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Contact Information

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Present Occupation

since Feb 2021 **Associate Professor**, *Dipartimento di Matematica e Geoscienze, Università di Trieste, Trieste, Italy.*

Education and Scholarships

- 2018 – 2021 **Researcher (tenure track)**, *Dipartimento di Matematica e Geoscienze, Università di Trieste, Trieste, Italy.*
Ricamatore a tempo determinato di tipo b
- 2015 – 2018 **Investigador Principal**, *Centro de Análise Matemática, Geometria e Sistemas Dinâmicos, Departamento de Matemática, Instituto Superior Técnico, Lisbon, Portugal.*
Fixed term faculty position funded by the national program Investigador FCT IF2014
- 2009 – 2014 **Investigador Auxiliar**, *Centro de Análise Matemática, Geometria e Sistemas Dinâmicos, Departamento de Matemática, Instituto Superior Técnico, Lisbon, Portugal.*
Fixed term junior faculty position funded by the national program Ciencia2008
- 2007 – 2009 **Post-Doctoral researcher**, *Institute for Theoretical Physics and Spinoza Institute, University of Utrecht, Utrecht, The Netherlands.*
partially supported by a EC-RTN Network 'Constituents, Fundamental Forces and Symmetries of the Universe' fellowship, project MRTN-CT-2004-005104
- 2006 – 2007 **Post-Doctoral researcher**, *Department of Physics, University of Patras, Patras, Greece.*
supported by a EC-RTN Network 'Constituents, Fundamental Forces and Symmetries of the Universe' fellowship, project MRTN-CT-2004-005104
- 2004 – 2006 **Research Associate**, *Department of Mathematics, Heriot-Watt University and Maxwell Institute for Mathematical Sciences, Edinburgh, UK.*
supported by a PPARC fellowship, Grant PPA/G/S/2002/00478

- 2001 – 2004 **Ph.D. in Theory of Elementary Particles**, *International School for Advanced Studies SISSA/ISAS*, Trieste, Italy.
- thesis title The Konishi Anomaly Approach to Effective Superpotentials
- supervisors Prof. E. Gava and Prof. K.S. Narain
- 1996 – 2001 **“Laurea” degree in Theoretical Physics**, *Department of Physics, University of Genova*, Genova, Italy, 110/110 cum laude.
- thesis title On the Role of Spin in the Fractional Quantum Hall Effect
- supervisors Prof. N. Maggiore and Prof. M. Sasseti

Research Interests

- Quantum Gravity **Quantum gravity, black holes and operator algebras. Nonequilibrium dynamics and fluctuation theorems.**
- Quantum Field Theory **Supersymmetric theories, defects and dualities. Localization techniques. Non-perturbative effects and instantons.**
- Geometry **Enumerative invariants, Donaldson-Thomas theory, quivers and their representations, cluster algebras. Categorification of BPS invariants.**
- String Theory **Black holes and modular forms. Compactifications. Holography and Quantum Gravity.**
- Topological Data Analysis **Persistent homology and applications to the string theory landscape.**

Full List of Publications

preprints

published

- 2025 **Gravitational Algebras and Applications to Nonequilibrium Physics**, *M. Cirafici*, 40 pages, *Universe* **2025**, 11, 24..
arXiv:2412.17674 [hep-th].
- 2024 **Fluctuation theorems, quantum channels and gravitational algebras**, *M. Cirafici*, 18 pages, *JHEP* **11** (2024), 089.
arXiv:2408.04219 [hep-th].
- On the Nonequilibrium Dynamics of Gravitational Algebras**, *M. Cirafici*, 38 pages, *Class. Quant. Grav.* **41** (2024) no.23, 235006.
arXiv:2402.03939 [hep-th].
- Hodge-Elliptic genera, K3 surfaces and Enumerative Geometry**, *M. Cirafici*, 44 pages, *Ann. Henri Poincaré* **25**, 2731–2779 (2024).
arXiv:2304.14105 [hep-th].
- 2022 **On the M2-Brane Index on Noncommutative Crepant Resolutions**, *M. Cirafici*, 38 pages, *Lett. Math. Phys.* **112**, 88 (2022).
arXiv:2111.01102 [hep-th].

- Discrete Integrable Systems, Supersymmetric Quantum Mechanics, and Framed BPS States**, *M. Cirafici and M. Del Zotto*, 74 pages, JHEP **07** (2022), 005.
arXiv:1703.04786 [hep-th].
- 2021 **A note on discrete dynamical systems in theories of class S**, *M. Cirafici*, 34 pages, JHEP **05** (2021), 224.
arXiv:2011.12887[hep-th].
- 2019 **Quantum Line Defects and Refined BPS Spectra**, *M. Cirafici*, 29 pages, Lett. Math. Phys. 110 (2019) no.3, 501.
arXiv:1902.08586 [hep-th].
- BPS spectra, barcodes and walls**, *M. Cirafici*, 41 pages, SIGMA 15 (2019) 052.
arXiv:1511.01421 [hep-th].
- 2018 **Quivers, Line Defects and Framed BPS Invariants**, *M. Cirafici*, 67 pages, Annales Henri Poincaré 19 (2018) 1, 1-70.
arXiv:1703.06449 [hep-th].
- 2017 **On framed quivers, BPS invariants and Defects**, *M. Cirafici*, Confluentes Mathematici 9 (2017) 2, 71-99, invited contribution for the volume *BPS states, Hitchin systems and quivers*.
arXiv:1801.03778 [hep-th]
- 2016 **Defects in cohomological gauge theory and Donaldson-Thomas invariants**, *M. Cirafici*, Adv. Theor. Math. Phys. 20, (2016) 945-1006, arXiv:1302.7297 [hep-th].
- Persistent homology and string vacua**, *M. Cirafici*, 32 pages, JHEP 03 (2016) 045.
arXiv:1512.01170 [hep-th].
- 2014 **Indefinite theta functions for counting attractor backgrounds**, *G. L. Cardoso, M. Cirafici and S. Nampuri*, 24 pages, JHEP 1410 (2014) 17.
arXiv:1407.0197 [hep-th].
- Indefinite theta functions and black hole partition functions**, *G. L. Cardoso, M. Cirafici, R. Jorge and S. Nampuri*, 34 pages, JHEP 1402(2014)019.
arXiv:1309.4428 [hep-th].
- 2013 **Line defects and (framed) BPS quivers**, *M. Cirafici*, 81 pages, JHEP 1311 (2013) 141.
arXiv:1307.7134 [hep-th].
- Curve counting, instantons and McKay correspondences**, *M. Cirafici and R. J. Szabo*, J. Geom. Phys. 72 (2013) 54-109, invited contribution to the special issue "Non-commutative Algebraic Geometry and its Application to Physics" , eds. G. Cornelissen and G. Landi.
arXiv:1209.1486 [hep-th].
- Instanton counting and wall-crossing for orbifold quivers**, *M. Cirafici, A. Sinkovics, R. J. Szabo*, Ann. Henri Poincaré 14 (2013), 1001-1041.
[arXiv:1108.3922 [hep-th]].
- 2011 **Instantons, Quivers and Noncommutative Donaldson-Thomas Theory**, *M. Cirafici, A. Sinkovics and R. J. Szabo*, Nucl. Phys. B 853 (2011) 508-605.
[arXiv:1012.2725 [hep-th]].

- Crystal melting on toric surfaces**, *M. Cirafici, A. K. Kashani-Poor and R. J. Szabo*, Journal of Geometry and Physics, 61 (2011) 2199–2218.
[arXiv:0912.0737 [hep-th]].
- 2009 **Cohomological gauge theory, quiver matrix models and Donaldson-Thomas theory**, *M. Cirafici, A. Sinkovics and R. J. Szabo*, Nucl. Phys. B 809, 452 (2009).
[arXiv:0803.4188 [hep-th]]
- 2008 **Topological Strings, Two-Dimensional Yang-Mills Theory and Chern-Simons Theory on Torus Bundles**, *N. Caporaso, M. Cirafici, L. Griguolo, S. Pasquetti, D. Seminara and R. J. Szabo*, Adv. Theor. Math. Phys. 12, (2008) 981.
[arXiv:hep-th/0609129]
- 2006 **Topological strings and large N phase transitions. II: Chiral expansion of q-deformed Yang-Mills theory**, *N. Caporaso, M. Cirafici, L. Griguolo, S. Pasquetti, D. Seminara and R. J. Szabo*, JHEP 0601, 036 (2006).
[arXiv:hep-th/0511043]
- Topological strings and large N phase transitions. I: Nonchiral expansion of q-deformed Yang-Mills theory**, *N. Caporaso, M. Cirafici, L. Griguolo, S. Pasquetti, D. Seminara and R. J. Szabo*, JHEP 0601, 035 (2006).
[arXiv:hep-th/0509041]
- 2005 **Morita duality and noncommutative Wilson loops in two dimensions**, *M. Cirafici, L. Griguolo, D. Seminara and R. J. Szabo*, JHEP 0510, 030 (2005).
[arXiv:hep-th/0506016]
- Spacetime properties of ZZ D-branes**, *M. Cirafici, J. R. David, E. Gava and K. S. Narain*, JHEP 0507, 036 (2005).
[arXiv:hep-th/0504042]
- 2004 **Gravitational F-terms through anomaly equations and deformed chiral rings**, *L. F. Alday, M. Cirafici, J. R. David, E. Gava and K. S. Narain*, JHEP 0401, 001 (2004).
[arXiv:hep-th/0305217]
- Matrix models of noncommutative (2d+1) lattice gauge theories**, *F. Bazzocchi, M. Cirafici, C. Maccaferri and S. Profumo*, Int. J. Mod. Phys. A 19, 4287 (2004).
[arXiv: hep-th/0211060]
- 2003 **Gravitational F-terms of SO/Sp gauge theories and anomalies**, *L. F. Alday and M. Cirafici*, JHEP 0309, 031 (2003).
[arXiv:hep-th/0306299]
- Effective superpotentials via Konishi anomaly**, *L. F. Alday and M. Cirafici*, JHEP 0305, 041 (2003).
[arXiv:hep-th/0304119]
- An example of localized D-branes solution on pp-wave backgrounds**, *L. F. Alday and M. Cirafici*, JHEP 0305, 006 (2003).
[arXiv:hep-th/0301253]
- [proceedings](#)
- 2007 **Instantons and Donaldson-Thomas Invariants**, *M. Cirafici, A. Sinkovics and R. J. Szabo*, Fortsch. Phys. 56, 849 (2008), [arXiv:0804.1087 [hep-th]].
3rd RTN Workshop: Constituents, Fundamental Forces and Symmetries of the Universe, Valencia, Spain , 1-5 Oct 2007

- 2006 **ZZ-branes from a spacetime perspective**, *M. Cirafici*, Fortsch. Phys. 54, 343 (2006).
Corfu Conference On Constituents, Fundamental Forces And Symmetries Of The Universe, 20-26 Sep 2005, Corfu, Greece.
- 2005 **Black-holes, topological strings and large N phase transitions**, *N. Caporaso, M. Cirafici, L. Griguolo, S. Pasquetti, D. Seminara and R. J. Szabo*, J. Phys. Conf. Ser. 33, 13 (2006)., [arXiv:hep-th/0512213].
4th Meeting On Constrained Dynamics And Quantum Gravity (QG05), 12-16 Sep 2005, Cala Gonone, Sardinia, Italy

Funding ID

- 2019-2021 **Fondo per la Ricerca di Ateneo - FRA 2018**, *K-theoretical enumerative geometry in Mathematical Physics*.
Role Principal Investigator
Type of grant 3000 euro, travel and research collaborations
- 2015-2020 **FCT, IF 2014 - Exploratory Project**, IF/01426/2014/CP1214/CT0001.
Role Principal Investigator
Type of grant 50000 euro, travel and research collaborations
- 2013-2016 **FCT, Excelência 2012 - Funding of Research and Development Projects in all Scientific Domains**, EXCL/MAT-GEO/0222/2012.
Role Participant
Type of grant Long term funding of the research group
- 2013-2017 **COST, The String Theory Universe**, MPNS COST Action MP1210 - COST European Cooperation in Science and Technology.
Role Participant
Type of grant Travel and research collaborations
- 2011-2014 **FCT, Geometry of Quantization**, PTDC/MAT/119689/2010.
Role Participant
Type of grant Travel and research collaborations
- 2011-2012 **FCT, Nonperturbative Quantum Strings and Blackfolds**, FCT/CERN: CERN/FP/116386/2010.
Role Participant
Type of grant Travel and research collaborations
- 2006-2009 **EC-RTN Network, Constituents, Fundamental Forces and Symmetries of the Universe**, MRTN-CT-2004-005104.
Role Participant
Type of grant Fellowship, travel and research collaborations

2004-2006 **PPARC**, PPA/G/S/2002/00478.
Role Participant
Type of grant Fellowship, travel and research collaborations

Student supervision

- Davide Polini**, *Center for Mathematical Analysis, Geometry and Dynamical Systems, Instituto Superior Técnico, Lisbon*, 2015-2019, Thesis: Classifying and Counting $N = 2$ BPS Black Holes in an STU Model.
Defended 21/10/2019
- Master **Michelangelo Tirelli**, *Department of Physics, Trieste University, Trieste*, 2019-2020, Thesis: Topological quantum field theories from Argyres-Douglas models.
Defended 20/07/2020
- Ingo Ji Tezza**, *Department of Physics, Trieste University, Trieste*, 2020-2021, Thesis: S-duality and superconformal index on the lens space in $\mathcal{N} = 4$ Super Yang-Mills.
Defended 17/09/2021
- Michele Pasetti**, *Department of Mathematics, Trieste University, Trieste*, 2021-2022, Thesis: $Spin^c$ -structures on smooth 4-manifolds and the Seiberg-Witten invariants.
Defended 23/03/2023
- Bachelor **Martina Lovisa**, *Department of Mathematics, Trieste University, Trieste*, 2024, Thesis: Sistemi Dinamici e Caos: Studio dell'Attrattore di Lorenz.
Defended 12/12/2024
- Arianna Ferrazzo**, *Department of Mathematics and Geoscience, Trieste University, Trieste*, 2024, Thesis: Studio di oscillatori e fenomeni di sincronizzazione.
Defended 18/07/2024
- Maximilian Majstorovic**, *Department of Mathematics and Geoscience, Trieste University, Trieste*, 2019, Thesis: Mathematical Models of Opinion Dynamics.
Defended 27/07/2020
- Chiara Conforto**, *Department of Mathematics and Geoscience, Trieste University, Trieste*, 2019, Thesis: Mathematical Aspects of Gene Regulatory Networks.
Defended 17/12/2019

Invited Lectures

- 2025 **IGAP Lectures on Algebraic Quantum Field Theory**, *Institute for Geometry and Physics, Trieste, Italy*, Overall 4 hours.
title An Invitation to Gravitational Algebras
- 2009 **Thematic period on Matrix Models and Geometry**, *Instituto Superior Técnico, Lisbon, Portugal*, Overall 9 hours.
title Calabi-Yau Crystals, Donaldson-Thomas Invariants and Emergent Geometry
- 2008 **IV Modave Summer School on Mathematical Physics**, *Modave, Belgium*, Overall 6 hours.
title Equivariant Cohomology, Localization and Gauge Theory

Teaching

- 2025-present **Topics in Advanced Mathematical Physics 2: Mathematical Gauge Theory**, *Instructor*, Master, duration: 1 semester (48 hours).
This course is an introduction to Mathematical Gauge Theory.
- 2020-2024 **Dynamical Systems**, *Main instructor*, Undergraduate, duration: 1 semester (48 hours).
This course is an introduction to the methods and techniques of dynamical systems. Syllabus: ordinary differential equations; flows; one dimensional dynamical systems and bifurcations; discrete dynamical systems; linear dynamical systems; hamiltonian and gradient systems; Hartman-Grobman theorem and conjugacy; planar dynamical systems, limit cycles and Poincaré-Bendixon theorem.
- 2019 **Mathematical Modelling**, *Instructor for the theoretical part*, Undergraduate, duration: 1 semester (24 hours).
This course is an introduction to the methods and techniques of mathematical modelling. It is divided in two parts, the first theoretical in nature, the second on numerical analysis. Syllabus of the theory part: introduction to mathematical modelling. Review of ordinary differential equations. Motion in a gravitational field. Mathematical Ecology and qualitative analysis of dynamical systems. Elements of continuum mechanics and boundary value problems. Models of stars.
- 2018-2024 **Analytical Mechanics**, *Main Instructor*, Undergraduate, duration: 1 semester (90 hours).
This course is an introduction to the methods and techniques of analytical mechanics. Syllabus: review of elementary mechanics, holonomic systems, virtual works, kinematics of a rigid body, statics, deformations of rigid bodies, Lagrange equations and dynamics, oscillations.
- 2011-2013 **Renormalization Group**, *Main Instructor*, Master level, duration: 1 semester (60 hours).
This course is an introduction to the ideas and techniques of renormalization in quantum field theory with particular emphasis on the role played by the renormalization group. Syllabus: review of elementary quantum field theory; functional integration and Feynman diagrams; divergent diagrams and regularization; renormalization in scalar field theory and quantum electrodynamics; renormalization and symmetries: the quantum action; renormalization group: the Wilsonian effective action and the ERGE; applications to statistical physics and critical phenomena; Yang-Mills theory and renormalization; the Higgs mechanism.
- 2010 **Renormalization Group and Conformal Symmetry**, *Main Instructor*, Master and postgraduate level, duration: 1 semester (60 hours).
This course is an introduction to the renormalization group and to conformal field theory with application to the theory of critical phenomena. Syllabus: finite dimensional integrals: saddle points and asymptotic expansions; functional integration and Feynman diagrams; scalar field theory; renormalization group; critical phenomena and real space renormalization; conformal field theory; supersymmetry and current algebras.
- 2006 **Topics on topological strings**, *Heriot-Watt String Theory Journal Club*, 6 hours mini-course at the postgraduate level, from 20/02/2006 to 06/03/2006.
- 2005 **D-branes in (super) string theory**, *Heriot-Watt String Theory Journal Club*, 6 hours mini-course at the postgraduate level, from 07/11/2005 to 28/11/2005.

Administrative duties and external activities

- 2023 **Member of the PhD thesis defense committee of *Paolo Arnaudo*, 20 September 2024, SISSA, Trieste, Italy.**
- 2023 **Member of the PhD thesis defense committee of *Cristoforo Iossa*, 18 September 2023, SISSA, Trieste, Italy.**
- Member of the PhD thesis defense committee of *Mario de Marco*, 20 March 2023, SISSA, Trieste, Italy.**
- since 2023 **Member of the Board for the PhD Program *Earth Science, Fluid-Dynamics, and Mathematics. Interactions and Methods*, Department of Mathematics and Geoscience, Trieste University.**
- since 2021 **Editor in Chief of the journal *Rendiconti dell'Istituto di Matematica dell'Università di Trieste*, ISSN 0049-4704, e-ISSN 2464-8728.**
- since 2021 **Member of the *Gruppo di Assicurazione della Qualità*, Trieste University.**
- since 2020 **Member of the *Comissione Paritetica SISSA-Università per la laurea magistrale*, Trieste University.**
- 2020 **Member of the PhD thesis defense committee of *Nadir Fasolai*, 18 December 2020, SISSA, Trieste, Italy.**
- 2018 **Member of the PhD thesis defense committee of *Matteo Poggi*, 21 September 2018, SISSA, Trieste, Italy.**
- 2017 **Member of the organizing committee for the conference *Iberian Strings 2017*, 16-19 January 2017, Instituto Superior Técnico, Lisbon, Portugal.**
<https://ibstrings.math.tecnico.ulisboa.pt/>
- 2016 **Member of the organizing committee for the Special Session *Recent developments in String Theory*, of the 2016 Meeting of the Portuguese Mathematical Society, 11-13 July 2016, Barreiro, Portugal.**
<http://enspm16.spm.pt/pt/>
- 2015 **Member of the organizing committee for the Special Session *Geometrical and Enumerative Structures in Supersymmetry*, of the 2015 International Meeting of the American Mathematical Society, the European Mathematical Society and the Portuguese Mathematical Society, 10-13 June 2015, Porto, Portugal.**
<http://aep-math2015.spm.pt/>
- 2014 **Member of the organizing committee for the conference *X Avogadro Meeting on Strings, Supergravity and Gauge Theories*, 17-19 December 2014, Scuola Normale Superiore, Pisa, Italy.**
<http://webtheory.sns.it/avogadro2014/index.php>
- Member of the organizing committee for the conference *Summer School on String Theory and Holography*, 14-18 July 2014, Instituto Superior Tecnico, Lisbon Portugal.**
<http://faraday.fc.up.pt/cfp-pages/School/index.html>
- Member of the PhD thesis defense committee of *Alvaro Veliz Osorio*, 16 January 2014, Physics Department, Instituto Superior Tecnico, Lisbon, Portugal.**

- 2013 **Member of the organizing committee for the conference *IX Avogadro Meeting on Strings, Supergravity and Gauge Theories*, 18-20 December 2013, SISSA, Trieste, Italy.**
<http://avogadro.ictp.it/>
- Member of the organizing committee for the conference *Iberian Strings 2013*, 22-25 January 2013, Instituto Superior Técnico, Lisbon, Portugal.**
<http://ibstrings.math.ist.utl.pt/>
- 2012 **Member of the organizing committee for the conference *VIII Avogadro Meeting on Strings, Supergravity and Gauge Theories*, 19-21 December 2012, Scuola Normale Superiore, Pisa, Italy.**
<http://webtheory.sns.it/avogadro/index.html>
- 2003 **Panel activity at the discussion session on *Matrix Models and Supersymmetric Gauge Theories*, RTN Workshop: *The Quantum Structure of Spacetime and the Geometric Nature of Fundamental Interactions*, Copenhagen, Denmark, 15–20 September 2003.**

Research visits

- Oct-Dec 2017 **Hausdorff Research Institute for Mathematics HIM, Bonn, Germany.**
- Apr-July 2016 **Institut Henri Poincaré, Paris, France.**
- Sept-Dec 2015 **Institut des Hautes Études Scientifiques, Bures-Sur-Yvette, France.**
- Feb-March 2015 **CERN, Switzerland.**
- Sept-Oct 2010 **Institut des Hautes Études Scientifiques, Bures-Sur-Yvette, France.**
- Sept 2007 **Department of Applied Mathematics and Theoretical Physics, Cambridge, UK.**

Talks

- 2024 **On the Nonequilibrium Dynamics of Gravitational Algebras, *International Congress of Mathematical Physics 2024*, Strasbourg, France, 1-6 July 2024.**
- On the Nonequilibrium Dynamics of Gravitational Algebras, *QUAST Seminar*, Okinawa Institute for Science and Technology, Japan, 27 June 2024.**
 Online
- Black holes and the information paradox, *Plenary Session Phd Days ESFM 2024*, Trieste University, 27 February 2024.**
- 2022 **(Refined) BPS States from HEII, *BPS States, Mirror Symmetry and Exact WKB II*, Sheffield University, UK, 05–09 September 2022.**
- (Refined) BPS States from HEII, *Workshop on Supermoduli and Superstrings*, Institute for Geometry and Physics, and SISSA, Trieste, Italy, 27-30 June 2022.**

- 2020 **A survey of the GMN construction**, *International School for Advanced Studies (SISSA-ISAS)*, Trieste, Italy, 17 and 21 February 2020.
- 2019 **Supersymmetric line operators and their spectral problem**, *Center for Mathematical Analysis Geometry and Dynamical Systems*, Lisbon University, Lisbon, Portugal, 22 October 2019.
- Refined BPS spectra and quantum line defects**, *Conference Workshop on Algebraic Geometry and Physics: Supermoduli*, Institute for Geometry and Physics, IGAP, Trieste, Italy, 23-26 September 2019.
- 2018 **On quantum line operators and refined DT invariants**, *Conference Geometry and Topology inspired by Physics, Monte Verità Conference Center*, Ascona, Switzerland, 24-29 June 2018.
- 2017 **Line defects in $N=2$ QFT and framed quivers**, *Workshop Young Researchers in String Mathematics, Max Planck Institute for Mathematics*, Bonn, Germany, 27-30 November 2017.
- On two applications of persistent homology to string theory vacua**, *CAMGSD, University of Lisbon*, Lisbon, Portugal, 13 November 2017.
- Framed BPS quivers and line defects**, *University of Heidelberg*, Heidelberg, Germany, 20 March 2017.
- Line defects and their algebraic structures**, *"Quantum Spacetime '17", Quantum Structure of Spacetime (QSpace) - 2nd COST MP1405 Meeting*, Porto, Portugal, 30 Jan - 3 Feb 2017.
- 2016 **Topological data analysis and string theory vacua**, *University of Seville*, Seville, Spain, 24 november 2016.
- Framed BPS states from framed BPS quivers**, *Institut des Hautes Études Scientifiques*, Bures-sur-Yvette, France, 20 october 2016.
- Persistent homology and the problem of vacuum selection in string theory**, *National Meeting of the Portuguese Mathematical Society*, Barreiro, Portugal, 11-13 july 2016.
- Persistent Homology and String Vacua**, *University of Barcelona*, Spain, 21 January 2016.
- 2015 **BPS invariants, quivers and line defects**, *Institut de Mathématiques de Bourgogne*, Dijon, France, 14 december 2015.
- Theories of class S and line defects**, *Institut des Hautes Études Scientifiques*, Bures-sur-Yvette, France, 30 september 2015.
- On Wilson-'t Hooft Lines in Theories of Class S**, *Iberian Strings 2015*, University of Salamanca, Spain, 28 may 2015.
- Framed quivers, line defects and BPS invariants**, *Institut Camille Jordan, Université Claude Bernard Lyon 1*, Lyon, France, 10 april 2015.
- Line defects in $\mathcal{N} = 2$ QFT and framed BPS states**, *University of Genoa*, Genoa, Italy, 31 march 2015.
- Line defects, framed quivers and quantum monodromies**, *CERN*, Switzerland, 27 January 2015.

- 2014 **Line defects in $\mathcal{N} = 2$ QFT: framed quivers and cluster algebras**, *The String Theory Universe - 2nd COST MP1210 Meeting and 20th European Workshop on String Theory*, Mainz, Germany, 22-26 September 2014.
- Line defects and framed quivers in $\mathcal{N} = 2$ QFT**, *University of Turin*, Turin, Italy, 29 April 2014.
- $\mathcal{N} = 2$ QFT, line defects and quivers**, *Centro de Física do Porto, Porto University*, Porto, Portugal, 14 February 2014.
- Line defects and cluster transformations**, *Iberian Strings 2014*, Palencia, Spain 29-31 January 2014.
- 2013 **Framed BPS quivers and line defects in $\mathcal{N} = 2$ QFT**, *Queen Mary, University of London*, London, UK, 2 October 2013.
- Problem solving with SuSy**, *LARSyS 2013: Robotics and Systems in Engineering and Science*, Pavilhão do Conhecimento, Lisbon, 4-5 July 2013.
- Defects in cohomological gauge theory and Donaldson-Thomas invariants**, *Vector Bundles on Algebraic Curves 2013: Hilbert Schemes, Sheaves and Representations*, SISSA, Trieste, 17-21 June 2013.
- 2012 **Line defects and framed BPS quivers**, *CAMGSD*, Instituto Superior Técnico, Lisbon, Portugal, 28 May 2012.
- BPS states, wall-crossing and quivers**, *Iberian Strings 2012*, Bilbao, Spain 31 January - 2 February 2012.
- 2011 **Quivers and Noncommutative Donaldson-Thomas Invariants**, *Problemi Attuali in Fisica Teorica – Contemporary Problems in Theoretical Physics*, Vietri sul Mare, Italy, 15 April 2011.
- 2010 **Non-perturbative Effects in Calabi-Yau Compactifications**, *Second Minho Meeting on Mathematical Physics*, Minho University, Guimarães, Portugal, 5 November 2010.
- Instantons, Quivers and Noncommutative Donaldson-Thomas Invariants**, *Rencontres théoricienne, Institut Henri Poincaré*, Paris, France, 7 October 2010.
- Quivers and Donaldson-Thomas theory on local threefolds**, *3rd Iberian Mathematical Meeting*, Braga, Portugal, 1-3 October 2010.
- On Wall Crossing and BPS States**, *Trends in Quantum Geometry: Jornada Matemática in honour of Maxim Kontsevich*, Lisbon, 7 July 2010.
- Cohomological Gauge Theory and Donaldson-Thomas Invariants**, *Vector Bundles on Algebraic Curves 2010 : New Invariants and Stability Conditions*, Lisbon, 14-18 June 2010.
- 2009 **Instantons, Hypermultiplets and Calabi-Yau Compactifications**, *Centro de Análise Matemática, Geometria e Sistemas Dinâmicos, Instituto Superior Técnico*, Lisbon, Portugal, 21 September 2009.
- On Instanton Effects in Calabi-Yau Compactifications**, *University of Utrecht*, Utrecht, the Netherlands, 19 June 2009.

- 2008 **Instantons and Hypermultiplet Moduli Spaces**, *Université Libre de Bruxelles*, Bruxelles, Belgium, 6 November 2008.
- Recent developments in Topological Strings: D-brane instantons and hypermultiplets**, *IV Avogadro Meeting on Strings, Supergravity and Gauge Theories*, SISSA, Trieste, Italy, 17-19 December 2008.
- On Instantons and Donaldson–Thomas Invariants**, *Convegno di Fisica Teorica*, Sestri Levante, Italy, 4–6 June 2008.
- Cohomological Gauge Theory and Enumerative Geometry**, *University of Genoa*, Genoa, Italy, 3 June 2008.
- Cohomological gauge theory, quiver matrix models and Donaldson-Thomas theory**, *University of Amsterdam*, Amsterdam, the Netherlands, 8 April 2008.
- 2007 **Instantons and Donaldson–Thomas Invariants**, *University of Utrecht*, Utrecht, the Netherlands, 30 November 2007.
- Topics in Donaldson–Thomas Theory**, *Third RTN workshop of the network Constituents, Fundamental Forces and Symmetries of the Universe*, Valencia, Spain, October 1–5 2007.
- Towards Donaldson–Thomas Theory on Orbifolds**, *Fourth Regional Meeting in String Theory*, Patras, Greece, 10–17 June 2007.
- 2006 **Topological Strings and 2D Yang–Mills on the torus**, *Workshop on Topological Strings and Black Holes*, Trieste, Italy, 20–22 November 2006.
- Topological Strings and q-deformed Yang–Mills**, *Department of Applied Mathematics and Theoretical Physics*, Cambridge, UK, 01 June 2006.
- 2005 **Topological Strings and Large N Phase Transitions**, *Queen Mary University*, London, UK, 25 November 2005.
- Spacetime Properties of ZZ D–Branes**, *Workshop of the Constituents, Fundamental Forces and Symmetries of the Universe network*, Corfu, Greece, September 20–26, 2005.
- 2D Yang–Mills, Topological Strings and large–N transitions**, *12th Meeting of the North British Mathematical Physics Seminar*, York, UK, 28 June 2005.
- Spacetime Properties of ZZ Branes**, *Heriot–Watt University*, Edinburgh, UK, 25 May 2005.
- 2004 **On the Konishi Anomaly Approach to Effective Superpotentials and Gravitational Corrections**, *Edinburgh University*, Edinburgh, UK, 12 October 2004.
- 2003 **Effective Superpotentials via Konishi Anomaly**, *Congresso di Fisica Teorica*, Cortona, Italy, 28–31 May 2003.

Other awards

- 2020-2029 **Abilitazione Scientifica Nazionale**, *Habilitation at the level of Full Professor in Mathematical Physics*, Italy, 01/A4 - Fisica Matematica.
I Fascia.

- 2014-2023 **Abilitazione Scientifica Nazionale**, *Habilitation at the level of Associate Professor in Mathematical Physics*, Italy, 01/A4 - Fisica Matematica.
II Fascia.
- 2017-2021 **Qualification**, *Habilitation at the level of Professeur des universités*, France, n. 17125231694D.
Section 25 - Mathématiques
- 2017-2021 **Qualification**, *Habilitation at the level of Maître de Conférence*, France, n. 17225231694D.
Section 25 - Mathématiques
- 2017-2021 **Qualification**, *Habilitation at the level of Maître de Conférence*, France, n. 17229231694D.
Section 29 - Constituants élémentaires

Languages

| | |
|--------------------------|----------------------|
| Italian | mother tongue |
| English, Portuguese | fluent |
| French | moderate |
| German, Dutch,Spanish | very basic |

Computer skills

| | |
|-------------------------|---------------------|
| symbolic computation | Mathematica, Matlab |
| writing | \LaTeX |

Science communication

- 2021 **Outreach activity**, *Entropy, Information and Biodiversity*, Collegio Fonda, 6-12-2021.
- Outreach activity**, *Dalla Geometria alle Geometrie*, Moduli Formativi Estivi, 30-08-2021 – 3-09-2021.
- 2019 **Outreach activity**, *Stringhe e Dimensioni Nascoste: un'occhiata all'interno dei buchi neri*, Circolo Matematico - outreach seminar for high school students, 15-02-2019.
- 2009-2018 **Popular Science Blog - Blog de Divulgação Científica**, *Contributor to the popular science blog of the Mathematical Physics group at CAMGSD, which is part of an outreach effort to raise public awareness of contemporary research in the mathematics of string theory*, English and Portuguese.
<http://www.math.ist.utl.pt/~strings/blog.php>