersion limit.
- 2011 **Master of Sciences**, Université Pierre et Marie Curie, Paris - France  
Numerical Analysis and Partial Differential Equations (M2 ANEDP).
- 2009 **Mathematical Engineering Degree**, Universidad de Chile, Santiago - Chile
- 2008 **Bachelor of Sciences**, Universidad de Chile, Santiago - Chile  
Major in Mathematics.

## PUBLICATIONS

15. **Stackelberg-Nash exact controllability for the Kuramoto-Sivashinsky equation with boundary and distributed controls.** (with M. C. Santos), *J. Differential Equations* 343 (2023), 1-63
14. **Internal null controllability of the generalized Hirota-Satsuma system** (with E. Cerpa and E. Crépeau), *ESAIM Control Optim. Calc. Var.* 26 (2020), Paper no. 75, 22 pp
13. **Boundary controllability of a cascade system coupling fourth- and second-order parabolic equations** (with E. Cerpa and A. Mercado), *Systems Control Lett* 133 (2019), 104542
12. **Stackelberg-Nash exact controllability for the Kuramoto-Sivashinsky equation** (with M. C. Santos), *J. Differential Equations* 266 (2019), no. 9, 6068-6108

11. **Potential reconstruction for a class of hyperbolic systems from incomplete measurements** (with R. Morales and A. Osses), *Inverse Problems* 34 (2018), no. 8, 085005, 18 pp
10. **Uniform null controllability of a linear KdV equation using two controls** (with S. Guerrero), *J. Math. Anal. Appl.* 457 (2018), no. 1, 922-943
9. **Insensitizing controls for the Boussinesq system with no control on the temperature equation**, *Adv. Differential Equations* 22 (2017), no. 3-4, 235-258
8. **On the cost of null controllability of a linear fourth order parabolic equation** (with P. Guzmán), *J. Differential Equations* 261 (2016), no. 11, 6485-6520
7. **Local controllability of the stabilized Kuramoto-Sivashinsky system by a single control acting on the heat equation** (with E. Cerpa), *J. Math. Pures Appl.* 106 (2016), no. 4, 670-694
6. **Insensitizing controls for a phase field system** (with B. M. R. Calsavara and E. Cerpa), *Nonlinear Anal.* 143 (2016), 120-137
5. **On the non-uniform null controllability of a linear KdV equation** (with S. Guerrero), *Asymptot. Anal.* 94 (2015), no. 1-2, 33-69
4. **Insensitizing controls with two vanishing components for the three-dimensional Boussinesq system** (with S. Guerrero and M. Gueye), *ESAIM Control Optim. Calc. Var.* 21 (2015), no. 1, 73-100
3. **Insensitizing controls with one vanishing component for the Navier-Stokes system** (with M. Gueye), *J. Math. Pures Appl.* 101 (2014), no. 1, 27-53
2. **Local controllability of the N-dimensional Boussinesq system with N-1 scalar controls in an arbitrary control domain**, *Math. Control Relat. Fields* 2 (2012), no. 4, 361-382
1. **Local null controllability of the N-dimensional Navier-Stokes system with N-1 scalar controls in an arbitrary control domain** (with S. Guerrero), *J. Math. Fluid Mech.* 15 (2013), no. 1, 139-153

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## AWARDS AND FELLOWSHIPS

- 2014 Postdoctoral grant by Fondecyt (Project No. 3150089: Control and inverse problems of partial differential equations).
- 2009 “Becas Chile PhD” Scholarship.
- 2007 Outstanding Student Award by Universidad de Chile.

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## TALKS

- 2022 **Control, observability and application to the control of the Hirota-Satsuma system**, Séminaire AMAC: EDP-AIRSEA-CVGI, Laboratoire Jean Kuntzmann - Université Grenoble-Alpes, Grenoble - France, May 23
- 2022 **Internal null controllability of the generalized Hirota-Satsuma system**, Seminário de EDP e Matemática Aplicada - Universidade Federal Fluminense, Rio de Janeiro - Brazil, May 4
- 2021 **Internal null controllability of the generalized Hirota-Satsuma system**, 9th Workshop in Nonlinear PDE's, Functional and Geometric Analysis, João Pessoa - Brazil, December 7
- 2020 **Control y Optimización de Sistemas Dinámicos (3-hour course)**, V-Escuela, Valparaíso - Chile, October 20,21
- 2019 **Boundary null-controllability of a system coupling fourth- and second-order parabolic equations**, French Latin-American Conference on New Trends in Applied Mathematics, Session Control of PDEs, Santiago - Chile, November 6
- 2019 **Control and Observability of the Heat Equation: An Introduction to the Control of Partial Differential Equations (3-hour course)**, XI Escuela Santaló, Buenos Aires - Argentina, August 7,9

- 2019 **Boundary null-controllability of a system coupling fourth- and second-order parabolic equations**, XXXII Jornada de Matemática de la Zona Sur, Sesión Ecuaciones Diferenciales Parciales, Punta Arenas - Chile, April 25
- 2018 **Boundary null-controllability of a system coupling fourth- and second-order parabolic equations**, LXXXVII Encuentro Anual - Sociedad de Matemática de Chile, Sesión Control y Problemas Inversos en EDP, Rancagua - Chile, December 19
- 2018 **Control of parabolic systems and some applications to the control of fluids**, III Congresso Brasileiro de Jovens Pesquisadores em Matemática Pura, Aplicada e Estatística, Session Recent trends in nonlinear PDEs, Curitiba - Brazil, December 13
- 2018 **Some control results for systems coupling second- and fourth-order parabolic equations**, Workshop on Inverse and Control Problems for Physical Systems (ICoPS), Valparaíso - Chile, December 7
- 2018 **Control of parabolic systems and some applications to the control of fluids**, XXXI Jornada de Matemática de la Zona Sur, Sesión Ecuaciones Diferenciales Parciales, Valdivia - Chile, April 26
- 2017 **Control of parabolic systems and application to a hierarchical control problem**, LXXXVI Encuentro Anual - Sociedad de Matemática de Chile, Sesión Análisis de Ecuaciones Diferenciales Parciales, Talca - Chile, November 3
- 2017 **Control of parabolic systems and application to a hierarchical control problem**, Séminaire du Département Automatique, Gipsa-lab - Université Grenoble-Alpes, Grenoble - France, September 14
- 2017 **Sobre el costo a cero de algunas ecuaciones en derivadas parciales lineales**, XXX Jornada de Matemática de la Zona Sur, Sesión Ecuaciones Diferenciales Parciales y Teoría de Control, Concepción - Chile, April 28
- 2016 **Stackelberg-Nash exact controllability for the Kuramoto-Sivashinsky equation**, V CLAM, Congreso Latinoamericano de Matemáticos - Universidad del Norte, Barranquilla - Colombia, July 11
- 2016 **Control de EDP: Observabilidad, costo y sistemas**, V-Coloquio, Instituto de Matemáticas - Pontificia Universidad Católica de Valparaíso, Valparaíso - Chile, June 14
- 2015 **On the cost of null controllability of some partial differential equations**, 2da Escuela de Control y Optimización ECOPT 2015 - Universidad Técnica Federico Santa María, Santiago - Chile, December 17
- 2015 **Insensitizing controls for the Boussinesq system with a reduced number of controls**, CAPDE seminar, Mathematical Engineering Department - Universidad de Chile, Santiago - Chile, November 30
- 2015 **Sobre el costo a cero de algunas ecuaciones en derivadas parciales lineales**, LXXXIV Encuentro Anual - Sociedad de Matemática de Chile, Sesión Problemas Inversos y de Control de EDP, Pucón - Chile, November 28
- 2015 **On the cost of null controllability of a linear KdV equation**, PDE Seminar, Mathematics Department - Universidade Federal de Pernambuco, Recife - Brazil, November 17
- 2015 **On the cost of null controllability of a linear KdV equation**, Conference Partial Differential Equations, Optimal Design and Numerics, Centro de Ciencias de Benasque Pedro Pascual, Benasque - Spain, August 26
- 2015 **On the cost of null controllability of a linear KdV equation**, Workshop on Control Systems and Identification Problems, Valparaíso - Chile, January 15
- 2014 **Insensitizing controls with vanishing components for the Boussinesq system**, LXXXIII Encuentro Anual - Sociedad de Matemática de Chile, Sesión Problemas Inversos y de Control de EDP, Quinamávida - Chile, December 5
- 2014 **On the cost of null controllability of a linear KdV equation**, Inverse and Control Problems Seminar, CMM - Universidad de Chile, Santiago - Chile, November 19

- 2014 **Sur la contrôlabilité de quelques systèmes de type parabolique avec un nombre réduit de contrôles et d'une équation de KdV avec dispersion évanescente**, Groupe de Travail des Thésards, Laboratoire Jacques-Louis Lions - UPMC, Paris - France, September 30
- 2014 **Insensitizing controls for the Boussinesq system with vanishing components**, Conference Control of PDEs, Conservatoire National des Arts et Métiers, Paris - France, April 2
- 2014 **Some controllability results for the Navier-Stokes equation with a reduced number of scalar controls**, Department of Mathematics Student Seminar, Universidad Técnica Federico Santa María, Valparaíso - Chile, January 9
- 2013 **Quelques résultats de contrôlabilité pour l'équation de Navier-Stokes avec un nombre réduit de contrôles**, Séminaire d'équations aux dérivées partielles et applications, Institut Élie Cartan de Nancy - Université de Lorraine, Nancy - France, June 4
- 2013 **Quelques résultats de contrôlabilité avec un nombre réduit de contrôles**, Matinée Contrôle avec Alfio Quarteroni, Laboratoire Jacques-Louis Lions - UPMC, Paris - France, March 21
- 2012 **Some controllability results for the Navier-Stokes and Boussinesq systems with a reduced number of scalar controls**, Inverse and Control Problems Seminar, CMM - Universidad de Chile, Santiago - Chile, September 6
- 2012 **Some controllability results with a reduced number of controls via Carleman estimates**, Journée Interne LJLL, Laboratoire Jacques-Louis Lions - UPMC, Paris - France, March 14
- 2011 **Local null controllability of the Navier-Stokes system with a reduced number of scalar controls**, Journée Jeunes Contrôleurs, Laboratoire Jacques-Louis Lions - UPMC, Paris - France, November 29

## CONFERENCE PARTICIPATION

### Organization

- 2022 **Thematic Session: Control Theory and Inverse Problems**, XXXIV Jornada de Matemática de la Zona Sur - U. de Los Lagos, Osorno - Chile, April 26-29
- 2021 **Thematic Session: Control Theory and Inverse Problems**, LXXXIX Encuentro Anual Sociedad Matemática de Chile - U. de O'Higgins, Rancagua - Chile, December 15-17
- 2021 **Thematic Session: Control Theory and Inverse Problems**, XXXIII Jornada de Matemática de la Zona Sur - U. de la Frontera, Temuco - Chile, April 20-24
- 2016 **Thematic Session: Control Theory and Inverse Problems**, 1er Encuentro de la Sociedad Matemática de Chile y la Unión Matemática Argentina (SUMA 2016) - U. de Valparaíso, U. Técnica Federico Santa María, Pontificia U. Católica de Valparaíso, Valparaíso - Chile, December 14-17
- 2016 **Mini-Workshop on Control and Inverse Problems of PDE**, U. Técnica Federico Santa María, Valparaíso - Chile, January 18-19

### Attendance

- 2019 **French Latin-American Conference on New Trends in Applied Mathematics**, Universidad de Chile, Santiago - Chile, November 5-8
- 2019 **XI Escuela Santaló**, Universidad de Buenos Aires, Buenos Aires - Argentina, August 7-9
- 2019 **XXXII Jornada de Matemática de la Zona Sur**, Universidad de Magallanes, Punta Arenas - Chile, April 24-26
- 2018 **LXXXVII Encuentro Anual - Sociedad de Matemática de Chile**, Universidad de O'Higgins, Rancagua - Chile, December 19-21

- 2018 **III Congresso Brasileiro de Jovens Pesquisadores em Matemática Pura, Aplicada e Estatística**, Universidade Federal do Paraná, Curitiba - Brazil, December 12-14
- 2018 **Workshop on Inverse and Control Problems for Physical Systems (ICoPS 2018)**, Universidad Técnica Federico Santa María, Valparaíso - Chile, December 4-7
- 2018 **XXXI Jornada de Matemática de la Zona Sur**, Universidad Austral de Chile, Valdivia - Chile, April 25-27
- 2017 **LXXXVI Encuentro Anual - Sociedad de Matemática de Chile**, Universidad de Talca, Talca - Chile, November 2-4
- 2017 **XXX Jornada de Matemática de la Zona Sur**, Universidad Católica de la Santísima Concepción, Concepción - Chile, April 26-28
- 2016 **V CLAM - Congreso Latinoamerica de Matemáticos**, Universidad del Norte, Barranquilla - Colombia, July 11-15
- 2016 **Nonlinear Partial Differential Equations and Applications - A conference in the honor of Jean-Michel Coron for his 60th birthday**, Institut Henri Poincaré, Paris - France, June 20-24
- 2015 **LXXXIV Encuentro Anual - Sociedad de Matemática de Chile**, Green Park Hotel, Pucón - Chile, November 26-28
- 2015 **Partial Differential Equations, Optimal Design and Numerics**, Centro de Ciencias de Benasque Pedro Pascual, Benasque - Spain, August 23-September 4
- 2015 **Workshop on Control Systems and Identification Problems**, Universidad Técnica Federico Santa María, Valparaíso - Chile, January 12-16
- 2014 **LXXXIII Encuentro Anual - Sociedad de Matemática de Chile**, Termas de Quinamávica, Quinamávica - Chile, December 4-6
- 2014 **Control of PDEs**, Conservatoire National des Arts et Métiers, Paris - France, March 31-April 4
- 2013 **MCPIT2013: Modelling, Control and Inverse Problems for the Planet Earth in all its states**, Institut Henri Poincaré, Paris - France, November 18-22
- 2013 **Mathematical Aspects of Fluid-Structure Interactions**, Institut Henri Poincaré, Paris - France, November 4-8
- 2013 **Partial Differential Equations, Optimal Design and Numerics**, Centro de Ciencias de Benasque Pedro Pascual, Benasque - Spain, August 25-September 5
- 2013 **8th Workshop on Control of Distributed Parameter Systems**, University of Craiova, Craiova - Romania, July 1-5
- 2012 **Thematic school of the GDRE ConEDP: Control of PDE's, interactions and application challenges**, Centre International de Rencontres Mathématiques (CIRM), Marseille - France, November 5-9
- 2012 **International Conference on Inverse Problems and PDE Control**, Sichuan University, Chengdu - China, July 30-August 3
- 2012 **Control of Fluid-Structure Systems and Inverse Problems**, Institut de Mathématiques de Toulouse, Université Paul Sabatier, Toulouse - France, June 25-28
- 2012 **PASI-CIPPDE 2012 Inverse Problems and PDE Control**, Pontificia Universidad Católica de Chile, Santiago - Chile, January 16-27
- 2010 **WIPA 2010: Workshop on Inverse Problems and Applications**, Universidad Técnica Federico Santa María, Valparaíso - Chile, January 18-22
- 2010 **CIMPA Summer School on Inverse Problems and its Applications**, Universidad de Chile, Santiago - Chile, January 4-15

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## RESEARCH PROJECTS

- 2021-2025 **Responsible Researcher**, FONDECYT Regular 1211292  
Carleman estimates for some partial differential equations with non-homogeneous boundary conditions and applications to controllability

- 2020-2021 **National Coordinator**, Math-Amsud Project ACIPDE MATH190008, Brazil - Chile - France  
Analysis, Control and Inverse problems for Partial Differential Equations
- 2017-2020 **Responsible Researcher**, FONDECYT Iniciación 11170489  
Carleman estimates and the control of parabolic systems
- 2017-2018 **Researcher**, Math-Amsud Project ICoPS 17MATH-04, Brazil - Chile - Colombia - France  
Inverse and control problems for physical systems
- 2017-2019 **Researcher**, ECOS-CONICYT Project C16E06, Chile - France  
Control of distributed systems with applications in physical networks
- 2014-2017 **Responsible Researcher**, FONDECYT Postdoctorado 3150089  
Control and inverse problems of partial differential equations
- 2014-2015 **Researcher**, Math-Amsud Project COSIP 14MATH-03, Brazil - Chile - France  
Control Systems and Identification Problems
- 2011-2014 **PhD Student**, Laboratoire Jacques-Louis Lions, Université Pierre et Marie Curie, Paris - France  
Controllability of Navier-Stokes like systems with a reduced number of scalar controls.  
Cost of null controllability of a transport equation in the zero-dispersion limit.

## TEACHING EXPERIENCE

### Instructor

**Universidad Técnica Federico Santa María**, Santiago - Chile

Real Analysis (2019-2, 2020-2, 2021-2, 2022-2).  
Calculus of Several Variables and ODE (2019-1).  
Linear Algebra (2016-2, 2017-2, 2018-1, 2018-2).  
Optimization and Control (2016-1, 2018-1, 2020-1, 2021-1, 2022-1).  
Introduction to Calculus (2015-1, 2015-2).  
Differential and Integral Calculus (2017-1).  
Control of Partial Differential Equations (2021-1).

**Universidad de los Andes**, Santiago - Chile

Differential and Integral Calculus (2010-1).  
Ordinary Differential Equations (2010-1).

### Teaching Assistant

**Universidad de los Andes**, Santiago - Chile

Calculus (2009-2).  
Differential and Integral Calculus (2008-2, 2009-1, 2009-2).  
Algebra (2009-1).  
Ordinary Differential Equations (2008-2, 2009-1).

**Universidad de Chile**, Santiago - Chile

Ordinary Differential Equations (2006-2, 2007-1, 2007-2, 2008-1, 2008-2).  
Algebra (2007-1).  
Numerical Analysis of Partial Differential Equations (2008-2, 2009-2).

## STUDENTS

- 2020-2021 **Cristóbal Loyola**, Master of Sciences and Mathematical Engineering, Universidad Técnica Federico Santa María, co-directed with Alberto Mercado
- 2019- **Jefferson Prada**, PhD in mathematics, Universidad Técnica Federico Santa María
- 2019-2021 **Nelson Cifuentes**, Master of Sciences, Universidad Técnica Federico Santa María, co-directed with Eduardo Cerpa
- 2016-2019 **Roberto Morales**, PhD in mathematics, Universidad de Chile, co-directed with Axel Osses

## SERVICE TO PROFESSION

Journal Manuscript Review Work  
Applied Mathematics and Computation

Communications in Contemporary Mathematics  
 ESAIM: Control, Optimisation and Calculus of Variations  
 Evolution Equations and Control Theory  
 IEEE Transactions on Automatic Control  
 Journal of the American Mathematical Society  
 Journal of Dynamical and Control Systems  
 Journal of Differential Equations  
 Journal of Evolution Equations  
 Journal of Mathematical Analysis and Applications  
 Journal de Mathématiques Pures et Appliquées  
 Journal of Optimization Theory and Applications  
 Mathematical Control and Related Fields  
 Mathematics of Control, Signals, and Systems  
 Systems & Control Letters  
 SIAM Journal on Control and Optimization

#### Evaluation Committees

- 2021 Marcos Gabriel Ferreira de Silva, Thesis defense, MSc in mathematics, Universidade Federal da Paraíba, João Pessoa - Brazil
- 2021 Nelson Cifuentes, Thesis defense, MSc in mathematics, Universidad Técnica Federico Santa María, Santiago - Chile
- 2021 Martín Hernández, Thesis defense, MSc in mathematics, Universidad Técnica Federico Santa María, Santiago - Chile
- 2021 Piero Visconti, Thesis defense, MSc in mathematics, Universidad Técnica Federico Santa María, Santiago - Chile
- 2021 Cristóbal Loyola, Thesis defense, MSc in mathematics, Universidad Técnica Federico Santa María, Valparaíso - Chile
- 2021 Jefferson Prada, Qualifying exam (thesis project), PhD in mathematics, Universidad Técnica Federico Santa María, Valparaíso - Chile
- 2021 Alex Imba, Qualifying exam, PhD in mathematics, Universidad Técnica Federico Santa María, Valparaíso - Chile
- 2021 Gonzalo Arias, Thesis defense, MSc in mathematics, Universidad Técnica Federico Santa María, Santiago - Chile
- 2020 Jefferson Prada, Qualifying exam, PhD in mathematics, Universidad Técnica Federico Santa María, Valparaíso - Chile
- 2019 Roberto Morales, Thesis defense, PhD in mathematics, Universidad de Chile, Santiago - Chile
- 2019 Esteban Hernández, Qualifying exam (thesis project), PhD in mathematics, Universidad Técnica Federico Santa María, Valparaíso - Chile
- 2018 Andrés Sandoval, Qualifying exam, PhD in mathematics, Universidad Técnica Federico Santa María, Valparaíso - Chile
- 2018 Esteban Hernández, Qualifying exam, PhD in mathematics, Universidad Técnica Federico Santa María, Valparaíso - Chile
- 2018 Claudia Moreno, Qualifying exam (thesis project), PhD in mathematics, Universidad Técnica Federico Santa María, Santiago - Chile
- 2017 Nicolás Espitia Hoyos, Thesis defense, PhD in automatic control, Université de Grenoble-Alpes, Grenoble - France
- 2017 María Soledad Gutiérrez, Qualifying exam, PhD in mathematics, Universidad de Chile, Santiago - Chile
- 2016 Cristhian Montoya, Thesis defense, PhD in mathematics, Universidad de Chile, Santiago - Chile

- 2016 Roberto Morales, Qualifying exam, PhD in mathematics, Universidad de Chile, Santiago  
- Chile
- 2016 Nicolás Molina, Thesis defense, Mathematical Engineering, Universidad de Chile, Santiago  
- Chile

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## LANGUAGES

Spanish Native.  
English Fluent.  
French Fluent.