Leonardo J. Colombo

Curriculum Vitae

March 2022

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Leonardo J. Colombo

Centre for Automation and Robotics (CSIC-UPM)
Spanish National Research Council
Carretera de Campo Real, km 0, 200, 28500 Arganda del Rey, Spain.
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Born: October 21, 1986 (Age: 35 years old)–Buenos Aires, Argentina.
Google Scholar citations: link to the profile - 476 cites (last update March 2022).
Webpage: https://sites.google.com/view/leonardojcolombo/home

1 Areas of Current Research and Interests

• Unmanned Aerial Vehicles • Modeling and Analysis of Complex and Cooperative Control Systems with Geometric Control. • Multi-agent and Multi-robot Control Systems • Machine Learning Methods in Control Theory • Nonlinear Control Theory • Robot Motion Planning.

2 Employment

Científico Titular del Consejo Superior de Investigaciones Científicas (Dec 2021-).
Centro de Automática y Robótica CAR (CSIC-UPM), Madrid, Spain.
Grupo de Robótica de Campo y Servicio.

3 Previous Employments

-Postdoctoral Junior Leader La Caixa Foundation (June 2019-Dec 2021).
Instituto de Ciencias Matemáticas ICMAT (CSIC-UAM-UCM-UC3M), Madrid, Spain.
7.56% funded proposals out of 291 received applications among all research disciplines. **Unique project awarded in the discipline of Applied Mathematics**.

- Juan de la Cierva Incorporación, CSIC (From March 2018-May 2019).
Juan de la Cierva Incorporación, Consejo Superior de Investigaciones Científicas,
Instituto de Ciencias Matemáticas ICMAT (CSIC-UAM-UCM-UC3M), Madrid, Spain.
Ranked 1st of 4 winning candidates in 2017.

- Postdoc, ACCESS Linnaeus Center, KTH (From June 2017-February 2018).
Department of Automatic Control, School of Electrical Engineering and Computer Sciences (EECS), Royal Institute of Technology (KTH), Stockholm, Sweden.
Ranked one of the 2 winning candidates among 65 applicants.

- Postdoc Assistant Professor, University of Michigan (September 2014-May 2017).
Department of Mathematics, University of Michigan, Ann Arbor, USA.

- JAE-Pre Position, CSIC (September 2010-August 2014).
Consejo Superior de Investigaciones Científicas, Instituto de Ciencias Matemáticas ICMAT (CSIC-UAM-UCM-UC3M), Madrid, Spain.

4 Education and Habilitations

4.1 Education

Ph. D. in Mathematics (Date of thesis defend July 3, 2014)
Instituto de Ciencias Matemáticas, ICMAT-CSIC, Spain
Enrolled in the Ph.D. of Applied Mathematics at Department of Mathematics, Universidad Autónoma de Madrid, Spain.
THESIS: "Geometric and Numerical Methods for Optimal Control of Mechanical Systems."
ADVISOR: David Martín de Diego, ICMAT-CSIC.
GRADE: Sobresaliente Cum Laude distinction and International doctorate mention.

Master degree (MSc) in Applied Mathematics (October 2012)
Department of Mathematics, Universidad Autónoma de Madrid, Spain.
THESIS: "Higher-Order Euler-Poincaré equations and its applications to optimal control."
ADVISOR: David Martín de Diego, ICMAT-CSIC.

Degree in Mathematics (Bachelor degree Bc.) (September 2009)
Universidad Nacional de La Plata, Facultad de Ciencias Exactas, Buenos Aires, Argentina.
THESIS: Optimal Control of underactuated mechanical systems: A geometric approach.
ADVISORS: Dr. David Martin de Diego (ICMAT-CSIC) - Dra. Marcela Zuccalli (Facultad de Ciencias Exactas-UNLP).

4.2 Habilitations

From ANECA (July 2018): Profesor Contratado Doctor, Profesor de Universidad Privada, Profesor Ayudante Doctor.

5 Academic Positions

Visiting Assistant Professor (competitive position).
Systems and Control Engineering, Indian Institute of Technology (IIT) at Bombay, India.
From July 2018 to July 2020 with a request of spend one month per year in the institution.

6 Coordination of research projects & financial support from contracts

6.1 Scientific coordination and managment of research projects

1. "Descentralized strategies for cooperative robotic swarms".
   La Caixa Junior Leader project. (June 2019-May 2022).
   Amount 305.100 Euros.

2. "Safety Guarantees with data-driven controls for cooperative systems".
   2020 Leonardo Grant for Researchers and Cultural Creators, BBVA Foundation. (Nov. 2020-Aug 2022).
   Amount 39.987 Euros.

3. "Path planning via interpolation and localization of agents through distance sensors in the design of controllers for the formation of multiple rotorcrafts".
   Santander Iberomerica Fellowship (March 2019-May2019).

Project evaluated and selected from Vice-presidency of International Relations at CSIC. Amount 5,000 Euros.

6.2 Coordination of financial support from contracts

3. Budget associated to the contract Juan de la Cierva Incorporación, MICIU (March 2018-May 2019) to carry out the research project "Geometry, Dynamics and Control of Hybrid Systems: Applications to Legged Locomotion" . Amount: 6,000 Euros.

7 Participation in Research Projects

1. **2019-2020** i-Link-CSIC (Ref: linkA20079).
   The interplay between geometry, mechanics and control in multi-agent systems.
   CSIC Researchers: David Martín de Diego and Leonardo Colombo, ICMAT.
   Project founded by Vice-presidency of International Relations, CSIC, Spanish National Research Council.
   Amount: 24.000 Euros.

2. **2020-2023** Geometric structures in dynamical systems, mechanics and hydrodynamics PID2019-106715GB-C21.
   Principal researchers: David Martín de Diego and Daniel Peralta Salas (ICMAT-CSIC).
   Project founded by MINECO, Spain.
   Amount: 76.287,00 Euros.

3. **2015-2017** Geometry, Mechanics and Control: MTM2015-69124-REDT.
   Principal researcher: Juan Carlos Marrero Gonzalez, Universidad de La Laguna,Spain.
   Project founded by Spanish Ministry of Sciences for thematic networks.
   Amount: 35.000 Euros.

4. **2017-2020** Geometric and numerical analysis of dynamical systems and applications to mathematical physics: MTM2016-76072-P.
   Principal researchers: David Martín de Diego and Daniel Peralta Salas (ICMAT-CSIC).
   Project founded by MINECO, Spain.
   Amount: 53.900 Euros.

5. **2017-2018** EU H2020 ICT #731869, Co4Robots (partial time, collaboration in a specific research task).
   Principal Researcher: Dimos Dimarogonas, KTH, Sweden.
   Project founded by European Commission.
   Amount: 3.820.956,25 Euros.

6. **2017** EU H2020 ICT #644128, AEROWORK (partial time, collaboration in a specific research task).
   Principal Researcher at Swidish Node: Dimos Dimarogonas, KTH, Sweden. Project founded by European Commission.
   Amount: 5.906.642,75 Euros.

7. **2016-2019** Premio Centro de Excelencia Severo Ochoa. project SEV-2015-0554.
   Principal researcher: Diego Córdoba, ICMAT-CSIC.
   Project founded by MINECO, Spain.
   Amount: 4.000.000 Euros.

8. **2014-2017** Geometric structures and integrability in dynamical systems and control theory: MTM2013-42870-P.
   Principal researchers: David Martín de Diego and Daniel Peralta Salas (ICMAT-CSIC). Project founded by MINECO, Spain.
   Amount: 31.921 Euros.

9. **2014-2016** NSF-INSPIRE Track 1: The Mathematics of Balance in Mechanical Systems with Impacts, Unilateral Constraints, Underactuation and Hyper-sensing: Application to Agile bipedal Locomotion.
   Principal researchers: Grizzle, Jessy and Anthony Bloch. University of Michigan, US.
   Project founded by National Science Foundation (NSF), USA.
   Amount: 800.000 American dollars.

10. **2012-2016** Geometric Mechanics and Mathematical Physics: PID/X628.
    Principal researcher: Marcela Zuccalli, Universidad Nacional de La Plata, Argentina.
    Project founded by Universidad Nacional de La Plata, Argentina.
    Amount: 3.000 Euros (approximately - changed from Argentinean pesos to Euros).

11. **2012-2015** Premio Centro de Excelencia Severo Ochoa. project SEV-2011-0087.
    Principal researcher: Manuel de León, ICMAT-CSIC.
    Project founded by MINECO, Spain.
    Amount: 4.000.000 Euros.

12. **2012-2013** Geometry, Mechanics and control: MTM 2011-15725-E,
    Principal researcher: Edith Padrón Fernandez, Universidad de La Laguna,Spain.
    Project founded by Spanish Ministry of Sciences for thematic networks.
    Amount: 15.000 Euros.

13. **2011-2015** IRSES network GEOMECH.
    Principal researcher: Frans Cantrijn, Ghent University, Belgium.
    IP for the Spanish node: David Martín de Diego (ICMAT-CSIC)
    Project founded within Marie Curie's International Research Staff Exchange Scheme (IRSES) in the 7th European Framework Program, under project nr. 246981.
    Amount: 158.400 Euros.

14. **2011-2012** Geometry, Mechanics and Control: MTM2010-12116-E.
    Principal researcher: Juan Carlos Marrero Gonzalez, Universidad de La Laguna,Spain.
    Project founded by Spanish Ministry of Sciences for thematic networks.
    Amount: 15.000 Euros.

15. **2010-2013** Global Structures and Numerical Methods in Mechanics, Dynamical Systems and Control: MTM2010-21186-C02-01.
    Principal researcher: David Martín de Diego. ICMAT-CSIC.
    Project founded by Spanish Ministry of Sciences.
    Amount: 148.346 Euros.

16. **2010-2012** Geometric Mechanics and Mathematical Physics: PID/X002.
    Principal researcher: Marcela Zuccalli, Universidad Nacional de La Plata, .
    Project founded by Universidad Nacional de La Plata, Argentina.
    Amount: 3.500 Euros (approximately - changed from Argentinean pesos to Euros).

17. **2010-2011** Geometry, Mechanics and Control: MTM2010-08166-E.
    Principal researcher: Juan Carlos Marrero Gonzalez, Universidad de La Laguna,Spain.
    Project founded by Spanish Ministry of Sciences for thematic networks.
    Amount: 20.000 Euros.

18. **2009-2010** Geometry, Mechanics and Control: MTM2008-03606-E.
Principal researcher: Juan Carlos Marrero Gonzalez, Universidad de La Laguna,Spain.
Project founded by Spanish Ministry of Sciences for thematic networks.
Amount: 12.000 Euros.

19. **2009-2010** Geometry, Constraints and Control.
Bi-lateral project between IMAFF (CSIC) and the Institute of Mathematics, Polish Academy of Sciences.
Principal researchers: Manuel de Leon (CSIC) and Janusz Grabowski (Polish Academy of Sciences).
Project founded by CSIC, Spain and co-founded by Polish Academy of Sciences.

20. **2009-2010** Applied analysis and mathematical physics: 11/X376.
Principal researchers: Jorge Solomin and Marcela Zuccalli, Universidad Nacional de La Plata.
Project founded by Universidad Nacional de La Plata, Argentina.
Amount: 3.000 Euros (approximately - changed from Argentinean pesos to Euros).

8 Teaching experience

8.1 Specialized Degree and Postgraduate Courses imparted in the research area of the researcher

- ATHENS course (ERASMUS Program Course): Geometric and numerical methods in control theory.
Universidad Politécnica de Madrid.
March 19-23, 2018 (30 hrs.).
Professors: María Barbero Linán (UPM), Leonardo Colombo (ICMAT-CSIC), David Martín de Diego (ICMAT-CSIC), Rodrigo Sato (ICMAT-UCM).

- Session on Quadrotors dynamics and cooperative work with quadrotors.
Course of Geometric Mechanics and Control Theory at Severo Ochoa Intro School at ICMAT during July 2019 (2hrs.).

8.2 Experience as Assistant Professor

Mathematics Department, Michigan University, Ann Arbor, USA.

• Fall Term 2014 (Sept-Dec 2014): Math 115. Calculus. Sections 036 and 046. Lecturer. Taught class to ~ 64 (2 sections of 32 students each one)

• Winter Term 2015 (Jan-April 2015): Math 115. Calculus. Sections 018 and 023. Lecturer. Taught class to ~ 64 (2 sections of 32 students each one)

• Fall Term 2015 (Sept-Dec 2015): Math 216. Differential Equations. Sections 020 and 030. Lecturer. Taught class to ~ 200 (2 sections of 100 students approximately each one)

• Winter Term 2016 (Jan-April 2016): Math 471. Introduction to Numerical Methods. Lecturer. Taught class to ~ 20 graduate and undergraduate students.

• Fall Term 2016 (Sept-Dec 2016): Math 115. Calculus. Lecturer. Taught class to 2 sections of 17 students each one.

• Winter Term 2017 (Jan-April 2017): Math 316. Differential Equations. Lecturer. Taught class to 2 sections of 25 undergraduate students each one.

8.3 Experience as Teaching Assistant

1. Mathematics Department, Universidad Autónoma de Madrid, Spain. Taught problem class to ~ 30 undergraduate students in mathematics

• Sept 2013-Feb 2014: Mathematical Analysis (Multivariable calculus and calculus in manifolds, 2 hours per week).

2.a) National University of La Plata, Argentina. In charge of problem classes of . ~ 100 students together with other TA's and Class Tutor At the Mathematics department,

• May 2006- July 2007: Algebra (BA in Mathematics, four hours per week)

• May 2007-Aug 2010: Mathematical Analysis (BA in Mathematics four hours per week)

• Nov 2009-Aug 2010: Mathematical Analysis II (Multivariable calculus) (BA in Mathematics, six hours per week)

• March 2010-Aug 2010: Mathematical Analysis II (Multivariable calculus) (BA in biotechnology, pharmacy and biochemistry, six hours per week)

• May 2010-Aug 2010: Algebra (BA in biotechnology, pharmacy and biochemistry, six hours per week)

• May 2010-Aug 2010: Mathematical Analysis (BA in biotechnology, pharmacy and biochemistry, six hours per week)

• Feb 2007-March 2007: Precalculus (6 hours per week)

• Feb 2008-March 2008: Precalculus (12 hours per week)

2.b) At Engineering faculty

• March 2007-April 2010: Mathematical Analysis (three hours per week).

8.4 Training Courses Received

• Assistant Professor Training Program (August 25-29, 2014).
Department of Mathematics, University of Michigan, Ann Arbor, USA.
Mandatory course of 40hs for Assistant Professors to teach at the Mathematics Department of the University of Michigan.
• La Caixa Foundation Junior Leader Program. Training Psotdoctoral Program (1 week per year, 2019 on site, 2020 online).

8.5 Published Lecture Notes

• L. Colombo and F. Jiménez.
Continuous and discrete mechanics for the attitude dynamics of a rigid body on SO(3).
GMC Notes, Number 1 (2012). Available at http://gmcnetwork.org.

9 Publications

9.1 Journal Publications

(signed by alphabetical order)

J37 T. Beckers, L. Colombo, S. Hirche, G. Pappas.
Online learning-based trajectory tracking for underactuated vehicles with uncertain dynamics. *IEEE Control Systems Letters.* Vol 6., 2090-2095, 2022.

J36 E. Aranda-Escolstico, L. Colombo, M. Guinaldo.
Distributed event-triggered flocking control of Lagrangian systems. *IEEE Control Systems Letters.* Vol 6., 1945-1951, 2022.

J35 L. Colombo and J. Goodman.
Variational Collision avoidance on Riemannian manifolds. *SIAM Journal on Control and Optimization.* Vol 60(1), 168-188, 2022.

J34 L. Colombo*, D. V. Dimarogonas, J. Giribet, P. Moreno, I. Mas.
Dual Quaternion Cluster-Space Formation Control.
IEEE Robotics and Automation Letters.
Vol 6 (4), 6789-6796, 2021.
Experimental test * corresponding author.

J33 L. Colombo, H. Garca de Marina.
Forced Variational Integrators for formation control of multi-agent systems.
IEEE Transactions on Control of Network Systems
Vol 8(3), 1336-1347, 2021.

J32 E. Aranda-Escolstico, L. Colombo, M. Guinaldo.
Periodic Event-Triggered Targeted Shape Control of Lagrangian Systems with discrete time-delay.
ISA Transactions
Vol. 117, 139-149, 2021.

J31 L. Colombo*, N. Raj, , A. Simha.
Structure-Preserving Reduced Attitude Control of Gyroscopes.
Automatica
Vol 125, 109471, 2021.
Experimental test * corresponding author.

J30 A. Bloch, M. Camarinha, L. Colombo.
Variational point-obstacle avoidance on Riemannian manifolds.
Mathematics of Control, Signals, and Systems.
Vol 33(1), 109-121, 2021.

J29 V. Arroyo, L. Colombo, M. Gamonal, P. Moreno
A data-driven method based on quadratic programming for formation control of Euler-Lagrange systems.
IEEE Control Systems Letters.
Vol 5 (1), 313-318, 2021.
Experimental test * corresponding author.

J28 L. Colombo and D. Dimarogonas.
Symmetry reduction for optimal control of multi-agent systems.
IEEE Transactions on Automatic Control.
Vol 66 (5), 2021.

J27. A. Bloch, M. Camarinha and L. Colombo.
Dynamic interpolation for obstacle avoidance on Riemannian manifolds.
International Journal of Control
Vol 96 (3), 588-600, 2021

J26. L. Colombo, D. Martín de Diego, A. Nayak and R. Sato de Almagro.
Geometric Optimal Trajectory Tracking of nonholonomic mechanical systems.
SIAM Journal on Control and Optimization.
Vol 58(3), 1652675. 2020.

J25. L. Colombo and E. Eyrea Irazu.
Symmetries and periodic orbits in simple hybrid Routhian systems.
Nonlinear Analysis: Hybrid Systems.
Vol 36, 100857, 2020.

J24. L. Colombo and J. Goodman.
On the existence and uniqueness of Poincaré maps for systems with impulse effects.
IEEE Transactions on Automatic Control.
Vol 65 (4), 1815-1821, 2020.

J23. L. Colombo and D. Dimarogonas.
Motion feasibility conditions for collision avoidance of multi-agent control systems on Lie groups.
IEEE Transactions on Control of Network Systems
Vol 7(1) 493-502, 2020.

J22 L. Colombo, E. Eyrea Iraz, E. Garca Torao Andrs.
A note on hybrid Routhian reduction for time-dependent Lagrangian hybrid systems.
Journal Geometric Mechanics.
Vol 12 (2), 309-321, 2020.

J21. A. Bloch, W. Clark and L. Colombo.
A Poincaré-Bendixon Theorem for Hybrid Systems.
Mathematical Control & Related Fields.
Vol 10, n1, 27-45, 2020.

J20. A. Bloch, W. Clark, L. Colombo and P. Rooney.
Time minimum Quantum Purity for 2-Level Lindblad equations.
Discrete and Continuous Dynamical Systems-Serie S, Vol.13, no.4, 2357-2372, 2020.

J19. A. Bloch, L. Colombo and F. Jiménez.
The variational discretization of the constrained higher-order Lagrange-Poincaré equations.
Discrete and Continuous Dynamical Systems - Serie A, Vol 39, n1, 309-344, 2019.

J18. L. Colombo.
A variational-geometric approach for the optimal control of nonholonomic systems.
International Journal of Dynamics and Control. Vol 6 (2), 652-662, 2018.

J17. L. Abrunheiro and L. Colombo.
Lagrangian Lie subalgebroids generating dynamics for second-order mechanical systems on Lie algebroids.
Mediterranean Journal of Mathematics. 15 (2), 57, 2018.

J16. A. Bloch, L. Colombo, R. Gupta and T. Ohsawa.
Optimal control problems with symmetries breaking cost functions.
SIAM Journal on Applied Algebra and Geometry, 1-1 (2017), pp. 626-646.

J15. L. Colombo.
Second-order constrained variational problems on Lie algebroids: Applications to optimal control.
Journal Geometric Mechanics. Vol 9, n1, 2017, 1-45.

J14. L. Colombo, S. Ferraro and D. Martín de Diego.
Geometric Integrators for Higher-Order Variational Systems and their applications to Optimal Control.
Journal of Nonlinear Science. 26 - 6, pp. 1615 - 1650, 2016.

J13. L. Colombo and D. Martín de Diego.
Higher-order variational problems on Lie groupoids and optimal control applications.
Discrete and Continuous Dynamical Systems, Serie A. Vol 36 (11), 6023-6064, 2016.

J12. L. Colombo and P. Prieto Martínez.
Regularity properties of fiber derivatives associated with higher-order mechanical systems.
Journal of Mathematical Physics, 57 (8), 2016.

J11. L. Colombo, F. Jiménez and D. Martín de Diego.
Variational Integrators for Mechanical Control Systems with Symmetries.
Journal of Computational Dynamics. Vol 2, n. 2, 193-225, 2015.

J10. L. Colombo and H. Jacobs.
Lagrangian Mechanics on centered semi-direct products.
Geometry, mechanics, and dynamics: the legacy of Jerry Marsden, Fields Inst. Communications, Vol. 73,167-184, 2015.

J9. A. Bloch, L. Colombo, R. Gupta and D. Martín de Diego.
A Geometric Approach to the Optimal Control of Nonholonomic Mechanical Systems.
Analysis and Geometry in Control Theory and its Applications. INdAM series. Vol 12. 2015.

J8. L. Colombo and D. Martín de Diego.
On the geometry of higher-order variational problems on Lie groups.
Journal Geometric Mechanics, Vol. 6, number 4, 451-478, 2014.

J7. L. Colombo and P. Prieto-Martínez.
Unified formalism for higher-order variational problems and its applications in optimal control.
International Journal of Geometric Methods in Modern Physics. Vol 11, n4, 2014,

J6. L. Colombo, M. de León, P. Prieto Martínez and N. Román-Roy.
Geometric Hamilton-Jacobi theory for higher-order autonomous systems.
J. Phys. A: Math. Theor. 47, 235203, 2014.

J5. L. Colombo, M. de León, P. Prieto Martínez and N. Román-Roy.
Unified formalism for higher-order geometric Hamilton-Jacobi theory.
International Journal of Geometric Methods in Modern Physics. Vol 11, n6, 2014.

J4. L. Colombo, D. Martín de Diego and M. Zuccalli.
Discrete higher-order variational problems with constraints.
Journal of Mathematical Physics. Vol 54, 093507, 2013.

J3. L. Colombo, F. Jiménez and D. Martín de Diego.
Discrete second-order Euler-Poincaré equations. Applications to optimal control.
International Journal of Geometric methods in Modern Physics. Vol 9, N4, 2012.

J2. L. Colombo, D. Martín de Diego and Marcela Zuccalli.
On Variational Integrators for Optimal Control of Mechanical Control Systems.
Revista de la Real Academia de Ciencias Exactas, Fisicas y Naturales. Serie A. Matematicas (Journal of Spanish Royal Society of Science).
Volume 106, Issue 1, Page 161-171, 2012.

J1. L. Colombo, D. Martín de Diego and Marcela Zuccalli.
Optimal Control of Underactuated Mechanical Systems: A Geometric Approach.
Journal Mathematical Physics. Vol 51, 083519, 2010.

9.2 Conference Proceedings (Peer-Reviewed)

C25 E. Eyrea Irazú and L. Colombo.
"Hybrid Routhian reduction for simple hybrid forced Lagrangian systems".
Proceedings of the 2022 European Control Conference (ECC), London, UK, 2022.

C24 T. Beckers, S. Hirche, and L. Colombo.
"Safe Online Learning-based Formation Control of Multi-Agent Systems with Gaussian Processes".
Proceedings of the 60th Conference on Decision and Control, 2021.

C23 J. Goodman, L. Colombo.
Variational Obstacle Avoidance with Applications to Interpolation Problems in Hybrid Systems.
7th IFAC Workshop on Lagrangian and Hamiltonian Methods in Nonlinear Control, 2021 (LHMNC 21).

C22 L. Colombo, D. Martn de Diego.
Noether Symmetries and Decay Laws in Formation Control of Multi-agent Systems.
7th IFAC Workshop on Lagrangian and Hamiltonian Methods in Nonlinear Control, 2021 (LHMNC 21).

C21 M. E. Eyrea Iraz, L. Colombo, A. Bloch.
Reduction by Symmetries of Simple Hybrid Mechanical Systems.
7th IFAC Workshop on Lagrangian and Hamiltonian Methods in Nonlinear Control, 2021 (LHMNC 21).

C20 M. Gamonal, P. Moreno, L. Colombo.
Learning Shape Control of Multi-Agent Systems with Lagrangian Neural Networks.
2021 Proceedings of the SIAM Conference on Control and Its Applications (CT21) , 40-47, 2021.

C19 O. Yago Nieto, L. Colombo.
A geometric path planning strategy based on variational calculus for the shape control of multi-agent Lagrangian systems.
29th Mediterranean Conference on Control and Automation. 1092-1099, 2021.

C18 L. Colombo, M. E. Eyrea Iraz. M. Zuccalli.
Reduction by symmetries and higher-order magnetic systems.
VIII Congress of Applied, Computational, and Industrial Mathematics (MACI), La Plata, Argentina. To appear, 2021.

C17 L. Colombo, J. Goodman.
A decentralized strategy for variational collision avoidance on complete Riemannian manifolds.
Proceedings of the 14th International Conference on Automatic Control and Soft Computing, 363-372, 2020.

C16 L. Colombo, P. Moreno, M. Ye, H. Garcia de Marina, M. Cao.
Forced variational integrators for distance based shape control with flocking behavior for multi-agent systems.
21st IFAC World Congress, 2020, Berlin, Germany.

C15. R. Seshan Chandrasekaran, L. Colombo, M. Camarinha, R. Banavar, A. Bloch.
Variational collision and obstacle avoidance of multi-agent systems on Riemannian manifolds.
Riemannian manifolds. Proceedings of the 2020 European Control Conference (ECC), Saint Petersburg, Russia, 1689-1694, 2020.

C14. E. Aranda Escolástico, L. Colombo, M. Guinaldo.
Targeted formation control of Lagrangian systems with time delay.
Proceedings of the 2020 European Control Conference (ECC), Saint Petersburg, Russia, 172-177, 2020.

C13. L. Colombo, H. Garcia de Marina, M. Barbero Linan, D. Martín de Diego.
On the observability of relative positions in left-invariant multi-agent control systems and its application to formation control.
Proceedings of the 58th. IEEE Conference on Decision and Control (CDC) Nice, France, 7333-7338, 2019.

C12. A. Nayak, R. Sato de Almagro, L. Colombo, D. Martín de Diego.
Optimal trajectory tracking of nonholonomic mechanical systems: a geometric approach.
Proceedings of The 2019 American Control Conference (ACC), Philadelphia, USA. 1924-1929, 2019.

C11. M. Asif, R. Banavar, L. Colombo, M. Camarinha and A. Bloch.
Collision avoidance on Riemannian manifolds.
Proceedings of the 56th. IEEE Conference on Decision and Control (CDC), Miami, FL, USA, 2791-2796, 2018.

C10. L. Colombo and H. García de Marina.
A Variational Integrator for the formation control of multi-agent systems.
Proc. 7th IFAC Workshop on Distributed Estimation and Control in Networked Systems (NECSYS), Groningen, the Netherlands, 2018. IFAC-PapersOnLine 51 (23), 76-81.

C9. L. Colombo and D. Dimarogonas.
Optimal control of left-invariant multi-agent systems with asymmetric formation constraints.
Proceedings of the17th annual European Control Conference (ECC), Limassol, Cyprus, 1728-1733, 2018.

C8. L. Colombo, W. Clark, A. Bloch.
Time reversal symmetries and zero dynamics for simple hybrid Hamiltonian control systems.

Proceedings of The 2018 American Control Conference (ACC), Milwaukee, 2218-2223, 2018.

C7. L. Colombo, A. Bloch, W. Clark.
Quasivelocities and symmetries in simple hybrid systems.
Proceedings of the 56th. IEEE Conference on Decision and Control (CDC), Melbourne, Australia. 1529-1534, 2017.

C6. A. Bloch, M. Camarinha and L. Colombo.
Variational obstacle avoidance problem on Riemannian manifolds.
Proceedings of the 56th. IEEE Conference on Decision and Control (CDC), Melbourne, Australia, 145-150, 2017.

C5. W. Clark, A. Bloch, L. Colombo and P. Rooney.
Optimal Control of Quantum Purity for $n = 2$ Systems.
Proceedings of the 56th. IEEE Conference on Decision and Control (CDC), Melbourne, Australia 1317-1322, 2017.

C4. L. Colombo, A. Bloch, R. Gupta and D. Martín de Diego.
Variational discretization for optimal control problems of nonholonomic mechanical systems. *Proceedings of the 54th. IEEE Conference on Decision and Control (CDC)*, Osaka, Japan, 4047-4052, 2015.

C3. L. Colombo, A. Bloch and R. Gupta.
Higher-Order Constrained Variational Problems on Principal Bundles with Applications to Optimal Control of Underactuated Systems.
IFAC Papers Online. Proceedings of the 5th IFAC Workshop on Lagrangian and Hamiltonian Methods for Non Linear Control, p.87-92, 2015.

C2. L. Colombo.
On the plate ball optimal control problem.
Actas del IV Congreso de Matemática Aplicada, Computacional e industrial (MACI), 2013, pp. 698-701.

C1. L. Colombo and D. Martín de Diego.
Optimal control of underactuated mechanical systems with symmetries.
Discrete and Continuous Dynamical Systems. Proceedings of the 9th. AIMS international conference on Dynamical Systems and Differential Equations, Orlando, Florida, USA. 149-158, 2013.

9.3 Book Chapters (Peer-Reviewed)

B4. E. Aranda-Escolástico, M. Guinaldo, L. J. Colombo, S. Dormido
Control de formaciones sobre regiones objetivo de sistemas multi-agente lagrangianos con retardo.
XL Jornadas de Automática, 655-662, Universidade da Coruña, Servizo de Publicacións, 2019.

B3. L. Colombo, D. Martín de Diego and Marcela Zuccalli.
On the construction of structure preserving algorithms for optimal control problems of nonholonomic mechanical systems.
Actas del XII Congreso Monteiro, 135-147, Universidad Nacional del Sur, 2014.

B2. L. Colombo, F. Jiménez and D. Martín de Diego.
Second-order Euler-Poincaré equations for trivial principal bundles.
Geometry and Physics, American Institute of Physics, Vol. 1460, 185-191 2012.

B1. L. Colombo and D. Martín de Diego.
Quasivelocities and optimal contol of underactuated mechanical systems.
Geometry and Physics, American Institute of Physics, Vol. 1260, 133-140, 2011.

9.4 Editor in Books and Special Issues in Indexed Research Journals

E1. Editor for the Book *Mathematical Texts, University of Coimbra*, Volume 48, 2019.
13th Young Researchers Workshop on Geometry, Mechanics and Control.
Editors: María Barbero Linán, Margarida Camarinha, Raquel Caseiro, Leonardo Colombo, Joana Nunes da Costa.

E2. Guess Editor in the Journal Geometric Mechanics, for the Special Issue *Geometric Mechanics, Dynamics and Control, in honor of the 65th birthday of Anthony Bloch.*
First of three volumes expected for June 2020.
Editors: Leonardo Colombo, Manuel de León, Tomoki Ohsawa.

10 Fellowships and Awards

10.1 Fellowships

(i) **Beca Santander Iberoamerica 2018**: Travel grant of Santander Bank to carry out during two month a research project on formation control of Multi-agent systems in Coimbra, Portugal. Amount 5.000 Euros. Date of research visit: April-May, 2019.

(ii) Juan de la Cierva Incorporación, MINECO (approx 60.000 Euros for 2 years).
Ranked 1st of 4 winning candidates in mathematics (2017).

(iii) ACCESS Linnaeus Center Scholarship, KTH (approx 90.000 Euros for 2 years).
Selected as first of 2 winning candidates from around 65 applicants (2017).

(iv) Fellowship from Isaac Newton Institute for Mathematical Science, Cambridge University, Cambridge, UK in order to attend *Mathematical Approaches to Complex Fluids: a Two Week Summer School* . From July 21st to August 3er, 2013 .

(v) Fellowship from Fields Institute of Research in Mathematical Science. Toronto, Canada in order to attend *Focus Program on Geometry, Mechanics and Dynamics at Fields Institute* . From July 6 to August 27, 2012 .

(vi) **Predoctoral Ph.D fellowship JAE-Predoc** in the framework of the **JAE program** financed by **CSIC**-Spain and co-funded by the European Union., 2010-2014.

(vii) **Pregraduate Fellowship JAE-Intro** in the framework of the **JAE program** founded by **CSIC**-Spain, three months (From July 2009 to September 2009).

(viii) Pregraduate fellowship financed by *Fundación YPF* , from May 2006 to September 2009.

(ix) Pregraduate fellowship financed by *Ministerio de Educación, Argentina* , from March 2005 to September 2009.

10.2 Awards

Premio Vicent Caselles 2016 (Vicent Caselles Award - 2016) from the Real Sociedad Matemática Española (Spanish Mathematical Royal Society) and BBVA Foundation (best Spanish 6 young researchers in mathematics).

Outstanding Postdoctoral Assistant Professor Teaching Award in Mathematics, University of Michigan, 2016.

Selected by the Vice-presidency of International Relations at CSIC as the unique candidate from CSIC to apply in a competitive Postdoctoral Fellowship from AXA Research Found in 2018.

Best Poster in XVIII International Workshop on Geometry and Physics: Quasivelocities and Optimal Control for Underactuated Mechanical Systems, 2010.

UPSILON PI EPSILON-Honor Society for Computing and Information Disciplines: Recognition of teams at the 2009 ACM-ICPC.

Internacional Collegiate Programming Contest:
1. 2008-South America Regionals, second position of Argentina, and third position Tercer of south América.
2. 2009-Final World- Honorable Mention- Stockholm, Sweden.

Award to the Best undergraduate students 2009 of Municipalidad de La Costa, Argentina.

Award to the Best undergraduate students 2008 of Municipalidad de La Costa, Argentina.

Award to the Best undergraduate students 2007 of Municipalidad de La Costa, Argentina.

Nominated for Golden Apple Award (the only student nominated award that recognizes outstanding university teaching), 2017.

11 Research Visits (experience in national or foreign research centers)

2021

BIRDS Lab and Department of Mathematics, University of Michigan, United States of America.
Within the *BIRDS Lab and Geometric Mechanics* group.
Visiting Prof. Shai Revzen and Anthony Bloch.
From December 1 to December 6 (6 days).

2019

Electrical Engineering Department at the School of Engineering, University of Buenos Aires (FIUBA), Argentina.
Within the *Signals Process, Identification and Control - GPSIC LAB,* visiting Prof. Juan Ignacio Giribet.
From December 18 to December 21 (3 days).

Department of Mathematics, Universidad Nacional de la Plata, Argentina.
Within the *Geometric Mechanics* group, visiting Profs. Marcela Zuccalli and Emma Eyrea.
From December 15 to December 18 (3 days).

Division of Systems and Control. Electrical Engineering and Computer Sciences School, KTH, Royal Institute of Technology, Sweeden.
Within the *Multi-agent Control Systems* group, visitng Prof. Dimos Dimarogonas.
From October 24 to November 2 (9 days).

Faculty of Science and Engineering, University of Groningen, The Netherlands.
Within the *Networked Control Systems* group, visiting Prof. Ming Cao.
From September 17 to September 28 (11 days).

Systems and Control, Indian Institute of Technology (IIT), Bombay, India.
Within the *Geometric Control* group, visiting Prof. Ravi Banavar.
From August 5 to August 16 (11 days).

Centro de Matemática da Universidade de Coimbra, Coimbra, Portugal.
Within the *Differential Geometry and Applications to Control Systems* group, visiting Prof. Fátima Silva Leite and Prof. Margarida Camarinha
From March 25 to May 31 (2 months and 6 days).

2018

Universidad Nacional de la Plata, Buenos Aires, Argentina.
Within the *Geometric Mechanics* group, visiting Profs. Marcela Zuccalli and Emma Eyrea.
From December 10 to December 21 (11 days).

Centro de Matemática da Universidade de Coimbra, Coimbra, Portugal.
Within the *Differential Geometry and Applications to Control Systems* group, visiting Prof. Fátima Silva Leite and Prof. Margarida Camarinha
From October 24 to October 31 (1 week).

2017

Centro de Matemática da Universidade de Coimbra, Coimbra, Portugal.
Within the *Differential Geometry and Applications to Control Systems* group, visiting Prof. Fátima Silva Leite and Prof. Margarida Camarinha.
From November 21 to November 24 (3 days).

2016

School of Electrical Engineering, Department of Automatic Control, KTH Royal Institute of Technology Stockholm, Sweden.
Within the *Multi-agent Control Systems* group, visitng Prof. Dimos Dimarogonas.
From December 6th to December 8th (2 days).

Instituto de Ciencias Matemáticas, Madrid, Spain.
Within the *Geometric Mechanics* group, visiting Dr. David Martín de Diego.
From May 1st to June 11 (1 month and 11 days).

Centro de Matemática da Universidade de Coimbra, Coimbra, Portugal.
Within the *Differential Geometry and Applications to Control Systems* group, visiting Prof. Fátima Silva Leite and Prof. Margarida Camarinha.

From June 12 to June 19 (1 week).

2015

Instituto de Ciencias Matemáticas, Madrid, Spain.
Within the *Geometric Mechanics* group, visiting Dr. David Martín de Diego.
From March 2 to March 7 and from July 14 to July 24 (15 days).

2014

Universidad Nacional del Sur, Bahia Blanca, Buenos Aires, Argentina.
Within the *Geometric Mechanics* group, visiting Prof. Sebastian Ferraro.
From February 3 to February 24 (3 weeks).

2013

Isaac Newton Institute for Mathematical Science, Cambridge University, Cambridge, UK.
In order to attend *Mathematical Approaches to Complex Fluids - a Two Week Summer School*, financed by a fellowship of Isaac Newton Institute.
From July 21st to August 3er (2 weeks).

Universidad Nacional del Sur, Bahia Blanca, Buenos Aires, Argentina.
Within the *Geometric Mechanics* group, visiting Prof. Sebastian Ferraro.
From April 26 to June 26 (2 months).

2012

Imperial College of London, London, England.
Within the *Geometric Mechanics* group visiting Prof. Darryl Holm.
From September 2nd, 2012 to January 6, 2013 (4 months).

Fields Institute of Research in Mathematical Science. Toronto, Canada.
In order to attend *Focus Program on Geometry, Mechanics and Dynamics at Fields Institute*, financed by a fellowship of Fields Institute of Research in Mathematical Science.
From July 6 to July 27 (3 weeks).

2011

Universidad Nacional del Sur, Bahia Blanca, Buenos Aires, Argentina.
Within the *Geometric Mechanics* group, visiting Prof. Sebastian Ferraro.
From December 1 to December 21 (3 weeks).

Universidad de La Laguna, Canary Islands, Spain.
Within the *Geometric and topology* group, visiting Prof. Juan Carlos Marrero.
From September 3 to September 26 (3 weeks).

Supelec, Paris Sud University, Paris, France.
From February 21 to March 4 (2 weeks), in order to attend the graduate courses of 2011 *HYCON-EECI Graduate School on Control*:

1. *Cooperative Navigation and Control of Multiple Robotic Vehicles.* Instructors: Professors Antonio M. Pascoal and Antonio P. Aguiar

2. *Normal Forms for Nonlinear Control Systems.* Instructor: Professor Witold Respondek.

2010

Instituto de Ciencias Matemáticas, Madrid, Spain.
Within the *Geometric Mechanics* group, visiting Dr. David Martin de Diego.
From February 3 to March 8 (1 month and 5 days).

2009

Instituto de Ciencias Matemáticas, Madrid, Spain.
Within the *Geometric Mechanics* group, visiting Dr. David Martin de Diego.
Research visit from February 20 to March 12 (3 weeks)
Enjoying JAE-Intro Fellowship from CSIC (2 months) + Research visit(1 month), from June 20 to September 21 (3 months).

12 Presentations: Conference Talks (T), Seminars (S) & Posters (P)

2021

T39. "Dual Quaternion Cluster Space Formation Control".
2021 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS 2021)..
Prague, Czech Republic, 2021 (online).

T38. "Geometric integration for formation control of multi-agent systems".
Conference on the Numerical Solution of Differential and Differential-Algebraic Equations .
University Halle-Wittenberg, Germany, 2021 (online).

T37. "Trajectory tracking of nonholonomic mechanical systems: a geometric approach. ".
Annual Portuguese Meeting on Optimal Control).
Portugal, 2021 (online).

T36. "Safe online learning-based control of multi-agent systems with Gaussian processes".
National Congress of the Portuguese Mathematical Society.
Lisbon, Portugal (online), 2021.

T35. " A geometric path planning strategy based on variational calculus for the shape control of multi-agent Lagrangian systems".
29th Mediterranean Conference on Control and Automation..
Italy, 2021 (online).

S17. "Mathematical methods for cooperative and multi-agent systems".
joint virtual seminar dvance robotics, two convergent viewpointsf the Royal Spanish Mathematical Society and the Spanish Committee for Automatica.
Madrid, Spain (online).

S16. "On the role of geometry and analysis in control theory".
Geometric Analysis and Applications Master School.
Santander, Spain, 2021 (online).

2020

T34. "Distributed targeted distance-based formation control for mechanical systems".
59th. IEEE Conference on Decision and Control (CDC).
Jeju Island, Republic of Korea, 2020 (online).

T33. "Forced variational integrators for distance based shape control with flocking behavior for multi-agent systems".
21st IFAC World Congress, 2020.
Berlin, Germany (online).

T32. " Variational collision and obstacle avoidance of multi-agent systems on Riemannian manifolds.".
2020 European Control Conference (ECC).
Saint Petersburg, Russia (online).

T31. "Distributed targeted distance-based formation control for mechanical systems".
2020 European Control Conference (ECC).
Saint Petersburg, Russia (online).

T30. "Decentralized cooperative localization in multi-agent systems and its application to formation control".
V congress of young researchers from the Spanish Royal Mathematical Society.
Castellón, Spain.

2019

S15. "Variational integrators for distance-based shape control with and without flocking behavior".
Colloquium at *Centre for Mathematics, University of La Plata.*
Buenos Aires, Argentina.

T29. "On the observability of relative positions in left-invariant multi-agent control systems and its application to formation control".
58th Conference on Decision and Control (CDC).
Niza, France.

S14. "Variational integrators for distance-based shape control with and without flocking behavior".
Seminar at *Division of Systems and Control. Electrical Engineering and Computer Sciences School.* KTH, Royal Institute of Technology.
Stockholm, Sweden.

S13. "Variational integrators: Applications to optimal control and formation control".
Seminar at *Faculty of Science and Engineering, ENTEG.* University of Groningen.
Groningen, The Netherlands.

S12. "Some applications of variational integrators to control systems".
Systems and Control Seminar. Indian Institute of Technology (IIT) at Bombay.
Bombay, Powai, India.

T28. "On the observability of relative positions in left-invariant multi-agent control systems and its application to formation control".
International Congress on Industrial and Applied Mathematics (ICIAM).
Valencia, Spain.

T27. "Trajectory tracking of nonholonomic mechanical systems: a geometric approach".
American Control Conference 2019 (ACC).
Philadelphia, USA.

2018

S11. "Formation control and collision avoidance of multi-agent control systems".
Colloquium of the Department of Mathematics, Universidad Nacional de La Plata.
Buenos Aires, Argentina.

T26. "Time reversal symmetries and zero dynamics for simple hybrid Hamiltonian control systems" (talk)
American Control Conference 2018 (ACC).
Milwaukee, Wisconsin, USA.

T25. "Optimal Control of Left-Invariant Multi-Agent Systems with Asymmetric Formation Constraints: a Lagrangian approach" (talk)
European Control Conference (ECC).
Limassol, Cyprus.

T24. "Optimal Control of Left-Invariant Multi-Agent Systems with Asymmetric Formation Constraints: A Hamiltonian approach " (talk)
2018 Portuguese Meeting on Optimal Control.
Coimbra, Portugal.

2017

T23. "Variational obstacle avoidance problem on Riemannian manifolds" (talk)
56th Conference on Decision and Control (CDC).
Melbourne, Australia.

T22. "Quasivelocities and symmetries in simple hybrid system " (talk)
56th Conference on Decision and Control (CDC).
Melbourne, Australia.

S10. "A walk around geometric mechanics and hybrid systems: symmetries, periodic orbits and feedback control" (seminar)
ACCESS-EES, KTH, Internal Seminar Series.
Stockholm, Sweden.

T21. "Optimal control problems with symmetries breaking cost functions" (invited speaker)
5th Iberoamerican conference on Geometry, Mechanics and Control.
La Laguna, Tenerife, Spain.

2016

S9. "Variational integrators and stability analogies between hybrid mechanical systems and nonholonomic systems"(seminar)
Seminar.
Department of Automatic Control, School of Electrical Engineer, KTH. Stockholm, Sweden.

T20. "New developments in the optimal control of nonholonomic mechanical systems" (talk)
7th European Congress of Mathematics.
Berlin, Germany.

P15. "Geometric Integrators for Higher-Order Variational Systems and their applications to Optimal Control" (poster)
10th ICMAT International GMC Summer School on Geometry, Mechanics and Control.
La Cristalera, Madrid, Spain.

S8. "Geometric and Numerical methods for optimal control of mechanical systems" (seminar)
Seminar of Geometry and Applications
Universidad de Coimbra, Portugal.

2015

T18. "Higher-Order Constrained Variational Problems on Principal Bundles with Applications to Optimal Control of Underactuated Systems" (talk)
5th IFAC Workshop on Lagrangian and Hamiltonian Methods for Non Linear Control.
Lyon, France.

P14. "Optimal control of left invariant systems on Lie groups " (poster)
Joint STAMP conference and 9th ICMAT International GMC Summer School on Symplectic Geometry, Classical Mechanics and Interactions with Spectral Theory.
La Cristalera, Madrid, Spain.

2014

S7. "Regularizaton of Hamilton's principle for higher-order Lagrangian systems" (seminar)
Junior Seminar.
Universidad Autónoma de Madrid, Spain.

S6. "Geometric and Numerical methods for optimal control of mechanical systems" (seminar)
Seminar of Applied Mathematics
Universidad Autónoma de Madrid, Spain.

2013

P13. "Geometry of optimal control problems of nonholonomic mechanical sytems" (poster)
deLeónfest
Madrid, Spain.

P12. "Optimal Control of nonholonomic mechanical systems" (poster)
8th International Young Researchers Workshop on Geometry, Mechanics and Control.
Barcelona, Spain.

P11. "Unified formalism for higher-order geometric Hamilton-Jacobi theory," (poster)
XXII fall workshop on Geometry and Physics.
Evora, Portugal.

T17. "Optimal control of nonholonomic mechanical systems" (talk)
VII Summer School on Geometry, Mechanics and Control.
La Cristalera, Madrid, Spain.

T16. "Optimal control of nonholonomic mechanical systems" (talk)
XII Congreso Dr. Antonio Monteiro.
Bahia Blanca, Argentina.

T15. "On the plate ball optimal control problem" (talk)
IV Congreso de Matemática Aplicada, Computacional e Industrial.
Ciudad Autónoma de Buenos Aires, Argentina.

T14. "Lagrangian submanifolds generating second-order Lagrangian mechanics on Lie algebroids" (invited talk)
XV Encuentro de Invierno de Geometría, Mecánica y Control.
Zaragoza, Spain.

S5. "On the geometry of higher-order mechanical systems on Lie groups"(seminar)
Seminar on Geometry of the Universitat Politècnica de Catalunya.
Facultad de Matemática y Estadistica, UPC, Barcelona, Spain.

2012

T13. "On the variational discretization of optimal control problems" (invited speaker)
XXI Fall workshop on Geometry and Physics.
Burgos, Spain.

T12. "Optimal control of underactuated mechanical systems with symmetries"(invited speaker)
Focus program on geometry, mechanics and dynamics: the Legacy of Jerry Marsden.
Fields Institute, Toronto, Canada.

T11. "On the geometry of mechanical control systems on Lie groups"(invited speaker)
9th. AIMS Conference on Dynamical systems, differential equations and applications.
Orlando, Florida, USA.

T10-P10. " On the geometry of discrete higher-order Lagrangian problems"(talk and poster)
6th. Summer school on geometry, mechanics and control.
Miraflores de la Sierra, Madrid, Spain.

S4. " Higher-order mechanics from Hamilton-Pontryagin principle and optimal control." (seminar).
Seminario Junior ICMAT-UAM.
Universidad Autónoma de Madrid, Madrid, Spain.

2011

S3. "Groupoids and Mechanics on Lie groupoids " (seminar).
Geometry seminar.
Department of Mathematics, Universidad Nacional de La Plata, Argentina.

S2. "On the geometry of higher-order Euler-Poincaré equations "(seminar).
Seminar on Geometry and Physics.
Universidad Complutense de Madrid, Spain.

T9-P9. "Second order Lagrangian mechanics on Lie algebroids"(talk and poster).
European Mathematical Society and Spanish Royal Academy of Science, joint weekend.
Bilbao, Spain.

T8. " On variational problems on Lie groups"(talk).
Primer Encuentro de Jóvenes Investigadores en Matemáticas Universidad de La Laguna (PEJIM 2011).
La Laguna, Canary Islands, Spain.

S1. "Quasivelocities and optimal control of mechanical systems"(seminar).
Seminar of Geometry.
Departamento de Matemática Fundamental, Universidad de La Laguna.

T7. " Discrete variational problems on Lie groupoids" (talk).
Congress of Young researchers of the Spanish Royal Mathematical Society.
Soria, Castilla y León, Spain.

P8. " Higher Order Mechanics on Lie Algebroids"(poster)
XX International Workshop on Geometry and Physics.
ICMAT, Madrid, Spain.

P7. " On the Geometry of higher order problems on Lie groups" (poster)
Poisson Geometry and applications.
Figueira da Foz, Portugal.

T6 "An introduction to higher-order mechanic on Lie algebroids"(talk).
Meeting of Geometry, Mechanics and Control.
ICMAT, Madrid, Spain.

P6. " Discrete second order mechanics on Lie groupoids." (poster).
5^{th} *International Summer School on GMC*
La Cristalera, Madrid, Spain.

T5 " A Variational and Geometric Approach for the Second Order Euler-Poincaré Equations"(talk).
XIII Winter Meeting on Geometry, Mechanics and Control and Thematic day on Fields Theory.
Zaragoza, Spain.

P5. "Optimal Control of Underactuated Mechanical Systems on Lie Groups" and "Higher Order Discrete Vakonomic Mechanics for Optimal Control of Underactuated Systems" (posters).
Second Iberoamerican Meeting on Geometry, Mechanics and Control, in Honor of Hernán Cendra.
Centro Atómico de San Carlos de Bariloche, Argentina.

2010

T4. "Optimal Control of Underactuated Mechanical Systems on Lie Groups"(talk).
5th Young Researchers Workshop on Geometry, Mechanics and Control.
Universidad de La Laguna, Tenerife, Spain.

P4. "Variational Integrators for Optimal Control of Mechanical Systems. 5th Young Reaserchers" (poster).
5th Young Researchers Workshop on Geometry, Mechanics and Control.
Universidad de La Laguna, Tenerife, Spain.

2009

T3. "Control Óptimo de Sistemas Mecánicos Infractuados: Una Aproximación Geométrica" (talk).
LIX Reunión Anual de la Unión Matemática Argentina.
Mar del Plata, Buenos Aires, Argentina.

P3. "Variational Integrators in Optimal Control for Underactuated Mechanical Systems" (poster).
Variational Integrators in Nonholonomic and Vakonomic Mechanics: an exploratory workshop.
Real Academia de Ciencias, Madrid, Spain.

T2. "A Survey of Optimal Control for Underactuated Mechanical Systems in Quasivelocities" (talk).
XVIII International Workshop on Geometry and Physics.
Benasque, Spain.

P2. "Quasivelocities and Optimal Control for Underactuated Mechanical Systems" (poster).
XVIII International Workshop on Geometry and Physics.
Benasque, Spain.

T1. "Una Aproximación Geométrica a la Teoría de Control Óptimo de Sistemas Infractuados" (talk).
XX Jornadas SIMUMAT de Geometría y Control Óptimo.
Universidad Carlos III de Madrid, Spain.

P1. "Optimal Control for Underactuated Mechanical Systems" (poster).
III Summer School on Geometry, Mechanics and Control.
L'Ametlla del Mar, Catalonia, Spain.

13 Experience organizing $R\&D$ activities

Member of the **Scientific Committee**.
International Young Researchers Workshop on Geometry, Mechanics and Control.
From May 2016 - May 2020.

Member of the **Organizing Committee**.

1. *13th. International Young Researchers Workshop on Geometry, Mechanics and Control.*
   Coimbra Portugal, December 2018.
2. Special Session *Geometric Structures applied to classical mechanics, control theory and engineering.*
   Bienal Congress of the Spanish Royal Mathematical Society. Main organizer together with M. Barbero Linan, UPM.
   Santander, Spain, February 2019.
3. *XXVIII International Fall Workshop on Geometry and Physics.*
   Madrid, Spain, September 2019.
4. Special Session *The interplay of mathematical engineering and control of networked systems.*
   International Congress on industrial and Applied Mathematics. Main organizer together with M. Barbero Linan, UPM.
   Valencia, Spain, July 2019.
5. Member of the organizing committee for the Thematic Trimester *Current trends in geometric methods in natural sciences.*
   ICMAT, Madrid, Spain, from September to December 2019.

6. Organizer of the Special Session *Geometry, Mechanics and Networked control*.
   Congress of Young Researchers in Mathematics of the Spanish Royal Mathematical Society.
   Castellón, Spain, January 2020.
7. Special Session *Geometric Mechanics, Dynamics and Control* in honor to Prof. Anthony Bloch 65th birthday.
   Main organizer, together with M. de León - ICMAT and T. Ohsawa - University of Texas at Dallas.
   AIMS Conference, Atlanta, USA, June 2020.
8. Member of the organizing committee for the 14^{th} Summer School on Geometry, Mechanics and Control.
   University of Burgos, Spain, July 5-10, 2020.
9. Member of the organizing committee for the 15^{th} Summer School on Geometry, Mechanics and Control.
   La Cristalera (UAM), Madrid, Spain, Date TBA, 2021.

Seminars Organizer.

1. Founder of the young researchers seminars (ICMAT-Universidad Autónoma de Madrid) and organizer (during 2012 -2013 together with Begona Barrios, Susana Merchán and Ana Zumalacarregui in different periods of time).
2. Organizer of the Seminar "Geometric Mechanics and Control" at ICMAT. From May 2019 to December 2020.

14 Ph.D. Scholars and Fellows

(a) María Emma Eyrea Irazú.
   5 years competitive Ph.D. Fellowship from **CONICET Argentina** (Argentinean National Council of Scientific and Technical Research) to conduct a Ph.D. at Universidad Nacional de La Plata (Equivalent to a JAE Intro Fellowship from CSIC in Spain).
   Period: April 2015-March 2020.
   Advisors: Leonardo J. Colombo and Marcela Zuccalli.

(b) Jacob Ryan Goodman.
   La Caixa INPhINIT Fellowship. 3 years competitive Ph.D Fellowship from La Caixa Foundation to conduct a Ph.D in Applied Mathematics at Universidad Autónoma de Madrid. Fellow granted in May 2019.
   Starting date of the Ph.D: January 2020.
   Advisor: Leonardo J. Colombo.

(c) Manuela Gamonal Fernandez.
   FPI-Severo Ochoa Fellowship. 4 years competitive Ph.D Fellowship from ICMAT Severo Ochoa Project to conduct a Ph.D in Applied Mathematics at Universidad Autónoma de Madrid. Fellow granted in June 2020.
   Starting date of the Ph.D: September 2020.
   Advisor: Leonardo J. Colombo.

(d) Veronica Arroyo Rodriguez.
   Master Severo Ochoa Fellowship. 1 years competitive Master Fellowship from ICMAT Severo Ochoa Project to conduct a Master in Mathematics at Universidad Complitense de Madrid. Fellow granted in June 2020.

Starting date of the September 2020, End of fellowship August 2021.
Advisor and supervisor of Fellowship: Leonardo J. Colombo.

(e) María Emma Eyrea Irazú.
2 years competitive Postdoctoral Fellowship from **CONICET Argentina** (Argentinean National Council of Scientific and Technical Research) to conduct the Postdoctoral project "Geometry, dynamics and control of Legged Systems: Applications to bipedal locomotion" Centre for Mathematics of La Plata. (Equivalent to a Juan de La Cierva Fellowship in Spain).
Starting date: April 2020.
Main Supervisor: Leonardo J. Colombo. Co-supervisor (responsible at the research centre): María del Rosario Etchechoury.

15 Supervision and Advision of undergraduate, master and Ph.D students, and postdoctoral researchers

15.1 Final degree thesis advised

(a) Omayra Yago Nieto.
Degree in Mathematics and Informatics, Polytechnical University of Madrid.
Title: **A decentralized strategy for trajectory planning with a team of quadrotors**.
Date: June 2020.

15.2 Ph.D thesis advised

(a) María Emma Eyrea Irazú.
Ph.D in Mathematics. Department of Mathematics, Faculty of Sciences, Universidad Nacional de La Plata, Argentina (co-advised with Marcela Zucalli).
Title: **Geometric and numerical methods associated to mechanical systems with magnetic terms**.
Keywords: Geometric Mechanics, Symmetries and reduction, Hybrid Systems, Robotic Applications, Underactuated Control Systems, Periodic Orbits.
Date of defense: Thesis defended on December 18, 2019.
Calification: 10 (highest degree, equivalent to Sobresaliente cum laude in the Spanish educational system).

(b) Jacob Ryan Goodman (in progress)
Ph.D. in Applied Mathematics. Department of Mathematics, Science Faculty, Universidad Autónoma de Madrid.
Title: **Geometric and numerical methods for cooperative tasks in multi-agent systems: applications to cooperative aerial robotics**.
Keywords: Multi-agent systems, Cooperative robotics, Aerial vehicles, Geometric Control, Variational Integrators, Convex and non-convex optimization.
Date of defense: Expected date for Thesis defend on January, 2023.

(c) Manuela Gamonal Fernandez (in progress)
Ph.D. in Mathematical Engineering, Statistics and Operative Research. Department of Mathematics, Science Faculty, Universidad Complutense de Madrid.
Title: **Learning-based Methods for Control of some Mechanical Systems.**.

Keywords: Multi-robot control systems, Aerial vehicles, Mechanical Systems, Machine Learning, Gaussian Processes, Neural Networks, Geometric Integration.
Date of defense: Expected date for Thesis defend on August 2024.

(d) Efstratios Stratoglou (in progress)
Ph.D. in Automatic Control and Robotics, Universidad Politécnica de Madrid.
Title: **Optimal Control of Multi-Body & Multi-Robot Systems with Applications to Autonomous Aerial and Ground Vehicles.**.
Keywords: Multi-robot control systems, Aerial vehicles, Multi-body systems, Optimal control, control methods for renewable energies.
Date of defense: Expected date for Thesis defend on the beginning 2026.

15.3 Supervision of Postdoctoral Researchers and Fellows

- **María Emma Eyrea Irazú**. Postdoctoral fellow from CONICET (Argentinean National Council of Scientific and Technical Research) at Centre for Mathematics of La Plata (April 2020 - March 2022).
- **Alexandre Anahory Simoes**. Postdoctoral fellow associated with FBBVA Project. Dec 2021-Aug 2022).

15.4 Supervision of Researchers Technicians for Projects

- **Juan Sebastian Cely Gutierrez**. Founded by La Caixa Project Decentralized strategies for cooperative robotic swarms. June 2021- Nov 2021.

15.5 Collaboration in advising and mentoring Ph.D. thesis

(a) **Aradhana Nayak** (Systems and Control IIT-Bombay, India). Supervisor for the competitive felowship Erasmus Alianza 4 to carry our research activities at ICMAT, Madrid during May 15 to August 14, 2018. Research topics:

i. Optimal trajectory tracking of nonholonomic systems: A geometric approach.
ii. Collision avoidance and formation control of multi-agent control systems on Lie groups.

(b) Academic Mentor (tutor) of the Ph.D. student **William Clark**. June 2016-May 2017.
Interdisciplinary Mathematics Ph.D program at the Department of Mathematics, University of Michigan, Ann Arbor, USA. In collaboration with Prof. Anthony Bloch. Expected date of defense, June 2020.

15.6 Master Students

(a) **Manuela Gamonal** (Universidad Complutense de Madrid).
Master in *Computational Statical Treatment of the Information*
Thesis Title: Gaussian Regression Processes for Learning of Mechanical Control Systems.
Period: June 2019-May 2020.
Founded by La Caixa Foundation Project Decentralized Strategies for Cooperative Robotic Swarms and by JAE Intro Fellowship from CSIC.

(b) **Omayra Yago Nieto** (Universidad Complutense de Madrid).
Master in *Engineering Mathematics*
Thesis Title: Optimal Control of multi-agent robotic systems.
Period: Sept 2020-July 2021.
Founded by La Caixa Foundation Project Decentralized Strategies for Cooperative Robotic Swarms

(c) **Veronica Arroyo Rodriguez** (Universidad Complutense de Madrid).
Master in *Advance Mathematics*
Thesis Title: Motion fesibility conditions for the coordinated motion of multi-agent systems.
Period: Sept 2020-Aug 2021.
JAE Intro Fellowship from CSIC at ICMAT and Beca de Master ICMAT-Severo Ochoa.

15.7 Introduction to Research Fellows

- **Veronica Arroyo Rodriguez**, Universidad Complutense de Madrid, Spain. JAE Intro Fellowship from CSIC (October 1, 2020-February 28, 2021).
- **Manuela Gamonal**, Universidad Complutense de Madrid, Spain. JAE Intro Fellowship from CSIC (October 1, 2019-July 31, 2020).
- **Enric Florit**, Universidad Politécnica de Catalunya, Spain. Intro Severo Ochoa Fellowship from ICMAT (15 June- 15 August, 2019).
- **Jacob Goodman**, University of Michigan, Ann Arbor, USA. Intro Severo Ochoa Fellowship from ICMAT (15 June- 15 August, 2018).
- **Viviano Fernandez**, Universidad Nacional de La Plata, Argenitna. Intro Severo Ochoa Fellowship from ICMAT (15 June- 15 August, 2018).

15.8 Advisor of Students for Internships at Research Centers

- **Jorge San Martín**. Undergraduate student from UNED University, Madrid.
  (i) Practicum at ICMAT from to conduct research on rigid body dynamics: stability and conservative numerical aspects.
- **Veronica Arroyo**. Undergraduate student from Universidad Politécnica de Madrid.
  (i) Summer Internship from June 10 to August 30, 2019, conducting research in the framework of the project "Decentralized strategies for cooperative robotic swarms" from La Caixa Foundation.
  (ii) Practicum at ICMAT from Polytechnic University of Madrid September-December 2019.
  (iii) Undergraduate student associated to the project "Decentralized strategies for cooperative robotic swarms" from La Caixa Foundation, from January 2020 to June 2020.
  Research topics: (i) Modelization and control design for the cooperative motion for a team of four quadrotors transporting a rigid object (ii) convex optimization problems to reconstruct the dynamics in a formation problem from given data based on real experimentation.

- **Omayra Yago Nieto** Undergraduate student from Universidad Politécnica de Madrid.
  (i) Summer Internship from June 10 to August 30, 2019, conducting research in the framework of the project "Decentralized strategies for cooperative robotic swarms" from La Caixa Foundation.
  (ii) Practicum at ICMAT from Polytechnic University of Madrid September-December 2019.
  (iii) Undergraduate student associated to the project "Decentralized strategies for cooperative robotic swarms" from La Caixa Foundation, from January 2020 to June 2020.
  Research topic: Modeling and decentralized trajectory planning strategies for cooperative aerial robotics.

16 Outreach and communication activities

16.1 Papers in Popular Science (Divulgative journal papers and newspapers)

D1. L. Colombo and R. Lafuente.
Sobre el uso de la descomposición en valores singulares para el tratamiento de imagenes (On the use of the singular value decomposition to images).
Matematicalia, Digital Journal. Vol.7, n4, 2011.

D2. Thomas Beckers, Sandra Hirche, Leonardo Colombo.
How to make the usage of machine learning in control safe?
Section "Café y Teoremas" (theorems and coffee), in *El Pais Newspaper* (main Spanish newspaper).

16.2 Activities developed for outreach and interviews

16.2.1 Activities

(a) Participation in the outreach activity by FECYT, "Somos Científicos, sacanos de aquí". 2020.
https://somoscientificos.es/

(b) Collaborator in the program of the Comunidad de Madrid: "Company-School and mathematics" (4to ESO+Empresa). Instituto de Ciencias Matemáticas and three high-schools of Madrid).
https://www.icmat.es/es/prensa%20divulgacion/divulgacion/4eso-empresa-past
March 2013.

(c) Collaboration in the Outreach Activity "Graffiti and maths": Fluids mathematics
https://www.icmat.es/cultura/graffiti/.
November 2013.

(d) Organizer for the daily activity "Conociendo un instituto de Investigación".
Activity organized for students of the double degree in Mathematics and Informatics from Polytechnic School at Autónoma University of Madrid to know the activity realized in a research institute with a conference from the director of ICMAT explaining in which consists the vision and objectives of the institute and the current outstanding research in mathematics.
December 2013.

(e) I collaborated in the blog of popular science *Las Matemáticas y sus frontéras* (*Mathematics and its frontiers*) (MatBlog).

16.2.2 Interviews

- Qué hacen 14 alumnos de la ESO en el ICMAT durante tres días?
  Blog from Comunidad de Madrid, Mathematics and its frontiers
  http://www.madrimasd.org/blogs/matematicas/2013/04/05/135960
- Matemáticos Made in Spain
  Revista Muy Interesante, December 21, 2016.
- Seis Jóvenes matemáticos explican para que sirven las matemáticas.
  Fundación BBVA.
  https://www.bbva.com/es/seis-jovenes-genios-explican-sirven-las-matematicas/
- Los algoritmos que coordinan un pelotón de drones.
  Press release from ICMAT
  https://www.icmat.es/press%20outreach/press/Releases/NP-17-09-19
- Cómo pueden los drones ayudar a las personas?
  Miradas con Alma. Blog La Caixa
  https://miradasconalma.org/noticias/pueden-los-drones-ayudar-las-personas/
- Drones que saben trabajar en equipo
  Blog Caixa Ciencia
  https://blog.caixaciencia.com/es/-/drones-colaborativos
  Video at: https://www.youtube.com/watch?v=tvi8I6YEqKs&feature=emb_title

16.3 Participation in commissions to promote outreach activities

- Member of "Unidad de cultura matemática" (department of outreach in mathematics), Instituto de Ciencias Matemáticas 2013-2014.
- Science mentor of the section Mathematics for *Frontiers for Young Minds*
  https://kids.frontiersin.org/specialties/mathematics
  since 2016.

17 Participation in Evaluation Committees and Commissions

- Undergraduate representative in the council of the mathematics department at Universidad Nacional de La Plata, Argentina between November of 2007 and November of 2009.
- Participant of the Advisor Committee of two positions of associate professor in the mathematical department of Universidad Nacional de La Plata, Argentina, 2009.
- Member of "Unidad de cultura matemática" (department of outreach in mathematics), Instituto de Ciencias Matemáticas 2013-2014.

18 Member of editorial boards, Scientific Reviews, Reports and Evaluation of Research (Scientific Advice)

(Last update January 2020) -

(a) **Associated Editor** in the *Journal of Geometric Mechanics*. American Institute of Mathematical Sciences (AIMS). From February 2020.

(b) Reviewer (Scientific reports) of AMS **Mathematical Reviewers** (from 2013).

(c) Reviewer of **International Journals Papers**:

Automatica (active reviewer, i.e., at least 3 reviews per year in the last 3 years)
IEEE Transactions on Automatic Control (active reviewer, i.e., at least 3 reviews per year in the last 3 years)
IEEE Transactions on Control of Networked systems
IEEE Control Systems Letters
SIAM Journal of Control and Optimization
Journal of Nonlinear Science
Nonlinearity
Systems and Control Letters
Journal of Optimization Theory and Applications
Nonlinear Dynamics
Journal of guidance, control and dynamics
International Journal of Robust and Nonlinear Control
European Journal of Control
Asian Journal of Control
Journal of Mathematical Physics
Journal Geometric Mechanics
Mathematics and Mechanics of Solids
SIGMA
Mediterranean Journal of Mathematics
International Journal of Geometric Methods in Modern Physics
International Journal of Dynamics and Control
Mathematics and Mechanics of Solids
Annales Mathematicae Silesianae
Journal of Engineering Mechanics
Ain Shams Engineering Journal (among others).

Reviewer of **International Conference Papers**:

Communications, Computing and Control Applications (CCCA11)
IEEE Conference on Decision and Control (CDC 2017, CDC 2018, CDC 2019)
Dynamical Systems and Control Conference (DSCC 17)
American Control Conference (ACC 2018, ACC 2019, ACC 2020)
European Control Conference (ECC18, ECC19, ECC 2020)

International Conference on Control, Decision and Information Technologies (CoDIT 18, CoDIT 19)

International Conference on Robotics and Automation (ICRA 2019)

IFAC Workshop on Distributed Estimation and Control in Networked Systems (NecSys 18)

International Conference on Control, Automation, Robotics and Vision (ICARCV 18)

IFAC Symposium on Nonlinear Control Systems (NOLCOS 2019)

IFAC World Congress 2020.

19 Attendances/Participation to Conferences, Workshops and Thematic Programs

(in person, previous COVID)

2020

- V congress of young researchers from the Spanish Royal Mathematical Society. Castellón, Spain.

2019

- 58th Conference on Decision and Control (CDC). Niza, France, December, 2019.
- International Congress on Industrial and Applied Mathematics (ICIAM). Valencia, Spain, July 2019.
- American Control Conference 2019. Philadelphia, USA, July 2019.
- Summer School on Geometry, Mechanics and Control, Madrid, Spain, June-July, 2019.
- Bienal Congress of the Spanish Royal Mathematical Society, Santander, Spain, February 2019.

2018

- 13 young Researchers Workshop on Geometry, Mechanics and Control. Coimbra, Portugal.
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), Madrid, Spain.
- Summer School on Geometry, Mechanics and Control, Santiago de Compostela, Spain.
- American Control Conference 2018. Wisconsin, USA.
- European Control Conference 2018. Limassol, Cyprus.
- Portuguese Meeting on Optimal Control 2018, Coimbra, Portugal.
- 60 Years Alberto Ibort Fest - Classical and Quantum Physics: Geometry, Dynamics and Control, Madrid, Spain.

2017

- 56th Conference on Decision and Control (CDC), Melbourne, Australia.

- New Trends in Applied Geometric Mechanics – Celebrating Darryl Holm's 70th birthday. Madrid, Spain.
- V Iberoamerican meeting on Geometry, Mechanics and Control. Tenerife, Canary Islands, Spain.
- 11th. International Young Researchers Workshop on Geometry, Mechanics and Control Tenerife, Canary Islands, Spain.

2016

- 7th European Congress of Mathematics. Berlin, Germany.
- 10th ICMAT International GMC Summer School on Geometry, Mechanics and Control. La Cristalera, Madrid, Spain.

2015

- 5th IFAC Workshop on Lagrangian and Hamiltonian Methods for Non Linear Control. Lyon, France.
- Joint STAMP conference and 9th ICMAT International GMC Summer School on Symplectic Geometry, Classical Mechanics and Interactions with Spectral Theory. Madrid.

2014

- X AIMS Conference. Madrid, Spain. July 2014.
- 8th Summer School on Geometry, Mechanics and Control. La Cristalera, Madrid, Spain. June 2014.

2013

- deLeonfest. Madrid, Spain. December 2013.
- 8th. International Young Researchers Workshop on Geometry, Mechanics and Control Barcelona, Spain. December 2013.
- XXII Fall workshop on Geometry and Physics. Evora, Portugal. September 2013.
- Mathematical Approaches to Complex Fluids - a Two Week Summer School. Isaac Newton Institute for Mathematical Science, Cambridge University, Cambridge, UK. July-August 2013.
- Topics in Numerical Analysis for Differential Equations. Madrid, Spain. July 2013.
- VII Summer School on Geometry, Mechanics and Control Miraflores de la Sierra, Madrid, Spain. July 2013.
- XII Congreso Dr. Antonio Monteiro. May 2013, Bahia Blanca, Buenos Aires, Argentina.
- IV Congreso de Matemática Aplicada, Computacional e Industrial. May 2013, Buenos Aires, Argentina.
- XIV Winter Meeting on Geometry, Mechanics and Control and Thematic day on Dirac Structures and applications. January 2013, Zaragoza, Spain.

2012

- XXI Fall workshop on Geometry and Physics. Burgos, Spain. August 2012.
- Focus Program on Geometry, Mechanics and Dynamics at Fields Institute. Fields Institute of Research in Mathematical Science. Toronto, Canadá. July de 2012.
- Ninth AIMS Conference on Dynamics Systems, Differential Equations and Application. Orlando, Florida, USA. July 2012.
- VI Summer School on Geometry, Mechanics and Control. Miraflores de las Sierras, Madrid, Spain. July 2012.
- Applied and Numerical Optimal Control spring School & Workshop. París, France. April 2012.
- IX Winter Meeting on Geometry, Mechanics and Control and Thematic day on Poisson, February, Zaragoza, Spain.

2011

- European Mathematical Society and Spanish Royal Academy of Science, joint weekend. September, Bilbao, Spain.
- Primer Encuentro de Jovenes Investigadores en Matemticas. Universidad de La Laguna (PEJIM 2011). La Laguna, Canary Islands, Spain.
- 20^{th} International Fall Workshop on Geometry and Physics, September, Madrid, Spain.
- Congress of Young researchers of the Spanish Royal Mathematical Society. Soria, Spain.
- V International Summer School on Geometry, Mechanics and Control. July, La Cristalera, Madrid, Spain.
- EECI-HYCON2 Graduate School on Control. Spring 2011, European Embedded Control Institute, Paris, France.
- Thematic day on Classic Field Theory. January, Universidad de Zaragoza, Spain.
- XIII Winter Meeting on Geometry, Mechanics and Control. January, Universidad de Zaragoza, Spain.
- Second Iberoamerican Meeting on Geometry, Mechanics and Control in Honor of Hernán Cendra. January, San Carlos de Bariloche, Argentina.

2010

- 5th Young Researchers Workshop on Geometry, Mechanics and Control. December, La Laguna, Tenerife, Spain.
- Geometry of Constraints and Control- New Developments. November, Banach Center, Warsaw, Poland.
- Workshop on Geometric and Topological Methods in Control and Robotics. October, La Cristalera, Madrid, Spain.

2009

- LIX Reunión Anual de la Unión Matemática. Mar del Plata, Mar del Plata.
- Variational Integrators in Non-holonomic and Vakonomic mechanics: an exploratoty workshop: September, Real Academia de Ciencias, Madrid, Spain.
- XVIII International Fall Workshop on Geometry and Physics: September, Centro para la Ciencia 'Pedro Pascual', Benasque, Spain.

- III International Summer School on Geometry, Mechanics and Control: June, L'Ametlla de Mar, Spain.

2008

- Primer Encuentro Iberoamericano de Geometría, Mecánica y Control. Universidad de Santiago, Santiago de Compostela, Spain.
- II Summer School on Geometry, Mechanics and Control. La Palma, Spain. June 2008.
- Tercer Encuentro Internacional de EDPs no-lineales. Buenos Aires, Buenos Aires, Argentina.

2006

- LIV Reunión Anual de la Unión Matemática Argentina. Bahia Blanca, Argentina.

20 Memberships

I was a member of RSME (Spanish Royal Mathematical Society), 2016-2022.

I am a member of IEEE (Institute of Electrical and Electronics Engineers).

I am a member of the Spanish Thematic Network *Geometry, Mechanics and Control Network* (gmcnetwork.org) from 2009.

I was a member of the IRSES program. The network was financially sponsored within Marie Curie's International Research Staff Exchange Scheme (irses) in the 7th European Framework Program, under project n.246981 (From 2010 to 2015). `http://www.geomechnetwork.ugent.be/`.