Andrea Zingarofalo

Curriculum Vitae & Studiorum

About Me

Theoretical physicist working on self-testing and device-independent approaches to quantum computation. My research investigates how entanglement and nonlocality can be used to certify quantum devices from first principles, linking foundational questions in quantum theory with the development of reliable quantum technologies.

Education

2025 – 2029 **PhD in Quantum Information Theory**, *Université libre de Bruxelles*
- Thesis: *Self-Testing and Device-Independent Verification of Quantum Computation*
- Advisor: Dr. S. Pironio

2020 – 2025 **Allievo del corso ordinario**, *Advanced School ISUFI* (Excellence Program)
- ∼10% Acceptance rate for the Natural Sciences Class in 2020
- Modules: Group Theory and Symmetries, Celestial Mechanics, Astroparticle Physics, Applied Physics I–II, Philosophy of Science, ICT for Research, Public Speaking, Scientific Writing

Sep 2024 – Jan 2025 **Exchange program**, *École normale supérieure*, Master ICFP (International Center for Fundamental Physics) M2, Theoretical Physics
- Modules: General Relativity, Quantum Field Theory, Statistical Field Theory, Algorithms & Computations

2023 – 2025 **MSc in Theoretical Physics**, *University of Salento*, 110/110 cum laude, GPA: 29.8/30
- Modules: Quantum Field Theory I–II, QCD, Statistical Mechanics, Quantum Computing, Physics of Complex Systems, Data Analysis, Mathematical Methods for AI
- Thesis: *Exploring the boundaries of quantum correlations: Bell inequalities, convex duality, and self-testing*
- Advisors: Prof. L. Martina & Prof. J.-D. Bancal

2020 – 2023 **BSc in Physics**, *University of Salento*, 110/110 cum laude, GPA: 30/30
- Electives: Nuclear Physics, Astronomy, Foundations of Physics
- Thesis: *Study of one-dimensional quantum integrable systems via the Bethe Ansatz*
- Advisor: Prof. L. Martina

2015 – 2020 **High School Diploma**, *Liceo Scientifico V. Lilla*, Oria, Italy, 100/100 cum laude
- Activities: Student ambassador

Experience

Oct 2025 – Feb 2026 **Visiting PhD Student**, *Institut de Physique Théorique – CEA Paris-Saclay*
- Research on verification protocols for quantum computation
- Supervisor: Prof. J.-D. Bancal

2025 – 2029 **Doctoral Researcher**, *Laboratoire d'Information Quantique – Université libre de Bruxelles*
- Research on self-testing and device-independent protocols for certifying components of quantum computation, from multipartite entanglement to error-correcting codes
- Supervisor: Dr. S. Pironio

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Mar – Jul 2025 **Research Intern**, *Institut de Physique Théorique – CEA Paris-Saclay*
- Derived analytically new Bell inequalities for partially entangled states
- Implemented SDP relaxations to numerically estimate quantum bounds of Bell inequalities via the Navascués-Pironio-Acín hierarchy
- Supervisor: Prof. J.-D. Bancal

Mar – Jul 2024 **Research Intern**, *Mathematical Physics Group – University of Salento* (with *University of Glasgow*)
- Derived multi-kink solutions of a generalized Fokker-Planck equation via Hirota's bilinear method
- Developed automated Mathematica scripts for symbolic generation of soliton solutions
- Supervisor: Prof. L. Martina

2019 – Present **Private Tutor** in Mathematics, Physics, and Chemistry for high-school and university students

Publications

Journal Articles

[1] F. Giglio, G. Landolfi, L. Martina, and **A. Zingarofalo**. Integrability properties and multi-kink solutions of a generalised Fokker-Planck equation. *Journal of Physics A: Mathematical and Theoretical*, 58(16):165202, April 2025.

Science Communication and Outreach

[2] **A. Zingarofalo**. Il conflitto tra meccanica quantistica e senso comune, 2024. Published on Il Chiasmo by Treccani – The Italian Encyclopaedia Institute.

[3] **A. Zingarofalo**. Il ruolo delle simmetrie nel problema di Keplero. In D. Avaro and F. Decataldo, editors, *Rete di Idee, Udine 2022*, pages 81–100, Udine, 2023. Forum Editrice.

Schools and Workshops

Domain-Specific

2025 **Workshop in honor of Ignacio Cirac and Peter Zoller**, Belgian Quantum Initiatives, Brussels, 3 Oct

2025 **Interdisciplinary Statistical Physics workshop**, University of Salento, Lecce, 18–19 Sep

2025 **Qiskit Global Summer School**, IBM, 7–22 Jul

2025 **Summer School "Mathematical Aspects of Quantum Information" (MAQI)**, Université Paris-Saclay and Institut Polytechnique, Paris, 16–20 Jun

2024 **Summer School "Theoretical Physics of Fundamental Interactions"**, Scuola Normale Superiore and Scuola Galileiana di Studi Superiori, Pisa, 27–31 May

2019 **Physics Summer School**, University of Salento, Lecce, 2–6 Sep

2018 **Stage at Asiago Astrophysical Observatory**, INAF (Italian Institute of Astrophysics) and University of Padua, Asiago, 9–13 Jul

2016 **Summer School on Astronomy**, INAF and SAIt (Italian Astronomical Society), Sant'Agata sui Due Golfi, 5–8 Jul

Others

2023 **Summer School "Reframing Sustainability: Bridging Environmental, Energy and Economical Challenges"**, Advanced School ISUFI, Otranto, 10–12 Sep

2023 **Winter School "Green and Digital Transition in Europe"**, ENCATC (European Network of Cultural Administration Training Centres), Brussels, 2–7 Dec

2019 **University Orientation School**, Scuola Normale Superiore and Accademia Nazionale dei Lincei, Rome, 8–13 Jul

Awards and Scholarships

2025 Selected as one of the few Italian members of **Nova** – The Global Top Talent Network that recognizes the **top 3%** of professionals worldwide across STEM, business, and innovation

2025 Winner of RIASISSU "Rete di Idee", XIII edition, Catania

2025 Selected among the **Top 100 STEM graduates in Italy** (Class of 2025), by Almalaurea, the national consortium of Italian universities

2025 Winner of the ISUFI "Research & Innovation" grant for international research mobility

2024 Winner of a Cité Internationale Universitaire de Paris scholarship (accomodation)

2022 Winner of RIASISSU "Rete di Idee", X edition, Udine

2020 Winner of the ISUFI Scholarship at the University of Salento, awarded for academic excellence (full accomodation and a stipend)

2018 Senior finalist at XVI Italian Astronomy Olympiads, ranking **among the top 30 out of over 6000 participants** nationwide

Presentations

2025 **Orthogonal Faces in the CHSH Scenario**, *Laboratoire d'Information Quantique – Université libre de Bruxelles*, Brussels, 13 Oct

2025 **Orthogonal Faces in the CHSH Scenario** (poster), MAQI School, Paris, 18 Jun

2025 **Exploring the Boundaries of Quantum Correlations**, *Institut de Physique Théorique – CEA Paris-Saclay*, Paris, 6 Jun

2022 **Il ruolo delle simmetrie nel problema di Keplero**, RIASISSU Rete di Idee, Udine, 9 Oct

Technical Skills

Programming and Scientific Computing

Programming Python (`NumPy`, `SciPy`, `Matplotlib`, `pandas`), `C`/`C++`, Julia, Bash and Javascript; symbolic and numerical computation in MATHEMATICA and MATLAB

Quantum Libraries Quantum simulation with `Qiskit` and `PennyLane`; SDPs and convex optimization using `CVXPY`, `MOSEK`, `ncpol2sdpa`

Data Analysis ROOT framework for experimental data, and introductory machine learning methods with `scikit-learn` and `TensorFlow`

Workflow LaTeX, Markdown, `git` version control, Inkscape, Microsoft Office; comfortable with UNIX systems, shell scripting, and basic system management

Communication and Teamwork

Collaborated within international research teams; presented theoretical results at seminars and co-authored peer-reviewed work

Languages

Italian (native), English (C1), French (B2), German (A2)

Professional Memberships

IEEE Quantum Technical Community (2025-), Quantum Flagship Community (2025-), Italian Physical Society – SIF (2023-), RIASISSU Excellence Network (2023-2025)

Additional Information

Music Guitar Grade 2 (Distinction), Trinity College of London

Interests Outside academia, I'm a tech enthusiast with a passion for music, history, travelling and geopolitics. Amateur astronomer, speaker at *XXXVII Meeting of Apulian Astrophiles*