Cristóbal Villalobos Guillén
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EDUCATION

Vanderbilt University — Nashville, TN, USA
Ph.D. in Mathematics — May 2019
Dissertation: *A Measure Theoretical approach to Geomagnetical Inverse Problems*

Universidad Autónoma de San Luis Potosí — San Luis Potosí, SLP, México
Bachelor's in mathematics — 2012
Thesis: *Algebras de Lie Reductivas sobre campos de característica cero (Reductive Lie Algebras over fields of characteristic zero.)*

RESEARCH EXPERIENCE

Universität Wien — March 2024 – Present
Postdoctoral position under the supervision of P. Elbau.

Centre Inria d'Université Côte d'Azur — December 2021 – November 2023
Postdoctoral position under the supervision of L. Baratchart.

CMAP École Polytechnique — October 2020 – November 2021
Postdoctoral position under the supervision of H. Haddar and with funding from the postdoctoral fellowship "Labex Mathématiques Hadamard" in Mathematics in Computational Science and Engineering.

Vanderbilt University — August 2014 – May 2019
Dissertation directed by D. P. Hardin.
Worked as part of the Impinge "Associate Inria team".
This was a collaboration between Vanderbilt University, the department of Earth, Atmospheric and Planetary Sciences of the MIT, and the research group FACTAS (formerly APICS) from the inria Inria center at Sophia Antipolis.

Universidad Autónoma de San Luis Potosí
- Thesis under the supervision of G. Salgado González. — August 2010 – March 2012
- Summer research for G. Salazar Anaya together with M. Cetina. — Summer 2008

REFERENCES

Peter Elbau (Austria)	peter.elbau@univie.ac.at	+43 1 4277 55774
Houssem Haddar, Inria (France)	houssem.haddar@inria.fr	+33 181 872 110
Laurent Baratchart, Inria (France)	laurent.baratchart@inria.fr	+33 492 387 874
Juliette Leblond, Inria (France)	juliette.leblond@inria.fr	+33 492 387 858
Douglas P. Hardin, Vanderbilt (USA)	doug.hardin@vanderbilt.edu	+1 615 322 6662
Eduardo Andrade Lima, MIT (USA)	limaea@mit.edu	+1 617 324 2829

MANUSCRIPTS

- L. Baratchart, D. P. Hardin, **C. Villalobos Guillén**, Notes on the discretization of TV-NORM regularized inverse potential problems
- L. Baratchart, D. P. Hardin, **C. Villalobos Guillén,** Uniqueness result for TV-norm regularized inverse problems with source term in divergence form.

PUBLICATIONS

- L. Baratchart, H. Haddar, **C. Villalobos Guillén**, *Silent surface sources for the Helmholtz equation and decomposition of L^2 vector fields.* SIAM Journal on Mathematical Analysis, 57, 682-713 (2025) DOI 10.1137/23M1626578
- L. Baratchart, **C. Villalobos Guillén**, D. P. Hardin, *Inverse potential problems in divergence form for measures in the plane.* ESAIM: COCV, 27 (2021) 87 DOI 10.1051/cocv/2021082
- Baratchart, L., **Villalobos Guillén, C.**, Hardin, D.P. et al. *Inverse Potential Problems for Divergence of Measures with Total Variation Regularization.* Found Comput Math 20, 1273–1307 (2020). DOI 10.1007/s10208-019-09443-x
- Laurent Baratchart, **Cristobal Villalobos-Guillen**, Douglas Hardin, Juliette Leblond and Edward Saff, *Sparse recovery for inverse potential problems in divergence form*, J. Phys.: Conf. Ser. 1476 012009 (2020) DOI 10.1088/1742-6596/1476/1/012009
- G. SALGADO, **C. Villalobos-Guillen**, *Algebras de Lie reductivas y semisimples; nuevas caracterizaciones, Aportaciones (Reductive and semisimple Lie Algebras, new characterizations)* Mat. Comun. 52, 3-12, (2017)
- M. Cetina, C. Hernández-Vélez, J. Leaños, **C. Villalobos**, *Point sets that minimize (≤k)-edges, 3-decomposable drawings, and the rectilinear crossing number of K_{30}*, Discrete Mathematics, 311, 16, 1646-1657 (2011) DOI 10.1016/j.disc.2011.03.030

PRESENTATIONS

- **A Gauss-Green formula approach for refractive index recovery from OCT**
  SFB Conference "Tomography Across the Scales", June 2025
- **Looking for cancer with lasers**
  Queer in Math Day 2025, June 2025
- **Uniqueness for TV-Norm Regularized Inverse Problems with Source Term in Divergence Form**
  37th Shanks Lecture, May 2025
- **Towards the general forward operator for the OCT problem**
  17th Internal SFB Meeting – SFB Project "Tomography Across the Scales", December 2024
- **Basis of Optical Coherence Tomography (OCT) for tissue diagnosis**
  FACTAS days 2024, October 2024
- **Different numerical approaches for the Magnetization Inverse Problem**
  - John Hopkins, AMS Postdoc Seminar, September 2024
  - 16th Internal SFB Meeting – SFB Project "Tomography Across the Scales", July 2024
  - Winter-School in Arpino, SOUND AND FURY OF MODELING, November 2023
  - "Les journées du GdR AFHP 2023 – Porquerolles", October 2023
- **Inverse problem for the Helmholtz equation and singular sources in the divergence form**
  2022 WAVES conference, July 2022
- **Some measure-theoretic aspects of planar magnetization reconstruction**
  10th International Conference Inverse Problems: Modeling and Simulation, May 2022
- **Inverse Problem for Singular Sources in the Divergence Form**
  2022 SIAM Conference on Imaging Science, March 2022
- **"El número de cruce rectilíneo y pseudolineal de K_{30} es 9726"** (The lineal and pseudo-lineal crossing number of K_{30} is 9726)
  XLI National Congress of the Mexican Mathematical Society (SMM), October 2008

POSTERS

- The Magnetization Inverse Problem on 2-D sources, at the Conference: 30 ans de mathématiques pour l'imagerie optique.
  Marseille, France from the 25th to the 27th of September 2023

SUMMER SCHOOLS

- Winter-School in Arpino, SOUND AND FURY OF MODELING
  Arpino, Italy from the 13th to the 17th of November 2023
- Scientific Machine Learning
  CIRM, Marseille, France from the 17th to the 21st of July 2023
- Deep Learning: a hands-on introduction and Computer Vision Crash Course
  Genoa, Italy, from the 12th to the 20th of July 2022
- "Escuela Matemática de América Latina y el Caribe 2010"
  (Mathematical School of Latin Amerca and the Caribbean)
  Villahermosa, México, from the 2nd to the 13th of August 2010.

OTHER EXPERIENCE

Technical proofreader January 2019 – March 2019

Department of Mathematics, Vanderbilt University

Proofread preliminary versions of the book: Borodachov, S. V., Hardin, D. P., and Saff, E. B. (2019). Discrete energy on rectifiable sets. New York, NY: Springer.

Teaching assistant August 2013 – December 2018

Department of Mathematics, Vanderbilt University

- Directed weekly lab on the 2017 Fall term on the basis of Data science with R
- Graded homework and exams
- Directed discussion sessions
- Held office hours to tutored students

Problem Judge of the 25th Mexican Mathematical Olympics (OMM) 13th – 19th of November of 2011

San Luis Potosí, México

This is a contest between highschool and middleschool students where they solve proof-based mathematical problems.