Asier López-Gordón

Postdoctoral researcher

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Education

Autonomous University of Madrid — *Madrid, Spain*

PhD Mathematics — *2021 - 2024*

- PhD thesis: The geometry of dissipation (arXiv:2409.11947)
- Advisor: Manuel de León

Autonomous University of Madrid — *Madrid, Spain*

MSc Theoretical Physics — *2020 - 2021*

- MSc thesis: The geometry of Rayleigh dissipation (arXiv:2107.03780)
- Advisor: Manuel de León

Complutense University of Madrid — *Madrid, Spain*

BSc Physics — *2016 - 2020*

- BSc thesis: Integrability, chaos and entanglement in quantum systems
- Advisors: Federico Finkel and Artemio González-López

Professional Experience

2024-	**Assistant professor (*adiunkt*)**, Institute of Mathematics of the Polish Academy of Sciences (IM PAN), Warsaw, Poland
2021-2024	**Predoctoral researcher**, Institute of Mathematical Sciences (ICMAT), Spanish National Research Council (CSIC), Madrid, Spain
2020-2021	**"JAE Intro" research grantee**, Institute of Mathematical Sciences (ICMAT), Spanish National Research Council (CSIC), Madrid, Spain

Research stays

February-May 2023	**Department of Mathematical Methods in Physics (KMMF), University of Warsaw, Poland**, collaborated with Professor Javier de Lucas and Bartosz M. Zawora

Research Publications

Journal articles

L. J. Colombo, M. de León, M. E. Eyrea Irazú and A. López-Gordón, "Generalized hybrid momentum maps and reduction by symmetries of forced mechanical systems with inelastic collisions", *J. Math. Phys.* (To Appear), arXiv:2112.02573 [eess.SY].

L. Colombo, M. de León, M. Lainz and A. López-Gordón, "Liouville-Arnold theorem for homogeneous symplectic and contact Hamiltonian systems", *Geom. Mech.*, doi: 10.1142/S2972458925400039.

L. Colombo, M. de León, M. E. Eyrea Irazú and A. López-Gordón, "Hamilton–Jacobi theory for nonholonomic and forced hybrid mechanical systems", *Geom. Mech.* **01**(02) (July 2024), doi: 10.1142/S2972458924500059.

M. de León, M. Lainz, A. López-Gordón and J. C. Marrero, "A new perspective on nonholonomic brackets and Hamilton-Jacobi theory", *J. Geom. Phys.* **198**, 105116 (Feb. 2024), doi: 10.1016/j.geomphys.2024.105116 (Open Access).

J. Gaset, A. López-Gordón and X. Rivas, "Symmetries, conservation and dissipation in time-dependent contact systems", *Fortschr. Phys.* **71** (8-9), 2300048 (May 2023), doi: 10.1002/prop.202300048 (Open Access).

M. de León, M. Lainz, A. López-Gordón and X. Rivas, "Hamilton-Jacobi theory and integrability for autonomous and non-autonomous contact systems", *J. Geom. Phys.* **187**, 104787 (Mar. 2023), doi: 10.1016/j.geomphys.2023.104787 (Open Access).

L. Colombo, M. de León and A. López-Gordón, "Contact Lagrangian systems subject to impulsive constraints", *J. Phys. A: Math. Theor.* **55**(42) (Oct. 2022), doi: 10.1088/1751-8121/ac96de.

M. de León, M. Lainz and A. López-Gordón, "Discrete Hamilton–Jacobi theory for systems with external forces", *J. Phys. A: Math. Theor.* **55**(20) (Mar. 2022), doi: 10.1088/1751-8121/ac6240.

M. de León, M. Lainz and A. López-Gordón, "Geometric Hamilton–Jacobi theory for systems with external forces", *J. Math. Phys.* **63**(2): 022901 (Feb. 2022), doi: 10.1063/5.0073214 (Open Access).

M. de León, M. Lainz and A. López-Gordón, "Symmetries, constants of the motion, and reduction of mechanical systems with external forces", *J. Math. Phys.* **62**(4): 042901 (Apr. 2021), doi: 10.1063/5.0045073.

Conference papers

L. Colombo, M. E. Eyrea Irazú, M. E. García, A. López-Gordón and M. Zuccalli, "Reduction of hybrid Hamiltonian systems with non-equivariant momentum maps", Geometric Science of Information. GSI 2025. Lecture Notes in Computer Science, Springer, Cham (To Appear), arXiv:2503.22290 [math-ph].

L. Colombo, M. de León, M. E. Eyrea Irazú and A. López-Gordón, "Homogeneous bi-Hamiltonian structures and integrable contact systems", Geometric Science of Information. GSI 2025. Lecture Notes in Computer Science, Springer, Cham (To Appear), arXiv:2502.17269 [math-ph].

A. López-Gordón and L. J. Colombo, "On the integrability of hybrid Hamiltonian systems", *8th IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control LHMNC 2024*, IFAC-PapersOnLine, vol. 58, pp. 83-88 (Sep. 2024), doi:. 10.1016/j.ifacol.2024.08.261 (Open Access).

M. de León, M. Lainz, A. López-Gordón and J. C. Marrero, "Nonholonomic brackets: Eden revisited", Geometric Science of Information. GSI 2023. Lecture Notes in Computer Science, vol. 14072. Springer, Cham (Aug. 2023), doi: 10.1007/978-3-031-38299-4_12.

A. Anahory Simoes, A. López-Gordón, A. Bloch and L. Colombo, "Discrete Mechanics and Optimal Control for a Passive Walker Experiencing Foot Slip", 2023 American Control Conference (ACC), pp. 4587-4592 (July 2023), doi: 10.23919/ACC55779.2023.10156020.

A. López-Gordón, L. Colombo and M. de León, "Nonsmooth Herglotz principle", 2023 American Control Conference (ACC), pp. 3376-3381 (July 2023), doi: 10.23919/ACC55779.2023.10156228.

M. E. E. Irazú, A. López-Gordón, L. J. Colombo and M. de León, "Hybrid Routhian reduction for simple hybrid forced Lagrangian systems", 2022 European Control Conference (ECC), pp. 345-350 (July 2022), doi: 10.23919/ECC55457.2022.9838077.

Awards, Fellowships, & Grants

2021	**"FPI" predoctoral contract**, Spanish Ministry of Science and Innovation	
	"JAE Intro" Grant extension, Institute of Mathematical Sciences (ICMAT)	*3 000 €*
2020	**"JAE Intro" Grant**, Spanish National Research Council (CSIC)	*3 000 €*
2019	**"Beca de Colaboración en Departamentos"**, Complutense University of Madrid	*2 000 €*

Talks and Posters

Invited Talks at Conferences

January 13, 2025. **VII Young Researchers Congress of the Royal Spanish Mathematical Society. Parallel session on Geometric Structures in Manifolds.** *On integrable contact systems and bi-Hamiltonian structures.* University of the Basque Country (UPV/EHU), Bilbao, Spain.

August 23, 2024. **Workshop on Geometric aspects in mathematical modelling.** *Hybrid dynamical systems for the modelling of rigid bodies with impacts.* National University of Distance Education (UNED), Madrid, Spain.

December 11, 2023. **deLeonfest 2023. An interdisciplinary conference on geometric mechanics and related fields.** *Integrability of contact Hamiltonian systems.* Institute of Mathematical Sciences (ICMAT), Madrid, Spain. Co-presented with Manuel Lainz.

February 6, 2023. **VI Young Researchers Congress of the Royal Spanish Mathematical Society. Parallel session on Symplectic Geometry and Hamiltonian Dynamics.** *Integrability of contact Hamiltonian systems.* University of León, Spain.

January 6, 2023. **Workshop on Nonlinear Systems III.** *Symmetries, conservation and dissipation in time-dependent contact systems.* Gebze Teknik Üniversitesi, Kocaeli, Turkey.

Contributed Talks at Conferences

June 2025. **XVII International ICMAT Summer School on Geometry, Dynamics and Field theory.** *Darboux theorem for homogeneous contact forms.* La Cristalera, Miraflores de la Sierra, Madrid, Spain.

September 5, 2024. **XXXII International Fall Workshop on Geometry and Physics.** *Contact bi-Hamiltonian systems.* University of Coimbra, Portugal.

June 21, 2024. **XVI International ICMAT Summer School on Geometry, Dynamics and Field theory.** *Nijenhuis–Jacobi structures and integrability of contact Hamiltonian systems.* La Cristalera, Miraflores de la Sierra, Madrid, Spain.

June 10, 2024. **8th IFAC Workshop on Lagrangian and Hamiltonian Methods for Non Linear Control.** *On the integrability of hybrid Hamiltonian systems.* Besançon, France.

February 23, 2024. **XXVIII International Young Researchers Workshop in Geometry, Dynamics and Field Theory.** *On the stability of contact Hamiltonian systems.* University of Warsaw, Poland.

January 19, 2024. **XXV Winter Meeting on Geometry, Dynamics and Field Theory.** *On the stability of contact Hamiltonian systems.* University of Zaragoza, Spain.

June 2, 2023. **2023 American Control Conference.** *Nonsmooth Herglotz variational principle.* San Diego, California, USA.

March 29, 2023. **17th International Young Researchers Workshop on Geometry, Mechanics and Control.** *Liouville-Arnold theorem for contact Hamiltonian systems.* KU Leuven, Belgium.

January 19, 2023. **XXIV Encuentro de Invierno en Geometría, Mecánica y Control.** *Symmetries, conservation and dissipation in time-dependent contact systems.* University of Zaragoza, Spain.

September 1, 2022. **XXX International Fall Workshop in Geometry and Physics.** *Hamilton-Jacobi theory for contact systems: autonomous and non-autonomous.* Instititute of Mathematical Sciences (ICMAT), Madrid, Spain.

July 20, 2022. **34th International Colloquium on Group Theoretical Methods in Physics.** *Non-conservative systems can have conserved quantities! Symmetries, reduction and Hamilton-Jacobi theory for forced mechanical systems.* Strasbourg University, France.

July 13, 2022. **2022 European Control Conference.** *Hybrid Forced Lagrangian Systems.* Imperial College and University College, London, UK (online).

July 5, 2022. **14th International Summer School on Geometry, Mechanics and Control.** *Reduction of forced mechanical systems with inelastic collisions.* University of Burgos, Spain.

March 7-11, 2022. **VII Iberoamerican Meeting on Geometry, Mechanics and Control.** *Forced Hamiltonian and Lagrangian systems. Symmetries, reduction and Hamilton-Jacobi theory.* National University of the South, Bahía Blanca, Argentina (online).

September 8, 2021. **XXIX International Fall Workshop in Geometry and Physics**. *Mechanical systems with external forces. Symmetries, reduction and Hamilton-Jacobi theory*. Centre of Mathematics and Applications, University of Beira Interior, Covilhã, Portugal (online).

Seminars and Colloquia

April 28, 2025. **Basic Notions and Applied Topology**. *A friendly invitation to geometric mechanics.* Organised jointly by Dioscuri Centre in Topological Data Analysis, University of Gdansk and Gdansk University of Technology.

March 12, 2025. **Trans-Carpathian Seminar on Geometry & Physics**. *Homogeneous symplectic manifolds and integrable contact systems.* Organised jointly by the Dept. of Mathematical Methods in Physics of the University of Warsaw, the Institute of Mathematics of the Polish Academy of Sciences, the Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering, and the Simion Stoilow Institute of Mathematics of the Romanian Academy.

December 4, 2024. **Geometry and Differential Equations Seminar**. *Liouville-Arnol'd theorem for contact Hamiltonian systems .* Institute of Mathematics of the Polish Academy of Sciences (IM PAN), Warsaw, Poland.

May 30, 2024. **Seminario de Doctorandos.** *Un primer contacto con la geometría de contacto.* Faculty of Mathematics, Complutense University of Madrid, Spain.

May 24, 2023. **Joint Mathematics Junior Colloquium (ICMAT-UAM-UC3M-UCM).** *Cómo la geometría nos permite entender la dinámica: una introducción a los sistemas integrables.* Instititute of Mathematical Sciences (ICMAT), Madrid, Spain.

May 11, 2023. **Geometry and Applications: Modern Mathematical Approaches (Gamma) Seminar.** *An introduction to integrable systems.* Organised jointly by the University of Warsaw, the Universitat Rovira i Virgili and the Polytechnic University of Catalonia. (online).

April 1, 2022. **Geometry, Mechanics and Control Seminar.** *Reduction, Hamilton-Jacobi theory and discretization of mechanical systems with external forces.* Instititute of Mathematical Sciences (ICMAT), Madrid, Spain (online).

Posters

July 10, 2023. **XV International ICMAT Summer School on Geometry, Dynamics and Field theory.** *Liouville–Arnold theorem for contact Hamiltonian systems.* La Cristalera, Miraflores de la Sierra, Madrid, Spain.

January 17-21, 2022. **Biennal Congress of the Royal Spanish Mathematical Society.** *Systems with external forces. Symmetries, reduction and Hamilton-Jacobi theory.* University of Castilla – La Mancha, Ciudad Real, Spain.

December 1-3, 2021. **Young Researchers Workshop in Geometry, Mechanics and Control.** *Symmetries, reduction, Hamilton-Jacobi theory and discretization for systems with external forces.* Centre de Recerca Matemàtica, Campus de Bellaterra, Barcelona, Spain.

Teaching Experience

Winter 2023-24	**Mathematics I**, Teaching Assistant, Degree in Biomedical Engineering, Autonomous University of Madrid	*30 h*
Winter 2023-2024	**Mathematics**, Teaching Assistant, Degree in Biochemistry, Autonomous University of Madrid	*30 h*
Winter 2022-23	**Mathematics**, Teaching Assistant, Degree in Food Science and Technology and Double Degree in Human Nutrition and Dietetics and FST, Autonomous University of Madrid	*30 h*
Winter 2022-2023	**Mathematics**, Teaching Assistant, Degree in Biochemistry, Autonomous University of Madrid	*30 h*

Outreach & Professional Development

Popular science articles

A. López-Gordón and A. Timón García-Longoria, "Los misterios de la cicloide, una de las curvas más presentes en la naturaleza ", *El País*, June 19, 2023, https://elpais.com/ciencia/cafe-y-teoremas/2023-06-19/los-misterios-de-la-cicloide-una-de-las-curvas-mas-presentes-en-la-naturaleza.html. Accessed October 31, 2023.

Organisation of scientific meetings

Organiser of the parallel session on *Differential Geometry, Mathematical Physics and Control Theory*, at the *VII Congreso de Jóvenes Investigadores de la Real Sociedad Matemática Española*, held at the University of the Basque Country (UPV/EHU), in Bilbao (Spain), on January 16-17, 2025.

Organiser of the *Joint Mathematics Junior Colloquium (ICMAT-UAM-UC3M-UCM)*, held alternatively at the Department of Mathematics of the Autonomous University of Madrid and the Institute of Mathematical Sciences, during the academic year 2023-2024.

Member of the Scientific Committee of the *5th BYMAT Conference*, held at the Institute of Mathematical Sciences in Madrid (Spain) from November 13 to November 16, 2023.

Member of the Organising Commitee of *Environmental Monitoring: An Exploratory Workshop*, held at the Spanish Royal Academy of Sciences from July 5 to July 7, 2023.

Organiser of the parallel session on *Differential Geometry, Mathematical Physics and Control Theory*, at the *VI Congreso de Jóvenes Investigadores de la Real Sociedad Matemática Española*, held at the University of León (Spain) on February 9, 2023.

Peer Review

I am a reviewer of MathSciNet/Mathematical Reviews from the AMS. Besides that, I have peer reviewed for several journals and conference proceedings, including the following:

Advances in Mathematical Physics
International Journal of Geometric Methods in Modern Physics
Journal of Geometric Mechanics
Journal of Physics A: Mathematical and Theoretical
Mediterranean Journal of Mathematics
Revista de la Real Academia de Ciencias Exactas, Físicas y Naturales. Serie A. Matemáticas
6th International Conference on Geometric Science of Information
61st IEEE Conference on Decision and Control

Professional Memberships

Real Sociedad Matemática Española (Royal Spanish Mathematical Society)
Real Sociedad Española de Física (Spanish Royal Physics Society)

Languages

Spanish. Mother tongue

English. Advanced, C1 in the CEFR, 7.5 band score in IELTS Academic

Polish. Basic communication ability, currently attending language classes

Computer skills

Advanced. LaTeX, GNU/Linux, macOS, Mathematica, Python, Windows

Basic. bash/shell, Excel, git, gnuplot, html, Julia, matlab, nginx, OriginLab, SciDAVis