Dario Corona, PhD

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17 papers in math journals · Seal of Excellence **93.8**/100 · **25+** talks in **6** countries · **2** patents

Research Statement

I work in nonlinear analysis and the calculus of variations, with a strong geometric flavour. The common thread of my research is the use of *topological and variational methods* — Lusternik–Schnirelmann category, relative category, Morse theory — to prove existence and, above all, *multiplicity* of solutions to nonlinear problems arising in geometry and mathematical physics. My work is organised along three lines.

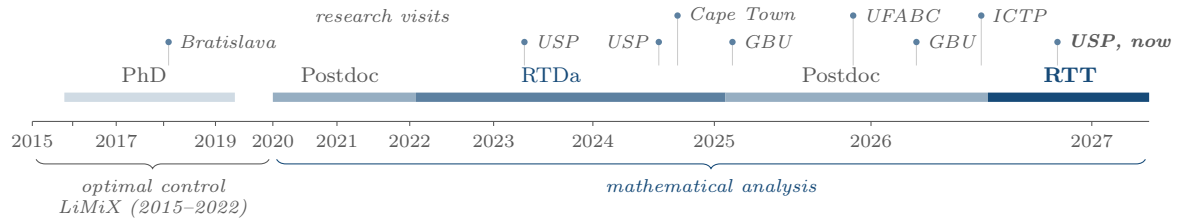
Phase transitions and diffuse interfaces on manifolds. This is the core of my current research. With the geometric analysis groups in São Paulo, I study the mass-constrained Allen–Cahn equation, Allen–Cahn systems and the Gross–Pitaevskii equation on compact Riemannian manifolds, with and without boundary, and obtain lower bounds on the number of solutions in terms of the topology of the manifold [23, 28, 30, 31]. My MSCA project *Diffuse Interfaces in Manifolds and Metric Spaces* (DIMMS), awarded the Seal of Excellence in 2026, develops this programme further, towards non-smooth ambient spaces.

Hamiltonian systems, Finsler geometry and Lagrangian dynamics. I proved multiplicity results for brake orbits and for orthogonal geodesic chords, by reducing them to geodesic problems in Finsler manifolds with boundary and using relative category [14–16, 18, 20]; I built variational settings for Lagrangians that are indefinite or have an affine Noether charge [19, 24], and studied the regularity of Riemannian splines [27].

Dynamical systems and variational models. I introduced, with A. Della Corte, the *critical exponent functions* of interval maps and used them to study mixing properties [17, 22, 29]; I also worked on a non-autonomous variational model for nonlinear Timoshenko beams [21] and on problems in mathematical relativity [25, 26].

Before moving to analysis, I worked on optimal control theory and its applications, the subject of my PhD (see the end of the publication list). This background, together with my experience in technology transfer, gives me a taste for problems that come from applications.

Career at a Glance



Academic Positions

2026 – **Tenure-Track Researcher (RTT)**. University of Camerino, Italy
Project: "Variational methods and geometric analysis for nonlinear problems and technological applications"

2025 – 2026 **Postdoctoral Researcher**. University of Camerino, Italy — Advisor: Prof. Roberto Giambò

2022 – 2025 **Research Assistant Professor – RTDa**. University of Camerino, Italy — Advisor: Prof. Fabio Giannoni

2020 – 2022 **Postdoctoral Researcher**. University of Camerino, Italy — Advisor: Prof. Maria Letizia Corradini

Education

2019 **PhD in Mathematics**. University of Camerino, Italy — Advisors: Prof. M. L. Corradini and Prof. R. Giambò
Thesis: "Decomposition of Optimal Tracking Controllers for Weakly Dual Redundant Systems"

2015, 2012 **Master's and Bachelor's Degrees in Mathematics and Applications**. University of Camerino, Italy — both 110/110 *summa cum laude*; INdAM national scholarship for bachelor students (2009–2012).

Grants, Fellowships and Distinctions

2026 **MSCA Postdoctoral Fellowship – Seal of Excellence**. Horizon Europe. Project "Diffuse Interfaces in Manifolds and Metric Spaces" (DIMMS)
Score: 93.8/100 – Host institution: University of Pisa

2026 **MSCA Seal of Excellence@UNIPI 2026**. Awarded a two-year research contract (plus €10,000 research budget) for DIMMS at the University of Pisa. Declined, as already holding a tenure-track position.

2026 **ICTP–INdAM Research in Pairs**. Participant, with E. H. Taha and E. Caponio, in a research stay at ICTP Trieste.

2024 **INdAM Scholarship for Research Abroad**. Universidade de São Paulo.

2024 **Principal Investigator – GNAMPA Visiting Professors Programme**. Project hosting Prof. S. Nardulli (UFABC) at UNICAM.

2022 – 2023 **Principal Investigator – GNAMPA Project**. *"Metodi variazionali per Lagrangiane con bassa regolarità e Lagrangiane indefinite"*, funded by INdAM–GNAMPA. Participants: E. Caponio, F. Giannoni, R. Giambò, A. Masiello.

2022 **Kovalevskaya Grant, UMI – INdAM**. For the International Congress of Mathematicians.

2023 – **Member of FAPESP research projects (Brazil)**. 2022/16097-2 *"Modern Methods in Differential Geometry and Geometric Analysis"* (PI P. Piccione, USP); 2021/05256-0 *"Geometric Variational Problems"* (PI S. Nardulli, UFABC); SPRINT 23/08246-0, USP–UNICAM partnership on the Allen–Cahn equation.

Publications in Mathematics

Numbered as in my complete CV, most recent first; the research lines above refer to these numbers.

31 · D. Corona, S. Nardulli, R. Oliver-Bonafoux, G. Orlandi, "Multiplicity of solutions for Gross–Pitaevskii equations on Riemannian manifolds", *Preprint*, (2025), arXiv:2511.21349

30 · J. H. Andrade, D. Corona, S. Nardulli, P. Piccione, R. Ponciano, "From bubbles to clusters: Multiple solutions to the Allen–Cahn system", *Journal of Differential Equations*, vol. 464, art. 114189, (2026), doi:10.1016/j.jde.2026.114189

29 · D. Corona, A. Della Corte, M. Farotti, "Dynamical properties of critical exponent functions", *Palestine Journal of Mathematics*, (2025), pjm.ppu.edu/paper/2266

28 · D. Corona, S. Nardulli, R. Oliver-Bonafoux, G. Orlandi, P. Piccione, "Multiplicity results for mass constrained Allen–Cahn equations on Riemannian manifolds with boundary", *Mathematische Annalen*, vol. 392, pp. 3479–3524, (2025), doi:10.1007/s00208-025-03178-7

27 · D. Corona, R. Giambò, P. Piccione, "A note on the regularity and the existence of Riemannian splines", *Mathematics of Control, Signals, and Systems*, vol. 37, pp. 661–695, (2025), doi:10.1007/s00498-025-00414-y

26 · D. Corona, R. Giambò, "Global Models of Collapsing Scalar Field: Endstate", *Symmetry*, vol. 16, art. 583, (2024), doi:10.3390/sym16050583

25 · D. Corona, R. Giambò, O. Luongo, "Motion of test particles in quasi anti-de Sitter regular black holes", *International Journal of Geometric Methods in Modern Physics*, vol. 21, art. 2440019, (2024), doi:10.1142/S021988782440019X

24 · E. Caponio, D. Corona, R. Giambò, P. Piccione, "Fixed energy solutions to the Euler–Lagrange equations of an indefinite Lagrangian with affine Noether charge", *Annali di Matematica Pura e Applicata*, vol. 203, pp. 1819–1850, (2024), doi:10.1007/s10231-024-01424-4

23 · V. Benci, D. Corona, S. Nardulli, L. E. Osorio Acevedo, P. Piccione, "Corrigendum to: Lusternik–Schnirelman and Morse Theory for the Van der Waals–Cahn–Hilliard equation with volume constraint", *Nonlinear Analysis*, vol. 238, art. 113389, (2024), doi:10.1016/j.na.2023.113389

22 · D. Corona, A. Della Corte, "Mixing properties of erasing interval maps", *Ergodic Theory and Dynamical Systems*, vol. 44, pp. 408–431, (2024), doi:10.1017/etds.2023.16

21 · D. Corona, A. Della Corte, F. Giannoni, "A non-autonomous variational problem describing a nonlinear Timoshenko beam", *SIAM Journal on Mathematical Analysis*, vol. 55, pp. 4664–4694, (2023), doi:10.1137/22M1493653

20 · D. Corona, R. Giambò, F. Giannoni, P. Piccione, "On the relative category in the brake orbits problem", *Topological Methods in Nonlinear Analysis*, (2023), doi:10.12775/TMNA.2022.057

19 · E. Caponio, D. Corona, "A variational setting for an indefinite Lagrangian with an affine Noether charge", *Calculus of Variations and Partial Differential Equations*, vol. 62, art. 39, (2023), doi:10.1007/s00526-022-02379-1

18 · D. Corona, F. Giannoni, "Brake orbits for Hamiltonian systems of classical type via Finsler geodesics", *Advances in Nonlinear Analysis*, vol. 11, pp. 1223–1248, (2022), doi:10.1515/anona-2022-0222

17 · D. Corona, A. Della Corte, "The critical exponent functions", *Comptes Rendus Mathématique*, vol. 360, pp. 315–332, (2022), doi:10.5802/crmath.286

16 · D. Corona, "A multiplicity result for orthogonal geodesic chords in Finsler disks", *Discrete and Continuous Dynamical Systems*, vol. 41, pp. 5329–5357, (2021), doi:10.3934/dcds.2021079

15 · D. Corona, "A multiplicity result for Euler–Lagrange orbits satisfying the conormal boundary conditions", *Journal of Fixed Point Theory and Applications*, vol. 22, art. 60, (2020), doi:10.1007/s11784-020-00795-4

14 · D. Corona, F. Giannoni, "A New Approach for Euler–Lagrange Orbits on Compact Manifolds with Boundary", *Symmetry*, vol. 12, art. 1917, (2020), doi:10.3390/sym12111917

Earlier work in control theory and applications (nos. 1–13)

Five journal papers and eight conference papers (2016–2023) on optimal output regulation, tracking control of redundant systems, wind-turbine control and gesture recognition, in *Optimal Control Applications and Methods*, *Journal of the Franklin Institute*, *ISA Transactions*, *SN Computer Science*, *Advances in Neurodevelopmental Disorders*, and in the proceedings of IEEE CDC, ECC, the IFAC World Congress and IEEE MED. Full list on my website.

Talks and Scientific Community

Invited talks at conferences

2025	Mathematical Congress of the Americas (MCA 2025), Miami, USA
2025	INdAM Workshop "Old and New Trends in Mathematical Collaboration between Brazil and Italy", Rome, Italy
2024	CLAM, Congresso Latino-Americano e do Caribe de Matemática, João Pessoa, Brazil
2023	La ricerca italo-brasiliana di fronte alle sfide della matematica contemporanea, Brasília, Brazil
2022	First Adriatic Meeting on Nonlinear Differential Equations, Ancona, Italy

Invited seminars and contributed talks

17 invited seminars (2020–2026) at Universidade de São Paulo, Universidade Federal do ABC, Universidade Federal de São Carlos (Brazil); Verona, Bologna, L'Aquila (Italy); Great Bay University, Henan Normal University, North China University of Water Resources and Electric Power (China); University of Cape Town (South Africa); Ruhr-Universität Bochum (Germany). Contributed talks at GAETA 2026, the Italian national meeting on the Calculus of Variations (2026) and the QFNU–UNICAM conference (2022).

Research visits and organisation

2023 – 2026	**Research visits**. Universidade de São Paulo (6 months in 2023, 2 months in 2024, with P. Piccione; research stay in progress, 6–26 Nov 2026); Universidade Federal do ABC (2025, with S. Nardulli); Great Bay University, China (2025, 2026); University of Cape Town (2024, with F. Russo).
2024 – 2026	**Conference organisation**. Mini-symposium "Nonlinear PDEs describing front propagation, geometric problems and singularities", GAETA 2026; co-organiser of the IRGTADS online seminar series (2025); organising committee of "Bridging Borders: International Geometric Analysis in São Paulo" (2024).

Teaching and Supervision

2016 – **University courses, University of Camerino**. **Calculus of Variations**, M.Sc. in Mathematics (42h, every year since 2022/23); **Analysis 3**, B.Sc. in Mathematics (42h, 2019–2025); **Analysis 2**, B.Sc. in Physics (2020–2022) and in Mathematics (2025/26); exercise classes in Analysis and Mathematical Methods for Physics (2016–2020).

2021 – 2024 **PhD courses**. "Critical Point Theory", Universidade de São Paulo (30h, 2021); "An Introduction to KAM Theory", School of Advanced Studies, UNICAM (21h, 2022); "Critical Point Theory in Geometric Analysis", USP, Erasmus+ Staff Mobility (16h, 2024).

2018 – **Supervision**. PhD co-supervisor of Bruno Almeida, Universidade Federal do ABC, Brazil (since 2023); 3 Master's theses (Allen–Cahn equation, Lorentzian geometry, KAM theory) and 25 Bachelor's theses in Mathematics.

Technology Transfer and Entrepreneurship

Between 2015 and 2022, alongside my research, I co-founded and led **LiMiX**, a spin-off company of the University of Camerino, taking a university research project all the way to an industrial exit. For seven years this experience trained me in what an academic career increasingly requires beyond research itself: *writing and winning competitive proposals, managing budgets and people, protecting results, and explaining science to non-specialists*. My current tenure-track project explicitly includes technological applications, and this background is part of what I bring to it.

2017 – 2021 **Leadership of funded projects – €418k as coordinator**. Three competitive grants for the *Talking Hands* technology, a wearable device that translates sign language into speech: Horizon 2020 SME Instrument Phase 1 (€50,000, 2018); POR Marche FESR start-up programme (€100,000, 2017–18); POR Marche FESR industrial research project *E-GLOVE* (€268,578, 2020–21). The Phase 2 proposal received the European Commission **Seal of Excellence** (2019).

2016 – 2022 **From research to impact**. Two Italian patents (2016, 2020); five papers on gesture recognition and assistive technology (2017–2021); a university research project (FAR 2019, UNICAM); a 108-hour module on *Talking Hands* at I.S.I.S.S. Magarotto, Rome, a school for deaf students (2019). The company was **acquired** after its start-up phase.

2015 – 2019 **Recognition**. **R.O.M.E. Prize** for the European maker project with the highest social impact ($100,000, 2016); **Finalist, Chivas Venture** (2018); **Premio ANGI** for young innovators (2019); StartCup Marche (2015) and E-Capital (2016).

2018 – 2019 **Visibility**. Speaker at **TEDxAscoliPiceno** (2019); invited to Forum PA in Rome by the Undersecretary for Family and Disability (2019); presented at EU events in Brussels on innovation and entrepreneurship (Makers Town, SUCCEED, 2018).

Outreach, Service and Languages

2022 – **Delegate for Student Orientation and Outreach**. Mathematics Section, School of Science and Technology, University of Camerino.

2019 – 2026 **Mathematics in schools and science communication**. Piano Lauree Scientifiche (2026); Next Generation EU project "Think STEM" (2024); outreach talks on isoperimetry, Fourier series, the history of calculus and machine learning; FameLab and European Researchers' Night (2021).

2021 – **Teacher of Mathematics**. Qualified secondary-school teacher (first in the Marche region); on leave.

Languages. Italian (native) · English (fluent, FCE) · Portuguese (fluent, CELPE-Bras).