

Andres Zuniga

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Date of birth: Feb 3rd, 1988. Citizenship: Chilean.

Research Interests

Partial Differential Equations, Calculus of Variations, Nonlinear Analysis.

Topics: Functional inequalities and nonlinear diffusions, phase transition models, connecting orbits of systems of differential equations, least gradient problems, models of liquid crystals and superconductors.

Academic Experience

2018–today **FSMP-PSL Post-doctoral fellow**, CEREMADE (CNRS) Université Paris-Dauphine (IX), Paris, France. Supervisor: Jean Dolbeault.

Education

- 2014–2018 **Ph.D. in Mathematics**. Indiana University, Department of Mathematics, IN, USA.
Dissertation title: *Geometric Problems in the Calculus of Variations*.
Defended in May 2018. Advisor: Peter Sternberg.
- 2012–2014 **M.A. in Mathematics**. Indiana University, Department of Mathematics, IN, USA.
- 2006–2012 **Mathematical Engineering**, University of Chile, Department of Mathematical Engineering, Santiago, Chile.
Thesis title: *Construction of two-end solutions to the inhomogeneous Allen-Cahn equation in the plane*. Defended in July 2012. Advisor: Manuel del Pino.
- 2006–2011 **B.S. in Engineering**. University of Chile, Department of Mathematical Engineering, Santiago, Chile.

Publications

- 2019 *Prescribed energy connecting orbits for gradient systems*, with Francesca Alessio and Piero Montecchiari. To appear **Discrete Contin. Dyn. Syst. Series A**, vol. 39, no. 8, #26, hal-01990860 & arXiv:1901.06951 [math.DS].
- 2019 *Continuity of minimizers to weighted least gradient problems*, **Nonlinear Analysis**, vol. 178, pp. 86–109.
- 2016 *On the heteroclinic connection problem for multi-well gradient systems*, with Peter Sternberg. **J. Differential Equations**, vol. 261, no. 7, pp. 3987–4007.
- 2014 *A two-end family of solutions for the inhomogeneous Allen-Cahn equation in \mathbb{R}^2* , with Oscar Agudelo. **J. Differential Equations**, vol. 256, no. 1, pp. 157–205.

Collaborations in progress

- *Symmetry for a weighted logarithmic Hardy inequality: carré du champ method*, with Jean Dolbeault.
- *Symmetry breaking in interpolation inequalities: The porous medium case*, with Jean Dolbeault and Matteo Muratori.
- *Weighted porous medium diffusion equation: Sharp asymptotic rates of convergence by entropy methods*, with Jean Dolbeault and Matteo Muratori.
- *Bifurcation analysis characterization of the symmetry breaking in the Caffarelli-Kohn-Nirenberg inequalities*, with Josefine Evans.
- *On the stability of radial solutions of an anisotropic Ginzburg-Landau equation arising from the study of umbilical defects in nematic liquid crystals*, with Xavier Lamy.

Awards and Honors

- 2019 Recipient of Financial Support Program for young researchers to attend the *International Congress of Industrial and Applied Math.* in Valencia. Academic Committee of ICIAM.
- 2018-2019 FMSP-PSL postdoctoral fellowship. Fondation de Sciences Mathématiques de Paris, France.
- 2017 Hazel King Thompson thesis-support fellowship. Department of Mathematics, Indiana University.
- 2016 Glenn Schöber research-abroad fellowship. Department of Mathematics, Indiana University.
- 2016 David Rothrock teaching award. Department of Mathematics, Indiana University.
- 2012 Outstanding incoming international graduate student fellowship, Department of Mathematics, Indiana University
- 2012-2016 Becas-Chile doctoral fellowship for study abroad (Doctorado en el extranjero). CONICYT, Republic of Chile.
- 2010,2011 Outstanding Student Award in Mathematics. Department of Mathematical Engineering, University of Chile.
- 2010 Best Undergraduate Teaching Assistant Award. Department of Mathematical Engineering, University of Chile.
- 2006 to 2008 Outstanding Student Award in Engineering. School of Engineering, University of Chile.

Talks in International Conferences (past&future)

- July 2019 *Minisymposium: Least Gradient Problems and Optimal Transport*, 9th International Congress on Industrial and Applied Mathematics (ICIAM), Valencia, Spain.
- June 2019 *Workshop on New Trends in Variational Models: From Superconductors to Liquid Crystals*. Fields Institute, Toronto, ON, Canada.
- Feb 2019 Participant talk in *Winter School in Calculus of Variations and Probability*, Institute of Mathematics (CIMI), University of Toulouse III, Toulouse, France.
- Nov 2017 *Special Session on Geometric Analysis*, AMS Fall Western Sectional Meeting at University of California, Riverside, CA, USA.
- July 2016 *Poster Session in LMS-CMI Research School: Modern topics in Nonlinear PDEs and Geometric Analysis*, University of Reading, Reading, UK.

Talks in Local Meetings (past&future)

- Apr 2019 *Analysis and Probability Seminar*, Université Paris Dauphine, Paris, France.
- Oct 2017 *PDE Seminar*, Indiana University, Bloomington, IN, USA.
- Sept 2017 *Applied Math. Seminar*, Michigan State University, East Lansing, MI, USA.
- Nov 2016 *Graduate-Student PDE Seminar*, Indiana University, Bloomington, IN, USA.
- Oct 2016 *PDE Seminar*, Indiana University, Bloomington, IN, USA.
- Jul 2016 *PDE Seminar*, DIM-University of Chile, Santiago, Chile.

Expository Talks

A least gradient problem in \mathbb{R}^n with L^∞ -constraint. Graduate-Student PDE Seminar. Indiana University, Bloomington, IN. (2 sessions: Feb.-March, 2017).

Reduced boundary and regularity theory of Minimal Surfaces. Graduate-Student PDE Seminar. Indiana University, Bloomington, IN. (3 sessions: Oct.-Dec., 2016).

Selected Schools, Seminars and Events attended (past&future)

- March 2019 Meeting of working group in Shape Optimization (ANR SHAPO), Université Paris Diderot, Paris, France.
- Feb 2019 Winter School in Calculus of Variations and Probability, Centre International de Mathématiques et Informatique (CIMI), Toulouse, France.

- Dec 2018 PDEs at Valparaiso: a conference in honor of Patricio Felmer 60th birthday, Universidad Técnica Federico Santa María. Valparaíso, Chile.
- Fall 2018 *Seminar of Paris Work-group in Calculus of Variations* (GT CalVa), Paris, France.
Seminar in Analysis and Probability, Université Paris-Dauphine, Paris, France.
- Oct-Nov 2018 *Course in Entropy Methods for PDEs* (by Christian Schmeiser). Institute of Mathematics Henri Poincaré, Sorbonne Université, Paris, France.
- Nov 2018 *Conference in PDEs and Geometric Measure Theory*. ETH, Zurich, Switzerland.
- Jan 2018 *Workshop on Liquid Crystals, Soft-matter packing, and active systems*. IMA, Minneapolis, MN, USA.
- May 2017 *Summer School in Calculus of Variations and Nonlinear PDEs*. University of California, Berkeley, CA, USA.
- Apr 2017 *20th Rivière-Fabes symposium: Topics in elliptic and parabolic PDEs*. University of Minnesota, Minneapolis, MN, USA.
- Jul 2016 *Summer School in Modern topics in nonlinear analysis and PDEs*. University of Reading, Reading, UK.

Teaching experience

- *Department of Mathematics, Indiana University (IU)*.

Served as *Instructor* for the following courses:

- Finite Math M118 (Sum 2017)
- Mathematical Reasoning J110 (Sum 2015)
- ODE I M343 (Sum 2016)
- Pre-Algebra M014 (Fall 2015)
- Introd. Finite Math II D117 (Spr 2016)
- Pre-Calculus M025 (Spr 2014)

I also served as *Assistant Instructor* for the following courses of the PhD program:

- PDE M540 (Spr 2018)
- ODE M544 (Fall 2016, Fall 2017)
- Real Analysis I M413 (Spr 2018, Fall 2017)
- Analysis I M511 (Fall 2016)
- Theory of Probability II M564 (Spr 2017)

- *Department of Mathematical Engineering, University of Chile (DIM-UCH)*.

Served as *Teaching Assistant* for the following courses:

- Vector Calculus MA2002 (Fa 2012, Spr 2011)
- Calculus III MA2001 (Fa 2011, Fa 2010)
- ODE MA2601 (Fa 2012, Spr 2011, Fa 2011)
- PDE in Math. Physics MA4601 (Fa 2010)
- ODE in Banach Spaces MA4802 (Spr 2010)
- Linear Algebra MA1102 (Spr 2009)
- Differential Calculus in Banach Spaces MA4002 (Spr 2010)
- Abstract Algebra MA1101 (Fa 2009)
- Functional Analysis MA4801 (Fa 2010)
- Calculus I MA1001 (Fa 2009)
- Statistical Mechanics (Fa 2008)

Service

- Reviewing Referee for the *Indiana University Mathematics Journal (IUMJ)*.
- Chair Session Contributed papers session II, AMS sectional meeting at Indiana University (Apr 2016).
- Co-Organizer PDE - Analysis Seminar for graduate students at Indiana University (Fa 2016 - Spr 2017).
- Outreach Volunteer for Indiana University Science Fest (Oct 2014, Oct 2015), Volunteer for University of Chile Summer School Program: PreCalculus courses aim towards high-school students (Jan 2008 - Jan 2012).

Languages

- Programming \LaTeX , MATLAB, JAVA. Some experience with FORTRAN 90 and C++.
- Spanish:** *Mother tongue*, **English:** *Fluent*, **French:** *Beginner* (Conversational).