Edoardo Lauria

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Personal information

Date of birth:	4th January 1989	Citizenship:	Italian
Place of birth:	Ivrea, Italy	Languages:	Italian (native), English (fluent), French (intermediate)

Employment

Mar. 2023	-	current	Postdoctoral Fellow (at Quantic group) LPENS, École Normale Supérieure - PSL CAS, Mines Paris - PSL Sorbonne Université, CNRS Inria, Paris, France
Oct. 2022	-	Feb. 2023	Visitor École Polytechnique, CPHT, Paris, France.
Jan. 2020	-	Sept. 2022	Postdoctoral Fellow *Simons Collaboration for the Nonperturbative Bootstrap* École Polytechnique, CPHT, Paris, France.
Oct. 2018	-	Dec. 2019	Postdoctoral Fellow *Simons Collaboration for the Nonperturbative Bootstrap* Durham University, Durham, UK.

Education

Sept. 2014	-	Oct. 2018	PhD in Physics, KU Leuven, Leuven, Belgium Advisors: Nikolay Bobev and Antoine Van Proeyen Title: *Points, Lines, Surfaces at Criticality* (Published by Springer Theses, 2019)
Sept. 2011	-	Apr. 2014	MSc in Physics, Università di Torino, Torino, Italy Advisor: Marco Billò Title: *Defects in Conformal Field Theories* Final grade: 110/110 *"cum laude"* (with distinction)
Sept. 2008	-	Sept. 2011	BSc in Physics, Università di Torino, Torino, Italy Advisor: Roberto Tateo Title: *Quantum Hamiltonian and Riemann Zeta function* Final grade: 110/110

Fellowships and awards received

- Von Humboldt Research Fellowship for Postdoc, July 2022. (Declined);
- Springer Theses, 2019. "Nominated as an outstanding Ph.D. thesis by the Institute for Theoretical Physics, KU Leuven, Leuven, Belgium";
- Visiting Graduate Fellowship, Perimeter Institute for Theoretical Physics, Waterloo (Canada), Sept. 2017 – Dec. 2017.

Qualifications

- Abilitazione Scientifica Nazionale (associate professor), valid from 05/11/2024 to 05/11/2036 (art. 16, comma 1, Legge 240/10);
- Qualification for the position of 'maître de conférences' (associate professor), section 29 (Constituants élémentaires). Number 23229385764, obtained on 10/02/2023;
- Dottore di ricerca (PhD), decreto direttoriale di equipollenza dottorato n. 2539 del 09/11/2021.

Teaching and mentoring experience

2018 - 2019 – Durham University

Tutoring for master classes in:

- *String Theory*, taught by Prof. S. Ross;
- *Supersymmetry*, taught by Prof. S. Cremonesi;
- *Renormalization Group*, taught by Prof. V. Niarchos;
- *Advanced QFT*, taught by Prof. N. Iqbal;
- *Group Theory*, taught by Prof. D. Dorigoni.

2016 - 2018 – KU Leuven

- Graded homework problems for master classes in *Weak and Strong Interactions*, taught by Prof. Alexander Sevrin;
- Exercises sessions (in class) for the bachelor student of the course in *Electromagnetism and Relativity*, taught by Prof. Wojciech De Roeck.

2018 - 2025 – Students mentored

- 2018 - 2019. Jingxiang Wu, PhD student at Perimeter Institute for Theoretical Physics (Waterloo, ON, CA) under the supervision of Prof. Davide Gaiotto and Prof. Lorenzo Di Pietro. Now postdoc at the Mathematical Institute of Oxford University (Oxford, UK). Our collaboration led to the paper: *3d Abelian Gauge Theories at the Boundary*, JHEP 05 (2019) 091.
- 2019 - 2020. Xiang Zhao, PhD student at École Polytechnique de Paris (FR) under the supervision of Prof. Balt van Rees. Now postdoc at IPhT, Saclay (FR); previously postdoc at EPFL (Lausanne, CH). Our collaboration led to the paper: *Line and surface defects for the free scalar field*, JHEP 01 (2021) 060.
- 2020 - 2021. Pierluigi Niro, PhD student at Université Libre de Bruxelles (BE) under the supervision of Prof. Riccardo Argurio. Now postdoc at SISSA (Trieste, IT); previously postdoc at UCLA (Los Angeles, USA). Our collaboration led to the paper: *3d large N vector models at the boundary*, SciPost Phys. 11 (2021) 3, 050. After he graduated, our collaboration continued and led to the papers:: *Vacuum stability, fixed points, and phases of QED_3 at large N_f*, Phys.Rev.D 108 (2023) 6, L061902; and *Conformal boundary conditions for a 4d scalar field*, SciPost Phys. 16 (2024), 090.
- 2021 - 2022. Michael Milam, MSc student at École Polytechnique de Paris (FR), under the supervision of Prof. Balt van Rees. Now Ph.D student at IPhT (Saclay, FR) with Prof. Ruben Minasian. Title of the thesis: *Renormalization Group Flows of Minimal Models in Anti-de Sitter Space*, awarded with the prestigious *Prix du Stage de Recherche* (Research Internship Prize) in December 2021. Our collaboration led to the paper: *Perturbative RG flows in AdS: an étude*, JHEP 03 (2024) 005.
- 2020 - 2023. Philine van Vliet, PhD student at DESY (Hamburg, DE) under the supervision of Dr. Pedro Liendo, now postdoc at École Normale Supérieure (Paris, FR). Our collaboration led to the paper: *Bootstrapping line defects with $O(2)$ global symmetry*, JHEP 11 (2022) 018. After she graduated, our collaboration continued and led to the papers: *Analytic and numerical bootstrap for the long-range Ising model* JHEP 03 (2024) 136, *1d Ising model with $1/r^{1.99}$ interaction*, Phys. Rev. Lett. 134 (2025) 20, *A strong-weak duality for the 1d long-range Ising model*, SciPost Phys. 20 (2026), 029.
- 2023 - 2025. Karan Tiwana, PhD student at École Normale Supérieure and INRIA (Paris, FR), under the supervision of Prof. Antoine Tilloy, now postdoc at Mines Paris (Paris, FR). Our work has led to the paper: *A relativistic continuous matrix product state study of field theories with defects*, JHEP 05 (2025) 097.
- 2024 - 2025. Fanny Eustachon, PhD student at École Polytechnique de Paris (FR) under the supervision of Dr. Dario Benedetti. Our work has led to the paper: *Long-range minimal models*, JHEP 02 (2026) 001.

Research

Summary of research interests

My research focuses on understanding non-perturbative aspects of Quantum Field Theories (QFTs) and Conformal Field Theories (CFTs). This includes studies with and without boundaries or defects, and has applications in areas ranging from condensed matter physics to string theory. I address these problems using the bootstrap framework, which relies on the consistency conditions of the theory, without depending on any specific microscopic model. My results include: 1) A classification of unitary conformal boundary conditions for 4d Maxwell theory and for a free massless scalar field in $d = 3, 4$ dimensions; 2) A classification of unitary conformal defects in the theory of a free massless scalar in $d > 2$ dimensions; 3) A bootstrap study of conformal line defects with continuous global symmetry; 4) A bootstrap study of the long-range Ising model in $d = 2, 3$ dimensions; 5) A new scaling theory for the 1d long-range Ising model near the long-range to short-range crossover transition; 6) A systematic exploration of renormalization group flows and Effective Field Theory corrections for strongly-coupled QFTs in AdS background; 7) A non-perturbative study of magnetic line defects in massive QFTs in $d = 1 + 1$ dimensions, using a variational approach inspired by tensor networks methods. I have also worked on similar classification problems for supersymmetric CFTs (SCFTs) without defects. I wrote a textbook on $\mathcal{N} = 2$ supergravity theories in $d = 4, 5, 6$ dimensions.

Keywords : Conformal Field Theories, Conformal Bootstrap, Boundaries and defects, Strong Coupling, Quantum Field Theory in curved background, Gauge Theories, Renormalization Group, Supersymmetry, Long-Range Interactions.

Publications

The full list also on iNSPIRE, or on arXiv. Authors appear in alphabetic order.

1. Published Research Articles (peer-reviewed)

1. M. Billò, V. Gonçalves, E. Lauria, and M. Meineri, *Defects in Conformal Field Theories*, JHEP 04 (2016) 091;

2. N. Bobev, E. Lauria, and D. Mazáč, *Superconformal Blocks for SCFTs with Eight Supercharges*, JHEP 07 (2017) 061;

3. M. Baggio, N. Bobev, S. Chester, E. Lauria, and S.S. Pufu, *Decoding a Three Dimensional Conformal Manifold*, JHEP 02 (2018) 062;

4. E. Lauria, M. Meineri, and E. Trevisani, *Radial Coordinates for Defect CFTs*, JHEP 11 (2018) 148;

5. E. Lauria, M. Meineri, and E. Trevisani, *Spinning operators and defects CFTs*, JHEP 08 (2019) 066;

6. L. Di Pietro, D. Gaiotto, E. Lauria, and J. Wu, *3d Abelian Gauge Theories at the Boundary*, JHEP 05 (2019) 091;

7. C. Behan, L. Di Pietro, E. Lauria, and B.C. van Rees, *Bootstrapping Boundary-Localized Interactions*, JHEP 12 (2020) 182;

8. E. Lauria, P. Liendo, B.C. van Rees, and X. Zhao, *Line and surface defects for the free scalar field*, JHEP 01 (2021) 060;

9. L. Di Pietro, E. Lauria, and P. Niro, *3d large N vector models at the boundary*, SciPost Phys. 11 (2021) 3, 050;

10. C. Behan, L. Di Pietro, E. Lauria, and B.C. van Rees, *Bootstrapping boundary-localized interactions II: Minimal models at the boundary*, JHEP 03 (2022) 146;

11. A. Gimenez-Grau, E. Lauria, P. Liendo, and P. Van Vliet, *Bootstrapping line defects with $O(2)$ global symmetry*, JHEP 11 (2022) 018;

12. L. Di Pietro, E. Lauria, and M. Niro, *Vacuum stability, fixed points, and phases of QED_3 at large N_f*, Phys.Rev.D 108 (2023) 6, L061902;

13. E. Lauria, M. Milam, and B.C. van Rees, *Perturbative RG flows in AdS: an étude*, JHEP 03 (2024) 005;

14. C. Behan, E. Lauria, M. Nocchi, and P. van Vliet, *Analytic and numerical bootstrap for the long-range Ising model*, JHEP 03 (2024) 136;

15. L. Di Pietro, E. Lauria, and P. Niro, *Conformal boundary conditions for a 4d scalar field*, SciPost Phys. 16 (2024), 090;

16. A. Antunes, E. Lauria, and B.C van Rees, *A bootstrap study of minimal model deformations*, JHEP 05 (2024) 027;

17. E. Lauria, A. Tilloy, and K. Tiwana, *A relativistic continuous matrix product state study of field theories with defects*, JHEP 05 (2025) 097,

18. D. Benedetti, E. Lauria, D. Mazáč, and P. van Vliet, *1d Ising model with $1/r^{1.99}$ interaction*, Phys. Rev. Lett. 134 (2025) 20;

19. D. Benedetti, E. Lauria, D. Mazáč, and P. van Vliet, *A strong-weak duality for the 1d long-range Ising model*, SciPost Phys. 20 (2026), 029;

20. C. Behan, D. Benedetti, F. Eustachon, and E. Lauria, *Long-range minimal models*, JHEP 02 (2026) 001.

2. Conference proceedings

1. E. Lauria, *Exact results in defect conformal field theories*, Fortsch.Phys. 64 (2016) 333-335.

3. Monographs (not peer-reviewed)

1. Edoardo Lauria, *Points, Lines, and Surfaces at Criticality*, Springer Theses, 2019. "Nominated as an outstanding Ph.D. thesis by the Institute for Theoretical Physics, KU Leuven, Leuven, Belgium";

2. Edoardo Lauria and Antoine Van Proeyen, *$\mathcal{N} = 2$ Supergravity in $D = 4, 5, 6$ Dimensions*, Lect.Notes Phys. 966 (2020), Springer.

Invited talks at seminar series and conferences

- 31/10/2025 - **Workshop** *Diving Deeper into Defects*, Newton Institute, Cambridge, UK. Title: *Strong-weak duality for 1d long-range Ising model*;
- 07/05/2025 - *Belgian Joint Seminars*, KU Leuven, Leuven, Belgium. Title: *The Ising model with* $1/r^{1.99}$ *interaction*;
- 01/04/2025 - LPTMC - Sorbonne Université, Paris, France. Title: *The Ising model with* $1/r^{1.99}$ *interaction*;
- 11/02/2025 - **Workshop** *QFT in AdS – from BCFT to Confinement*, Trieste, Italy. Title: *A bootstrap study of RG flows in* AdS_2;
- 20/03/2024 - Uppsala Math. Dept. Journal Club, Uppsala, Sweden. Title: *Conformal Field Theories (and their defects)*;
- 19/03/2024 - Crete Center for Theoretical Physics, on Zoom. Title: *A bootstrap study of RG flows in* AdS_2;
- 06/03/2024 - LPTHE - Sorbonne Université, Paris, France. Title: *Bootstrapping the Long-Range Ising model*;
- 06/02/2024 - University of Torino, Torino, Italy. Title: *Bootstrapping the Long-Range Ising model*;
- 30/01/2024 - ENS Bootstrap Journal Club, Paris, France. Title: *Bootstrapping RG flows in AdS*;
- 26/10/2023 - Pisa Journal Club, on Zoom. Title: *A study on RG flows in AdS*;
- 07/10/2024 - *TLS*, INRIA, Paris, France. Title: *Conformal Field Theories (and the bootstrap): an invitation*;
- 19/04/2022 - *Seed Seminar of Mathematics and Physics*, on Zoom. Title: *Boundary conditions for free fields*;
- 16/12/2021 - *Rencontres Théoriciennes* at Institut Henri Poincaré, Paris, France. Title: *Boundary conditions for free fields*;
- 16/12/2021 - *Belgian Joint Seminars*, on Zoom. Title: *Boundary conditions for free fields*;
- 02/03/2021 - ETH Zurich, on Zoom. Title: *Bootstrapping Defect-Localized interactions*;
- 30/09/2020 - Porto University, on Zoom. Title: *Bootstrapping Defect-Localized interactions*;
- 16/11/2019 - **Conference** *North British Mathematical Physics Seminars*, Durham University, Durham, UK. Title: *3d Abelian Gauge Theories at the Boundary*;
- 01/11/2019 - University of Swansea, UK. Title: *3d Abelian Gauge Theories at the Boundary*;
- 02/10/2019 - University of Southampton, UK. Title: *3d Abelian Gauge Theories at the Boundary*;

- 07/08/2019 - **Conference** *Boundaries and Defects in QFT*, Perimeter Institute, Waterloo, ON, Canada. Title: *3d Abelian Gauge Theories at the Boundary*;
- 23/05/2019 - *Rencontres Théoriciennes* at Institut Henri Poincaré, Paris, France. Title: *3d Abelian Gauge Theories at the Boundary*;
- 09/05/2019 - DESY, Hamburg, Germany. Title: *3d Abelian Gauge Theories at the Boundary*;
- 20/03/2019 - King's College London, London, UK. Title: *3d Abelian Gauge Theories at the Boundary*;
- 26/02/2019 - University of Torino, Torino, Italy. Title: *3d Abelian Gauge Theories at the Boundary*;
- 21/02/2019 - **Conference** *South-East Mathematical Physics Seminars* at King's College London, London, UK. Title: *3d Abelian Gauge Theories at the Boundary*;
- 06/02/2019 - Durham CPT's Journal Club, Durham University, Durham, UK. Title: *3d Abelian Gauge Theories at the Boundary*;
- 22/09/2017 - Perimeter Institute's Journal Club, Waterloo, ON, Canada. Title: *An Etúde on $\mathcal{N} = 2$ conformal manifolds in 3d*;
- 21/02/2017 - Gong Show at the **Conference** *The String Theory Universe*, Milano Bicocca, Milano, Italy. Title: *Bootstrapping SCFTs with 8 supercharges*;
- 13/06/2016 - **Workshop** *GGI on CFTs and RG flow in $d > 2$*, Firenze, Italy. Title: *Defects in Conformal Field Theories*;
- 10/09/2015 - Gong Show at the **Conference** *The String Theory Universe*, KU Leuven, Leuven, Belgium. Title: *Defects in Conformal Field Theories.*

Other activities

Organization of scientific events

- Co-organizer theoretical Physics seminars at Durham University from 2019 to 2020;
- 09/2023 to 09/2025, co-organizer of the Seed seminars of Mathematics and Physics. The seminar series is organized into thematic periods lasting three months each. Each thematic period includes a kick-off event at the Institut Henri Poincaré (IHP) and several talks at the Institut des Hautes Études Scientifiques (IHES), which are streamed on Zoom (a list can be found here). Supported by the Fondation Mathématique Jacques Hadamard, the CNRS, and the IHES;

  Past events organized within this series include:

  - 04/06/2025 at IHP, Spin systems and phases of matter;
  - 25/04/2025 at Institut Pascal, Annual workshop of the Seed seminars;
  - 12/02/2025 at IHP, Random geometry and quantum gravity;
  - 09/11/2024 at IHP, New trends in QFT, modularity, resurgence;
  - 07/06/2024 at IHES, one-day conference on Matrix models for quantum systems;

- 27/03/2024 at IHP, Integrable systems;
- 17/01/2024 at IHP, From discrete models to condensed matter;
- 18/10/2023 at IHP, Sphere Packings and CFT.

Referee activity

- Journal of High Energy Physics (SISSA);
- European Physical Journal Plus;
- SciPost Physics.