

Juan Manuel Pérez Pardo

Curriculum Vitae

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Positions

Current

04/2019 – **Assistant Professor (Profesor Ayudante Doctor)**. *Universidad Carlos III de Madrid (UC3M), Departamento de Matemáticas*. Leganés, Madrid, Spain.

Previous

04/2018 – **Juan de la Cierva Postdoctoral Researcher**. *Universidad Carlos III de Madrid (UC3M), Departamento de Matemáticas*. Leganés, Madrid, Spain.

06/2016 – **QUITEMAD+ Postdoctoral Researcher**. *Universidad Carlos III de Madrid (UC3M), Departamento de Matemáticas*. Leganés, Madrid, Spain.

06/2014 – **INFN Postdoctoral Researcher**. *Istituto Nazionale di Fisica Nucleare (INFN), Sezione di Napoli*. Naples, Italy.

11/2013 – **Postdoctoral Researcher**. *Instituto de Ciencias Matemáticas (ICMAT)*. Madrid, Spain.

09/2009 – **Teaching Assistant**. *Departamento de Matemáticas, Universidad Carlos III de Madrid*. Madrid, Spain.

Education

2009 – **PhD in Mathematics**. Universidad Carlos III de Madrid. PhD Thesis: On the theory of self-adjoint extensions of the Laplace-Beltrami operator, quadratic forms and symmetry. October 2013
Advisors: Alberto Ibort and Fernando Lledó.

Honors: Special award of the PhD program, International Mention.

2009 – 2011 **Master en ingeniería matemática. [Master degree in mathematical engineering]**. Universidad Carlos III de Madrid. Master Thesis: On the Self-Adjoint Extensions of the Laplace-Beltrami operator: Analytic and Numerical Aspects. Advisor: Alberto Ibort.

Honors: Special award of Master in mathematical engineering.

2007 – 2008 **Master en física fundamental. [Master degree in Theoretical Physics]**. Universidad Complutense de Madrid. Master Thesis: Quantum Control and Representation Theory. Advisor: Alberto Ibort.

2002 – 2008 **Licenciado en física. [Bachelor degree in Physics]**. Universidad Complutense de Madrid.

Publications

- [21] A. IBORT, J.G. LLAVONA, F. LLEDÓ AND J.M. PÉREZ-PARDO. *Representation of non-semibounded quadratic forms and orthogonal additivity*. **J. Math. Anal. Appl** **495** 2, 124783. (2021).
doi: [10.1016/j.jmaa.2020.124783](https://doi.org/10.1016/j.jmaa.2020.124783).

- [20] A. BALMASEDA, F. DI COSMO AND J.M. PÉREZ-PARDO. *On Z-Invariant Self-Adjoint Extensions of the Laplacian on Quantum Circuits*. **Symmetry** 11 8, 1047. (2019).
doi: [10.3390/sym11081047](https://doi.org/10.3390/sym11081047).
- [19] A. BALMASEDA AND J.M. PÉREZ-PARDO. *Quantum Control at the Boundary*. **Classical and Quantum Physics. Springer Proceedings in Physics** 229. (2019).
doi: [10.1007/978-3-030-24748-5](https://doi.org/10.1007/978-3-030-24748-5).
- [18] F.M. CIAGLIA, G. MARMO AND J.M. PÉREZ-PARDO. *Generalised Potential Functions in Differential Geometry and Information Geometry*. **Int. J. Geom. Methods Mod. Phys** 16 Supp. 1, 1940002. (2019).
doi: [10.1142/S0219887819400024](https://doi.org/10.1142/S0219887819400024).
- [17] F. DI COSMO, G. MARMO, J.M. PÉREZ-PARDO AND A. ZAMPINI. *A Hodge - De Rham Dirac operator on the quantum $SU(2)$* . **Int. J. Geom. Methods Mod. Phys** 15 02, 1850030. (2018).
doi: [10.1142/S0219887818500305](https://doi.org/10.1142/S0219887818500305).
- [16] F.M. CIAGLIA, F. DI COSMO, D. FELICE, S. MANCINI, G. MARMO AND J.M. PÉREZ-PARDO. *Aspects of Geodesical motion with Fisher-Rao metric: classical and quantum*. **Open Systems & Information Dynamics** 25 1. (2018).
doi: [10.1142/S1230161218500051](https://doi.org/10.1142/S1230161218500051).
- [15] S. PASCAZIO, F.V. PEPE AND J.M. PÉREZ-PARDO. *Huygens' principle and Dirac-Weyl equation*. **Eur. Phys. J. Plus** 132 287. (2017).
doi: [10.1140/epjp/i2017-11593-6](https://doi.org/10.1140/epjp/i2017-11593-6).
- [14] J.M. PÉREZ-PARDO. *Dirac-like operators on the Hilbert space of differential forms on manifolds with boundaries*. **Int. J. Geom. Methods Mod. Phys** 14 8. (2017).
doi: [10.1142/S0219887817400047](https://doi.org/10.1142/S0219887817400047).
- [13] F.M. CIAGLIA, F. DI COSMO, D. FELICE, S. MANCINI, G. MARMO AND J.M. PÉREZ-PARDO. *Hamilton-Jacobi approach to Potential Functions in Information Geometry*. **J. Math. Phys.** 58, 063506. (2017).
doi: [10.1063/1.4984941](https://doi.org/10.1063/1.4984941).
- [12] A. LÓPEZ-YELA AND J.M. PÉREZ-PARDO. *Finite element method to solve the spectral problem for arbitrary self-adjoint extensions of the Laplace-Beltrami operator on manifolds with a boundary*. **J. Comp. Phys** 347 C, 235-260. (2017).
doi: [10.1016/j.jcp.2017.06.043](https://doi.org/10.1016/j.jcp.2017.06.043).
- [11] P. ANIELLO, F.M. CIAGLIA, F. DI COSMO, G. MARMO AND J.M. PÉREZ-PARDO. *Time, classical and quantum*. **Ann. Phys** 373, 532-543. (2016).
doi: [10.1016/j.aop.2016.08.001](https://doi.org/10.1016/j.aop.2016.08.001).
- [10] M. ASOREY, A.P. BALACHANDRAN AND J.M. PÉREZ-PARDO. *Edge States at Phase Boundaries and Their Stability*. **Rev. Math. Phys.** 28 09, 1650020. (2016).
doi: [10.1142/S0129055X16500203](https://doi.org/10.1142/S0129055X16500203).
- [9] J.M. PÉREZ-PARDO, M. BARBERO-LIÑÁN AND A. IBORT. *Boundary dynamics and topology change in quantum mechanics*. **Int. J. Geom. Methods in Modern Phys.** 12, 1560011. (2015).
doi: [10.1142/S0219887815600117](https://doi.org/10.1142/S0219887815600117).
- [8] A. IBORT AND J.M. PÉREZ-PARDO. *On the theory of self-adjoint extensions of symmetric operators and its applications to Quantum Physics*. **Int. J. Geom. Methods Mod. Phys** 12, 1560005. (2015).
doi: [10.1142/S0219887815600051](https://doi.org/10.1142/S0219887815600051).
- [7] A. IBORT, F. LLEDÓ AND J.M. PÉREZ-PARDO. *Self-Adjoint Extensions of the Laplace-Beltrami Operator and unitaries at the boundary*. **J. Funct. Anal** 268, 634-670. (2015).
doi: [10.1016/j.jfa.2014.10.013](https://doi.org/10.1016/j.jfa.2014.10.013).

- [6] A. IBORT, F. LLEDÓ AND J.M. PÉREZ-PARDO. *On self-adjoint extensions and symmetries in Quantum Mechanics*. **Ann. Henri Poincaré** **16** 10, 2367-2397. (2015).
doi: [10.1007/s00023-014-0379-4](https://doi.org/10.1007/s00023-014-0379-4).
- [5] A. IBORT, G. MARMO AND J.M. PÉREZ-PARDO. *Boundary Dynamics Driven Entanglement*. **J. Phy. A: Math. Theor** **47**, 385301. (2014).
Highlighted in Europhysics News 45/5. doi: [10.1088/1751-8113/47/38/385301](https://doi.org/10.1088/1751-8113/47/38/385301).
- [4] M. ASOREY, A.P. BALACHANDRAN AND J.M. PÉREZ-PARDO. *Edge States: Topological Insulators, Superconductors and QCD Chiral Bags*. **J. High Energ. Phys** **2013** 12, 073. (2013).
doi: [10.1007/JHEP12\(2013\)073](https://doi.org/10.1007/JHEP12(2013)073).
- [3] J.M. PÉREZ-PARDO. *Quadratic Forms, Unbounded Self-Adjoint Operators and Quantum Observables*. **Nuovo Cimento C** **36** 3, 205-214. (2013).
doi: [10.1393/ncc/i2013-11533-3](https://doi.org/10.1393/ncc/i2013-11533-3).
- [2] A. IBORT AND J.M. PÉREZ-PARDO. *Numerical Solutions of the Spectral Problem for Arbitrary Self-Adjoint Extensions of the One-Dimensional Schrödinger Equation*. **SIAM J. Numer. Anal** **51** 2, 1254-1279. (2013).
doi: [10.1137/110856800](https://doi.org/10.1137/110856800).
- [1] A. IBORT AND J.M. PÉREZ-PARDO. *Quantum Control and Representation Theory*. **J. Phys. A: Math. Theor** **42**, 205301. (2009).
doi: [10.1088/1751-8113/42/20/205301](https://doi.org/10.1088/1751-8113/42/20/205301).

Conference Addresses and other Contributions

- February 2021 MATHEMATICAL ASPECTS OF PHYSICS WITH NON-SELF-ADJOINT OPERATORS: 10 YEARS AFTER. **Contributed Talk**. Title: "Quantum controllability of infinite dimensional quantum systems based on Quantum Graphs". *Centre International de Rencontres Mathématiques, Marseille, France*.
- February 2020 IV INTERNATIONAL WORKSHOP ON INFORMATION GEOMETRY, QUANTUM MECHANICS AND APPLICATIONS 2020. **Invited Speaker**. Title: "On Uhlmann's proof of the monotonicity of the relative entropy for CTPT maps". *Universidad Carlos III de Madrid (Leganés), Spain*.
- June 2019 III INTERNATIONAL WORKSHOP ON INFORMATION GEOMETRY, QUANTUM MECHANICS AND APPLICATIONS. **Invited Speaker**. Title: "On Uhlmann's definition of relative entropy". *Grajera (Segovia), Spain*.
- November 2018 NONCOMMUTATIVE GEOMETRY: PHYSICAL AND MATHEMATICAL ASPECTS OF QUANTUM SPACE-TIME AND MATTER. **Invited Speaker**. Title: "Quantum control and approximate controllability of infinite dimensional quantum systems". *S.N. Bose National Centre for Basic Sciences, Kolkata, India*.
- September 2018 XXVII INTERNATIONAL FALL WORKSHOP ON GEOMETRY AND PHYSICS. **Invited Speaker**. Title: "Quantum Control on the boundary". *IMUS, Universidad de Sevilla, Spain*.
- March 2018 CLASSICAL AND QUANTUM PHYSICS: GEOMETRY, DYNAMICS AND CONTROL. **Invited Speaker**. Title: "Quantum Control at the boundary". *ICMAT, Madrid, Spain*.
- February 2018 FUNCTION THEORY ON INFINITE DIMENSIONAL SPACES XV. **Plenary Speaker**. Title: "Representation of unbounded quadratic forms and orthogonal additivity". *Universidad Complutense de Madrid, Spain*.
- January 2018 QUANTUM PHYSICS: FIELDS, PARTICLES AND INFORMATION GEOMETRY. **Invited Speaker**. Title: "Edge States on Quantum Systems". *Dublin Institute for Advanced Studies, Ireland*.

- September 2017 XXVI INTERNATIONAL FALL WORKSHOP ON GEOMETRY AND PHYSICS. **Contributed talk.** Title: "Hamilton-Jacobi approach to contrast functions and geodetical motion in information geometry". *University of Minho, Braga, Portugal.*
- February 2017 V INTERNATIONAL WORKSHOP ON FOUNDATIONS OF QUANTUM MECHANICS AND APPLICATIONS. **Plenary speaker.** Title: "An Introduction to Information Geometry". *ICMAT, Madrid, Spain.*
- September 2016 XXV INTERNATIONAL FALL WORKSHOP ON GEOMETRY AND PHYSICS. **Contributed talk.** Title: "Quantum Mechanics and Information Geometry". *Consejo Superior de Investigaciones Científicas, Madrid, Spain.*
- February 2016 INTERNATIONAL WORKSHOP ON QUANTUM PHYSICS: FOUNDATIONS AND APPLICATIONS. **Plenary speaker.** Title: "Laplacians and Dirac-like operators on the Hilbert space of differential forms on manifolds with boundaries". *Center for High Energy Physics, Indian Institute of Science, Bangalore, India.*
- June 2015 WORKSHOP ON MATHEMATICAL STRUCTURE AND FOUNDATIONS OF QUANTUM PHYSICS. **Plenary speaker.** Title: "Boundary conditions and topology change in Quantum Mechanics". *Universidad de los Andes, Bogotá, Colombia.*
- February 2015 INTERNATIONAL WORKSHOP ON QUANTUM PHYSICS: FOUNDATIONS AND APPLICATIONS. **Plenary speaker.** Title: "Self-adjoint extensions on the Hilbert space of differential forms". *National Institute for Theoretical Physics, Wallenberg Research Centre, Stellenbosch, South Africa.*
- October 2014 SEMINARIO GRUPPO IV. **Invited Speaker.** Title: "Boundary dynamics and topology change in Quantum Mechanics". *INFN, Sezione di Napoli.*
- September 2014 XXIII FALL WORKSHOP ON GEOMETRY AND PHYSICS. **Plenary speaker.** Title: "Boundary dynamics and topology change in Quantum Mechanics". *Universidad de Granada.*
- July 2014 FIRST JOINT INTERNATIONAL MEETING RSME-SCM-SEMA-SIMAI-UMI. SPECIAL SESSION IN OPERATOR ALGEBRAS AND APPLICATIONS TO QUANTUM PHYSICS. **Invited speaker.** Title: "Quantum symmetries, self-adjoint extensions and reduction theory". *Universidad del Pais Vasco, Bilbao.*
- February 2014 INTERNATIONAL WORKSHOP ON MATHEMATICAL STRUCTURES IN QUANTUM PHYSICS AND APPLICATIONS. **Plenary speaker.** Title: "Quadratic Forms and Self-adjoint extensions. Kato's Theorem and Friedrichs' extensions". *Center for High Energy Physics, Indian Institute of Science, Bangalore, India.*
- July 2012 CONFERENCE ON MATHEMATICAL STRUCTURES IN QUANTUM SYSTEMS AND APPLICATIONS. **Invited speaker.** Title: "Quadratic Forms, unbounded Self-Adjoint Operators and Self-Adjoint Extensions of the Laplace-Beltrami Operator". *Centro de Ciencias de Benasque "Pedro Pascual", Spain.*
- 2011 SEMINARIO INTERGRUPOS DEL DEPARTAMENTO DE MATEMÁTICAS, SESIÓN JUNIOR. **Contributed talk.** Title: "Quadratic Forms and self-adjoint extensions of the Laplace-Beltrami Operator". *Universidad Carlos III de Madrid.*
- July 2011 KOLLOQUIUM DES GRADUIERTENKOLLEGS. **Contributed talk.** Title: "Quadratic Forms and general self-adjoint extensions of the Laplace-Beltrami Operator". *Georg-August-Universitaet Goettingen, Germany.*
- December 2010 QUITEMAD WORKSHOP. **Contributed talk.** Title: "Quadratic Forms and general self-adjoint extensions of the Laplace-Beltrami Operator". *Centro Universitario María Cristina, El Escorial, Spain.*
- December 2010 GROUP OF APPLIED MATHEMATICAL ANALYSIS. **Invited speaker.** Title: "Quadratic Forms and general self-adjoint extensions of the Laplace-Beltrami Operator". *Universidad Carlos III de Madrid, Spain.*

- September 2010 WORKSHOP OF YOUNG RESEARCHERS IN MATHEMATICS 2010. **Invited speaker.** Title: "Quadratic Forms and general self-adjoint extensions of the Laplace–Beltrami Operator". *Universidad Complutense de Madrid, Spain.*
- May 2010 JORNADA MTM2010. **Contributed talk.** Title: "Quadratic Forms and general self-adjoint extensions of the Laplace–Beltrami Operator". *ICMAT.*
- January 2010 XII ENCUENTRO DE INVIERNO DE GEOMETRÍA, MECÁNICA Y TEORÍA DE CONTROL. **Contributed talk.** Title: "Self-Adjoint extensions of Schroedinger Operators and Numerics". *Universidad de Zaragoza, Spain.*
- October 2009 SEMINARIO DE INFORMACIÓN Y COMPUTACIÓN CUÁNTICA. **Contributed talk.** Title: "Control Cuántico y Teoría de Representaciones". *Universidad Complutense de Madrid.*

Scientific Service

- February 2020 **Organisation:** IV International Workshop on Information Geometry, Quantum Mechanics and Applications 2020. Universidad Carlos III de Madrid, Leganés, Spain. Held from February 27th-28th 2020.
- June 2019 **Organisation:** III International Workshop on Information Geometry, Quantum Mechanics and Applications. Grajera (Segovia), Spain. Held from June 24th-28th 2019.
- October 2018– **Organisation of Q-Math seminar.** Biweekly seminar held at UC3M and ICMAT.
- March 2018 **Organisation:** Conference on Classical and quantum Physics: Geometry, Dynamics and Control. ICMAT, Madrid, Spain. Held from March 5th 2018 to March 9th 2018.
- February 2017 **Organisation:** V International Workshop on Foundations of Quantum Mechanics and Applications. ICMAT, Madrid, Spain. Held from January 30th 2017 to February 10th 2017.
- 2015– **Member of the editorial board:** International Journal of Geometric Methods in Modern Physics.
- October 2013 – June 2014 **Organisation of Q-Math seminar.** Biweekly seminar held at UC3M and ICMAT.

Participation in Research Projects

- 01/01/2019 - 31/12/2020 **S2018/TCS-4342, CAM Consejería de Educación e Investigación.** Quantum Information Technologies Madrid, QUITEMAD. *PR:* Alberto Iborat. Budget: €99.317,45.
- 01/01/2019 - 31/12/2019 **Cofinanciación Seminarios Severo Ochoa.** Seminario Q-Math. *PR:* J.M. Pérez-Pardo. Budget: €2400,00.
- 01/01/2018 - 31/12/2020 **MTM2017-84098-P, Ministerio de Economía y Empresa.** Fundamentos Matemáticos de las tecnologías de la Información Cuánticas: Convexidad, Muestreo y Algebras de Operadores. *PR:* Luis Alberto Iborat Latre. Budget: €58.564,00.
- 01/01/2015 - 31/12/2017 **MTM2014-54692, Ministerio de Economía y Competitividad.** Mathematics and Quantum Information Theory: From operator Algebras to Quantum Sampling. *PR:* Luis Alberto Iborat Latre. Budget: €80.223,00.
- 01/01/2014 - 31/12/2018 **S2013/ICE-2801, Comunidad Autónoma de Madrid.** Quantum Information Technologies in Madrid +, QUITEMAD+. *PR:* Miguel Angel Martín-Delgado. Budget: €850.000,00.
- 01/01/2011 - 31/12/2013 **MTM2010-21186-C02-02, Ministerio de Ciencia e Innovación.** Estructuras globales y métodos numéricos, sistemas dinámicos y control: Aplicaciones cuánticas. *PR:* Luis Alberto Iborat Latre. Budget: €61.226,00.
- 01/01/2010- 31/12/2013 **S2009/ESP-1594, Consejería de Educación, Comunidad de Madrid.** Tecnologías de información cuánticas: criptografía, computación y simulación QUITEMAD. *PR:* Miguel Angel Martín-Delgado. Budget: €1.050.000,00.

01/01/2012 - **Workshops VI - 2012, Universidad Carlos III de Madrid.** International Workshop on
31/12/2012 Mathematical Properties of Quantum Systems and Applications. *PR:* Luis Alberto Ibor
Latre. Budget: €375,00.

Referee / Reviewer

- Czech Science Foundation.
- European Journal of Physics Plus.
- Europhysics Letters.
- General Relativity and Gravitation.
- International Journal of Geometric Methods in Modern Physics.
- Mathematical Reviews.
- Reports on Mathematical Physics.

Awards and Honors

- 2018 - 2020 **Juan de la Cierva - Incorporación.** International application. Post-doctoral Fellowship.
- 2016 - 2018 **QUITEMAD+ Postdoctoral Fellowship.** Post-doctoral Fellowship at Department of Mathematics, Universidad Carlos III de Madrid.
- 2014 - 2016 **INFN Postdoctoral Fellowship.** Post-doctoral Fellowship at the Naples Section of "Istituto Nazionale di Fisica Nucleare" (INFN).
- 2014 **Highlight of the article:** A. Ibor, G. Marmo, J.M. Pérez-Pardo. *J. Phy. A: Math. Theor.* 47 385301 (2014) in *Europhysics News* 45/5. It was also tagged as IOPselect by the editors of the Institute of Physics (collection of articles chosen by their novelty, significance and potential impact on future research).
- 2014 **Premio extraordinario de doctorado.** [Special award of the PhD program].
- 2012 **Ayuda a la movilidad de investigadores de la Universidad Carlos III 2012.** [Mobility grant for researchers at Universidad Carlos III de Madrid 2012].
- 2011 **Premio extraordinario de Master en Ingeniería Matemática.** [Special award of Master in mathematical engineering].
- 2011 **Ayuda a la movilidad de investigadores de la Universidad Carlos III 2011.** [Mobility grant for researchers at Universidad Carlos III de Madrid 2011].

International Research Experience

- 2017 **Università degli Studi di Napoli Federico II.** *Naples, Italy.* 1 week. Host: G. Marmo.
- 2014 **Istituto Nazionale di Fisica Nucleare (Sezione di Napoli).** *Naples, Italy.* 24 months. Host: G. Marmo.
- 2012 **University of California, Berkeley.** *Berkeley, USA.* 2 months. Host: A. Weinstein.
- 2012 **Università degli Studi di Napoli Federico II.** *Naples, Italy.* 2 weeks. Host: G. Marmo.
- 2011 **Georg-August-Universität Goettingen.** *Goettingen, Germany.* 3 months. Hosts: D. Bahns and K.H. Rehren.

Teaching

Vector Calculus. Lecture Hours: **354.** Institution: Universidad Carlos III de Madrid. 2019, 2018, 2017, 2013, 2012, 2011, 2010.

Calculus. Lecture Hours: **60.** Institution: Universidad Carlos III de Madrid. 2019.

Numerical Methods in Biomedicine. Lecture Hours: **28**. Institution: Universidad Carlos III de Madrid.
2018.

Numerical Calculus Laboratory. Lecture Hours: **58**. Institution: Universidad Carlos III de Madrid.
2016.

Numerical Methods in Engineering. Lecture Hours: **89**. Institution: Universidad Carlos III de Madrid.
2011, 2010.

Fundamentos de Física: Dinámica y Calor. Lecture Hours: **90**. Institution: Universidad Complutense de Madrid.
2006.

Advising

PhD Students

Ángel Aitor Balmaseda Martín. Quantum Control of Systems with Boundaries. Start: September 2018.
Coadvisor: Alberto Iborra.

MSc Students

Ángel Aitor Balmaseda Martín. Quantum Control at the Boundary: an application to quantum circuits. Start: September 2017. End: September 2018.
Coadvisor: Alberto Iborra.

BSc Students

Juan Camilo Bucheli Victoria. Implementación de rutinas básicas de cálculo numérico de código libre con interfaz gráfica. Start: September 2019. End: September 2020.

Languages

	Reading	Listening	Speaking	Writing
German	C1	C1	C1	C1
English	C1	C1	C1	C1
Italian	B2	B2	B2	B1
Spanish	C2	C2	C2	C2

Programming Languages

- Python.
- \LaTeX .
- Matlab.
- Lua.