

Lorenzo Baldi

Curriculum Vitæ

Universität Leipzig, Mathematisches Institut, Germany

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Personal Information

Surname	Baldi
Name	Lorenzo
Nationality	Italian
Date of birth	17.07.1995
Place of birth	Figline Valdarno, Italy
Professional address	Mathematisches Institut Augustusplatz 10, 04109 Leipzig, Germany
Email address	lorenzo.baldi.math@gmail.com
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ORCID	https://orcid.org/0000-0001-5601-0783
Languages	Italian (mother tongue), English (fluent), French (intermediate), Spanish (intermediate), German (beginner)

Research Interests

Real Algebra, Real Algebraic Geometry and their Applications, in particular:

- Positive Polynomials
- Real Algebraic Curves
- Real Abelian Varieties
- Polynomial Optimization

Current Position

- 1.6.2024– **Humboldt Postdoctoral Fellow**, Universität Leipzig, Algebra group
31.5.2026 Mentor: Rainer Sinn

Past Positions

- 1.1–31.5.'24 **Postdoctoral researcher**, Max Planck Institute for Mathematics in the Sciences, Nonlinear Algebra group
Mentor: Rainer Sinn
- 2022–2023 **Postdoctoral researcher**, Sorbonne University, PolSys team
Mentors: Jérémie Berthomieu and Pierre Lairez

Education and Academic Habilitations

- 2025 **Equipollenza del titolo di dottorato**, Università di Firenze, formal Italian equivalence for the Ph.D. title obtained abroad

- 2024–2028 **Qualification for *Maître de Conférences* positions**, Section 25 (Mathematics), French academic habilitation for MdC (assistant professor)
- 2024–2028 **Qualification for *Maître de Conférences* positions**, Section 26 (Applied Math.), French academic habilitation for MdC (assistant professor)
- 2019–2022 **Ph. D. in Mathematics**, Inria Sophia Antipolis – Université Côte d’Azur, ESR9 of POEMA network. Title: Effective Representations in Real Algebraic Geometry and Polynomial Optimization,
Advisor: B. Mourrain
Jury members: M-F. Roy (president), M. Laurent (reviewer), M. Schweighofer (reviewer), J-B. Lasserre, A. Parusiński and M. Putinar.
- 2017–2019 **Master Degree in Mathematics**, Università di Trento, 110/110 *summa cum laude*, title: Real Tensors and Algebraic Geometry.
Supervisor: E. Ballico.
- 2014–2017 **Bachelor Degree in Mathematics**, Università di Firenze, 110/110 *summa cum laude*, title: Introduzione ai gruppi di movimenti rigidi.
Supervisor: C. Casolo.

Grants and Academic Distinctions

Grants

- 2024–2026 **Humboldt Post-Doctoral Research Fellowship**, Universität Leipzig, awarded from the Alexander von Humboldt Foundation
Mentor: Rainer Sinn
- 2019–2022 **Ph. D. Scholarship in POEMA**, European Union’s H2020 research and innovation programme, Marie Skłodowska-Curie Actions, grant n. 813211
Workshop funding
- 8-18.7.2026 **FoCM 2026**, Wien University, European Mathematical Society individual travel grant
- 12.8–16.8.-24 **IWOTA 2024**, University of Kent, European Mathematical Society Workshop funding
- 30.10– 2.11.2023 **Research School in Real Algebraic Geometry**, SISSA, Trieste, Workshops funding
- 12–25.3.2023 **Grant Oberwolfach Leibniz Graduate Students**, Workshops funding
- Academic distinctions**
- 2017–2019 **Path of Excellence for the Master in Mathematics**, Università di Trento, including extra academic assignments and awarded on merit base
- 2014–2017 **Prize for the Bachelor in Mathematics and Computer Science**, Università di Firenze, awarded to the four best Bachelor’s students

Research Works

Preprints

- [11] L. Baldi, G. Blekherman, K. Kozhasov, D. Plaumann, B. Reznick and R. Sinn. Stubborn polynomials. *Submitted for publication.*
<https://arxiv.org/abs/2602.01191>
- [10] L. Baldi, R. Sinn, M. L. Telek and J. Weigert. Toric Extensions of Pólya's theorem. *Submitted for publication.*
<https://arxiv.org/abs/2511.07342>
- [9] L. Baldi, M. Kummer and D. Plaumann. Totally real divisors on curves. *Submitted for publication.*
<https://arxiv.org/abs/2509.07544>
- [8] L. Baldi, G. Blekherman and R. Sinn. Nonnegative Polynomials and Moment Problems on Algebraic Curves. *Submitted for publication.*
<https://arxiv.org/abs/2407.06017>

Journal Publications

- [7] L. Baldi, T. Krick and B. Mourrain. An Effective Positivstellensatz over the Rational Numbers for Finite Semialgebraic Sets. *Mathematics of Computation*, 2025.
<https://doi.org/10.1090/mcom/4153>
- [6] L. Baldi and B. Mourrain. Exact Moment Representation in Polynomial Optimization. *Journal of Symbolic Computation* 129, 2025.
<https://doi.org/10.1016/j.jsc.2024.102403>
- [5] L. Baldi, B. Mourrain and A. Parusiński. On Łojasiewicz Inequalities and the Effective Putinar's Positivstellensatz. *Journal of Algebra* 662, 2025, pp. 741–767.
<https://doi.org/10.1016/j.jalgebra.2024.08.022>
- [4] L. Baldi and L. Slot. Degree bounds for Putinar's Positivstellensatz on the hypercube. *SIAM Journal on Applied Algebra and Geometry*, 2024, pp. 1–25.
<https://pubs.siam.org/doi/10.1137/23M1555430>
- [3] L. Baldi and B. Mourrain. On the effective Putinar's Positivstellensatz and moment approximation. *Mathematical Programming* 200, 2023, pp. 71–103.
<https://doi.org/10.1007/s10107-022-01877-6>

Conference Proceedings

- [2] L. Baldi and B. Mourrain. Computing Real Radicals by Moment Optimization. *Proceedings of the 2021 on International Symposium on Symbolic and Algebraic Computation*. ISSAC '21. New York, NY, USA: Association for Computing Machinery, 2021, pp. 43–50.
<https://doi.org/10.1145/3452143.3465541>

Thesis

- [1] L. Baldi. Effective representations in real algebraic geometry and polynomial optimization. *Ph.D. Thesis*, 2022.
<https://theses.hal.science/tel-03937680>

Teaching and Supervision Activity

Teaching

Information about my teaching activity can be found in [my website](#).

- 2025 Lecturer for the Ph.D. course *A course on Nonnegative Polynomials*, SISSA, Trieste, 10h.
<https://www.math.sissa.it/course/phd-course/course-non-negative-polynomials>
- 2024–25 Lecturer for the Ph.D. and Master course *Real Algebraic Geometry*, University of Leipzig and MPI for Mathematics in Sciences, 28h.
<https://www.mis.mpg.de/de/events/event/real-algebraic-geometry>
<https://www.informatik.uni-leipzig.de/ifijung/10/service/stundenplaene/ws2024/dozent.html#BaldiLorenzo>
- 2023 Co-lecturer (with S. Debus) for the Ph. D. course *Semidefinite programming for Algebra, Geometry and Combinatorics*, University of Magdeburg, 30h.
https://www.mathcore.ovgu.de/index.php?show=teaching_compactcourses&course=2023alg
- 2019 *Informatica*, tutorial exercises (teaching professor: R. Zunino), Department of Mathematics, Trento
- 2018 *Geometria e algebra lineare*, tutorial exercises (teaching professors: A. Bernardi and S. Siboni), Department of Civil, Environmental and Mechanical Engineering, Trento
- Supervision**
- 12–31.1.26 Supervision for the research visit of Paula Pilatus on the topic *Positivity Cones in Physics*, MPI for Mathematics in Sciences, Leipzig.
- 2024–2025 Co-supervision (with R. Sinn) of the Master's thesis *Signomial Coordinates on Convex Polytopes* by Florian Bräunlich, Leipzig University.

Service

- Referee activity Journal of Algebra; SIAM Journal on Applied Algebra and Geometry; SIAM Journal on Optimization; Numerical Algebra, Control and Optimization; Optimization Letters; Mathematics of Operations Research; International Symposium on Symbolic and Algebraic Computation (ISSAC); Information and Inference: A Journal of the IMA; Journal of Symbolic Computation; Journal of Complexity.
See also <https://orcid.org/0000-0001-5601-0783>
- 3.8.2024 **Co-organizer** of BM60, satellite event of MEGA 2024, Leipzig
- 2023– **Reviewer for zbMATH Open** (Zentralblatt für Mathematik)
- 11.2.2022 **Co-organizer** of the POEMA ESR Day, in POEMA Workshop 4, online

Research Visits

- 23–27.7.2025 SISSA, Trieste
- 10–12.7.2024 Università di Trento, TensorDec Laboratory
- 18–20.6.2024 Technical University of Dresden, Real Algebraic Geometry Group
- 5–9.7.2023 Technical University of Dortmund, Algebra und Geometrie group
- 24–27.6.2023 Max Plank Institute Leipzig, Nonlinear Algebra group
- 19–23.6.2023 University of Magdeburg, Discrete, Convex and Toric Geometry group
- 8–10.6.2022 University of Konstanz, Research Group in Real Algebraic Geometry
- 30.5–3.6.'22 Max Plank Institute Leipzig, Nonlinear Algebra group

Programming Skills

- Languages Julia, C, Singular, Magma, Maple, Macaulay2, Git, L^AT_EX
- Packages MomentPolynomialOpt.jl, PMO.jl, MultivariateSeries.jl
developed

Talks

Invited plenary talks

- 03.2027 **Real Analytic Geometry (upcoming)**, Title TBD, CIRM, Marseille
- 03.2026 **Workshop on Real Applied Algebra (upcoming)**, Toric extensions of Polya's theorem, University of Copenhagen
- 6–10.10.2025 **Real Algebraic Geometry and Interactions**, Totally real divisors on curves, Université Côte d'Azur, Nice
- 16.12.2021 **POEMA Workshop**, On Moment Approximation and the Effective Putinar's Positivstellensatz, INRIA Sophia Antipolis, Nice

Invited talks in special sessions

- 09.2026 **German Mathematical Society meeting (upcoming)**, Title *TBD*, Konstanz University
- 07.2026 **Foundations of Computational Mathematics (FoCM, upcoming)**, Title *TBD*, University of Vienna
- 7.7.2025 **SIAM Conference on Applied Algebraic Geometry**, *Totally real divisors on curves*, University of Wisconsin-Madison
- 13.8.2024 **International Workshop on Operator Theory and Applications (IWOTA)**, *Truncated moment problems for genus one curves*, invited minisymposium speaker, University of Kent
- 10.7.2023 **SIAM Conference on Applied Algebraic Geometry**, *The Cone of Non-negative Forms on Genus One Curves*, Eindhoven University of Technology
- 16.6.2023 **Foundations of Computational Mathematics (FoCM)**, *Complexity in Polynomial Optimization*, Sorbonne University, Paris
- 2.6.2023 **SIAM Conference on Optimization**, *Local Algebro-Geometric Properties for Complexity Estimates in Polynomial Optimization*, Seattle
- 25.7.2022 **International Conference on Continuous Optimization (ICCOPT)**, *On Putinar's Positivstellensatz and Convergence Rates in Polynomial Optimization*, Lehigh University, Pennsylvania
- 20.8.2021 **SIAM Conference on Applied Algebraic Geometry**, *Exact Moment Representation in Polynomial Optimization*, online
Invited seminar talks
- 2.17.2026 **Séminaire systèmes dynamiques et géométrie**, *Totally real divisors on curves*, Université d'Angers
- 21.1.2026 **Seminar Algorithmische und Diskrete Mathematik**, *Toric extensions of Polya's theorem*, TU Chemnitz
- 27.2.2025 **Seminar on Nonlinear Algebra**, *The totally real divisor bound for real algebraic curves*, MPI MiS, Leipzig
- 11.7.2024 **TensorDec Lab Seminar**, *Carathéodory Numbers: a Real point of view on Nonnegative Decompositions*, Università di Trento
- 25.6.2024 **AROMATH seminar**, *Nonnegative Polynomials and Moment Problems on Algebraic Curves*, Inria Sophia Antipolis, Nice
- 18.6.2024 **Geometry seminar**, *Nonnegative Polynomials and Moment Problems on Algebraic Curves*, TU Dresden
- 8.2.2024 **Seminar on Nonlinear Algebra**, *Carathéodory numbers for measures supported on genus one curves*, MPI MiS, Leipzig
- 6.7.2023 **Oberseminar Algebra und Geometrie**, *The Effective Putinar's Positivstellensatz on the Hypercube*, TU Dortmund

- 22.6.2023 **Math Oberseminar Universität Magdeburg**, *Non-negative Polynomials on Real Plane Curves*, University of Magdeburg
- 10.6.2022 **Seminar Reelle Geometrie und Algebra**, *Convergence Rates and Flat Truncation in Lasserre's Hierarchies*, University of Konstanz
- 1.6.2022 **Seminar on Nonlinear Algebra**, *Flat Truncation in Polynomial Opt.: a Geometric and Algebraic Perspective*, MPI MiS, Leipzig
- 3.2.2022 **Joint PolSys–SpecFun Seminar**, *On Finite Convergence and Convergence Rates in Polynomial Optimization*, online
- Contributed presentations**
- 20.3.2025 **Winter school on Moments, Non-Negative Polynomials, and Algebraic Statistics**, *Open problems for the Effective Positivstellensätze*, Konstanz University
- 10.13.2024 **Summer School on Real Algebraic Geometry and Hodge Theory**, *Nonnegative polynomials on algebraic curves*, TU Dresden
- 30.7.2024 **Effective Methods in Algebraic Geometry (MEGA)**, *An Effective Positivstellensatz over the Rational Numbers for Finite Semialgebraic Sets*, MPI MiS, University of Leipzig
- 14.3.2024 **Moments and Polynomials: Applications and Theory (MoPAT-24)**, *Carathéodory numbers and flat extension for measures supported on genus one curves*, Zukunftskolleg, Konstanz University
- 20.3.2023 **New Directions in Real Algebraic Geometry**, *Non-negative forms on cubic curves*, contributed, Oberwolfach workshop
- 13.3.2023 **Real Algebraic Geometry with a View toward Koopman Operator Methods**, *Degree bounds for Putinar's Positivstellensatz on the hypercube*, Oberwolfach workshop
- 24.6.2022 **Effective Methods in Algebraic Geometry (MEGA)**, *On Lojasiewicz Inequalities and the Effective Positivstellensatz*, Pedagogical University of Krakow, Krakow
- 3.3.2021 **Journées nationales de calcul formel (JNCF)**, *Geometry of Lasserre's Truncated Moments*, online
- 20.7.2021 **International Symposium for Symbolic and Algebraic Computation (ISSAC)**, *Computing real radicals by moment opt.*, online
- 10.6.2021 **Effective Methods in Algebraic Geometry (MEGA)**, *Exact Moment Representation in Polynomial Optimization*, online
- 2–6.3.2020 **Journées nationales de calcul formel (JNCF)**, *Polynomial Optimization and Moments*, CIRM, Luminy, Marseille