

# Nikola Kamburov

Avda. Vicuña Mackenna 4860  
Santiago, RM 7820436, Chile  
✉ [nikamburov@uc.cl](mailto:nikamburov@uc.cl)  
<http://mat.uc.cl/~nikamburov>

## Education

- 2007–2012 **Ph.D. in Mathematics**, *Massachusetts Institute of Technology*, Cambridge, MA, USA,  
Dissertation title: “*A free boundary problem inspired by a conjecture of De Giorgi*”  
Advisor: Prof. David Jerison
- 2003–2007 **A.B. in Mathematics**, *Princeton University*, Princeton, NJ, USA  
Graduated Magna Cum Laude, June 2007

## Academic Positions

- 2016–Present **Assistant Professor**, *Facultad de Matemáticas, Pontificia Universidad Católica de Chile*, Santiago, Chile
- 2015–2016 **Visiting Assistant Professor**, *Department of Mathematics, University of Arizona*, Tucson, AZ, USA
- 2012–2015 **Hanno Rund Postdoctoral Fellow**, *Department of Mathematics, University of Arizona*, Tucson, AZ, USA

## Grants, Awards and Distinctions

- 2024–2028 **Research grant FONDECYT Regular**, “*Stability in Families of Free Boundary Interfaces*”, Project no. 1241588, Principal investigator  
(\$96.964.000 Chilean pesos)
- 2020–2024 **Research grant FONDECYT Regular**, “*Free Boundaries Subject to Topological and Variation-Theoretic Constraints*”, Project no. 1201087, Principal investigator  
(\$80.642.000 Chilean pesos)
- 2016–2019 **Research grant FONDECYT Iniciación**, “*Free Boundaries and Minimal Surfaces*”,  
Project no. 11160981, Principal investigator  
(\$50.653.000 Chilean pesos)
- 2007–2008 **American Foundation for Bulgaria Fellowship**, MIT
- 2006 **Phi Beta Kappa**, Elected to membership
- 2006 **Sigma Xi**, Elected to membership
- 2006 **Gottdiener Fellowship for Summer Research**, Princeton University
- 2004 & 2005 **Shapiro Prize for Academic Excellence**, Princeton University
- 2003 **National Diploma of Excellence**, Ministry of Education and Science, Bulgaria
- 2002 & 2003 **International Physics Olympiad**, Bronze Medal

---

## Research Interests

Free boundary problems, non-linear PDE, geometric analysis, calculus of variations

---

## Publications

- 2024 (with K. Wang) Nondegeneracy for stable solutions to the one-phase free boundary problem. *Math. Ann.* 388 (2024): 2705–2726.
- 2023 (with J. Basulto) One-phase free boundary solutions of finite Morse index, *submitted*, arXiv:2311.10185
- 2023 Nondegeneracy and stability in the limit of a one-phase singular perturbation problem. *Discrete Contin. Dyn. Syst.* 43, no. 12 (2023): 4328–4360.
- 2023 (with B. Sirakov) Uniform a priori estimates for positive solutions of the Lane–Emden system in the plane, *Calc. Var.* 62, no. 76 (2023).
- 2021 (with L. Sciaraffia) Nontrivial solutions to Serrin’s problem in annular domains, *Ann. I. H. Poincaré–AN* 38, no. 1 (2021): 1–22.
- 2019 (with D. Jerison) Free boundaries subject to topological constraints, *Discrete Contin. Dyn. Syst.* 39, no. 12 (2019): 7213–7248.
- 2018 (with B. Sirakov) Uniform a priori estimates for positive solutions of the Lane–Emden equation in the plane, *Calc. Var.* 57, no. 164 (2018).
- 2018 (with N. Ercolani and J. Lega) The phase structure of grain boundaries, *Phil. Trans. R. Soc. A* 376, no. 2117 (2018): 20170193.
- 2016 (with D. Jerison) Structure of one-phase free boundaries in the plane, *Int. Math. Res. Notices* 2016, no. 19 (2016): 5922–5987.
- 2013 A free boundary problem inspired by a conjecture of De Giorgi, *Commun. Part. Diff. Eq.* 38, no. 3 (2013): 477–528.

---

## Advising

- 2023 José Basulto, undergraduate thesis “*Estabilidad de soluciones clásicas al problema de frontera libre de una fase en 2 y 3 dimensiones*”
- 2023 Pablo Navarro, undergraduate thesis “*Problemas elípticos sobredeterminados en dominios acotados*”
- 2022 José Basulto, undergraduate research project (IPRE) “*Separación del catenoide formado por una película de jabon, un enfoque matematico*”
- 2019–2020 Luciano Sciaraffia, MSc thesis “*Overdetermined elliptic problems in annular domains*”; Luciano subsequently enrolled in a Ph.D. programme at the Università di Pisa, Italy
- 2018 Luciano Sciaraffia, undergraduate thesis “*Construcción de soluciones no triviales a problemas sobredeterminados*”

---

## Academic Visits

- 2024 **MIT, Department of Mathematics**, Cambridge, MA, USA, January 28–February 3, Host: David Jerison
- 2022 **Columbia University, Department of Mathematics**, New York, NY, USA, October 17–21, Hosts: Daniela De Silva & Ovidiu Savin
- 2022 **MIT, Department of Mathematics**, Cambridge, MA, USA, January 30–February 13, Host: David Jerison
- 2020 **Instituto Superior Técnico Lisboa, Departamento De Matemáticas**, Lisboa, Portugal, January 7–17, Host: Hugo Tavares
- 2019 **Universidad de Granada, Departamento de Geometría y Topología**, Granada, Spain, December 14–19, Host: Pieralberto Sicbaldi
- 2019 **Wuhan University, School of Mathematics and Statistics**, Wuhan, China, July 18–28, Host: Kelei Wang
- 2018 **MIT, Department of Mathematics**, Cambridge, MA, USA, August 12–18, Host: David Jerison
- 2017 **PUC-Rio, Departamento de Matemática**, Rio de Janeiro, Brazil, November 11–December 2, Host: Boyan Sirakov

## Invited Talks

### Upcoming

- 2024 **Mostly Maximum Principle**, Rio de Janeiro, Brazil, June 24–28
- 2024 **PDE Seminar**, DIM-CMM, Universidad de Chile, June 17

### Past

- 2024 **XXXVI Jornada de Matemática de la Zona Sur**, Temuco, Chile, April 24–26
- 2023 **Mathematics Days in Sofia**, IMI-BAS, Sofia, Bulgaria, July 10–14
- 2023 **13th AIMS Conference on Dynamical Systems, Differential Equations and Applications**, *Session “Singular Limits in Elliptic and Parabolic PDEs”*, UNCW, Wilmington, NC, USA, May 31–June 4
- 2022 **XC Encuentro Anual de la SOMACHI**, Punta de Tralca, Chile, December 8–10
- 2022 **Geometry and Analysis Seminar**, Columbia University, October 21
- 2022 **Analysis and Geometry Seminar**, PUC de Chile, October 11
- 2022 **Second Annual Meeting of Young Bulgarian Mathematicians**, IMI-BAS, Sofia, Bulgaria, June 13–15
- 2022 **Seminar in Algebra and Geometry**, (*virtual*), University of New Mexico, March 23
- 2021 **Escuela Doctoral de Matemática y Estadística**, (*virtual*), PUC de Chile, September 28–October 1 (minicourse)
- 2021 **XXXIII Jornada de Matemática de la Zona Sur**, (*virtual*), April 20–24
- 2020 **PDE Seminar**, Instituto Superior Técnico Lisboa, January 13
- 2019 **PDE Seminar**, Wuhan University, July 23

- 2018 **Analysis and Geometry Seminar**, PUC de Chile, September 25
- 2018 **12th AIMS Conference on Dynamical Systems, Differential Equations and Applications**, *Session "Qualitative and Quantitative Properties of Quasilinear Elliptic and Parabolic Equations and Systems"*, Taipei, Taiwan, July 5–9
- 2017 **First Belgium-Chile-Italy Conference in PDEs**, Brussels, Belgium, November 13–17
- 2017 **LXXXVI Encuentro Anual de la SOMACHI**, Talca, Chile, November 2–4
- 2017 **Geometric Properties of Local and Nonlocal PDEs**, Casa Matemática Oaxaca, Mexico, May 21–26
- 2017 **Coloquio de Matemática**, PUC de Chile, April 7
- 2016 **CAPDE Seminar**, CMM, Universidad de Chile, November 7
- 2015 **Math Department Colloquium**, University of New Mexico, September 24
- 2015 **6th Symposium on Analysis and PDEs**, Purdue University, June 1–4
- 2013 **Qualitative and Geometric Aspects of Elliptic PDEs**, CRM, Barcelona, September 2–6
- 2012 **Nonlinear Analysis Seminar**, Rutgers University, March 27
- 2012 **Geometry and Analysis Seminar**, Columbia University, February 2
- 2011 **Geometric Analysis Seminar**, MIT, September 21

---

## Conferences Attended

- 2024 **Nonlinear Analysis: Geometric, Variational and Dispersive aspects**, CMM, Universidad de Chile, April 4–5
- 2019 **1st PUC-Bath Workshop on Nonlinear PDEs and Applications**, PUC de Chile, September 10–13
- 2018 **Workshop on Mean Curvature and Regularity**, IAS, Princeton NJ, November 5–9
- 2017 **2nd Mathematical Congress of the Americas**, Montreal, Canada, July 24–28
- 2017 **Mathematics Days in Sofia**, IMI-BAS, Sofia, Bulgaria, July 10–14
- 2017 **Variational Models of Soft Matter**, PUC de Chile, January 9–13
- 2014 **Mathematics Days in Sofia**, IMI-BAS, Sofia, Bulgaria, July 7–10
- 2014 **Kinetics, Non-Standard Diffusions and Stochastics**, UT Austin, May 4–16
- 2013 **Current Developments in Mathematics**, Harvard University, November 22–23
- 2013 **Recent Advances in Nonlinear PDE**, Courant Institute, May 20–22
- 2012 **The Riviere-Fabes Symposium on Analysis and PDE**, University of Minnesota, April 20–22
- 2011 **Analysis and Applications. A Conference in Honor of Elias M. Stein**, Princeton University, May 16–20
- 2009 **Workshop on Analysis of Nonlinear PDEs and Free Boundary Problems: Applications to Homogenization**, PIMS, Vancouver, July 20–24

2009 **The Power of Analysis. Conference on the Occasion of Charles Fefferman's 60th Birthday**, Princeton University, May 4–8

## Teaching Experience

### At Pontificia Universidad Católica de Chile

- 2024, sem 1 **Cálculo I (MAT 1610)**, Instructor
- 2024, sem 1 **Cálculo I (MAT 1100)**, Instructor
- 2023, sem 2 **Análisis Funcional (MAT 2555/255I)**, Instructor
- 2023, sem 1 **Cálculo III (MAT 1630)**, Instructor
- 2023, sem 1 **Cálculo I (MAT 1610)**, Instructor
- 2022, sem 2 **Ecuaciones Diferenciales Ordinarias (MAT 2500)**, Instructor
- 2022, sem 1 **Ecuaciones Diferenciales Parciales (MAT 2505/250I)**, Instructor
- 2022, sem 1 **Cálculo I (MAT 1610)**, Instructor
- 2021, sem 2 **Geometría Riemanniana (MPG 3971)**, graduate course, Instructor
- 2021, sem 1 **Teoría de Integración (MAT 2535/253I)**, Instructor
- 2021, sem 1 **Cálculo I (MAT 1610)**, Instructor
- 2020, sem 2 **Ecuaciones Diferenciales (MAT 1640)**, Co-Instructor
- 2020, sem 1 **Teoría de Integración (MAT 2535/253I)**, Instructor
- 2020, sem 1 **Cálculo I (MAT 1610)**, Instructor
- 2020, sem 1 **Optativo I (MPG 3120)**, *Introducción a los problemas de frontera libre*, graduate reading course, Mentor
- 2019, sem 2 **Ecuaciones Diferenciales Ordinarias (MAT 2500)**, Instructor
- 2019, sem 1 **Optativo I (MPG 3120)**, *Introducción a los problemas de frontera libre*, graduate reading course, Mentor
- 2019, sem 1 **Ecuaciones Diferenciales Parciales (MAT 2505/250I)**, Instructor
- 2019, sem 1 **Cálculo I (MAT 1610)**, Instructor
- 2018, sem 2 **Álgebra Lineal (MAT 1203)**, Instructor
- 2018, sem 1 **Cálculo II (MAT 1620)**, Instructor
- 2017, sem 2 **Teoría de Números (MAT 2225)**, Instructor
- 2017, sem 2 **Cálculo I (MAT 1100)**, Instructor
- 2016, sem 2 **Ecuaciones en Derivadas Parciales II (MPG 3131)**, graduate course, Instructor

### At the University of Arizona

- 2016, spring **Analysis of ODE (Math 355)**, Instructor
- 2015, fall **Calculus I (Math 125)**, Instructor
- 2015, spring **Nonlinear Dynamics and Chaos (Math 454)**, Instructor
- 2014, fall **Analysis of ODE (Math 355)**, Instructor
- 2014, spring **Nonlinear Dynamics and Chaos (Math 454)**, Instructor

- 2013, fall **Analysis of ODE (Math 355)**, Instructor
- 2013, spring **Analysis of ODE (Math 355)**, Instructor
- 2012, fall **Calculus I (Math 125)**, Instructor  
At MIT
- 2012, spring **Principles of Applied Mathematics (18.311)**, Teaching Assistant
- 2011, summer **Linear Algebra (18.06)**, Recitation Instructor for **OCW Scholar**
- 2011, spring **Real and Functional Analysis (18.125)**, Grader
- 2011, spring **Analytic Number Theory (18.785)**, graduate course, Grader
- 2011, winter **Directed Reading Program in Mathematics**, Mentor
- 2010, fall **Computational Science and Engineering I (18.085)**, graduate course, Teaching Assistant
- 2010, spring **Differential Equations (18.03)**, Recitation Instructor
- 2009, fall **Calculus (18.01A/02A)**, Recitation Instructor
- 2009, spring **Theory of Probability (18.175)**, graduate course, Grader
- 2008, fall **Differential Analysis I (18.155)**, graduate course, Grader

---

## Events Organization

- 2024 **Conference “Modern Methods in Nonlinear Elliptic and Parabolic PDE”**, Plovdiv, Bulgaria, May 27-31, Member of the organizing committee  
Obtained Simons Foundation funding for the conference from a project by ICMS-Sofia
- 2023–Present **Analysis and Geometry Seminar**, PUC de Chile, Co-organizer  
Was awarded a grant from the Vicerrectoría de Investigación UC to invite speakers from abroad in 2023
- 2019 **Spring School in Analysis and Mathematical Physics**, Santiago, Chile, October 14-22, Member of the organizing & scientific committees  
Obtained a CIMPA grant to cover the travel expenses of one mini-course lecturer
- 2019 **First UC-Bath Workshop on Nonlinear PDEs and Applications**, Santiago, Chile, September 10-13, Member of the organizing committee

---

## Service

- Referee for *Advances in Mathematics*, *Analysis & PDE*, *Bulletin of the London Mathematical Society*, *Duke Mathematical Journal*, *Journal d'Analyse Mathématique*, *Journal für die Reine und Angewandte Mathematik*, *Mathematische Annalen*, *Mathematische Nachrichten*, *Mathematische Zeitschrift*, *Nonlinear Differential Equations and Applications*, *Publicacions Matemàtiques*, *Taiwanese Journal of Mathematics*
- Grant reviews for ANID (Chile)
- 2023–Present Elected to the *Council of the Department of Mathematics*, PUC de Chile
  - 2023 Member of the MSc thesis defence committee of Cristian Figueroa (PUC de Chile)

- 2017-2019 Faculty Liaison to the Gauss Science Library, PUC de Chile
- 2019 Gave the outreach talk “*La armónica y singular visión de Elias Stein*” at the *Encuentro con Gauss*, Santiago, Chile, April 25
- 2018 Member of the Committee on self-evaluating the mathematics major at the Faculty of Mathematics, PUC de Chile
- 2016 Member of the Commission on updating the plan of development of the mathematics graduate programme at the Faculty of Mathematics, PUC de Chile
- 2015 Mentor at the Research Summer School of Mathematics and Informatics for high-school students (LISH’15), Blagoevgrad, Bulgaria

---

## Professional Memberships

American Mathematical Society (AMS)

Sociedad de Matemática de Chile (SOMACHI)