

Héctor Andrés Chang-Lara

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1 Academic Background and Appointments

1.1. Education

PhD in Mathematics, University of Texas at Austin, May 2013

Regularity for Solutions of Nonlocal Fully Nonlinear Parabolic Equations and Free Boundaries on Two Dimensional Cones.

Advisor: Luis Caffarelli

Master of Science, University of New Mexico, May 2008

Bachelor in Mathematics, Universidad Simón Bolívar, May 2007

1.2. Positions Held

Investigador Doutorado equiparado a Investigador Auxiliar (CEEC Individual 6ª Edição)

Centre for Mathematics of the University of Coimbra

Coimbra, June 2nd 2025 - present

Investigador Titular “B” (Associate Professor)

Área de Matemáticas Básicas del CIMAT

Guanajuato, Spring 2024 - present

Investigador Titular “A” con definitividad (Tenured Assistant Professor)

Área de Matemáticas Básicas del CIMAT

Guanajuato, Spring 2022 - Spring 2024

Investigador Titular “A” con vías a definitividad (Tenure-track Assistant Professor)

Área de Matemáticas Básicas del CIMAT

Guanajuato, Spring 2018 - Spring 2022

Ritt Assistant Professor

Columbia University, Fall 2013 - Fall 2017

Supervisor: Ovidiu Savin

1.3. Fellowships and Grants

Concurso Estímulo ao Emprego Científico Individual – 6.^a Edição
Fundação para a Ciência e a Tecnologia, Portugal, 2023

Sistema Nacional de Investigadores CONACyT

Investigador Nacional Nivel I, 2019 - 2021

Investigador Nacional Nivel I, 2021 - 2025

Proyectos de Ciencia Básica CONACyT (CB2017-2018)

Análisis y Aplicaciones de Problemas de Frontera Libre Mediante Ecuaciones Integro-diferenciales,
2020 - 2023

2 Publications

Peer-reviewed refereed articles: 16

Citations: 223 in 142 publications (MathSciNet), 398 ([Google Scholar](#))

MR Author ID: [1000439](#)

Unique Citing Authors: 182

1. Regularity Theory for Elliptic Equations

- a) H. A. Chang-Lara
Well-posedness for a Transmission Problem Connecting First and Second-order Operators.
ESAIM: Control, Optimisation and Calculus of Variations (2024).
- b) H. A. Chang-Lara, A. Saldaña
Classical Solutions to Integral Equations With Zero Order Kernels.
Mathematische Annalen (2023).
Citations: 5 (MathSciNet), 17 (Google Scholar)
- c) H. A. Chang-Lara, D. Kriventsov
Further Time Regularity for Non-Local, Fully Non-Linear Parabolic Equations.
Communications in Pure and Applied Mathematics 70 (2017), no. 5, 950-977.
Citations: 15 (MathSciNet), 25 (Google Scholar)
- d) H. A. Chang-Lara, G. Dávila.
 $C^{\sigma+\alpha}$ Estimates for Concave, Non-local Parabolic Equations with Critical Drift
J. Integral Equations Appl. 28 (2016), no. 3, 373-394.
Citations: 10 (MathSciNet), 13 (Google Scholar)
- e) H. A. Chang-Lara, G. Dávila.
Hölder Estimates for Non-local Parabolic Equations with Critical Drift
J. Differential Equations 260 (2016), no. 5, 4237-4284.
Citations: 24 (MathSciNet), 43 (Google Scholar)
- f) H. A. Chang-Lara, D. Kriventsov
Further Time Regularity for Fully Non-linear Parabolic Equations
Math. Res. Lett. 22 (2015), no. 6, 1749-1766.
Citations: 3 (MathSciNet), 5 (Google Scholar)

- g) H. A. Chang-Lara, G. Dávila.
[*Regularity for Solutions of Nonlocal Parabolic Equations II*](#)
 J. Differential Equations 256 (2014), no. 1, 130-156.
 Citations: 34 (MathSciNet), 49 (Google Scholar)
- h) H. A. Chang-Lara, G. Dávila.
[*Regularity for Solutions of Non Local Parabolic Equations*](#)
 Calculus of Variations and Partial Differential Equations 49 (2014), no. 1-2, 139-172.
 Citations: 69 (MathSciNet), 109 (Google Scholar)
- i) H. A. Chang-Lara, G. Dávila.
[*Regularity for Solutions of Non Local, Non Symmetric Equations*](#)
 Ann. Inst. H. Poincaré C Anal. Non Linéaire, 29 (2012) no. 6, pp. 833-859.
 Citations: 32 (MathSciNet), 56 (Google Scholar)

2. Analysis of Free Boundary Problems

- a) H. A. Chang-Lara, M. Santos
[*Hölder Regularity for Non-variational Porous Media Type Equations*](#)
 J. Differential Equations 360 (2023), 347372.
 Citations: 1 (MathSciNet), 3 (Google Scholar)
- b) H. A. Chang-Lara, E. Pimentel
[*Non-convex Hamilton-Jacobi Equations with Gradient Constraints*](#)
 Nonlinear Anal. 210 - Special Issue: Free Boundary Problems (2021), 112362, 17 pp.
 Citations: 2 (MathSciNet), 3 (Google Scholar)
- c) H. A. Chang-Lara, O. Savin
[*Boundary Regularity for the Free Boundary in the One-phase Problem*](#)
 New Developments in the Analysis of Nonlocal Operators in Contemporary Mathematics
 Proceedings of the Special Session, 723. Amer. Math. Soc. (2019), 149-165.
 Citations: 11 (MathSciNet), 24 (Google Scholar)
- d) H. A. Chang-Lara, N. Guillen, R. Schwab
[*Some Free Boundary Problems Recast as Nonlocal Parabolic Equations*](#)
 Nonlinear Anal. 189 (2019), 11538, 60 pp.
 Citations: 11 (MathSciNet), 18 (Google Scholar)
- e) M. Allen, H. A. Chang-Lara
[*Free Boundaries on Two Dimensional Cones*](#)
 Journal of Geometric Analysis (2015), no. 3, 1547-1575.
 Citations: 4 (MathSciNet), 10 (Google Scholar)

3. Analysis of Stochastic Models

- a) F. Baccelli, H. A. Chang-Lara, S. Foss
[*Shape Theorems for Poisson Hail on a Bivariate Ground*](#)
 Adv. in Appl. Probab. 48 (2016), no. 2, 525-543.
 Citations: 2 (MathSciNet), 4 (Google Scholar)

2.1. Surveys and Scientific Outreach

1. H. A. Chang-Lara
A Perspective on the Regularity Theory of Degenerate Elliptic Equations
Notices of the AMS. 70 (2023), no. 10, 1604-1614.
Citations: 1 (Google Scholar)
2. H. A. Chang-Lara
El Problema del Barrendero.
Revista Mixba'al. 14 (2023), no. 1, 7-25.

2.2. Accepted Papers

1. H. A. Chang-Lara
A Visual Approach to the Regularity Theory for Fully Nonlinear Elliptic Equations.
Chapter in Modern Methods in the Analysis of Free Boundary Problems.
Coimbra Mathematical Texts, Springer.

2.3. Submitted Papers

1. H. A. Chang-Lara, S. D. Zapeta-Tzul
A Dynamic Model of Congestion.
2. H. A. Chang-Lara, J. C. Fernandez Morelos, A. Saldaña
Fractional Q -curvature on the Sphere and Optimal Partitions.

3 Invited Talks

1. 2025

- a) Analysis and PDE in MT
Montana State University in Bozeman, May 14–17
Cancelled.
- b) Mathematical Congress of the Americas
Session 20: Advances in Nonlinear PDEs, Analysis and Geometry
Miami, July 21-25
Cancelled.
- c) Conferencia Satélite ICMAM en Análisis y EDP para Centroamérica y El Caribe
El Salvador, July 14-18
- d) Workshop on Nonlinear PDEs at Juriquilla
Mexico, August 6-8

2. 2024

- a) *The Non-convex Gradient Constrained Problem*
Modern Methods in Nonlinear Elliptic and Parabolic PDE.
International Center for Mathematical Sciences-Sofia. Bulgaria, May 2024.
- b) *A Dynamic Model of Congestion*
Optimal Transport and Dynamic Workshop
Casa Matemática Oaxaca, August 2024.
- c) *The Non-convex Gradient Constrained Problem*
Geometry of Measures and Free Boundaries; a Conference in Honor of Tatiana Toro.
Seattle, July 2024.
- d) *The Non-convex Gradient Constrained Problem*
Workshop in Nonlinear PDE.
IMPA. Rio de Janeiro, August 2024.
- e) *Well-posedness for a Transmission Problem Connecting First and Second-order Operators*
Recent trends on nonlinear PDEs.
Congreso Latinoamericano de Matemáticos. João Pessoa, Brasil, August 2024.
- f) *Un Modelo Dinámico de Congestión*
Resultados Recientes en Ecuaciones Diferenciales Parciales No Lineales
Congreso de la Sociedad Matemática Mexicana, Durango, Octubre 2024.
- g) *Mecanismos de Regularidad para Soluciones de Ecuaciones en Derivadas Parciales*
Sesión de Análisis
Congreso de la Sociedad Matemática Mexicana, Durango, Octubre 2024.

3. 2023

- a) *Well-posedness for a Transmission Problem Connecting First and Second-order Operators*
Reunión anual SIAM Sección México.
ITAM, Mexico 2023.
- b) *A Transmission Problem for First and Second Order Operators*
ICMC's Summer Meeting on Differential Equations and
13th Americas Conference on Differential Equations and Nonlinear Analysis.
Sao Carlos, Brazil, February 2023.

4. 2022

- a) *Introducción a las Soluciones Viscosas: Browniano vs. eikonal.*
Cibercoloquio Latinoamericano de Matemáticas. February 2022.
- b) *A Non-variational Approach for the Porous Medium Equation.*
SIAM Conference on Analysis of PDE. Berlin, March 2022.
- c) *Browniano vs. Eikonal.*
13th Minimeeting on Differential Geometry. September 2022.

5. 2021

- a) *A Non-variational Approach for the Porous Medium Equation*
Congreso Latinoamericano de Matemáticos, Montevideo, September 2021.
- b) *Obstacle Type Problems with Gradient Constraints*
Mathematical Congress of the Americas. Buenos Aires, July 2021.
- c) *Non-convex Hamilton-Jacobi Equations with Gradient Constraints*
VIII Congreso de Matemática Aplicada, Computacional e Industrial.
Buenos Aires, May 2021.

6. 2020

- a) *Eikonal vs. Brownian*
Rio de Janeiro Webinars on Analysis of PDE, November 2020.

7. 2019

- a) *Boundary Regularity for the Free Boundary in the One-phase Problem*
Swedish Summer PDEs. Stockholm, August 2019.
- b) *Regularidad en el Borde de la Frontera Libre en el Problema de una Fase*
VII Taller de Geometría y Sistemas Dinámicos. Hermosillo, April 2019.
- c) *Some Free Boundary Problems Recast as Nonlocal Parabolic Equations*
AMS Sectional Meeting, Interactions between Geometric Measure Theory, PDE, and Harmonic Analysis. University of Hawaii, March 2019.

8. 2018

- a) *Regularidad en el Borde de la Frontera Libre en el Problema de una Fase*
51 Congreso Nacional de la Sociedad Matemática Mexicana. Villahermosa, October 2018.
- b) *Further Time Regularity for Parabolic Equations*
BUC-XV: Function spaces meet materials science: recent developments in spectral theory and scattering. CIMAT-Guanajuato, September 2018.
- c) *From the Free Boundary Condition for Hele-Shaw to the Fractional Parabolic Equation*
AMS Sectional Meeting, Analysis at the intersection of Geometric Measure Theory and Partial Differential Equations. Portland, April 2018.

9. 2011-2017

- a) Rocky Mountain Partial Differential Equations
Provo, May 2017.
- b) AMS Sectional Meeting, Qualitative and Quantitative Properties of Solutions to PDE.
New York, May 2017.
- c) AMS Fall Central Sectional Meeting.
Minnesota, October 2016.
- d) 11th AIMS Conference on Dynamical Systems Differential Equations and Applications.
Orlando, July 2016.
- e) 3rd Conference on Nonlocal Operators and Partial Differential Equations.
Poland, June 2016.

- f)* Math Finance and Partial Differential Equations Conference.
Rutgers University, November 2013.
 - g)* 9th AIMS Conference on Dynamical Systems Differential Equations and Applications.
Orlando, July 2012.
 - h)* SIAM Conference on Analysis of Partial Differential Equations (PD11).
San Diego, November 2011.
10. **Seminar talks:** University of Texas in Austin, Columbia University, Princeton University, Massachusetts Institute of Technology, University of California Los Angeles, University of Washington, University of Pennsylvania, Rutgers University, McGill University, Purdue University, University of New Mexico, Michigan State University, Brigham Young University, UNAM (Mexico), Universidad de los Andes (Colombia), Universidad Nacional (Medellín, Colombia).

4 Mentorship

4.1. Post-doctoral Supervision

1. [Makson Santos](#)
Published paper: *Hölder Regularity for Non-variational Porous Media Type Equations*
CIMAT. Guanajuato, 2020-2021
Currently a researcher at the Center for Mathematical Studies at the University of Lisbon.

4.2. Doctorate students

1. Gabriel Gomes Figueiredo
Co-directed with Jimmy Petean (CIMAT)
Research on the fractional Yamabe problem.

4.3. Master Students

1. [Sergio Zapeta Tzul](#)
Congestion Games in Graphs
CIMAT. Guanajuato, 2023
Currently pursuing a Ph.D. at the University of Minnesota under the direction of Max Engelstein and Jeff Calder.
2. Emanuel Rivera
 L^1 Optimal Transport Theory and Minimal Flow Problems
CIMAT. Guanajuato, 2021
3. Diego Castro
Schwarz Method and Balayage
CIMAT. Guanajuato, 2021
Currently pursuing a Ph.D. at the Universidad Tecnológica de Pereira (Colombia) under the direction of Fernando Andrés Gallego.

4.4. Summer Project Mentorship

1. Iancarlo Ariel Espinoza - DEMAT, UG
Based on: Alan Turing, the Chemical Basis of Morphogenesis.
XXX Verano de la investigación Científica de la Academia Mexicana de Ciencias, 2020.
2. Leslie Quincosa - DEMAT, UG
Control óptimo aplicado a modelos epidemiológicos.
Estancias de Investigación de Verano, CIMAT 2021.
3. Karlo Jair Guevara - DEMAT, UG
Control óptimo aplicado a modelos epidemiológicos.
Estancias de Investigación de Verano, CIMAT 2021.
4. Kapioma Villarreal - DEMAT, UG
Divisible Sandpiles.
Estancias de Investigación de Verano, CIMAT 2021.
5. Enrique Galicia Pineda - UNAM
Modelación y análisis de pilas de arena.
Estancias de Investigación de Verano, CIMAT 2021.
6. Josué Juárez - U. Veracruzana
(Colaboration with Jesús Núñez Zimbrón, CIMAT-Gto)
Flujos gradientes y la Ecuación de Fokker-Planck
Estancias de Investigación de Verano, CIMAT 2021.
7. Alberto Isaac Estrella - UNAM
Introducción a las soluciones viscosas
Estancias de Investigación de Verano, CIMAT 2022.
8. Jesús Emmanuel Román Acosta - FCFM-UANL
Introducción al estudio de ecuaciones diferenciales parciales elípticas
Estancias de Investigación de Verano, CIMAT 2022.

5 Teaching

1. *CIMAT/DEMAT (2018-present)*: [Multivariable Calculus](#), [Ordinary Differential Equations](#), [Partial Differential Equations](#), [Measure Theory](#), [Partial Differential Equations](#), [Classical Mechanics](#), [Analytical Modeling](#), [Hamilton-Jacobi Theory](#), [Analytic Geometry \(highschool\)](#).
2. *Columbia University (2013-2017)*: Single and Multivariable Calculus, Ordinary Differential Equations, Linear Algebra, Real Analysis.
3. **Workshops:**
 - a) [Problemas de Control Óptimo](#)
XI Summer School. Universidade Federal de Sergipe 2022.
 - b) [Ecuaciones Diferenciales Parciales Elípticas](#)
EMALCA. Universidad Juárez Autónoma de Tabasco 2021

- c) *Elliptic Regularity for some Degenerate Equations*
Learning seminar, CMUC. Coimbra, 16 de julio del 2021
- d) *Problemas de Control Óptimo*
Escuela de Verano del CIMAT-Guanajuato 2021.
- e) *Introducción al Cálculo de Variaciones*
XVI Taller de Soluciones de Problemas de Cálculo.
CIMAT-Guanajuato 2019
- f) *Redes Eléctricas*
Taller de Ciencia para Jóvenes.
CIMAT-Guanajuato 2019.
- g) *Introducción a la Teoría Potencial*
Escuela de Verano
CIMAT-Guanajuato 2019.

6 Professional Service

6.1. Organization of Events

1. *Potential Theory Workshop:*
Intersections in Harmonic Analysis, Partial Differential Equations and Probability
CIMAT Guanajuato, September 28th to October 6th 2023.
2. *Taller de Ecuaciones Diferenciales y Cálculo de Variaciones*
Special Guest: Connor Mooney (UC Irvine)
CIMAT Guanajuato, May 2019.
3. *Elliptic Equations Session*
V Encuentro Conjunto de la Real Sociedad Matemática Española y la Sociedad Matemática Mexicana.
CIMAT Guanajuato, June 2021.
4. *Differential Equations Session*
Congreso Nacional Virtual de la Sociedad Matemática Mexicana.
Sociedad Matemática Mexicana, October 2020.
5. *Variational Methods and Elliptic PDEs Session*
12th Americas Conference on Differential Equations and Nonlinear Analysis.
CIMAT Guanajuato, December 2019.
6. *Modelos Multiescalas: Teoría y Aplicaciones*
Special Guests: Christina Frederick (NJIT), Jessica Lin (McGill).
CIMAT Guanajuato, December 2018

6.2. Committees

1. *CIMAT-DEMAT Colloquium*
CIMAT Guanajuato, 2022-2024.
2. *Academic Committee Member for the Applied Mathematics Masters Program:*
CIMAT Guanajuato, 2021-present.
3. *Organizer Partial Differential Equations Seminar.*
CIMAT Guanajuato, Fall 2018
CIMAT Guanajuato, Fall 2020 (joint with IMUNAM-Mexico City).
4. *Examining committee:* Connor Mooney (Columbia 2015), Claudia Acosta Díaz (CIMAT 2018), Jurgén Alfredo Julio Batalla (CIMAT 2019), José Hermenegildo Ramírez (CIMAT), Santiago Arenas (CIMAT), Camilo González (CIMAT), Pedro Salazar (CIMAT), Arturo Arellano (CIMAT 2020 (undergraduate) and 2021 (MS)).
5. *Analysis and Differential Equations Qualifying Exam Committee*
CIMAT Guanajuato, 2018 - present.

6.3. Reviewer

1. Reviewer of two projects for the *Ciencia Básica y de Frontera* call for proposals.
SECIHTI 2025.
2. Evaluator of two projects in the *Ciencia Básica y de Frontera* grants.
CONAHCyT 2023-present.
3. Reviewer for a project in the *Proyectos Fondecyt de Iniciación en Investigación* call for proposals.
FONDECYT, Chile.
4. Reviewer for *Estancias postdoctorales en el extranjero 2019*.
CONACyT, Mexico.
5. Reviewer for *Ciencia de Frontera 2019*.
CONACyT, Mexico.
6. *Peer-reviewer:* Inventiones Mathematicae, Archive for Rational Mechanics and Analysis, Journal of Differential Equations, Journal of Functional Analysis, Analysis & PDE, Calculus of Variations and PDEs, International Mathematical Research Notices, Nonlinear Analysis, Potential Theory and Applications, SIAM Journal on Mathematical Analysis, AMS Mathematical Reviews, Memorias de la Sociedad Matemática Mexicana.

6.4. Examination Jury

1. Ph.D. theses:

- a) Pedro Ulises Salazar Sánchez
Risk sensitive LQG Discounted control problems and their asymptotic behavior.
CIMAT, Guanajuato, January 2024
- b) Carlos Rubén Gutierrez Arias
El problema inverso para la ecuación de Burgers.
CIMAT, Guanajuato, December 2023
- c) Sahid Bernabé Catalán
Bifurcación local en ecuaciones tipo Yamabe.
CIMAT, Guanajuato, November 2023
- d) [Lauro Morales Montesinos](#)
Estructuras minimizantes para la energía elástica en transiciones de fase bajo el régimen de teoría geométrica lineal en película delgada.
UNAM, Ciudad de México, February 2022.
- e) [Jurgen Alfredo Julio Batalla](#)
Topological and Geometric Aspects of Yamabe-Type Equations.
CIMAT, Guanajuato, June 2019.
- f) [Connor R. Mooney](#)
Singular Solutions to the Monge-Ampère Equation.
Columbia University, New York, April 2015

2. Master theses:

- a) Cipriano Callejas Hernandez
Numerical constrained controllability of the heat equation.
CIMAT, Guanajuato, June 2024
- b) Gabriel Gomes Figueiredo
Unicidade de soluções L^p fortes.
Pontifícia Universidade Católica do Rio de Janeiro, August 2023
- c) Emmanuel Antonio Cuevas
Métodos aproximados para persecución-evasión.
CIMAT, Guanajuato, May 2023
- d) Arturo Arellano Arias
Percolación, el modelos de Ising y las ecuaciones de evolución de Schramm-Loewner.
CIMAT, Guanajuato, September 2021
- e) Claudia Acosta Díaz
Métodos Numéricos para Ecuaciones Parabólicas Degeneradas con Flujo Advectivo Discontinuo.
CIMAT, Guanajuato, June 2018.

7 Outreach

1. Trainer of CIMAT's PUTNAM student team 2024.
2. *Venezuela Team Leader at the XXXV Iberoamerican Mathematical Olympiad* Costa Rica (online), October 2021.
3. *Venezuela Team Leader at the XXXIV Iberoamerican Mathematical Olympiad* Peru (online), November 2020.
4. *Observer for Venezuela at the 61th International Mathematical Olympiad* St. Petersburg (online), September 2020.
5. *Venezuela Team Leader at the XXXIV Iberoamerican Mathematical Olympiad* Guanajuato. September 2019.