DAVIDE FERMI

Curriculum Vitae et Studiorum

Personal Data

Name and surname:	Davide Fermi
Place and date of birth:	Melzo (Milan, Italy), 1 August 1988
Citizenship:	Italian
Civil status:	married with Erika Ghidini since 25 July 2015, one child born on 7 October 2018
Work address:	Dipartimento di Matematica Politecnico di Milano Piazza Leonardo da Vinci, 32 - Ed. 14 "Nave" I–20133 Milano MI, Italy
Email addresses:	`davide.fermi@polimi.it`, `fermidavide@gmail.com`, `davide.fermi@protonmail.com`
Webpage:	https://fermidavide.com
Spoken Languages:	Italian: mother tongue English: fluent
Orcid ID:	0000-0002-4651-1784
Scopus Author ID:	54383178400
Researcher ID:	S-6536-2018
MR Author ID:	1142559

Education

2012 - 2016 **Ph.D. degree in Mathematics**, Università degli Studi di Milano, Math. Dep. (Milano, Italy)
(XXVIII cycle, with scholarship)
Thesis: "*A functional analytic framework for local zeta regularization and the scalar Casimir effect*"
defended in Milan, Italy on 22 February 2016
Advisor: Prof. Livio Pizzocchero

2010 - 2012 **Master degree in Physics**, Università degli Studi di Milano, Physics Dep. (Milano, Italy)
Thesis: "*L'Effetto Casimir e la Regolarizzazione Zeta*"
(transl. "*Zeta regularization and the Casimir effect*")
defended in Milan, Italy on 24 July 2012
Marks: 110/110 *magna cum laude*
Advisor: Prof. Livio Pizzocchero Co-advisor: Prof. Franco Gallone

2007 - 2010 **Bachelor degree in Physics**, Università degli Studi di Milano, Physics Dep. (Milano, Italy)
Thesis: "*Lo Spaziotempo di Alcubierre*" (transl. "*Alcubierre's spacetime*")
defended in Milan, Italy on 21 October 2010
Marks: 110/110 *magna cum laude*
Advisor: Prof. Livio Pizzocchero

2002 - 2007 **Italian High School diploma**, Liceo Scientifico Statale Giordano Bruno, Melzo (Milan, Italy)
(diploma di Maturità Scientifica PNI - Piano Nazionale Informatica), Marks: 100/100

Academic positions

06/11/2024 - present **Associate professor** in Mathematical Physics
(s.s.d. MATH-04/A, g.s.d. 01/MATH-04 - Fisica Matematica)
Politecnico di Milano, Mathematics Dep. (Milano, Italy)

28/10/2022 - 05/11/2024 **Researcher** (tenured) in Mathematical Physics
(RTD-b – art.24, c.3–a, legge 240/2010, s.c. 01/A4, s.s.d. MAT/07 Fisica Matematica)
Politecnico di Milano, Mathematics Dep. (Milano, Italy)

01/06/2021 - 27/10/2022 **Researcher** (non-tenured) in Mathematical Physics
(RTD-a – art.24, c.3–a, legge 240/2010, s.c. 01/A4, s.s.d. MAT/07 Fisica Matematica)
Università degli Studi Roma Tre, Mathematics and Physcis Dep. (Roma, Italy)
Position funded by ERC consolidator grant UniCoSM (PI: Prof. Alessandro Giuliani)

01/01/2021 - 31/05/2021 **Postdoc**, Università degli Studi di Roma La Sapienza, Mathematics Dep. (Roma, Italy)
Project: "*Metodi matematici in meccanica quantistica*"
(transl. "*Mathematical methods in quantum mechanics*")
Supervisor: Prof. Alessandro Teta

02/03/2020 - 31/12/2020	**Postdoc**, Scuola Normale Superiore, Classe di Scienze (Pisa, Italy) Project: "*Aspetti matematici della fisica della materia condensata*" (transl. "*Mathematical aspects of condensed matter physics*") Supervisor: Prof. Michele Correggi
01/12/2016 - 29/02/2020	**Postdoc**, Università degli Studi di Milano, Mathematics Department (Milano, Italy) Project: "*Metodi analitici e geometrici per le equazioni differenziali e la teoria quantistica dei campi*" (transl. "*Analytical and geometrical methods for differential equations and quantum field theory*") Supervisors: Prof. Marco M. Peloso and Prof. Livio Pizzocchero
15/04/2016 - 30/11/2016	**Postdoc**, Università degli Studi dell'Insubria, DiSAT (Como, Italy) Project: "*Problemi matematici nella fisica della materia condensata - FIR 2013*" (transl. "*Mathematical problems in condensed matter physics*") Supervisors: Dr. Claudio Cacciapuoti and Prof. Andrea Posilicano

Academic Record

10/2022	**Shortlisted** for Associate Professor position in mathematical physics (Professore Associato, s.c. 01/A4, s.s.d. MAT/07) Università degli Studi di Torino, Dip. Matematica (Torino, Italy) Selection committee: Prof. Dario Martelli, Prof. Sameer Murthy, Prof. Diego Noja
09/2021	**Shortlisted** (2^{nd} place) for Associate Professor position in mathematical physics (Professore Associato, s.c. 01/A4, s.s.d. MAT/07) Università degli Studi di Bologna, Dip. Matematica (Bologna, Italy) Selection committee: Prof. Maria Letizia Bertotti, Prof. Pierluigi Contucci, Prof. Maria Groppi
2020	**Abilitazione Scientifica Nazionale** for *Associate Professor* in Mathematical Physics (Professore di II Fascia, s.c. 01/A4 Fisica Matematica, valid from 09/11/2020 until 09/11/2031)
2020	**Shortlisted** (6^{th} place, >20 partecipants) for a permanent full-time researcher position at INdAM (concorso pubblico per titoli ed esami per l'assunzione con contratto di lavoro a tempo pieno e indeterminato di una unità di personale Profilo Ricercatore, III Livello Professionale presso l'Istituto Nazionale di Alta Matematica "Francesco Severi"), Selection procedure: 1 preliminary written evaluation, 2 written exams, 1 oral exam (8 partecipants selected for final stage). Selection committee: Prof. Dario Bambusi, Prof. Carla Manni, Prof. Marco Romito
2018 - 2022	**Shortlisted** for 9 non-tenured and 10 tenured researcher positions in mathematical physics (RTD-a and RTD-b, s.c. 01/A4, s.s.d. MAT/07) at various Italian Instiutions.
01/2020	**Winner** of a 2−years postdoc scholarship (assegno di ricerca) at SISSA, Trieste, funded by ERC Starting Grant "*MaMBoQ-Macroscopic Behavior of Many-Body Quantum Systems*" (I renounced the assignment in favour of a postdoc scholarship at Scuola Normale Superiore). Selection committee: Prof. Gianni dal Maso, Prof. Marcello Porta, Prof. Ludwik Dabrowski
11/2012	**Winner** (1^{st} place, 26 partecipants) of a 3−years Ph.D. scholarship funded by MIUR (Italy), Università degli Studi di Milano, Dip. Matematica (Milano, Italy). Selection committee: Prof. Livio Pizzocchero, Prof. Paolo Stellari, Prof. Enrico Valdinoci

Scientific Works

Preprints

1. D. Fermi,
   The Aharonov-Bohm Hamiltonian: self-adjointness, spectral and scattering properties,
   arXiv:2407.15115 [math-ph] (2024)

Books

1. D. Fermi, L. Pizzocchero,
   Local zeta regularization and the scalar Casimir effect. A general approach based on integral kernels,
   World Scientific Publishing, Singapore (2017) [276 pages]
   ISBN: 978-981-3224-99-5 (hardcover), ISBN: 978-981-3225-01-5 (ebook); arXiv:1505.00711, arXiv:1505.01044

Published papers

25. W. Borrelli, M. Correggi, D. Fermi,
    Pauli Hamiltonians with an Aharonov-Bohm Flux,
    J. Spectral Theory **14**(3), 1147–1193 (2024) [47 pages]
    DOI:10.4171/JST/496 ; arXiv:2312.11971 [math-ph]

24. M. Correggi, D. Fermi,
    Schrödinger operators with multiple Aharonov-Bohm fluxes,
    Ann. Henri Poincaré (2024) [41 pages]
    DOI:10.1007/s00023-024-01446-x ; arXiv:2306.08910 [math-ph]

23. M. Correggi, D. Fermi,
Deficiency indices for singular magnetic Schrödinger operators,
Milan J. Math. **92**, 25–39 (2024) [15 pages]
DOI:10.1007/s00032-023-00390-5 ; arXiv:2311.09987 [math-ph]

22. D. Fermi,
Quadratic forms for Aharonov-Bohm Hamiltonians,
pp. 205–228 in M. Correggi, M. Falconi (Eds.), "Quantum Mathematics I", Springer INdAM Series (SINDAMS, vol. 57), Springer Singapore (2024) [24 pages]
DOI:10.1007/978-981-99-5894-8_7 ; arXiv:2208.06285 [math-ph]

21. D. Fermi, D. Ferretti, A. Teta,
Rigorous derivation of the Efimov effect in a simple model,
Lett. Math. Phys. **113**, 113 (2023) [37 pages]
DOI:10.1007/s11005-023-01734-3 ; arXiv:2306.12157 [math-ph]

20. D. Fermi, L. Pizzocchero,
On the Casimir effect with δ-like potentials, and a recent paper by K. Ziemian (Ann. Henri Poincaré, 2021),
Ann. Henri Poincaré **24**, 2363–2400 (2023) [38 pages]
DOI:10.1007/s00023-022-01263-0

19. D. Fermi, A. Giuliani,
Periodic striped states in Ising models with dipolar interactions,
pp. 269–293 in R. L. Frank, A. Laptev, M. Lewin, R. Seiringer (Eds.), "The Physics and Mathematics of Elliott Lieb. The 90th Anniversary Volume I", EMS Press (2022) [25 pages]
DOI:10.4171/90-1/12 ; arXiv:2203.01249 [math-ph]

18. C. Cacciapuoti, D. Fermi, A. Posilicano,
The semi-classical limit with a delta-prime potential,
Rev. Math. Phys. **34**(06) (2022), 2250015 [33 pages]
DOI:10.1142/S0129055X22500155 ; arXiv:2012.12735 [math-ph]

17. D. Fermi,
Vacuum polarization with zero-range potentials on a hyperplane,
Universe **2021**, 7(4) (2021), 92 [27 pages] (*invited feature article*)
DOI:10.3390/universe7040092 ; arXiv:2103.13720 [math-ph]

16. M. Correggi, D. Fermi,
Magnetic perturbations of anyonic and Aharonov-Bohm Schrödinger operators,
J. Math. Phys. **62**(3) (2021), 032101 [25 pages]
DOI:10.1063/5.0018933 ; arXiv:2006.09056 [math-ph]

15. C. Cacciapuoti, D. Fermi, A. Posilicano,
The semiclassical limit on a star-graph with Kirchhoff conditions,
Analysis and Math. Phys. **11** (2021), 45 [43 pages]
DOI:10.1007/s13324-020-00455-3 ; arXiv:2005.03790 [math-ph]

14. C. Cacciapuoti, D. Fermi, A. Posilicano,
Scattering theory for delta-potentials supported by locally deformed planes,
pp. 35–55 in A. Michelangeli (Ed.), "Mathematical Challenges of Zero-Range Physics", Springer (2021) [20 pp]
DOI:10.1007/978-3-030-60453-0_2

13. D. Fermi, M. Gengo, L. Pizzocchero,
Integrable scalar cosmologies with matter and curvature,
Nucl. Phys. B **957** (2020), 115095 [102 pages]
DOI:10.1016/j.nuclphysb.2020.115095 ; arXiv:2001.03228 [gr-qc]

12. C. Cacciapuoti, D. Fermi, A. Posilicano,
The semi-classical limit with a delta potential,
Annali di Matematica Pura ed Applicata (2020), **200**(2), 453–489 [37 pages]
DOI:10.1007/s10231-020-01002-4 ; arXiv:1907.05801 [math-ph]

11. D. Fermi,
The Casimir energy anomaly for a point interaction,
Mod. Phys. Lett. A **35**(03) (2020), 2040008 [5 pages]
DOI:10.1142/S0217732320400088 ; arXiv:1909.00604 [math-ph]

10. C. Cacciapuoti, D. Fermi, A. Posilicano,
Scattering from local deformations of a semitransparent plane,
J. Math. Anal. Appl. **473**(1) (2019), 215-257 [43 pages]
DOI:10.1016/j.jmaa.2018.12.045 ; arXiv:1807.07916 [math-ph]
Corrigendum,
J. Math. Anal. Appl. **482**(1) (2020), 123554 [2 pages]
DOI:10.1016/j.jmaa.2019.123554

9. D. Fermi,
Some remarks on a new exotic spacetime for time travel by free fall,
pp. 243–265 in S. Cacciatori, B. Güneysu, S. Pigola (Eds.), "Einstein Equations: Physical and Mathematical Aspects of General Relativity. DOMOSCHOOL 2018", Birkhäuser, Cham, Springer Nature Switzerland AG (2019) [23 pages]
DOI:10.1007/978-3-030-18061-4_8 ; arXiv:1812.09021 [gr-qc]

8. D. Fermi, M. Gengo, L. Pizzocchero,
On the necessity of phantom fields for solving the horizon problem in scalar cosmologies,
Universe **2019**, 5(3) (2019), 76 [20 pages] (*invited feature article*)
DOI:10.3390/universe5030076 ; arXiv:1901.11511 [gr-qc]

7. C. Cacciapuoti, D. Fermi, A. Posilicano,
On inverses of Krein's Q-functions,
Rend. Mat. Appl. (7) **39**(2) (2018), 229–240 [12 pages]
Editor's page ; arXiv:1809.05150 [math.SP]

6. D. Fermi, L. Pizzocchero,
A time machine for free fall into the past,
Class. Quant. Grav. **35**(16) (2018), 165003 [42 pages]
DOI:10.1088/1361-6382/aace6e ; arXiv:1803.08214 [gr-qc]

5. D. Fermi, L. Pizzocchero,
Local Casimir Effect for a Scalar Field in Presence of a Point Impurity,
Symmetry **2018**, **10**(2) (2018), 38 [20 pages] (*invited* contribution in I. H. Brevik, K. A. Milton (guest Eds.), Special Issue of Symmetry "*Casimir Physics and Applications*")
DOI:10.3390/sym10020038 ; arXiv:1712.10039 [math-ph]

4. C. Cacciapuoti, D. Fermi, A. Posilicano,
Relative-Zeta and Casimir energy for a semitransparent hyperplane selecting transverse modes,
pp. 71–97 in G.F. Dell'Antonio and A. Michelangeli (Eds.), "Advances in Quantum Mechanics: contemporary trends and open problems", Springer (2017) [26 pages]
DOI:10.1007/978-3-319-58904-6_5 ; arXiv:1702.05296 [math-ph]

3. D. Fermi, L. Pizzocchero,
Local zeta regularization and the scalar Casimir effect IV. The case of a rectangular box,
Int. J. Mod. Phys. A **31**(04&05) (2016), 1650003 [56 pages]
DOI:10.1142/S0217751X16500032 ; arXiv:1505.03276 [math-ph]

2. D. Fermi, L. Pizzocchero,
Local zeta regularization and the scalar Casimir effect III. The case with a background harmonic potential,
Int. J. Mod. Phys. A **30**(35) (2015), 1550213 [42 pages]
DOI:10.1142/S0217751X15502139 ; arXiv:1505.01651 [math-ph]

1. D. Fermi, L. Pizzocchero,
Local Zeta Regularization and the Casimir Effect,
Prog. Theor. Phys. **126**(3) (2011), 419 – 434 [15 pages]
DOI:10.1143/PTP.126.419 ; arXiv:1104.4330 [math-ph]

Citation metrics

	Scopus	Web of Science	Google Scholar
Number of publications	26	38*	32
Total number of citations	123	75	194
Average number of citations per paper	4.73	1.97*	6.06
H-index	7	5	9

*The chapters of the book "*Local zeta regularization and the scalar Casimir effect. A general approach based on integral kernels*" (World Scientific Publishing, Singapore 2017) are counted as separate publications.

Participation in workshops and invitations

Invited talks

2024 "*Spectral and scattering properties of Aharonov-Bohm Hamiltonians*" invited talk at *Assemblea Scientifica GNFM 2024*, Montecatini, 3-5 October 2024.

2024 "*Self-adjointness and scattering features of Aharonov-Bohm Hamiltonians*" invited talk at *First Workshop on Singular Interactions and Effective Models in Mathematical Physics*, "Sapienza" Università degli Studi di Roma, Dip. Matematica, 15-17 July 2024.

2023 "*The semi-classical limit with zero-range potentials*", invited talk at *Trails in Quantum Mechanics and surroundings*, SISSA - Trieste, 8 – 10 February 2023.

2023 "*Periodic striped states in Ising models with dipolar interactions*", invited talk at *Universality in Condensed Matter and Statistical Mechanics*, Università degli Studi Roma Tre, 6 – 8 February 2023.

2022 "*Vacuum fluctuations with zero-range potentials*", invited talk at *Itinerant Quantum Math Meetings*, Politecnico di Milano, 5 December 2022.

2022 "*Hamiltonians for multiple Aharonov-Bohm fluxes*", invited talk at *INdAM Quantum Meetings - IQM22 - Workshop II*, Politecnico di Milano, 23 – 27 May 2022.

2022 "*Self-adjoint realizations of Aharonov-Bohm Hamiltonians: classical results and recent advances*", invited talk at *Aharonov-Bohm day*, part of *INdAM Quantum Meetings - IQM22*, Politecnico di Milano, 19 May 2022.

2021 "*Homogenization limit for multiple Aharonov-Bohm fluxes*", invited talk at *Quantum before Christmas - Mathematical Physics from Many–Body Quantum Systems to Normal Forms*, Università degli Studi di Milano, 20 – 22 December 2021.

2019 "*Zeta regularization in the scalar Casimir effect*", invited talk at *1st Vacuum Fluctuations at Nanoscale and Gravitation conference: theory and experiments*, Orosei, 28 April – 3 May 2019.

2017 "*Local Casimir effect and ζ-regularization: scalar field in a rectangular box*", invited talk at *QFT Day in Milan: mathematical aspects of renormalization*, Univ. degli Studi di Milano, Dip. Matematica, 13 April 2017.

2017 "*Zeta regularization and Casimir effect for a scalar field with singular background potentials*", invited talk at *Microlocal analysis: a tool to explore the quantum world*, Università degli Studi di Genova, Dip. Matematica, 12 – 13 January 2017.

2016 "*Zeta-function regularization in Wightman scalar field theory and applications to the Casimir effect*", invited talk at *Workshop in Mathematical Physics*, ETH Zürich 28 – 30 November 2016.

2016 "*Casimir energy for singular potentials concentrated on a plane*", invited talk at *Mathematical Challenges of Zero-Range Physics: rigorous results and open problems*, SISSA Trieste 7 – 10 November 2016.

Contributed Talks & Posters

2022 "*The semiclassical limit with zero-range potentials in one dimension*", contributed talk at *Mathematical Challenges in Quantum Mechanics - 3rd School and Workshop (MCQM22)*, Como, 13 – 18 June 2022.

2022 "*Hamiltonians for multiple Aharonov-Bohm fluxes*", contributed talk at *INdAM Quantum Meetings (IQM22) - Workshop II*, Politecnico di Milano, 23 – 27 March 2022.

2021 "*The semiclassical limit with zero-range potentials*", poster at *International Congress on Mathematical Physics (ICMP 2021)*, Geneva, 2 – 7 August 2021.

2020 "*Magnetic perturbations of Aharonov-Bohm and 2-body anyonic Hamiltonians*", contributed talk at *Mathematics of Condensed Matter and Beyond (MCMB)*, American University of Beirut - online conference, 22 – 25 February 2021.

2019 "*Scattering from local deformations of a semitransparent plane*", contributed talk at *XXI Congresso dell'Unione Matematica Italiana*, Università degli Studi di Pavia, 2 – 7 September 2019.

2019 "*Scalar Casimir effect for delta-type potentials*", contributed talk at *10th Alexander Friedmann International Seminar on Gravitation and Cosmology, and 4th Symposium on the Casimir Effect*, Saint Petersburg Polytechnic University, 23 – 29 June 2019.

2018 "*Free fall into the past*", contributed talk at *DOMOSCHOOL - International Alpine School of Mathematics and Physics. Einstein's Equations: Physical and Mathematical Aspects of General Relativity*, Domodossola, 16 – 20 July 2018.

2018 "*Some results on scattering theory for delta interactions concentrated on deformed planes*", contributed talk at *Mathematical Challenges in Quantum Mechanics 2018*, "Sapienza" Università degli Studi di Roma, 19 – 24 February 2018.

2016 "*Zeta regularization and the Casimir effect: a functional analytic framework*", contributed talk at *Mathematical Challenges in Quantum Mechanics 2016*, Bressanone, 8 – 13 February 2016.

2015 "*Local zeta regularization and the scalar Casimir effect*", contributed talk at *Assemblea Scientifica GNFM*, Montecatini, 22 – 24 October 2015.

Invited seminars

2021 "*An axiomatic zeta-function approach to Casimir physics*", Karlsruher Institut für Technologie, online seminar, 31 May 2021.

2021 "*Semiclassical limit with zero-range potentials in one dimension*", "Sapienza" Università degli Studi di Roma, Dip. Matematica, online seminar, 5 May 2021.

2020 "*Magnetic perturbations of anyonic and Aharonov-Bohm Hamiltonians*", Scuola Normale Superiore, online seminar, 9 December 2020.

2019 "*Casimir energy and relative zeta function for a semitransparent plane*", Università degli Studi di Genova, Dip. Matematica, 21 May 2019.

2018 "*Free fall into the past. A time-orientable spacetime model with closed timelike curves and no curvature singularity*", Università degli Studi di Milano, Dip. Matematica, 18 January 2018.

2015 "*A functional analytic framework for local zeta regularization and the scalar Casimir effect*", Università degli Studi di Trento, Dip. Matematica, 5 October 2015.

2011 "*La regolarizzazione zeta locale e l'effetto Casimir*" (transl. "*Local zeta regularization and the Casimir effect*"), Università degli Studi di Milano, Dip. Matematica, 28 June 2011.

Invited visiting

2020 Visiting professor at Scuola Normale Superiore di Pisa,
Pisa, 12–14 February 2020.

2016 Visiting scientist at SISSA (International School for Advanced Studies, Trieste),
Trieste, 26–29 September 2016.

Organization of Conferences, Workshops, Schools

2025 Upcoming school and workshop *Mathematical Challenges in Quantum Mechanics (MCQM25)*,
to be held at Gran Sasso Science Institute (l'Aquila), 10 – 14 February 2025.
Organizers: G. Basti, S. Cenatiempo, M. Falconi, D.F., A. Olgiati.
website: https://indico.gssi.it/event/696/

2025 Upcoming intensive period *Quantum Mathematics at Polimi (QMP25)*, to be held at Politecnico di Milano, comprising:

- Workshop *Kick-off meeting*, 10 – 11 March 2025.
- Workshop *Mathematics of condensed matter systems*, 26-30 May 2025.
- Workshop *Recent advances in operator theory and its applications*, 3-6 June 2025 (jointly organized with A. De Martino, P. Schlosser).
- 4 thematic mini-courses given by J. Behrndt, D. Hundertmark, D. Lundholm, Á. Capel Cuevas.

Organizers: D.F., M. Moscolari, A. Olgiati.
website: https://sites.google.com/view/qmp25-intensiveperiod

Research Projects and Funding

- **Participant** to **ERC Consolidator Grant 2016** "*UniCoSM - Universality in Condensed Matter and Statistical Mechanics*" (June 2021 – October 2022)
  Principal investigator: Prof. Alessandro Giuliani
- **Participant** to **Progetto Giovani GNFM 2020** "*Emergent Features in Quantum Bosonic Theories and Semiclassical Analysis*"
  Principal investigator: Prof. Marco Falconi
- **Participant** to **INFN Project 2017-2019** "*BELL - Fundamental Problems in Quantum Physics*"
  National coordinator: Prof. Pierantonio Zanghì Local coordinator: Prof. Bassano Vacchini
- **Participant** to **Progetto Giovani GNFM 2017** "*Quasi-classical dynamics for the polaron model*"
  Principal investigator: Prof. Raffaele Carlone
- **Participant** to **FIR project 2014-2017** "*COND-MATH - Condensed Matter in Mathematical Physics*" (University of Insubria Unit, from April 2016)
  Principal investigator: Prof. Michele Correggi
- **Participant** to **MIUR - PRIN 2010 - 2011** "*Teorie geometriche e analitiche dei sistemi Hamiltoniani in dimensioni finite e infinite*" (transl. "*Geometric and analytic theories of Hamiltonian systems in finite and infinite dimensions*")
  National coordinator: Prof. Boris A. Dubrovin Local coordinator: Prof. Dario P. Bambusi

Teaching activity

Graduate level teaching (35 hours)

- PhD Course "Spectral and Scattering theory in Quantum Mechanics" held at Politecnico di Milano (14 hours by W. Borrelli and 14 hours by D.F.).
- PhD Course "Mathematical Quantum Mechanics" held at Università degli Studi di Roma Tre, borrowed from the course "Aspetti Matematici della Meccanica Quantistica" for the master degree in Mathematics (20 hours).
- '*Stati legati in guide d'onda*' ('*Bound states in waveguides*'), introductive 1-hour seminar for the MCQM Seminar by Pavel Exner '*Discrete spectrum of two-dimensional soft waveguides*', Politecnico di Milano, 11 January 2021.

Master level teaching (90 hours + 18 hours to be delivered from September to December 2024)

- Course "Mathematics of Quantum Mechanics" for the M.Sc. degree in Mathematical Engineering, Politecnico di Milano, academic year 2024/2025 (18 hours of theory lectures by D.F., 18 hours of theory lectures by M. Moscolari and 14 hours of exercise classes by M. Cantoni to be delivered from September to December 2024).
- Course "Aspetti Matematici della Meccanica Quantistica" (Mathematical Aspects of Quantum Mechanics) for the M.Sc. degree in Mathematics, Università degli Studi di Roma Tre, academic year 2022/2023 (60 hours of theory lectures).
- Course "Algebra Lineare per il Machine Learning" (Linear Algebra for Machine Learning) for the M.Sc. degree degree in Computational Sciences, Università degli Studi di Roma Tre, academic year 2021/2022 (30 hours of theory lectures).

Bachelor level teaching (380 hours + 60 hours to be delivered from September to December 2024)

- Course "Meccanica Razionale" (Rational Mechanics) for the B.Sc. degree in Civil Engineering, Politecnico di Milano, academic year 2024/2025 (60 hours of theory lectures by D.F., 40 hours of exercise classes by P. Mora, to be delivered from September to December 2024).
- Course "Meccanica Razionale" (Rational Mechanics) for the B.Sc. degree in Civil Engineering, Politecnico di Milano, academic year 2023/2024 (60 hours of theory lectures by D.F., 40 hours of exercise classes by P. Mora).
- Course "Matematica - Modulo 1" (basic mathematics course) for the B.Sc. degree in Geological Sciences, Università degli Studi di Roma Tre, academic year 2021/2022 (24 hours of theory lectures, 36 hours of exercise lectures).
- Teaching assistant for "Meccanica Razionale" (Analytical Mechanics) for the B.Sc. degree in Materials and Nanotechnology Engineering, Politecnico di Milano, academic year 2020/2021 (20 hours of blended teaching).
- Teaching assistant for "Fisica Matematica" (Mathematical Physics) for the B.Sc. degree in Mathematics, Università degli Studi dell'Insubria, academic year 2020/2021 (12 hours of online teaching activity).
- Teaching assistant for "Meccanica Analitica" (Analytical Mechanics) for the B.Sc. degree in Physics, Università degli Studi di Milano, academic years 2017/2018, 2018/2019, 2019/2020 (20 hours of teaching activity per year).
- Teaching assistant for "Matematica del continuo" (basic mathematics course) for the B.Sc. degree in Computer Science, Università degli Studi di Milano, academic years 2014/2015, 2015/2016 (48 hours of teaching activity, 20 hours of support for exams per year).
- Teaching assistant for "Istituzioni di matematica" (basic mathematics course) for the B.Sc. degree in Computer Science, Università degli Studi di Milano, academic year 2013/2014 (48 hours of teaching activity, 20 hours of support for exams).
- Freshmen tutor for "Corsi di azzeramento" (mathematics pre-introductory course) for the B.Sc. degree in Biological Sciences, Università degli Studi di Milano, September 2014 (24 hours of teaching activity).

Total hours of teaching activity: 505 + 78 hours to be delivered from September to December 2024
Total hours of support for exams: 60

Supervised Students

PhD Students

- Domenico Cafiero, Ph.D. in Mathematical Models and Methods in Engineering, Mathematics Department, Politecnico di Milano.
  Supervision period: from October 2023
  Co-supervised with Prof. Michele Correggi

Master Students

- Marco Gurgoglione, M.Sc. in Engineering Physics, Physics Department, Politecnico di Milano
  Supervision period: from September 2024
- Zhiwei Peng, M.Sc. in Mathematical Engineering, Politecnico di Milano, Mathematics Department
  Supervision period: from September 2023 (expected dissertation: December 2024)
  Co-supervised with Prof. Michele Correggi

- Marco Mastronicola, M.Sc. in Theoretical Physics, Università degli Studi di Pavia, Physics Department
  Thesis: "*Backreaction of a scalar quantum field on a wormhole spacetime in semiclassical gravity*"
  Dissertation date: 25 February 2022
  Co-supervised with Prof. Claudio Dappiaggi and Prof. Livio Pizzocchero
- Guglielmo Moroni, M.Sc. in Theoretical Physics, Università degli Studi di Milano, Physics Department
  Thesis: "*Scalar Casimir effect on a line in presence of delta-interaction*"
  Dissertation date: 2 April 2020
  Co-supervised with Prof. Livio Pizzocchero

Affiliations

- Member of "*Gruppo Nazionale per la Fisica Matematica*" (INdAM-GNFM, Italian National Group for Mathematical Physics) since 2015.
- Member of "*International Association of Mathematical Physics*" (IAMP) since 2017.
- Member of "*Istituto Nazionale di Fisica Nucleare*" (INFN, Italian National Institute for Nuclear Physics) from March 2017 to March 2020, and from April 2023 to today.
- Member of "*Unione Matematica Italiana*" (UMI) since 2019.
- Member of "*Seminario Matematico e Fisico di Milano*" from September 2023.

Referee and Reviewer activity

Referee for the following journals:

- *Analysis and Mathematical Physics* (by Springer)
- *Annales Henri Poincaré* (by Springer)
- *Classical and Quantum Gravity* (by IOP Science)
- *Communications in Mathematical Physics* (by Springer)
- *European Journal of Physics* (by IOP Science)
- *European Physical Journal C* (by Springer)
- *International Journal of Geometric Methods in Modern Physics* (by World Scientific)
- *Journal of Physics A: Mathematical and Theoretical* (by IOP Science)
- *Journal of Physics G: Nuclear and Particle Physics* (by IOP Science)
- *Journal of Statistical Physics* (by Springer)
- *Note di Matematica* (by Dep. of Mathematics and Physics, University of Salento, Italy)
- *Physica Scripta* (by IOP Science)
- *Springer INdAM Series*
- *Universe* (by MDPI)

Reviewer for

- Mathematical Reviews (Americal Mathematical Society)
- zbMath

Administration Posts

- Representative of postdoc researchers at the Department Council ("Consiglio di Dipartimento") of the Department of Mathematics, Università degli Studi di Milano, academic years 2017/2018, 2018/2019, 2019/2020.

Research Interests

- Classical spin systems with competing interactions.
- Emergence of Efimov effect in few body quantum systems.
- Schrödinger operators with Aharonov-Bohm potentials; anyonic systems and fractional statistics.
- Schrödinger operators with singular potentials; perturbations of self-adjoint operators and self-adjoint extensions of symmetric operators; scattering theory for non-relativistic quantum particles; semi-classical limit; quantum graphs.
- Mathematical aspects of relativistic quantum field theories (axiomatic QFT); zeta-regularization and its applications to the renormalization of vacuum expectation values; Casimir effect for a scalar field in presence of external potentials or classical boundaries.
- Exotic solutions of Einstein's field equations; violations of the classical positive energy conditions; non-standard causal structures with closed timelike curves; scalar field models for early-stage inflation in cosmology.

Other titles

- Partecipation in the course "*PhD Supervisor Training*" - 14 hours.
- Partecipation in the course "*Approcci pratici all'innovazione didattica*" (transl. "*Practical approaches to teaching innovation*") - 15 hours.

Last update: November 19, 2024