

# Alessandro Portaluri

## Curriculum Vitæ

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### Personal Information

Language skills Italian (native), English and Portuguese (fluent), Spanish (Intermediate)

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### Position held

- January 2020 - present **Abilitazione Nazionale al ruolo di Professore di I fascia nel settore SSD/MAT05 Analisi Matematica .**
- March 2016 - present **Associate Professor in Mathematical Analysis, Università degli Studi di Torino, Torino (Italy).**
- Oct. 2012 - Feb.2016 **Researcher in Mathematical Analysis , Università degli Studi di Torino, Torino (Italy).**
- Jan.2009 - Sept. 2012 **Researcher in Mathematical Analysis , Università del Salento, Lecce (Italy).**
- Jan. 2007 - Dec. 2008 **Postdoc position, Università degli Studi di Milano-Bicocca (Italy).**
- Jan. 2005 - Dec. 2006 **Postdoc position, Università degli Studi di Milano-Bicocca (Italy).**
- June 2003 - Dec. 2003 **Visiting position , Universidade de São Paulo (Brazil).**

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### Education

- March 2000 - May 2004 **PhD student in Mathematics, Università degli Studi di Genova.**  
Advisor: Prof. Jacobo Pejsachowicz (Politecnico di Torino).  
PhD thesis (in english): *Morse index theorem and bifurcation of semi-Riemannian geodesics.*
- Oct. 1994 - July 1999 **Student of Mathematics, Università degli Studi di Pisa.**  
Laurea thesis (in italian): *Stime di Strichartz per l'equazione delle onde con dati iniziali di energia finita.*  
Supervisor: Prof. M.K.V. Murthy.

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### Grants

- 2017 **FFABR, Finanziamento Ricerca di Base, PI. Prof. A. Portaluri.**
- 2013–2018 **ERC Advanced Grant, Complex Patterns for Strongly Interacting Dynamical Systems (COMPAT), PI. Prof. S. Terracini. Advanced Grant 2013. N. 339958.**
- 2017–2020 **PRIN 2015, Research Project: "Variational methods, with applications to problems in mathematical physics and geometry". PI.Prof. A. Malchiodi.**
- 2014–2017 **PRIN 2012, Research project: "Aspetti variazionali e perturbativi nei problemi differenziali nonlineari " PI.Prof. S. Terracini.**

- 2012 **GNAMPA 2012**, (*National Group of Mathematical Analysis, Probability and Applications*) research project: “*Indice di Maslov per operatori differenziali in dimensione finita e infinita*”. *PI. Dr. Roberta Fabbri.*
- 2011 **5 per mille per la ricerca dell’Università del Salento**, *Research project: “Collisioni fra vortici puntiformi e fra filamenti di vorticità: singolarità, trasporto e caos”.* *PI Dr. A. Portaluri.*
- 2011–2013 **PRIN 2009**, *Research project: “Equazioni ellittiche non lineari in mancanza di compattezza, dinamica simbolica e moti parabolici per il problema degli  $N$  corpi.”* *PI. Prof. S. Terracini.*

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## Mentoring

### Postdocs

- 2016 - present Wu Li, Math. Dept. Shandong University (Jinan), co-advised with prof. Xijun Hu (Shandong University)

### PhD Students

- 2017-present Qin Xing, co-advised with prof. Xijun Hu (Shandong University)
- 2015-2019 Ran Yang, *G-equivariant Bott-type iteration formulae*, co-advised with prof. Xijun Hu (Shandong University)
- 2012-2015 Riccardo D. Jadanza, *Morse Index and Linear Stability of relative equilibria in singular mechanical systems*, co-advised with prof.ssa Vivina Barutello (University of Turin)

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## Administrative and Scientific responsibilities

### Administrative responsibilities

- 2017 E-learning administrator on the DISAFA Moodle e-learning platform: [disafa.i-learn.unito.it](http://disafa.i-learn.unito.it)
- 2012 - 2016 E-learning administrator on the DISAFA Moodle UniTo e-learning platform
- 2015 - present Member of the *Commissione per la didattica*, DISAFA, University of Turin (Torino)
- 2012 - present Member of the *Commissione per il test di ammissione ai CdL a numero programmato*, DISAFA, University of Turin (Torino)

### Scientific responsibilities

- 2017 - present Member of the *Collegio dei docenti del Dottorato in Matematica Pura e Applicata*, University of Turin and Polytechnic of Turin (Torino)
- 2009 - 2011 Member of the *Collegio dei docenti del Dottorato di Ricerca in Matematica*, University of Salento (Lecce)

### Editorial work

- 2002 - present Referee for the following selected Mathematical Journals: Journal of Differential Equations, Zeitschrift für angewandte Mathematik und Physik, Communication in Mathematical Physics, Advances in Mathematics, Nonlinear Differential Equations and Applications NoDEA, ESAIM-COCV, Proc. Roy. Soc. Edin. Sect. A, Proceedings of the American Mathematical Society, Differential and Integral Equations, Advances in Differential Equations, Advances in Nonlinear Studies, Journal of Topology and Analysis.
- 2005 - present Reviewer for Math Reviews (MathSciNet).

### Grant Assessment

- 2016 Evaluator of grant proposal for FARE 2016  
 2012 Evaluator of grant proposal for MIUR-CINECA

### Conference organization

- September 17–20, 2018 **Workshop “SIMAI-UMI, PTM 2018, Joint Meeting”**, *Co-organizer of the session: “New perspectives in Singular Hamiltonian systems”*, Wroclaw, Poland..
- July 01–05, 2016 **Workshop “11th AIMS Conference on Dynamical Systems, Differential Equations and Applications”**, *Co-organizer of the session: “Celestial Mechanics and beyond”*, Orlando, Florida, USA..
- January 26–30, 2015 **Workshop “Complex Patterns in Nonlinear Phenomena with a day dedicated to Jacobo Pejsachowicz on the occasion of his 70th birthday”**, *Member of the Scientific Committee*, E.R.C. Advanced Grant-COMPAT, Turin, Italy.
- June 24–28, 2013 **Workshop “Mathematical Paradigms of Climate Science ”**, *Member of the Scientific Committee*, I.N.D.A.M. Roma, Italy.
- June 20–21, 2013 **Workshop “Giornate fiorentine su dinamica non autonoma e metodi topologici in equazioni differenziali ”**, *Member of the Scientific Committee*, G.N.A.M.P.A., Firenze, Italy.
- May 28– June 8, 2013 **“Workshop on Variational methods in N-body and Vortex Dynamics ”**, *Member of the Scientific Committee*, Università del Salento, Lecce, Italy.
- March 30, 2009 **“Workshop on Index theory, nonlinear Dirac equations and Morse-Floer homology”**, *Member of the Scientific Committee*, Politecnico di Torino, Torino, Italy.
- May 2007 **“Workshop on Mathematical control theory”**, *Member of the Scientific Committee*, Università di Milano-Bicocca, Milano, Italy.
- March 2005 **Lecture of Prof. A. Mischenko on “Novikov conjecture and almost flat bundle”**, *Member of the Scientific Committee*, Università di Milano-Bicocca, Milano, Italy.
- July 2002 **“Quattro lezioni introduttive alla topologia simplettica”**, *Member of the Scientific Committee*, Politecnico di Torino, Torino, Italy.

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## Research

### Research Interests

- Index theory **Ordinary and partial differential operators**, *Maslov index and Spectral flow for paths of self-adjoint (un)bounded Fredholm operators. Index theory for singular differential operators.*

- Singular problems **Linear (in)stability**, *Linear stability and instability of periodic solutions of Hamiltonian systems and variational characterization through the Morse index. Equivariant central configurations, Instability of periodic solutions for the  $N$ -vortex problem.*
- Hamiltonian dynamics **Morse theory**, *Morse and Floer homology for singular Lagrangian systems, Morse theory for the  $N$ -body type problems.*
- Bifurcation theory **Bifurcation theory**, *For potential operators, bifurcation of geodesics and conjugate points.*

Published/Accepted papers

- [38] V. L. Barutello, D. Offin, A. Portaluri, L. Wu, *Sturm theory with applications in geometry and classical mechanics*, Math. Z. 299 (2021), no. 1-2, 257–297. Preprint available at <https://arxiv.org/abs/2005.08034>.
- [37] A. Portaluri, L. Wu, R. Yang, *Linear instability for periodic orbits of non-autonomous Lagrangian systems*, Nonlinearity 34 (2021), no. 1, 237–272. Preprint available at <https://arxiv.org/abs/1907.05864>.
- [36] H. Kavle, D. Offin, A. Portaluri, *Keplerian orbits through the Conley-Zehnder index*, Qual. Theory Dyn. Syst. 20 (2021), no. 1, Paper No. 10, 27 pp. Preprint available at <https://arxiv.org/abs/1908.00075>.
- [35] X. Hu, A. Portaluri, Q. Xing, *Morse index and stability of the planar  $N$ -vortex problem*, Qual. Theory Dyn. Syst. 19 (2020), no. 2, Paper No. 76, 39 pp. Preprint available at <https://arxiv.org/abs/1905.05297>.
- [34] A. Portaluri, L. Wu, *Spectral flow, Brouwer degree and Hill's determinant formula*, J. Differential Equations 269 (2020), no. 9, 7253–7286. Preprint available at <https://arxiv.org/abs/2006.00956>.
- [33] V.L. Barutello, X. Hu, A. Portaluri, Alessandro, S. Terracini, *An index theory for asymptotic motions under singular potentials*, Adv. Math. 370 (2020), 107230, 57 pp. Preprint available at <https://arxiv.org/abs/1705.01291>.
- [32] X. Hu, A. Portaluri, R. Yang *A dihedral Bott-type iteration formula and stability of symmetric periodic orbits*, Calc. Var. Partial Differential Equations 59 (2020), no. 2, Paper No. 51, 40 pp. Preprint available at <https://arxiv.org/abs/1705.09173>.
- [31] X. Hu, A. Portaluri, R. Yang *Instability of semi-Riemannian closed geodesics*, Nonlinearity 32 (2019), no. 11, 4281–4316. Preprint available at <http://arxiv.org/pdf/1706.07619.pdf>.
- [30] X. Hu, A. Portaluri *Bifurcation of heteroclinic orbits via an index theory*, Math. Z. 292 (2019), no. 1-2, 705–723. Preprint available at <http://arxiv.org/pdf/1704.06806.pdf>.
- [29] G. Marchesi; A. Portaluri; N. Waterstraat. *Not every conjugate point of a semi-Riemannian geodesic is a bifurcation point*, Differential Integral Equations 31 (2018), no. 11-12, 871–880. Preprint available at <http://arxiv.org/pdf/1703.10483.pdf>.
- [28] A. Portaluri; N. Waterstraat *Corrigendum to: A Morse-Smale index theorem for indefinite elliptic systems and bifurcation*, [J. Differential Equations **258** (5) (2015) 1715–1748]. J. Differential Equations **264** (2018), no. 4, 3067–3069.
- [27] X. Hu, A. Portaluri, *Index theory for heteroclinic orbits of Hamiltonian systems*, Calc. Var. Partial Differential Equations **56** (2017), no. 6, 56:167, 1–24 Preprint available at <https://arxiv.org/abs/1703.03908>.
- [26] A. Portaluri, N. Waterstraat, *A  $K$ -theoretical invariant and bifurcation for homoclinics of Hamiltonian systems*, J. Fixed Point Theory Appl. **19** (2017), no. 1, 833–851. Preprint available at <https://arxiv.org/abs/1605.08402>.

- [25] V. Barutello, R. D. Jadanza, A. Portaluri, *Morse Index and Linear Stability of the Lagrangian Circular Orbit in a Three-Body-Type Problem Via Index Theory*, Arch. Ration. Mech. Anal. **219** (2016), no. 1, 387–444. Preprint available at <http://arxiv.org/pdf/1406.3519.pdf>.
- [24] A. Portaluri, N. Waterstraat, *Yet another proof of the Morse index theorem*, Expo. Math. **33** (2015), no. 3, 378–386. Preprint available at <http://arxiv.org/pdf/1312.5291.pdf>.
- [23] A. Portaluri, N. Waterstraat, *A Morse-Smale index theorem for indefinite elliptic systems and bifurcation*, J. Differential Equations **258** (2015), no. 5, 1715–1748. Preprint available at <http://arxiv.org/pdf/1408.1419.pdf>.
- [22] V. Barutello, R. D. Jadanza and A. Portaluri, *Linear instability of relative equilibria for n-body problems in the plane*, Barutello, Vivina L.; Jadanza, Riccardo D.; Portaluri, Alessandro J. Differential Equations **257** (2014), no. 6, 1773–1813. Preprint available at <http://arxiv.org/pdf/1310.8318v3.pdf>.
- [21] N. Waterstraat, A. Portaluri, *On bifurcation for semilinear elliptic Dirichlet problems on geodesic balls*, J. Math. Anal. Appl. **415** (2014), no. 1, 240–246. Preprint available at <http://arxiv.org/abs/1305.3078>.
- [20] N. Waterstraat, A. Portaluri, *Bifurcation results for critical points of families of functionals*, Differential Integral Equations **27** (2014), no. 3-4, 369–386. Preprint available at <http://arxiv.org/abs/1210.0417>.
- [19] N. Waterstraat, A. Portaluri, *On bifurcation for semilinear elliptic Dirichlet problems and the Morse–Smale index theorem*, J. Math. Anal. Appl. **408** (2013), no. 2, 572–575.
- [18] R. Castelli, F. Paparella, A. Portaluri, *Singular dynamics under a weak potential on a sphere*, NoDEA Nonlinear Differential Equations Appl. **20** (2013), no. 3, 845–872. Preprint available at <http://arxiv.org/abs/1109.1128>.
- [17] D. L. Ferrario, A. Portaluri, *Dynamics of the dihedral four body problem*, Discrete Contin. Dyn. Syst. Ser. S **6** (2013), no. 4, 925–974. Preprint available at <http://arxiv.org/abs/1112.4623>.
- [16] F. Paparella, A. Portaluri, *Geometry of stationary solutions for a system of vortex filaments: a dynamical approach*, Discrete Contin. Dyn. Syst. **33** (2013), no. 7, 3011–3042. Preprint available at <http://arxiv.org/abs/1112.1789>.
- [15] F. Paparella, A. Portaluri, *Dynamics of (4+1)-Dihedrally Symmetric Nearly Parallel Vortex Filaments*, Acta Applicandae Math., **122** (2012), 349–366. DOI 10.1007/s10440-012-9748-5.
- [14] F. Dalbono, A. Portaluri, *Morse-Smale index theorems for elliptic boundary deformation problems*, J. Differential Equations **253** (2012), no. 2, 463–480.
- [13] A. Portaluri, *A K-theoretical invariant and bifurcation for a parameterized family of functionals*. J. Math. Anal. Appl. **377** (2011), no. 2, 762–770. Preprint available at <http://arxiv.org/abs/0905.3897>.
- [12] L. Abatangelo, A. Portaluri, *Morse theory for a fourth order elliptic equation with exponential nonlinearity*, NoDEA Nonlinear Differential Equations Appl. **18** (2011), no. 1, 27–43. Preprint available at <http://arxiv.org/abs/0911.2563>.
- [11] A. Capietto, F. Dalbono, A. Portaluri, *A multiplicity result for a class of strongly indefinite asymptotically linear second order systems*, Nonlinear Anal. **72** (2010), no. 6, 2874–2890. Preprint available at <http://arxiv.org/abs/0906.0172>.
- [10] A. Portaluri, *On a generalized Sturm theorem*, Adv. Nonlinear Stud. **10** (2010), no. 1, 219–230. Preprint available at <http://arxiv.org/abs/0705.3516>.
- [9] A. Portaluri, *Indefinite Sturm theory*. (Russian) Funktsional. Anal. i Prilozhen. **43** (2009), no. 4, 91–96; translation in Funct. Anal. Appl. **43** (2009), no. 4, 316–319. Preprint available at <http://arxiv.org/abs/0812.1933>.

- [8] A. Abbondandolo, A. Portaluri, M. Schwarz, *The homology of path spaces and Floer homology with conormal boundary conditions*, J. Fixed Point Theory Appl. **4** (2008), no. 2, 263–293. Preprint available at <http://arxiv.org/abs/0810.1977>.
- [7] D. L. Ferrario, A. Portaluri, *On the dihedral n-body problem*, Nonlinearity **21** (2008), no. 6, 1307–1321. Preprint available at <http://arxiv.org/abs/0707.3598>.
- [6] A. Portaluri, *Maslov index for Hamiltonian systems*, Electron. J. Differential Equations (2008), **09**, 10 pp. Preprint available at <http://arxiv.org/abs/math/0405153>.
- [5] M. Musso, J. Pejsachowicz, A. Portaluri, *Morse index and bifurcation of p-geodesics on semi-Riemannian manifolds*, ESAIM Control Optim. Calc. Var. **13** (2007), no. 3, 598–621.
- [4] M. Musso, J. Pejsachowicz, A. Portaluri, *A Morse index theorem for perturbed geodesics on semi-Riemannian manifolds*, Topol. Methods Nonlinear Anal. **25** (2005), no. 1, 69–99. Preprint available at <http://arxiv.org/abs/math/0311147>.
- [3] P. Piccione, A. Portaluri, *A bifurcation result for semi-Riemannian trajectories of the Lorentz force equation*, J. Differential Equations **210** (2005), no. 2, 233–262.
- [2] R. Giambò, P. Piccione, A. Portaluri, *Computation of the Maslov index and the spectral flow via partial signatures*, C. R. Math. Acad. Sci. Paris **338** (2004), no. 5, 397–402.
- [1] P. Piccione, A. Portaluri, D. V. Tausk, *Spectral flow, Maslov index and bifurcation of semi-Riemannian geodesics*, Ann. Global Anal. Geom. **25** (2004), no. 2, 121–149. Preprint available at <http://arxiv.org/abs/math/0211091>.

#### Submitted papers

- [2] X. Hu, A. Portaluri, R. Yang, *A dihedral Bott-type iteration formula and stability of symmetric periodic orbits*. Preprint available at <https://arxiv.org/abs/1705.09173>.
- [1] V. L. Barutello, X. Hu, A. Portaluri, S. Terracini, *An Index theory for asymptotic motions under singular potentials*. Preprint available at <https://arxiv.org/abs/1705.01291>.

#### Preprints

- [1] R. Giambò, P. Piccione, A. Portaluri, *On the Maslov index of Lagrangian paths that are not transversal to the Maslov cycle. Semi-Riemannian index theorem in the degenerate case*. Preprint available at <http://arxiv.org/abs/math/0306187>.

#### Books

- [1] F. Ancona, P. Cannarsa, C. Jones and A. Portaluri, *Mathematical Paradigms for Climate Sciences*. Springer INDAM Series 15

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## Other publications

#### Published/accepted papers

- [3] F. Paparella, C. Ferracini, A. Portaluri, A. Manzo, A. Alma *Biological control of the chestnut gall wasp with T. sinensis: a mathematical model*. Ecological Modelling (2016), pp. 17–36. DOI : 10.1016/j.ecolmodel.2016.07.023 Preprint available at <http://arxiv.org/pdf/1512.06255.pdf>.

- [2] F. Lessio, A. Portaluri, F. Paparella, A. Alma, *A Mathematical Model of Flavescence Dorée Epidemiology*, *Ecological Modelling* **312** (2015), 41–53. Preprint available at <http://arxiv.org/pdf/1407.4003.pdf>.
- [1] M. G. Bergomi, R. D. Jadanza and A. Portaluri, *Una geometrizzazione dello spazio degli accordi*, *Ithaca* **III** (2014), 33-45.

### Preprints

- [2] M. G. Bergomi, R.D. Jadanza, A. Portaluri, *A mathematical model for voice leading and its complexity* Preprint available at <https://arxiv.org/abs/1508.05833>.
- [1] M. G. Bergomi, A. Portaluri, *Modes in modern music from a topological viewpoint* Preprint available at <http://arxiv.org/abs/1309.0687>.

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## Teaching

### Undergraduate and graduate classes

- 2001 - 2002 **Calculus I**, *Tutoring for undergraduate class*, Polytechnic of Turin, Torino.
- 2001 - 2002 **Matlab**, *Tutoring for undergraduate class*, Polytechnic of Turin, Vercelli.
- 2001 - 2002 **Calculus II**, *Tutoring for undergraduate class*, Polytechnic of Turin, TORINO.
- 2001 - 2002 **Linear Algebra**, *Tutoring for undergraduate class*, Polytechnic of Turin, Torino.
- 2001 - 2003 **General Topology**, *Tutoring for undergraduate class*, Polytechnic of Turin, Torino.
- 2005 - 2008 **Geometry and Topology**, *Tutoring for undergraduate class*, University of Milano-Bicocca, Milano.
- 2006 - 2008 **Algebraic topology**, *Tutoring for graduate class*, University of Milano-Bicocca, Milano.
- 2012 - present **Mathematics**, *Teaching undergraduate class*, Department of Agriculture, Forestry and Food Sciences, University of Turin, Torino.

### Mathematics Competitions for high school students

- A.A. 2009 - 2011 **IX Certamen Nazionale Fisico-Matematico “Fabiana d’Arpa”**, Member of the selection board, Maglie (LE).  
<http://www.liceodavincimaglie.gov.it/index.php/252-certamen/976-certamen>
- A.A. 2011 - 2019 **XI-XVIII Certamen Nazionale Fisico-Matematico “Fabiana d’Arpa”**, Member of the Committee for the preparation of the final text together with prof. Renato Orta (Polytechnic of Turin), Torino (TO).  
<http://www.liceodavincimaglie.gov.it/index.php/252-certamen/976-certamen>
- A.A. 2018 - present **(CISIA)**, *Membro della Commissione di Logica per la preparazione dei test di Accesso (CISIA)*, Pisa (PI).
- A.A. 2018 - present **(CISIA)**, *Responsabile della Commissione di Matematica per la preparazione dei test di Accesso alla Facoltà di Agraria (CISIA)*, Pisa (PI).

### Invited PhD and research-level courses

- A.A.2018/2019 **Ph.D. Course**, “*MATH 943, Symplectic Topology and Dynamics*”, Queen’s University, Kingston, Ontario (Canada).
- A.A.2015/2016 **Ph.D. Course**, “*Aspects of stability theory in Hamiltonian Dynamics*”, Università di Torino, Torino (Italy).

- A.A.2013/2014 **Ph.D. Course**, “*Modelli matematici nelle scienze applicate*”, Università di Torino, Torino (Italy).
- A.A.2012/2013 **Ph.D. Course**, “*Grado topologico, indice di Maslov e flusso spettrale con applicazioni a ODEs e PDEs*”, Università di Torino, Torino (Italy).
- A.A. 2009/2010 **Virtual Coordinator**, *13th International Internet Seminar on “Gradient Systems”*, Germany.
- May 5–8, 2009 **Mini-course**, *Intensive INDAM bimester on “New connections between dynamical systems and Hamiltonian PDEs”*, Università di Napoli, Napoli (Italy).
- A.A.2007/2008 **PhD course**, “*Introduzione alla teoria di Morse in spazi di Hilbert e applicazioni,*”, Università degli Studi di Milano-Bicocca, Milano (Italy).

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## Invitations and communications

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### Invited lectures (Selected)

- August . 18–23, 2019 **Conference on “V AMMCS International Conference”**, *Waterloo*, (Canada).  
Invited talk: “A symplectic sightseeing tour on Singular Hamiltonian Systems”
- July. 23–27, 2018 **Conference on “Mathematics of Wave Phenomena”**, *Karlsruhe*, (Germany).  
Invited talk: “ Index and stability of closed semi-Riemannian geodesics”
- June. 18–22, 2018 **Conference on “Perspectives in Hamiltonian Dynamics”**, *Venezia*, (Italy).  
Invited talk: “ Index and stability of closed semi-Riemannian geodesics”
- Sept. 3-9, 2017 **Conference on “ The Seventh International Meeting on Celestial Mechanics (CELMEC VII)”**, *San Martino al Cimino*, Viterbo (Italy).  
Invited talk: Stability dreams (with a symplectic friend) in Celestial Mechanics
- July 24-28, 2017 **Conference on “ Mathematical Congress of the Americas”**, Montreal (Canada).  
Invited talk: Index and stability of closed semi-Riemannian geodesics
- July 24-28,2017 **Conference on “ Mathematical Congress of the Americas”**, Montreal (Canada).  
Invited talk: Index theory, Maslov index, Spectral flow, Colliding trajectories, Parabolic motions, Homothetic orbits
- Sept. 21-25, 2015 **Conference on “ Jahrestagung der Deutschen Mathematiker-Vereinigung 2015 in Hamburg”**, Hamburg (Germany).  
Invited talk: Index theory in Celestial Mechanics:recent results and new perspectives
- Sept. 6-11, 2015 **Hamiltonian systems and Celestial Mechanics, CMO-BIRS Workshop**, Oaxaca (Mexico).  
Invited talk: An index theory for colliding solutions in Celestial Mechanics
- June 7-12, 2015 **Conference in the 2015 AMMCS-CAIMS Congress**, Waterloo (Canada).  
Invited talk: Index theory in Celestial Mechanics:recent results and new perspectives
- June 2-6, 2014 **Conference on Hamiltonian Systems and Celestial Mechanics**, Bellaterra (Spain).  
Plenary talk: Index theory in Celestial Mechanics: recent results and new perspectives
- May 19-23, 2014 **Symplectic Dynamics and Hamiltonian Systems**, Tianjin (China).  
Lecturers: Prof. Alain Chenciner (University of Paris VII, France), Prof. Leonardo Macarini (Federal University of Rio de Janeiro, Brazil), Prof. Hans-Bert Rademacher (University of Leipzig, Germany), Prof. Susanna Terracini (University of Torino, Italy).  
Organised by: Chern Institute of Mathematics.
- Sept. 9-13, 2013 **Mathematical Methods in Celestial Mechanics**, Marseille (France).  
Lecturers: Prof. Susanna Terracini (University of Torino, Italy), Prof. Davide L. Ferrario (University of Milano-Bicocca, Italy), Prof. Gabriella Pinzari (University of Roma Tre, Italy), Prof. Florin Diacu (University of Victoria, Canada).  
Organised by: Centre International des Rencontres Mathématiques (CIRM). (Invited Participant)



- June 20-21, 2013 **Giornate fiorentine su dinamica non autonoma e metodi topologici in equazioni differenziali**, Firenze (Italy).  
Invited talk: “Linear (in)stability for relative equilibria in singular Lagrangian systems“
- Jan. 13-18, 2013 **Workshop on the N-body problem**, BIRS Banff (Canada).  
Invited Participant
- Jan. 2011 **Variational and perturbative Methods for nonlinear differential equations**, Venezia (Italy), Invited talk: “ Global dynamics for the dihedral four body problem”.
- Sept. 12-17, 2011 **XIX Congresso UMI**, Bologna (Italy), Invited talk: “Dinamica globale per un problema singolare con vincolo di simmetria diedrale“.
- Sept. 14-17, 2010 **Group Actions in Topology and Analysis. The Fourth Group Action Forum Conference.**, Milano (Italy), Invited talk: “On the dihedral four body problem”.
- June 13-19, 2010 **13th Internet Seminar on Gradient Systems**, Kacov, Czech Republic, Virtual Coordinator of Project 12.
- Apr. 14-16, 2010 **Topological and Set-valued Methods for Nonlinear Differential Problems**, Messina (Italy), Invited talk: “Morse theory for a fourth order elliptic equation with exponential nonlinearity”.
- July 22-28, 2007 **Fixed point theory and its applications**, Bedlewo (Poland), Invited talk: “On the dihedral  $n$ -body problem”.
- June 2-9, 2007 **SPT 2007**, Otranto (Italy), Invited talk: “On the dihedral  $n$ -body problem”.
- Aug. 1-8, 2005 **Fixed point theory and its applications. International Conference in memory of Jim Dugundji**, Bedlewo (Poland), Invited talk: “Generalized Maslov index and bifurcation of kissing manifolds”.
- June 2005 **Dynamical Systems and Nonlinear Analysis**, Voronezh (Russia), Invited talk: “Estimate from below for the number of conjugate points along a semi-Riemannian geodesic”.
- Mar. 2005 **Topological methods in nonlinear Analysis**, Bedlewo (Poland), Invited talk: “Bifurcation of Lagrangian submanifolds”.
- Feb. 2005 **Two weeks in Global Analysis**, Pisa (Italy), Invited Talk: “The Morse index and Atiyah-Singer Theorem”.
- June 2003 **Topological and Variational Methods in Nonlinear Analysis**, Bedlewo (Poland), Invited talk: “Bifurcation of semi-Riemannian geodesics”.

#### Invitations (Selected)

- May 2018 **Augsburg University**, Augsburg (Germany), Title: “Index and stability of closed semi-Riemannian geodesics”. Invited by Prof. Urs Frauenfelder [One week].
- Mar. 2018 **Chern Institute**, Nankai (China), Title: “Index and stability of closed semi-Riemannian geodesics”. Invited by Proff. Chaofeng Zhu, Yiming Long [One week].
- Mar. 2018 **Shandong University**, Jinan (China), Title: “Index and stability of closed semi-Riemannian geodesics”. Invited by Prof. Xijun Hu [One month].
- Mar. 2017 **Shandong University**, Jinan (China), Title: “Spectral flow and Maslov index: a common computational root”. Invited by Prof. Xijun [One month].
- Feb. 2017 **New York University Abu-Dhabi**, Abu Dhabi (Emirates), Title: “Stability dreams (with a symplectic friend) in Celestial Mechanics”. Invited by Prof. Francesco Paparella [Two weeks].
- Mar. 2016 **Shandong University**, Jinan (China), Title: “Amazing orbits in Celestial Mechanics”. Invited by Prof. Xijun [One month].

- Mar. 2016 **Capital Normal University**, Beijing (China), Title: “A new counting index of conjugate points along semi-Riemannian geodesics”. Invited by Prof. Shanzhong Sun [One week].
- Sept. 2015 **Instituto, Tecnológico Autónomo de México**, Mexico City (Mexico).  
Invited talks:  
  - Collisions, Variational Regularisation and Stability in Celestial Mechanics
  - Symmetries, homographic solutions and Choreographies in Celestial Mechanics
[One week]
- Nov. 2014 **Bochum University**, *Invited talk in the local Seminars*, Title: “Index theory in Celestial Mechanics: recent results and new perspectives”, Invited by Prof. Alberto Abbondandolo. [One week].
- June 2014 **Shandong University**, *Invited talk in the local Seminars*, Title: “Linear Stability and Morse index theorem of the Lagrangian circular orbit in a three-body type problem,”, Invited by Prof. Xijun Hu. [One week].
- Mar. 2014 **Humboldt Universität**, *Invited talk in the Seminars “ Geometrische Analysis und Spektralthorie Humboldt Universität”*, Title: “Linear stability in the relative equilibria in the N-body type problem, via index theory”, Invited by Prof. Nils Waterstraat.  
[Two weeks]
- June 2012 **CMAF, Lisboa**, *Invited talk in the Seminars “ Seminário de Análise e Equações Diferenciais”*, Title: “Towards an index theorem for semilinear wave equation”, Invited by Prof. Francesca Dalbono. [Two weeks].
- June 2011 **Bilbao BCAM**, *Invited talk in the local Seminars* , Title: “Global dynamics for the dihedral 4-body problem ”, Invited by Prof. R. Castelli. [One week].
- Nov. 2009 **Warwick University**, *Invited talk in the Seminars “ Maslov index and nonlinear waves”*, Title: “The homology of path space and Floer homology with conormal boundary conditions”, Invited by Prof. Chris Jones. [One week].
- May 2008 **Bonn University**, *Invited talk in the “Seminars on Global Analysis”*, Title: “The homology of path space and Floer homology with conormal boundary conditions” , Invited by Prof. Dr. Werner Müller. [One week].
- Jan. 2004 **Leipzig University**, *Invited talk in the “Seminars on Symplectic Geometry”*, Title: “The semi-Riemannian Morse index theorem and bifurcation of geodesics”, Invited by Prof. Dr. Matthias Schwarz. [Two weeks].
- Sept. 2003 **São Paulo (Brazil)**, *Invited talk in the “Working group on Differential geometry”*, Title: “Maslov Index and spectral flow via partial signatures”, Invited by Prof. P. Piccione. [Six months].
- July 2003 **São Paulo (Brazil)**, *Invited talk in the “Working group on Differential geometry”*, Title: “The Morse Index Theorem on semi-Riemannian manifolds”, Invited by Prof. P. Piccione. [Six months].

#### Research seminars (Selected)

- March 22, 2019 **Seminar Dynamics, Geometry, & Groups Seminar**, *Department of Mathematics and Statistics, Queen’s University, Kingston, (Canada)*.  
Invited talk: “ Visiting Kepler with a couple of symplectic friends”
- March 01, 2019 **Colloquim at the Department of Mathematics and Statistics**, , *Queen’s University, Kingston, (Canada)*.  
Invited talk: “ Existence and stability results in Celestial Mechanics”
- Dec. 2016 **Mathematical Analysis Seminars**, *Math. Department, University of Turin, Turin (Italy)*.  
Title: *Index, stability and hyperbolicity of closed geodesics*

- Feb. 2014 **ERC Project: Complex Patterns for Strongly Interacting Dynamical Systems (COMPAT) — First Meeting**, University of Turin, Torino (Italy).  
Title: *Index theory in Celestial Mechanics: recent results and new perspectives*
- Nov. 2012 **Analysis Seminars**, Università di Milano-Bicocca, Milano (Italy).  
Title: *An index theorem for an ill-posed hyperbolic problem*
- Nov. 2012 **Analysis Seminars**, Università del Salento, Lecce (Italy).  
Title: *An index theorem for an ill-posed hyperbolic problem*
- June 2012 **Seminars on ordinary differential equations**, CMAF, Lisboa (Portugal).  
Title: *Morse-Smale index theorem for an elliptic boundary deformation problems*
- June 2012 **Seminars on ordinary differential equations**, CMAF, Lisboa (Portugal).  
Title: *Global dynamics for the dihedral singular logarithmic potential*
- June 2012 **Seminars on ordinary differential equations**, Universidade Nova, Lisboa (Portugal).  
Title: *Towards an index theorem for semilinear wave equation*
- May 2012 **Analysis Seminars**, Università del Salento, Lecce (Italy).  
Title: *Geometria della varietà Lagrangian Grassmanniana e indice di Maslov*
- June 2011 **Analysis Seminars**, Università di Milano-Bicocca, Milano (Italy).  
Title: *Global dynamics for the dihedral four vortex problem*
- June 2011 **Analysis Seminars**, BCAM: Basque center for Applied Mathematics, Bilbao (Spain).  
Title: *Global dynamics for the dihedral four body problem*
- Jan. 2010 **Analysis Seminars**, Università degli Studi di Bari, Milano (Italy).  
Title: *Teoremi Indice in geometria semi-Riemanniana*
- Dec. 2008 **Analysis Seminars**, Università degli Studi di Bari, Napoli (Italy).  
Title: *Il problema degli N-corpi con vincolo di simmetria diedrale*
- Nov. 2006 **Analysis Seminars**, Università di Milano-Bicocca, Milano (Italy).  
Title: *A generalized Sturm theory I*
- Nov. 2006 **Analysis Seminars**, Università di Milano-Bicocca, Milano (Italy).  
Title: *A generalized Sturm theory II*
- Mar. 2005 **Analysis Seminars**, Università di Milano-Bicocca, Milano (Italy).  
Title: *A Morse index theorem in semi-Riemannian geometry*

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## Various

### Scientific Membership

- 2000 - present Member of GNAMPA (National Group of Mathematical Analysis, Probability and Applications).
- 2008 - 2013 Member of UMI (Unione Matematica Italiana).
- 2008 - 2014 Member of AMS (American Mathematical Society).

### Computer Skills

Operating systems	Mac OS X, Windows, Linux
Scientific software	Matlab, Maple, Mathematica, Maple TA, GeoGebra, Sage
Programming languages	C, C++, Python
Typesetting software	LaTeX, XeLaTeX, Lualatex

Common software	MS Office, iWork, Open Office
E-learning platform	Moodle

(D.L. 196/03).

Turin, October 7, 2021

Signature