Leonardo S. Cardinale

Theoretical High Energy Physics PhD Student

Theoretical physicist working on quantum field theory with a strong background in scientific computing

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EDUCATION

PhD in theoretical physics *Ecole Normale Supérieure - PSL* 2025–2028 (expected)
Doctoral dissertation supervised by Miguel Paulos, funded by a *normalien* PhD fellowship.

International Center for Fundamental Physics master's degree *Ecole Normale Supérieure - PSL* 2023–2025
Theoretical physics track, *highest honors*

- Advanced coursework in quantum field theory, conformal field theory & AdS/CFT, string theory, general relativity, statistical field theory, Lie groups & algebras, differential geometry, and gauge theory; additional background in quantum information, phenomenology, cosmology, dynamical systems, and machine learning for physics.

Diplôme d'ingénieur **(MSc engineering)** *Ecole Nationale Supérieure des Mines de Paris - PSL* 2021–2025
Highest honors

- Advanced coursework in quantum mechanics, classical field theory, and continuum mechanics; mathematics in differential equations, measure theory, stochastic processes, and theoretical computer science; computational methods in optimization, signal processing, and data science.

Classe préparatoire **mathematics, physics and computer science track** *Lycée Louis-le-Grand* 2019–2021
Highest honors

- Highly selective undergraduate two-year program preparing students for admission to French *grandes écoles.*

EXPERIENCE

Doctoral researcher *Laboratoire de Physique de l'Ecole Normale Supérieure & CNRS* 2025 - 2028 (expected)
Working in the Fields, Gravity and Strings group towards developing methods for solving strongly coupled quantum field theory in AdS_2 spacetime via the study of their dual 1D CFTs (using techniques from the conformal bootstrap, Hamiltonian truncation, numerical optimization, symbolic computation).

Research intern *Laboratoire de Physique de l'Ecole Normale Supérieure & CNRS* 2025 (3 months)
Supervised by Miguel Paulos, with CNRS funding, in the Fields, Gravity and Strings group. Studying Hamiltonian truncation for long-range one-dimensional CFTs.

Research intern *University of Turin, Department of Physics* 2024 (5 months)
Supervised by Lorenzo Bianchi, with Erasmus+ funding, in the Strings and Supergravity group. Studying defects in the long-range O(N) model.

Oral examiner *Institut Bossuet* 2023-2024 (4 months)
Organizing oral examinations for classe préparatoire students, preparing exercises and solutions, grading their work.

Research intern *Inria Paris & Mines Paris, Centre Automatique et Systèmes* 2023 (4 months)
Supervised by Antoine Tilloy, with ARMINES funding, in the QUANTIC group. Analytical and numerical (Monte Carlo) study of lattice gauge theory and emergent tensor network structure in gauge-invariant observables.

Research intern *University of Oxford, Department of Engineering Science* 2022–2023 (5 months)
Supervised by Dorian Gangloff, with Erasmus+ funding in the quantum engineering group. Studying nuclear spin control in semiconductor quantum dots. Presented a poster at the QUEST 2023 international conference in Paris.

PUBLICATIONS & PROJECTS

Bianchi, L., LSC, & de Sabbata, E. Defects in the long-range O(N) model. J. Phys. A: Math. Theor. 2025
Paper published in Journal of Physics A: Mathematical and Theoretical following internship at the University of Turin.

Defect conformal field theory 2025
Master's project studying defect CFTs, the triviality of defects in most free field theories, the localized magnetic field and surface defects in the O(N) model.

Conformal field theory and the long-range Ising model 2024
Master's project studying conformal field theory and a proof of conformality of the long-range Ising fixed point.

Accelerated sampling of Boltzmann distributions with neural networks 2024
Master's project studying algorithms involving normalizing flows to optimize the performance of Monte Carlo simulations.

SKILLS

- **Languages**: French, English, Greek (native languages), Italian (full professional proficiency), Spanish (professional working proficiency)
- **Programming and tools**: Python (NumPy, SciPy, PyTorch), C++, LaTeX, Mathematica, COMSOL, JavaScript, Bash, SQL, OCaml, version control (Git).